

Understanding Total Cost of Ownership for Digital Health

A Budgetary Reference Document on Digital Supply Chain Systems for Investors, Governments, and Implementers

Successful digital health interventions (DHIs) are enabled by a number of factors: alignment with national digital strategies, sustained political commitment and leadership, active participation of stakeholders, and the adoption of a detailed implementation plan.

From a financial perspective, however, long-term success has one underlying requirement: the alignment of revenue and expenditures over the lifecycle of the intervention. This alignment can only be attained when all costs of an intervention are understood and documented. Too often, governments, investors, and implementers working in low resource settings have lacked visibility to this information.

It is especially critical for governments to understand the totality of costs to implement and sustain a DHI. Even when outside resources are available to fund its development and deployment, government resources, both human and capital, are needed to sustain it over the long term. This Total Cost of Ownership (TCO) analysis will help government leaders, and their implementing partners and investors, understand what costs to include in a five-year budget, common cost variances, hidden costs, and key questions to ask when budgeting for a DHI. The TCO analysis was based on digital supply chain systems but the cost categories and variances that are described are relevant to many different DHIs.

After reading the document, you will know:

- ▶ 1. What costs should you include in a five-year TCO budget?
- ▶ 2. What cost variances will impact your implementation?
- ▶ 3. What hidden costs should you look for in a budget?
- ▶ 4. What key questions should you ask when developing and vetting a DHI budget?

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What costs should you include in a five-year TCO budget?

While every implementation is different, your DHI entails the same types of activities and resources across its implementation lifecycle. These costs are organized into four phases of your DHI's lifecycle and split into common cost categories. Operations phase costs are substantial and often overlooked.

- ▶ **PHASE I (PLANNING & DEVELOPMENT)**
Planning and development costs include the activities and resources for project management, needs assessment and system requirements specifications, and initial software development. While investors and implementers generally provide the resources and activities for this phase, government input on the context for implementation and its direction is critical to ensure the DHI is built to support strategic digital health objectives and can be operated long-term by government resources. Software development and project management may constitute the largest costs for this phase.
- ▶ **PHASE II (DEPLOYMENT)**
Deployment costs include the activities and resources for the initial deployment phase, defined as the time period for the initial DHI investment (e.g., a three-year donor investment cycle). Governments will actively plan the deployment with donors and implementing partners to define the geographical location, number of health facilities, and target population that can be reached in the initial deployment period and metrics to measure prior to scaling up. New deployment training and infrastructure to support new deployments may be the biggest costs for this phase.
- ▶ **PHASE III (SCALING)**
Scaling costs are associated with expanding your DHI across a wider geographic area, number of facilities, or number of end users than originally planned for the deployment phase. These activities are often a blend of deployment activities and operations activities (e.g., helpdesk support, maintenance and testing), as the DHI transitions from a new deployment to active operations. While economies of scale and incremental improvements may be achieved across most cost categories, equipment costs often dominate the cost of scaling.
- ▶ **PHASE IV (OPERATIONS)**
Operations cost categories are associated with ongoing operations. They will include the human resources needed to manage and operate a DHI, as well as regular maintenance and replacement costs incurred every year to keep it running. The largest costs for long term operations include recurrent training, monitoring & evaluation, and ongoing governance.

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What cost variances will impact your implementation?

Costs of a digital health intervention will vary depending on your context. Understanding the ways in which costs can vary will help you estimate and influence costs over time. These key drivers of variance include:

▶ MARKET MATURITY

Your country's digital health market maturity is determined by the availability of required infrastructure, local ICT capacity and skills, and the extent of a supportive policy environment.

Cost Driver: Making dedicated government resources available for the implementation, including ICT and monitoring and evaluation staff, decreases implementation reliance on foreign vendors and decreases labor costs in addition to establishing institutional know-how for long-term operations.

▶ SCALE

The planned scale of your implementation is the number of deployments within your health ecosystem (facilities, end users).

Cost Driver: Your total hardware and human resource costs will increase with the scale of deployment. Costs per deployment will generally decrease as economies of scale are achieved; however, scaling to harder-to-reach facilities or locations with language or cultural differences, or variable workflows can introduce new requirements and additional software development costs.

▶ SERVER HOSTING

The location and provider for the infrastructure within which your system's central software resides (e.g., national data center, international distributed cloud).

Cost Driver: Locally hosting your DHI will increase initial procurement costs for required equipment and human resources to operate and manage your hosting environment. Cloud hosting entry costs are minimal compared to establishing a national data center or other, robust hosting environment, and increase incrementally as your system scales. If your country possesses a low market maturity you may be reliant on cloud-hosting in the absence of a national data center or other local hosting provider.

▶ SHARED RESOURCES

The equipment, infrastructure, and human resources in your health ecosystem are shared resources that may be available for your DHI.

Cost Driver: Costs will decrease if existing equipment, infrastructure, or labor can be leveraged.

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What hidden costs should you look for in a budget?

The TCO analysis identified five DHI cost categories that are commonly omitted or inaccurately budgeted. You will want to ensure that these costs are discussed and rigorously documented to ensure they are well understood, transparent, and included in project budgets.

