Tool sheet

3i Division

**How to run a cost analysis
The case of 3D-printed-orthoses service integration into public services**

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Introduction:

Cost analysis can be a powerful tool for convincing stakeholders (of all kinds: governments, donors, civil society organizations or others) to invest in a project, a solution. Cost analysis are crucial as they produce concrete and detailed information on the costs involved in implementing and/or replicating an underlying project. Cost analysis do no provide sufficient information alone to inform investment decision but they are a significant piece of the rationale and represent a pertinent start entry point for future negotiations, especially when it comes to discuss about the adoption of new and innovative solutions. Cost analyses, therefore, produce evidence to support a strategic advocacy/ lobbying process to convince third parties.

Humanity and Inclusion has been implementing an innovative 3D printing project in Uganda, in the Omugo Refugee Settlement, to address the unmet rehabilitation needs of people with disabilities (PETRA Project) since November 2018. This project was implemented in collaboration with the public hospital of the Arua District (Arua Regional Referral Hospital - ARRH). A cost analysis has been led in 2022, in partnership with ARRH, to calculate the implementation and running costs to integrate a 3D-printed-orthoses service within their rehabilitation public service.

This tool sheet provides general information and key messages on cost analysis and is illustrated by the cost analysis tailored to the Ugandan context. Its principles and lessons learnt can be useful and used in other countries and contexts to generate cost information to help deciders to make an informed-based decision.

What is a cost analysis?

Cost analysis is a systematic method for identifying and documenting the quantity, quality, and economic value of all resources required to implement a program in practice[1]. It focuses on the costs and viability of implementing a program/ a solution.

Cost Analysis: one piece of the puzzle to move forward cost benefits analysis or cost effectiveness analysis. Cost-benefits analysis and cost-effectiveness analysis will include a second component in addition to the cost evaluation: the measure of the outcomes of the project/ solution. Cost effectiveness analysis focuses on one single outcome and allows calculating the ratio of the amount of "effect" a program achieves for a given amount of cost[2]. Cost effectiveness analysis allows comparing different solutions that aim at the same outcome. Cost benefit analysis look at all the benefits of a solution. They can be challenging as they usually involves making assumptions about the monetary value of social benefits.

Cost Analysis: design options[3]. There are two approaches:
- **Prospective analysis of planned project/ program** (or what could be the cost of the planned project?): the project or program does not yet exist, but costs are evaluated from existing data and projection exercises.
- **Retrospective analysis of a completed project/ program** (or what is the exact cost of a program?): this option is more precise as all figures used are the actual costs of the project/ program and as this is possible to triangulate the information between the different implementers/ partners involved.

Focus Uganda case study: The objective was to calculate the total costs to integrate a 3D-printed-orthoses service within the rehabilitation service of the ARRH. A prospective approach was used.

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[1] Hollands, F.M., Pratt-Williams, J., & Shand, R. (2021). Cost analysis standards & guidelines 1.1. Cost Analysis in Practice (CAP) Project. https://capproject.org/resources

[2] https://www.povertyactionlab.org/blog/10-23-17/cost-effectiveness-informed-decision-making

[3] https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_policy/documents/presentation/wcms_326495.pdf

Cost analysis: done by who? with who? for who?

Who should do the cost analysis?

Design a cost analysis, collect and analyse detailed cost data and share and explain figures and findings request some expertise and time.

> ✕ **Focus Uganda case study:** The research was implemented by a research fellow, working full-time for 6 months, and who received the additional support of an economics expert.

With who?

The expert will not work alone and will need the feedback from diverse stakeholders, especially from the implementer (or future implementer) of the project/ solution: a cost analysis is a collective adventure. Some data that might be considered sensitive in some contexts will be needed (such as salaries). So make sure you have the support of the right people, in terms of who can know this information accurately, but also who has the power to decide to share this information.

> ✕ **Focus Uganda case study:** The expert worked mainly with two teams:
> - First the HI PETRA project team shared their experience in the implementation of 3D orthoses production. The team includes the project managers and technicians in the field but also the human resources and logistics departments.
> - Then a delegation of representatives from the ARRH rehabilitation service, who contributed to the definition of the projected service and the identification of the requested needs.

For who?

Cost information will generally target decision-makers to support them in their choices. Determine who the audience is for the findings is crucial to be able to tailor key messages (and arguments) to the information needs of the targets.

> ✕ **Focus Uganda case study:** The direction of the ARRH hospital can use the cost information generated to decide to invest in 3D printing of orthoses. These results are also strongly useful for HI to start gathering information on the detailed costs of such production solutions, improving the implementation and fine-tuning the economic model.

What are the key steps of a prospective cost analysis?

1- Prerequisite: guarantee the availability of all requested data and resources

Beforehand, it is crucial to ensure access to timely, reliable and detailed cost-related data, whatever their level of sensitivity (salaries, service costs etc). The research team must be able to track costs through clean and updated financial and logistical monitoring systems. Even if the researchers are autonomous and even if the financial follow-up is done correctly, the time and contribution of the support services will also be required to explain abnormal data or find any missing information.

