

# Budget Considerations for Smartphone Based Mobile Learning for Health Workers

April 2017



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## Introduction

The potential impact of mobile technologies for international development is very significant<sup>1</sup>. Many organisations are now including digital and mobile components to their programs; however they may have limited knowledge and experience in the implementation costs of mobile health and areas for budgeting. This is a discussion of the budget considerations for smartphone based mobile learning initiatives. The paper is based mainly on the experiences of Digital Campus and Jhpiego who used OppiaMobile (an android content delivery application) to deliver rich learning content to Health Extension Workers (HEWs) in Ethiopia, funded by DFID's UK Aid Direct programme. The discussion below also reflects experiences of OppiaMobile implementations in India, Pakistan, Nigeria and Zambia.

Although this document has been primarily based on implementing a mobile learning project in Ethiopia, it is expected that similar types of implementations in other countries, or within Ethiopia for different training content, would have very similar budget considerations.

## Methodology and Scope

The budget areas are primarily based on the areas of expenditure from the UK Aid Direct project budget, and have been divided into 4 key areas: Technical, Content, Training and Monitoring & Evaluation. Indicative costs have not been included, since each project and country implementation may vary significantly depending on:

- The number of health workers involved
- Implementation design - for example how technical support is provided
- Country or regional capacity for providing support and management
- How it is linked to other mobile health initiatives

Budget areas and factors/considerations that have been included are:

- Factors on the project design and different potential approaches for replication and scale-up in each cost area, since these will be critical in determining future budgets.
- Factors that would help build in-country capacity in taking ownership of and maintaining the implementation.

Budget factors not included are:

- Management, finance and admin costs as these will be dependent on the implementing organisation(s) and donor requirements.

This document should assist organisations to determine all the factors that contribute to the 'total cost of ownership' (TCO) of implementing or including mobile learning in their programs. The Total Cost of Ownership Model from Dimagi<sup>2</sup> can also help with this, although it should be noted that the Dimagi TCO model does not cover content adaptation/development.

1DFID Review of Digital in Development Programmes, published February 2015, accessed 19 Sept 2016 - [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/417521/Review-Digital-Programmes-Feb2015.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/417521/Review-Digital-Programmes-Feb2015.pdf)

2Dimagi Total Cost of Ownership Model - <http://sites.dimagi.com/totalcostownership>

Finally, this document is not designed to be a cost benefit analysis of using mobile learning tools vs classroom/face-to-face training, since it is not comparing like for like and too many variables would need to be accounted for. A more comprehensive research methodology and design would be needed for such analysis.

## Technical

This section discusses the software and hardware costs associated with mobile learning for health workers. It may also be applied to other mobile health initiatives, or mobile learning for other areas (such as education or agriculture).

Technical (software and hardware) cost considerations, especially for mobile, tend to be where organisations have the most limited experience. Although it may be straightforward to determine what a smartphone may cost in a particular country, there are many other factors to consider when budgeting and determining the TCO for a mobile learning initiative.

The table below sets out the budget areas and considerations in some detail.

Budget area	Factors/Considerations
Initial technical development & set-up	<ul style="list-style-type: none"> <li>● The core OppiaMobile platform is now well developed and documented. Any future project would need minimal technical development to get up and running, as it will essentially be building on the initial investment made in the UK Aid Direct project.</li> <li>● All technologies require continual development to stay up to date (discussed below).</li> <li>● Using a common open source platform for many projects, even in different countries, allows all implementations to commonly benefit from new features, bug fixes and performance improvements.</li> <li>● Apps built specifically for one project, using custom code will be much more expensive to develop, maintain and sustain, compared with implementations based from a common platform<sup>3</sup>.</li> </ul>
Ongoing technical development, support and maintenance	<p>All technical systems require ongoing development, support and maintenance, yet the costs of this are often overlooked.</p> <p>Examples:</p> <ul style="list-style-type: none"> <li>● Running and maintaining a server, hosting costs and server admin.</li> <li>● Devices may need support, as field workers may not be able to solve all the problems and need higher level technical support and advice to fix.</li> <li>● Technical systems are never 'finished' - requirements from the system may change, and keeping with the current versions of the technical platforms used by OppiaMobile (Android and Django frameworks) requires ongoing technical support and maintenance by software engineers.</li> </ul> <p>A future project would look closer at building local capacity in technical support and maintenance, although in many countries the local technical and programming capacity/experience (and especially within health ministries and regional health bureaus) may be very low and will require long term training and investment.</p>
Devices and Warranty	<ul style="list-style-type: none"> <li>● Often cited as a key cost barrier, initial costs for devices are not likely to be a highly substantial proportion of a total budget - even assuming</li> </ul>

