KEY CONSIDERATIONS: Solution Design & Testing

THESE FACTORS TO CONSIDER WILL HELP DEVELOPERS AND HEALTH PROGRAM IMPLEMENTERS DESIGN AND TEST THE TECHNOLOGY SPECIFICATIONS AND CONTENT FOR THE MHEALTH SOLUTION.

TECHNOLOGY DECISIONS

CORE FUNCTIONALITY

Describe the core functions that the technology needs to perform, focusing on the experience of the end user.

- Describe the user journey, from beginning to end. What is the user expected to do? What is the technology expected to do?

- What communication format will be used (for example, short message service (SMS), multimedia messaging service (MMS), interactive voice response (IVR), video, voice, survey, forms, web, general packet radio service (GPRS))? Confirm that the format aligns with your formative research results, and is practical given the context of the program setting.

- How will the user access the program? For example, does the user have to opt in to use the service, is it pre-loaded on the mobile device, or does it need to be downloaded?

- Will the application involve one-way communication or two-way interaction between the program and the end user?

- How often does the mHealth program interact with the user, and vice versa (daily, weekly, or monthly)?

- In which languages will the program be available?

- If a user wishes to discontinue the program, how will the user disable the application?

- What will a user do if he or she needs help? Will there be a customer service line or a point person to help with questions?

DATA ANALYTICS, STORAGE, & AVAILABILITY

Mobile platforms have the capability to collect and store data, often in real time, which is unprecedented data functionality for the public health field. When designing an mHealth program, one must think through the data needs of the program and further understand if and how a mobile platform could collect that information. Some key considerations include:

- What are the key performance indicators for the project, and how will the program measure success? How can user data be used to report on the key performance indicators? Refer to the Logic Model and Data Collection, Monitoring & Evaluation pages for more information.

- What are the standard reports that you want the program to generate?

- At what interval does data need to be available (real time, weekly, monthly), and to whom? Consider how will the data be transmitted, and whether there needs to be a back-up plan.

- How will data be stored and accessed? What are the hosting options? Consider whether web-enabled databases are appropriate (for example, with data sets available to researchers via a login).

- What volume of records will need to be stored? How will data be backed up?

- In what format will the data be available? Consider a format that facilitates analysis, and consult with researchers if necessary to determine the appropriate format.

- Will the program need a data dashboard? If so, who is the audience, and what are the specifications?
**KEY CONSIDERATIONS: Solution Design & Testing**

These factors to consider will help developers and health program implementers design and test the technology specifications and content for the mHealth solution.

### Technology Decisions

- How will data needs change over time, especially if the program is intended to reach significant scale?
- Who owns the data generated by the mobile application?
- How will the data be managed? Who will be responsible for managing the data? Refer to [Project Management](#) for more information.

### Security, Hosting, & Privacy

Data—especially health information about patients—must be handled with care to protect human rights and personal safety. Data security, hosting, and privacy are serious issues to grapple with. Consider how to find and maintain robust and secure hosting. Patient privacy laws vary by country and will likely affect your data collection plans and systems. To understand mHealth privacy and legal issues, get in touch with mHealth experts who can help (see [Networks](#) under Resources). For more guidance, refer to the mHealth Alliance’s June 2013 report titled, *Patient Privacy in a Mobile World: A Framework to Address Privacy Law Issues in Mobile Health*.

### Mobile Delivery Platform

A service delivery platform is a set of components that enable a service to be deployed and integrated with the mobile telecommunications network. Essentially, it is what allows a service to operate. Based on your technology requirements, you will need to identify which platform best suits your technology needs and organizational capacity. Note that there are existing platforms available, such as CommCare, DataDyne, DataWinners, FrontlineSMS, and RapidSMS. Some are open source downloads which may or may not require programming to fit your needs; others are online services with limited customization capabilities. After reviewing available solutions, you might determine that you need a customized platform to be built to meet your specific requirements. Example exploratory questions include:

- What existing open source tools can be used, if any? Consider the pros and cons of each option, mapping your technology requirements to the capabilities of the platforms. Also understand the programming needs, the level of ongoing support available for each option, and the costs.
- Identify how the technology will be enabled in the mobile telecom environment. Will it work across different mobile network operators (MNOs)? What partnerships need to be developed to activate the service (for example, partnerships with aggregators, MNOs, mobile gateway providers)?
- Consider how the platform will be able to adapt to changes and advances in technology.
- Based on the platform, will the project need new or additional computers or a server to run the program?
- Consider issues around interoperability and licensing. Both topics are addressed in more detail below.

Table 4.1 of the *Planning an Information Systems Project: A Toolkit for Public Health Managers* provides a detailed breakdown of the benefits and risks of working with different software models. Some of these questions were also posed for the [Landscape Analysis](#).