▶ PROJECT MANAGEMENT

Organizational costs for human resources, travel, and other direct and indirect overhead costs (ranging from 7% to 11% of the TCO for implementations analyzed).

▶ EQUIPMENT REPLACEMENT

Annual costs to replace defunct infrastructure and equipment (typical 15% to 30% of capital costs).

▶ DATA AND VOICE

Annual costs for mobile data, voice, and SMS required to operate the DHI. The maximum total cost for these services in implementations evaluated was just over 7% of TCO.

▶ GOVERNANCE

Costs for labor, travel, and overhead required to comply with government health strategies and policies. Effective governance can consume as much as 8% of TCO, and is critical to ensure long-term operations.

▶ SCALING

Costs that are often underestimated or omitted in initial project budgets include the costs to adapt the solution when scaling to new geographies or address issues encountered during the initial deployment phase. For one implementation evaluated, scaling costs were more than double the cost for another implementation that used a more mature desktop solution due to the increased software development effort required for iteration on the solution after its initial deployment.

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What key questions should you ask when developing and vetting a DHI budget?

INVESTORS

▶ PHASE I (PLANNING & DEVELOPMENT)

1. How large is the consortium of implementation partners?
2. Are multiple partners involved in the same activities or are responsibilities clearly divided?
3. Will early-stage investment contribute improvements to open-source software that can be used by others?

▶ PHASE II (DEPLOYMENT)

1. Is a cost-effective training delivery model employed?
2. What other opportunities exist to procure equipment and infrastructure (e.g., in-kind-donations)?
3. Are the right technology and implementing partners engaged to ensure local skills transfer?

▶ PHASE III (SCALING)

1. Is future scale considered or planned beyond the initial funding term?
2. What other funders have been identified to support scaling activities?
3. Is the government able to fund scaled operations long term?

▶ PHASE IV (OPERATIONS)

1. Are shared resources utilized to drive down recurrent hardware, infrastructure, and data costs?
2. Are long-term operational roles filled by capable government resources?
3. What other sources have been identified for long-term operations funding?
4. Are there mechanisms that exist to pool investor resources into shared digital assets?

GOVERNMENT OFFICIALS

▶ PHASE I (PLANNING & DEVELOPMENT)

1. Are you involved in planning and development processes to ensure optimal use of available government resources?
2. Are costs transparent across all partners, including in-kind contributions by government?
3. Are you involved in the final signoff process and approval of project plans and budgets?

▶ PHASE II (DEPLOYMENT)

1. What degree of training will be required, given the digital literacy of your end users?
2. Are any of your resources at health facilities being shared?
3. Is sufficient time allocated for training your health facility workers and management staff?

▶ PHASE III (SCALING)

1. Is the DHI servicing remote locations? If so, how will remote geographies with significant infrastructure limitations be addressed?
2. What new infrastructure, equipment, and human resources will you need to sustain for years to come?
3. Are you able to scale the technology with limited partner participation?

▶ PHASE IV (OPERATIONS)

1. Do you and your staff have sufficient visibility into the budgeting process and have the partners shared relevant operational expenditures, including labor and capital costs?
2. Is there planned ICT capacity building included throughout the implementation, and is it sufficiently funded?
3. Is a comprehensive recurrent training program included and adequately budgeted, and what resources will you contribute to deliver it?

IMPLEMENTERS

▶ PHASE I (PLANNING & DEVELOPMENT)

1. Is there adequate time built into Phase I activities to enhance the software without taking shortcuts?
2. Has the cost of change management been quantified separately from training?
3. Will investments in a local office increase the pool of skilled ICT resources available to support this implementation long term?

▶ PHASE II (DEPLOYMENT)

1. Are all health system resources that could be shared factored into the budget?
2. With which existing systems will this DHI need to integrate and is required data easily accessible?
3. Has sufficient time been allocated to iterative software development to address early issues?

▶ PHASE III (SCALING)

1. What infrastructure, equipment, and human resources are available in geographies targeted for scaling?
2. What partner organizations will be engaged for future scale?
3. What lessons learned from initial deployment can provide efficiencies for scaling new deployments?

▶ PHASE IV (OPERATIONS)

1. Are there government counterparts dedicated to project management, governance, and M&E, or must the implementation fund these resources?
2. What is the optimal training model to support both rapid deployment and lower-cost, long-term recurrent trainings?
3. What cost savings can be obtained through use of shared resources?

Understanding DHI budget cost categories, variances impacting your implementation, awareness of common hidden costs, and key questions you should answer provides a reference for practical discussions and planning among stakeholders. Furthermore, this knowledge of TCO is key to understanding all of the resources, both capital and human, your implementation will incur over the life of the DHI. Finally, it helps you understand the financing required to not only cover startup costs but long-term operational expenses, increasing your digital health intervention's scale, sustainability, and success.

This TCO reference document is part of a larger body of work conducted by Digital Square, Vital Wave, and a consortium of partners to understand market forces in digital health in low-resource settings.

To learn more, please visit:
<https://digitalsquare.org/market-analytics>