	<p>individual devices are purchased by the project for each health worker (and costs should in any event be compared with the alternatives, such as printing and distributing training manuals).</p> <ul style="list-style-type: none"> <li>● Smartphone and tablet costs are coming down rapidly leading to ownership becoming much more widespread, although costs vary significantly from country to country. Bulk purchasing of devices will also help to get better value for money.</li> <li>● Consideration needs to be given to whether smartphone or tablet devices are more appropriate. Smartphones are easier to carry around and this leads to better security for the devices.</li> <li>● Cost should not be the only factor when purchasing devices, quality and warranty/support should also be considered carefully. Using better quality devices with warranty is likely to be cheaper in the long run.</li> <li>● Device loss or breakage should also be considered - evidence from this project show this can be minimised with strong device ownership.</li> <li>● Replacement costs - as with all technologies, the devices will have a lifespan and so will need to be replaced at some point, so budgeting should include replacements based on expected lifespan of devices. Paper training manuals similarly have a lifespan and also more costly to update.</li> </ul>
Device ownership	<p>The UK Aid Direct project purchased smartphones for each of the HEWs and teachers. This allowed each beneficiary to have their own device, which they could keep with them all the time. The devices were also unlocked, allowing users to install their own apps, access the internet, social media etc. This combination meant the devices were quickly recognised as being valuable and empowering, ensuring the devices were well looked after and maintained.</p> <p>Alternative approaches to a project purchasing devices for each health worker are:</p> <ol style="list-style-type: none"> <li>1. Subsidized purchases - give the health worker a voucher towards the cost of purchasing a device for themselves</li> <li>2. Using devices owned by the health workers, naturally this will only work if they already own Android phones, and it may be some years before smartphone ownership by HEWs could be assumed;</li> <li>3. Use a 'shared device' model, where a group of health workers share a device. This reduces the advantages of the HEW having the content with her all the time, and usage of the content by each health worker is likely to be significantly lower. This would also raise issues on who is responsible for maintaining the device.</li> <li>4. Ministry or regional government might be willing to purchase devices for their health workers <sup>4</sup>.</li> </ol>
Peripherals	<ul style="list-style-type: none"> <li>● Protective cases and replacement batteries costs should also be factored into the device purchase.</li> <li>● SD cards - if devices are being provided, then they may also need sd cards if the device does not have large memory</li> <li>● SIM cards - if the devices are being provided in addition to basic phones health workers may already own, then SIM cards may need to be provided</li> </ul>
Connectivity & Internet access	<p>The OppiaMobile platform is designed for low bandwidth/connectivity environments, so can cope with very limited/ erratic internet connectivity. 1 GBP</p>

<sup>4</sup>Example from the Ethiopian Ministry of Health bulk purchasing Android tablet devices - "Ministry donates 20,000 tablets to medical schools": <http://www.ena.gov.et/en/index.php/social/item/1456-ministry-donates-20-000-tablets-to-medical-schools> - however it should be noted that this does not include ongoing support, maintenance, replacement or other costs.

	per month per health worker, would be more than sufficient to cover mobile data connection for each HEW. During the period when the HEWs were in the training centre, a wifi connection was made available by the college, this helped reduce mobile data top-up costs. The HEWs quickly became aware of how useful the devices were to them (both in their professional and personal lives) and so were willing to add their own mobile top-ups to have additional internet connectivity.
Power access	Smartphones require more regular charging than lower end phones. About 50% of HEWs we worked with had significant problems with power/electricity access, due to the rural locations, so solar lamp/chargers were provided to these HEWs for recharging the phones.