### Monitoring & Maintenance

How will the technology be monitored and maintained over time? What kind of capacity will keep technology functioning as expected, and systems updated appropriately? (See [Capacity Needs](#), as well as the [Project Management](#) and [Partnership Development](#) pages).
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TECHNOLOGY DECISIONS

USER CONSIDERATIONS—HARDWARE, EQUIPMENT, & POWER, AND CONNECTIVITY NEEDS

In addition to getting an effective platform in place, you will need to think through other elements that affect the user’s ability to use the technology reliably and consistently. These considerations include hardware, connectivity, and power needs. For example:

- Will the project purchase phones for the end users? How much lead time is needed to order the phones? Where will the phones be stored before they are handed out? Will the phones need to be charged before they are distributed, and if so, how will this happen? If you have bulk inventory, do you need to purchase charging hardware?

- Do the end users have access to electricity to recharge their phones? If not, will the program provide access to charging stations? If solar chargers are used, will that conflict with the time when they need to be used?

- Will network service be available consistently in the local environment of the end user? How fast is the network?

- Will end users need training on the phones? What time and resources will be needed for end user training?

- What other hardware does the program need to operate? Think about modems, subscriber identity module (SIM) cards, access to Internet, and more.

- Consider whether a maintenance plan for the mobile devices used for the project is needed. How will broken phones be fixed or replaced?

- Consider developing a policy for lost or misplaced phones. For example, would the user have to pay for the replacement?

These considerations should be informed by findings from the Landscape Analysis and interviews with the Target Population.

ENABLING ENVIRONMENT—TELECOM REGULATIONS, NATIONAL POLICIES, & INTEROPERABILITY

When developing the technology scope, re-consider questions asked during the Landscape Analysis to ensure that you staying current. The technology environment can shift in a matter of weeks or months. Refer to publications by your country’s telecom regulatory authority, and gather insights from industry insiders by researching for new article and publications, and subscribing to and connecting to others on listservs. Also, speak with ministry officials and the members of the mHealth community. Some considerations include:

- Explore current mobile industry regulations, policies, and upcoming changes. Do any pose a challenge or advantage to the proposed mHealth solution?

- What are the national policies regarding mHealth, if any, where the solution will be implemented? Are there discussions underway to develop a national mHealth plan, if there is not one?

- How might existing or developing policies present challenges or advantages to the project?
  - If the government is planning for or has established interoperability of systems, explore their system specifications and considerations for integration.
  - Are there relevant national policies or regulations regarding the collection, use, and storage of patient health data? If so, is this work in compliance?
**KEY CONSIDERATIONS: Solution Design & Testing**

**TECHNOLOGY DECISIONS**

- Will the solution need to link to an existing health management information system (HMIS), and what do you need to know to make that happen? How will the mHealth solution work with existing technology and infrastructure in the country of operation? Is it a possibility that it may need to link to these kinds of systems in the future?

Key resources to consult include the mHealth Alliance’s report *The State of Standards and Interoperability for mHealth among Low- and Middle-Income Countries* and the World Health Organization’s resource *National eHealth Strategy Toolkit*.

**SCALABILITY**

Most likely, your mHealth technology will be created or customized to handle a particular volume of users at the outset of your project, with the intention that the technology will be built out further as the user volume increases. The way the technology is originally set up can have major implications for scalability.

- What volume of users is expected in the short and long term?
- What is the expected volume of message or information transmission over time?
- Where may the program be scaled over time?

Ensure that the mobile delivery platform can operate at scale or can be adapted to do so. Refer to *Scale-up* for more information regarding scale up processes.

**SUSTAINABILITY**

Sustainability—how the program will be financed to operate over time—deserves consideration during the design phase. Often mHealth programs stall after a pilot phase because financial resources cannot be secured. Consider:

- What is the financial plan for sustaining operations of the mHealth solution over time?
- What donors are funding mHealth deployments? What are their funding levels? What are their application requirements and funding cycles?
- If you plan to integrate advertising or mobile payments into the solution, what are the technology implications to consider during the design phase?

Visit the *Sustainability* page of the Guide for more information on this topic.

**LICENSING**

Software licensing models exist to establish who owns the software, who has the right to modify the software, and the fees associated with using the software (for example, per installation or per license).

Open source software is a favorable model in the mHealth community. Open source software allows programmers to change and adapt software without needing the permission of the original software developers. Over time, the software evolves and improves as a result of collaborative work among multiple parties.

Consider:

- If you develop new software, how will you license your software?
- If you are using existing software, what is that software's licensing model? What impacts will this model have on your ability to adapt the code and sustain operations in the future?
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TECHNOLOGY DECISIONS

CAPACITY

Should you develop the mHealth solution in-house—or find a technology firm or expert to help? When it comes to mHealth technology design and development, some organizations choose to work with an external technology partner, while others are able to handle development in-house. Consider these points when making your decision.

