

## INTRODUCTION

"In many resource-constrained communities, mobile devices are increasingly used to support essential sectors such as healthcare, education, and economic development. However, these communities often face significant challenges. Internet connectivity is often unreliable or unavailable, which complicates consistent data collection and service delivery. Additionally, there may be limited technical expertise available, making it hard for organizations to set up and maintain complex digital solutions.

Organizations working in these areas recognize these challenges and are focusing on improving services by targeting these three sectors specifically. Their goal is to implement mobile applications and data management tools that work effectively in offline or low-connectivity settings. Disconnected operation is a crucial feature for these applications, as it allows data collection and essential services to continue, even in areas where internet access is limited. By prioritizing offline functionality, organizations can help ensure that important services reach those who need them most, regardless of connectivity issues."

## PROBLEM

"Despite the widespread use of mobile phones globally, less than half of the users have reliable internet access. Existing mobile frameworks are not built to handle long periods of disconnection, which is common in underserved communities. These tools also tend to require technical expertise, making them challenging to use for organizations with limited resources. This creates a major gap: there's a need for a solution that can operate effectively offline and is easy for non-technical users. Addressing these challenges would enable better data collection and management in areas with limited connectivity, helping organizations serve these communities more effectively."

## SOLUTION

"**ODK 2.0** is a modular application framework created to address the challenges of data collection in disconnected environments. Unlike traditional mobile tools, it's designed to work offline, making it ideal for use in areas with limited or no internet access. ODK 2.0 is user-friendly and doesn't require extensive technical skills, making it accessible to organizations with limited resources. This solution enables efficient data collection and management, even in remote areas, and allows data synchronization once internet connectivity is available. Overall, ODK 2.0 empowers organizations to provide critical services in underserved communities."

### ODK 1.x

"ODK 1.x, while effective for basic data collection, has several limitations. It mainly supports linear workflows, which means it's not well-suited for complex data processes. Additionally, it uses a one-way data flow, meaning once data is collected, it can't be updated or modified, making it less useful for ongoing studies. The offline support is basic, with limited caching, so it

struggles in areas with long-term connectivity issues. Customization is also a challenge, as it requires technical expertise to adjust forms, which can be a barrier for non-technical users. Finally, security features are limited, restricting control over data access in multi-user environments."

## ODK 2.0 CORE COMPONENTS

"ODK 2.0 includes six modular components that together create a comprehensive solution for offline data collection, synchronization, and management. Each component is designed with a specific role, contributing to a complete data management system that functions well in disconnected environments. The framework is customizable, allowing organizations to adapt it to their unique needs and skill levels. ODK 2.0 also uses flexible abstractions, making it accessible for users with varying levels of technical expertise. This modularity and flexibility make ODK 2.0 ideal for organizations working in low-connectivity areas."

## CORE COMPONENTS

"This system has six core components designed to manage data effectively, even in disconnected environments:

1. **Survey** - Allows data collection through customizable forms tailored to specific needs.
2. **Tables** - Manages and displays collected data for easy access and organization.
3. **Scan** - Digitizes paper forms, turning physical information into digital data.
4. **Sensors** - Integrates data from external sensors, like environmental monitors or other hardware.
5. **Services** - Manages user permissions, synchronizes data, and handles backend tasks to keep everything in sync.
6. **Submit** - Enables data transfer across devices using different networking options for flexible connectivity.

Together, these components provide a complete solution for data collection, management, and transfer, even without constant internet access."

## DESIGN CONSIDERATION

"ODK 2.0 was designed with a focus on flexibility and resilience, especially for offline and low-resource environments. The key design principles prioritize simplicity, offline capability, and customization, making it highly adaptable. The interface is user-friendly, so even non-programmers can easily navigate and manage data. Basic, easy-to-handle data structures help reduce complexity, while the system's adaptability ensures it can function in extreme networking conditions. Overall, these design considerations aim to make ODK 2.0 accessible, reliable, and effective, even in challenging, low-connectivity settings."

"ODK 2.0 is designed with six key features to support effective data management in challenging environments:

1. **Flexibility** - Offers customizable forms, interfaces, and workflows to adapt to specific needs.
2. **Simplicity** - Uses JavaScript, making it easy for non-technical users to make modifications.
3. **Security** - Implements user and group-based permissions to protect sensitive data and control access.
4. **Offline Operation** - Works without internet for extended periods, storing data locally until a connection is available.
5. **Efficiency** - Minimizes bandwidth usage and syncs data only when a connection is established.
6. **Extensibility** - Modular design allows for adding or customizing components as requirements change.

These features make ODK 2.0 a robust, adaptable solution for data collection in low-resource settings."

## CASE STUDIES

"ODK 2.0 has been successfully used in diverse field settings worldwide, each highlighting its adaptability:

1. **Childhood Pneumonia** - Supports health workers with diagnostic workflows for better care.
2. **Chimpanzee Behavior Tracking** - Replaces paper with real-time tracking for efficient data collection.
3. **HIV Clinical Trial** - Manages patient records across multiple sites, ensuring accurate and synchronized data.
4. **Disaster Response (Red Cross)** - Tracks beneficiaries during disaster relief, helping coordinate aid effectively.
5. **Mosquito Infection Tracking** - Facilitates disease tracking across different locations for public health efforts.
6. **Tuberculosis Patient Records (Mercy Corps)** - Digitizes TB records in rural clinics, improving data accuracy and patient tracking.

These examples demonstrate how ODK 2.0 adapts to specific needs, from healthcare to wildlife monitoring and disaster response, proving its versatility in various sectors."

## CHALLENGES & FUTURE IMPROVEMENTS

"While ODK 2.0 is effective, it faces several challenges. One issue is **handling frequent changes** in data models, especially in dynamic field environments where needs evolve rapidly. Another

challenge is **balancing scalability with limited infrastructure**, which can impact performance in resource-constrained settings. The **data model flexibility** can be difficult to maintain with frequent updates, and **long-term storage and analysis** are limited by row-based storage, which simplifies analysis but isn't ideal for high-frequency updates.

Future improvements could focus on better managing data model updates to enhance adaptability, making ODK 2.0 even more versatile in changing environments."