Technical development and maintenance was carried out by experienced in-house software engineers. Local developer teams without extensive experience in the technologies would require significant support and training time, and would be highly dependent on their previous experience and motivation to learn. Dedicated software houses may have the experience, although they may charge similar to consultant level daily rates as in EU/US.

## Content Development and Adaptation

The UK Aid Direct project worked with the existing Level 4 upgrade HEW training program that is approved by the FMoH. The goal is for all 35,000+ HEWs in Ethiopia to take this program, and is one of three training programs approved by the FMoH that all HEWs will take.

Budget area	Factors/Considerations
Content adaptation	<p>The HEW Level 4 content is now adapted in full for use on mobiles. It can be re-used by all HEWs in Ethiopia as well as health workers in other countries.</p> <p>Other print-based training packages could also be adapted and run on the same platform with minimal technical/programmer development time required.</p> <p>For other training packages to be mobile optimised, the cost will depend (and vary significantly) on the following:</p> <ul style="list-style-type: none"> <li>● The format and quality of the current content</li> <li>● How the content will be integrated into existing face-to-face teaching - for example, whether all the content be adapted, or just supplemental content for a mobile component</li> </ul>

<p>Content development</p>	<p>Developing new training packages can be expensive and time consuming, whether designed for mobile or traditional print &amp; classroom based.</p> <p>In developing new training packages, consideration should be given to how the content is linked to (and adapted from) existing national/ministry approved programmes as these trainings will have far more potential for scale.</p> <p>To help reduce costs for creating new courses, there are already many high quality mobile ready resources openly available (for example, on the mPowering ORB platform<sup>5</sup>) that can be integrated and structured into new courses. Especially for video content, this can help to significantly reduce costs by reusing existing content.</p> <p>Openly licensed (Creative Commons<sup>6</sup> or public domain) content ought to be used where possible, as this then allows further reuse and adaptation.</p>
<p>Content updating/ revision</p>	<p>As with technical development, any training content also needs to be regularly reviewed and updated to make sure it fits with current Ministry of Health policies and priorities, as well as current medical best practice or to incorporate updates related to disease outbreaks (such as recent situations with Ebola and Zika)</p>

## Training and Support

In the UK Aid Direct project, all the health workers involved were paid staff of the Ethiopian health system workforce and had all been selected by the regional health bureau to receive the Level 4 upgrade training program at the training college. This meant that all the health workers were already physically located at the college for a full year, having a project officer based in the college enabled more responsive and cost-effective support and training than would have been possible had the health workers been located at their rural health posts. Most of the costs for training and support were therefore in staff time, and one full time project officer was sufficient to provide support for all 160 HEWs.

Budget area	Factors/Considerations
<p>Initial training on device and app</p>	<p>Experience from several implementations of OppiaMobile (in Ethiopia, Nigeria, India, Pakistan and Zambia) has shown that new Android/smartphone users (even those who have never used the internet before), will very quickly get used to the devices and the app. A 2 day orientation workshop was sufficient<sup>7</sup>.</p>
<p>Follow up training and support in health college</p>	<p>All the college teachers in the UK Aid Direct project already had their own Android devices, so were familiar with the phones and able to provide direct support to the health workers. Also the health workers in this project were quick to understand how useful the devices are and so support each other and learn a lot for themselves. All this helped to keep down the amount of formal training required.</p>

5mPowering ORB platform - <http://health-orb.org>

6Creative Commons licensing - <https://creativecommons.org/>

7Example workshop training plan for this introductory training - <http://oppiamobile.readthedocs.io/en/latest/training/intro/index.html>

