

Factors for successful adaptation of handheld digital devices for health systems in low-income countries - Empirical review of eight projects from Asia and Africa

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Background

With recent technological advancements, there is growing interest in using handheld digital devices (HDD), such as smart phones and personal digital assistants, for global health projects in low-income countries. Applications of these devices include field data collection, disease surveillance, and diagnostic algorithms for case management. We conducted an empirical review of eight global health projects that used HDDs in low-income countries to identify and distill major factors that enhance the success of such applications. The findings will inform projects that are considering application of HDD. This research was conducted as part of a landscape analysis for the Optimize: Immunization Systems and Technologies for Tomorrow—a WHO-PATH collaborative project funded with grant from the Bill & Melinda Gates Foundation.

Objectives

- Identify applications of HDD in global health projects in low-income countries.
- Identify factors that influence successful application of HDD in low-income countries.

Methodology

We identified 33 projects that used HDD in low-income countries between 2001 and 2008 through interview searches and literature reviews. Eight projects were selected for review to provide diversity in project purpose, specific purpose of HDD, and geographical region. We reviewed each project in terms of funding agency, types of hardware, operating system and system architecture, costs, challenges of implementation, and outcomes. Additionally, we conducted key informant interviews with four experts in application of HDD for health care projects in low-income countries.

Key findings

- 1) Hardware Characteristics – cell phone, Personal Digital Assistant (PDA), smart phones

Characteristics	Low	High
Price	Cell phone	Smart phone
Computing capability	Cell phone	Smart phone
Networking capability	PDA	Smart phone
Visual display capability	Cell phone	Smart phone
Existing user base in low-income countries	Smart phone	Cell phone

- 2) There is no one HDD choice that fits all project needs.

Key findings (continued)

- 3) The HDD market is converging rapidly.
Cell phone capabilities are increasing and will likely have similar functional capabilities to current smart phones. Similarly, smart phones will continue to increase processing and connectivity capabilities at an accelerated rate.
- 4) Local language and level of literacy influence hardware selection and software development.
Certain language types can be more challenging than others: non-Latin languages pose challenges in terms of complex glyphs, keys, translation, and screen breaks. Software and interface development can be more challenging for programs with device-users who are semi-literate. Technologies such as iconic interfaces and voice-based interfaces can offer solutions.
- 5) Infrastructure problems could impede adaptation of technologies.
- 6) Deep collaboration with stakeholders is necessary.
Deep collaboration will produce an understanding of stakeholders that would include their level and areas of expertise, help to identify any confidence/competence gap, and enable the system to interact at an appropriate level for users' actual capabilities.
- 7) Brief, widely spaced consultation with political stakeholders is inadequate to ensure project adaptation and sustainability.

Recommendations

Collaborate deeply and continually with stakeholders:

- Deep collaboration with direct stakeholders (people using the system) could help prevent threats to short-term project sustainability.
- Continual, persistent collaboration with indirect stakeholders (people affected by the system) can help support longer term sustainability.

Select technology based on program, environment, and infrastructure. Consider questions such as:

- Where will the device be used?
- How will information be shared and stored?
- How will devices be charged?
- What environmental factors could damage the device?
- What interface would be most comfortable for users and appropriate for the information?
- What are the motivations, goals, and loyalties of direct stakeholders? What levels of trust are most appropriate?
- How can the device support health workers?

Design for long-term sustainability:

- Design a flexible system in which users can “finish the design” by selecting from a number of different ways to achieve their tasks.

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