- **If developing the technology internally**—Some organizations decide to invest time and resources to develop the staff capacity to develop and deploy mHealth solutions. Often an organization sees this investment as a strategic opportunity to expand on its core competencies. If your organization needs to strengthen its technology capacity, some options include: hiring staff with appropriate technology experience, funding professional development for current staff, or hiring a short-term consultant to train existing staff.

- **If working with local developers**—Technology capacity varies by country. You might be able to find a small team of local developers willing to take on the work for a reasonable price, but ensure that they can comply with your scalability and interoperability specifications.

- **If working with a global technology partner**—Some technology partners have a multi-country presence, which is appealing for projects that are intended to expand to multiple countries.

A common way to solicit possible vendors is through a competitive bidding process, through which your organization would develop and post a request for proposals (RFP). Tech Soup provides [detailed guidance on the RFP process](http://www.techsoup.org), including sample RFPs and tips on vendor management.

COSTS

While planning the design of the technology, be aware of the wide range of costs associated with developing, deploying, and maintaining an mHealth solution. Some are one-time costs, while others must be budgeted annually (or at other regular intervals). This list covers the key costs only (research and implementation cost considerations are noted elsewhere):

- **Programming costs**—staff time (for technical input and training), developer time
- **Hardware**—phones, servers, computers, electric chargers, solar chargers
- **Deployment costs**—renting a [short code](http://example.com) or [virtual number](http://example.com), hosting, web access
- **Service costs**—cost of sending messages, transmitting data; ongoing monitoring and maintenance (planned to meet the evolving scale of your program)
KEY CONSIDERATIONS: Solution Design & Testing

These factors to consider will help developers and health program implementers design and test the technology specifications and content for the mHealth solution.

CONCEPT DEVELOPMENT & TESTING

DRAFTING THE CONTENT

Consider the following details, informed by preferences and abilities of the target audience, as you develop your draft content. Depending on the type of mHealth solution you have in mind, these might not all be applicable.

- Language—Which language should be used? What language is used when texting? Is there a particular script or alphabet that is used (for example, Hindi, Arabic, Roman characters?).
- Vocabulary and phrasing—What typical words or phrases does the target audience use to talk about the health issue?
- Length—How long should each message or screen be, considering ease-of-use and attention span?
- Frequency—How often should messages or content be sent or received, considering user preferences for receiving and sharing information?
- Tone—Given the message content, what tone would resonate most with the end users? For example, is an informal, colloquial tone or professional, technical tone more appropriate?
- Messenger—Does the messenger matter? How does the source, or perceived source, influence a user’s reaction to the content? For example, receiving a message from a doctor could be perceived differently than receiving a message from a friend.
- Accuracy—Is the content medically accurate according to the country’s technical guidelines and global standards? Can you adapt content from existing libraries, or local or global resources and guidelines (see resources below)? Have you vetted the content with technical experts in the field?
- Consistency—If the mHealth solution is part of a multi-channel campaign, are the messages consistent and complementary across the program?

TESTING THE CONTENT

Content testing with members of the target population is critical to solution development. Test the content to ensure it is comprehensible, appropriate, accessible, and effective for the intended users. You do not have to test the content with a large sample size—in fact, start out by interviewing 5–10 individuals, make changes based on feedback, and repeat the process until it is evident that the content is clear and effective. Here are tips for the content testing phase:

- Test all of the messages or content, one section at a time, in the intended sequence and format. It is ideal if the content can be tested in the anticipated delivery format, such as voice or SMS, to accurately reflect the user experience.
- Ask a number of probing questions to assess the user’s ability to understand, remember, and/or react to the message, video, survey prompt, etc. If appropriate, ask, “What is this message asking you to do?” to capture comprehension. Consider using a “think aloud” approach, during which you ask participants to narrate what they are thinking when they see the content.
- Observe the participant’s verbal and non-verbal cues, noting moments of confusion or pause as well as ease.
- Ask the user how easy or difficult they find the messages.
- Explore reactions to, and preferences for, content length, tone, frequency, and the messenger.
- Ask for suggestions for word choice, keywords, or visuals for multimedia messages.
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PROTOTYPING & USABILITY TESTING

- Does the solution function as intended? What does or does not work well?
- What do end users like and dislike about the solution? What could be improved, and how?
- Are end users interacting with the technology as expected?
- Do end users understand the content? Do they have preferences for when and how often to be contacted?
- Is the technology platform easy to use for project administrators? What do they like or dislike about the administrative user interface? What improvements can be made?
- Is data collected as intended, in the correct format?
- What are anticipated barriers to correct use based on observation and user testimonies? (For example, if the end user shares her phone with another family member, she may not receive the messages intended for her; or if a community health worker’s phone runs out of battery while he is in the field and he cannot collect data on his phone as planned.) What can be done to overcome these barriers?