	<p>Monthly half-day workshops were held to get user feedback through focus group discussions and respond to queries/issues that may affect many users.</p> <p>It is important that the project officer is someone whom the health workers feel comfortable with and can easily approach for support, for example with local language, similar background, education level, gender/age. The project officer does not need to have high technical skills, just be computer and mobile literate.</p> <p>Automatic activity tracking in OppiaMobile of the HEWs use of the phone allowed support to be directed at those who were not using the app regularly, even if they had not specifically requested assistance.</p> <p>For follow up/scaled projects, there are some alternative ways in which this support could be provided:</p> <ul style="list-style-type: none"> <li>● Dedicated staff from Ministries of Health or Education</li> <li>● A dedicated teacher or group of teachers who can provide the main support to their students (extending what was already happening in our project to a more formal structure)</li> <li>● A dedicated college staff member (perhaps already responsible for IT support)</li> <li>● A telephone helpline - although it may be difficult to deal remotely with some queries</li> </ul>
<p>Follow up training and support in health post</p>	<p>Once the health workers had completed their in-centre training they were deployed back to their rural health posts. Given they already had a lot of experience with the devices and most common issues had already been resolved, relatively little ongoing technical support was required.</p> <p>Monthly phone calls were made to each HEW, and only those who had specific technical issues that couldn't be resolved by phone needed an in-person visit. The monthly mobile data top up was provided remotely using a service provided by Ethiopia's national telephone carrier, EthioTelecom.</p> <p>Visits to HEWs health posts were kept to a minimum. When meeting with a HEW was required to provide technical support, this was timed with other meetings/training they were already attending. This meant that more HEWs could be supported at one time than would have been feasible by visiting their health posts. As with the in-centre support the automatic activity tracking in OppiaMobile allowed support to be directed and focussed on those who were not using the app regularly.</p> <p>For replicated/scaled projects, dedicated health district staff may be able to provide first line technical support and monitoring.</p>
<p>Support staff training</p>	<p>For a replicated/scaled project, consideration will need to be given to the training of staff providing the HEWs training and first line technical support, as described above. The effort and costs for this will much depend on the model used for providing this support and their previous experience.</p>

## Monitoring and Evaluation

This section describes the monitoring and evaluation factors that are specific to using mobile learning tools.

Budget area	Factors/Considerations
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User acceptance and feasibility	Evidence from several implementations of OppiaMobile has shown high levels of user acceptance by health workers of using the platform for training. Although this user acceptance should be part of the monitoring and evaluation, the relevance of the specific training course content and structure may be a more prominent area to focus on for evaluation purposes.
Measuring impact	Standards for assessing and evaluating the impact of digital and mobile health programs are not yet fully formed and “the evidence base is patchy” <sup>8</sup> . Careful consideration needs to be given to select appropriate output, outcome and impact indicators for mobile learning initiatives. Several factors seen in the UK Aid Direct project, such as empowerment and confidence of the HEWs, may be difficult to quantify for cost-benefit purposes.
Content usage monitoring	The OppiaMobile platform provides a lot of data on usage and tracking which individual activities, quizzes, scores and videos that health workers have watched. This can help with evaluation, as decisions can be made on a real evidence base, rather than self-reported usage of how useful (and how often) the mobile training content was to the HEWs.



## Factors for scaling up/replication

For scaling and replicating the UK Aid Direct project, there are several other overarching factors/considerations (in addition to those already mentioned previously) which may influence a project budget:

- Combining mobile learning with other mobile health initiatives - such as data collection, case management and decision support systems - will help reduce the overall costs for devices, training, follow up support and M&E. With devices used for multiple purposes and combined training and support, the overall cost can be spread between the different aspects of the project.
- Training centre/region selection should be considered carefully, working in colleges/regions with good management and leadership. Technology is just a tool, it is not going to fix underlying issues.
- Increased support for tutors and teachers in how to apply blended learning approaches in their teaching practice, to take advantage of the tools their student health workers have access to.
- As smartphone and tablet technologies become more widespread (particularly as the cost of devices continues to fall), and health workers are or become familiar with these technologies, it is likely that training and ongoing support costs could be reduced. The costs will be more specific to the app/platform rather than supporting device usage generally.
- A key factor in keeping costs down is the use of a common technical platform and reuse/adaptation of existing content. This approach also reflects the open source and open content aspects of the Principles for Digital Development<sup>9</sup>.
- A common platform also helps to reduce costs for local technical maintenance and development, and a common platform used across many countries/implementations helps to spread the load and cost of technical development, support and fixing issues. In addition, improvements made to a common platform by one project can benefit all other projects sharing the platform.

## Lessons Learned/Conclusion

OppiaMobile is the first rich-content learning platform specifically designed for health workers in low bandwidth/connectivity environments. As such there are many lessons to be learned for budgeting, evaluation and the potential to achieve scale for future health worker mobile learning initiatives around the globe.

Specific lessons learning include the following:

- Build from a nationally approved training curriculum - this promotes significant potential for scale across a country.
- Build training programs to include digital/mobile components from the start, reusing openly licensed content where possible, and ensuring that any new content is also released under an open license.
- Follow the Principles for Digital Development (<http://digitalprinciples.org/>); using open source, open content and re-use, leads to cost benefits which are apparent in replicated projects.

- Build from an open source platform, rather than creating a bespoke app for a particular vertical project or health domain.
- Ongoing technical support is required, but can often be provided in ways that do not require extensive travel to rural locations.
- Strong device ownership by the health workers helps to reduce breakage/loss. This includes allowing health workers to use the devices for other areas of their professional and personal lives, rather than devices being locked-down to specific apps.

As smartphone and tablet technologies become more widespread, there is likely to be increasing demand for mobile based components in health worker training. Eventually it will logically come to a point where mobile training is considered to be a standard component of any health training program. A comparison can be made to wide-spread acceptance of e-learning platforms over the last 15+ years in many schools, colleges and universities. Initially e-learning platforms were innovative and bespoke, with each institution building their own platform. However within a few years e-learning became the norm and a handful of platforms became the leaders, and are now reused across many institutions. This led to the (now) expectation that students will be able to access their course content digitally.

The question for providers of global health training is not if, but when, their health workers can expect mobile or digital components to be an integral part of their learning experience and professional lives.

## Further Information

**Creative Commons** - <https://creativecommons.org/>

**Creative Commons for Global Health (video)** - <https://www.youtube.com/watch?v=zbqq6Gg5g3U>

**DFID Review of Digital in Development Programmes** -

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/417521/Review-Digital-Programmes-Feb2015.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/417521/Review-Digital-Programmes-Feb2015.pdf)

**Establishing a Global End to End Mobile Content Distribution Process for Health Workers (OpenDeliver)** - <http://mpoweringhealth.org/wp-content/uploads/2015/06/ORB-White-Paper-v1r10-Screen-Res.pdf>

**mPowering ORB platform** - <http://health-orb.org>

**OppiaMobile platform:**

Overview: <https://digital-campus.org/oppiamobile/overview/>

App: <https://play.google.com/store/apps/details?id=org.digitalcampus.mobile.learning>

Documentation: <http://oppiamobile.readthedocs.io>

**Principles for Digital Development** - <http://digitalprinciples.org/>

## Acknowledgements

Thank you to DFID's UK Aid Direct programme which provided the core funding for the GPAF-INN-026 project in Ethiopia.

We are grateful to the all health extension workers and the teaching staff and management at Dr Tewolde Health Sciences Training College (Mekelle, Ethiopia) and the Tigray Regional Tigray Health Bureau, for their support and engagement in the UK Aid Direct project.

Finally, thank you to the teams at Jhpiego Ethiopia and mPowering Frontline Health Workers who helped review and develop this document.