> ⟩⟨ **Focus Uganda case study:** To get the most accurate costs, one single figure may be the result of the aggregation of different data. For example, the cost calculation of the mobile team in Uganda relied on: the type of vehicle and its price, the fuel prices, an estimate of the distances to be covered per day, the fuel consumption by the vehicle, the maintenance costs of the vehicle etc.

2- Define the scope of the project/ solution: what will be evaluated?

A cost analysis rests on a clear definition and a strong understanding of what is exactly being evaluated: defining this scope is crucial to delineate the boundaries of the exercise. This is essential to identify the resources required and their allocation for the optimal operations of every step of the service (e.g. materials and human resources) and then be able to carry out the most exhaustive and relevant cost analysis possible.

Some key questions: What are the core components/ phases of the project/ solution? Where is it implemented (context)? By who? What are the activities involved in each phase? What is the timing? Over what time (s) do we need to estimate costs (time horizon)?

This first stage must be done in collaboration with the implementers of the project, through workshop or regular meetings. Indeed, a series of brainstorm sessions, choices and decisions will need to be made to ensure that the project fits not only with their needs and perspectives but also with the context of implementation. Please do not forget that what is relevant somewhere won't be in another context, and what is relevant for one partner won't be the same for another one.

> ⟩⟨ **Focus Uganda case study:** The patient pathway description, from identification to orthoses delivery, was a multi-stakeholder process that took a long time to get to its final version. Key decisions on the implementation and organisation of the service were taken. For example:
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> - The ARRH staff members were willing to have a complementary approach and be able to respect the patient's preferences to maintain a patient-centred approach providing both traditional and 3D printed orthoses.
> - Patients shared their difficulties to reach the hospital and the financial challenge they faced. Then, to reach beneficiaries who are vulnerable, isolated and in need of orthopaedic devices, it seemed relevant to integrate a mobile team that would deliver the 3D printing service to their home.

3- For a prospective analysis, tailor the service offer to the catchment area/ demands/ service capacity

This phase aims to verify that the solution proposed is calibrated well and will match the actual population needs. At this stage, it is required to identify a limiting factor that determines the scope of the solution to implement. There are different possible options, amongst others: an estimation of the demand (e.g. the number of persons who need a service), a technical element (e.g. the daily capacity of a 3D printer), human resources availability or even a fixed budget for the final investment. Whatever the choice, costs are tailored and finally depend on this limiting factor.

> ⟩⟨ **Focus Uganda case study:** The printers' capacity has been identified as the limiting factor. Based on this, the number of team members required per day, the maximum number of devices produced per month using two big 3D printers, and the time for a complete patient's pathway to ensure the deontology rules have been calculated.
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> But others choices were possible. Human resources (HR) could have been chosen as a limiting factor. HR is a significant cost and the service could decide to reduce the team to only one orthopaedic technician and one physiotherapist. In that case, the number of patients and number of printers to implement would have been different and would imply different costs.

3-Collect detailed cost data

- **Identify sources of information**

Multiple sources of information are required in a cost analysis, to triangulate information and have robust data. These multiple sources also helped to base the assumptions and choices on robust information. Collaboration and partnership with the team is crucial to ensure the quality of the analysis. This is essential to be transparent and share the source and the way of calculations of each figure. This information may be useful for future users to better understand the work done but also identify what is replicable or not, adapted to their context or not.

> **Focus Uganda case study:** The cost analysis rested upon a multi sources approach, based on project desk review, semi-structured interviews with key informants, surveys with implementers and beneficiaries, and literature review.

- **Define cost categories**

The ingredients method is generally accepted as the standard approach for estimating costs. It entails identifying all resources needed to implement a program and documenting information about them to allow assignment of an appropriate value. This includes not only physical materials but also labor, transportation, administration, infrastructure, etc. What will be included will get a direct impact on the cost calculation and figures produced at the end of the exercise.

> **Focus Uganda case study:** The cost analysis has adopted the same categorization as another approach developed at HI in order to respect a certain standardization, and to allow for the creation of links in the future if relevant. The following breakdown has been used: 1) Implementation costs; 2) Running Costs; 3) Administrative Costs; 4) Devices materials; 5) Imports;; 6) Human resources.

- **Respect the adequate level of detail of the data**

It is important to share the list of the ingredients with the stakeholders, but this is also essential to explain the origin of the figures detailing unit quantities and related costs (for example: number of workers, level of expertise required, full or partial working time...). All this information will be valuable to identify the main cost drivers and maybe change/ adapt them when considering a project/ solution for replication.

> ✂ **Focus Uganda case study:** The limiting factor of the 3D printing services was the printing capacity. However, the demand and need within the community surpass the offer and the actual printing capacity. It would be possible to increase the number of printers and beneficiaries while maintaining the same team setup and working space. If the number of printers was increased - and therefore the number of devices produced - the costs per beneficiary could decrease.

- **Fill in a matrix to run calculations**

Total calculations by cost category, costs staggering month by month on a given period, additional calculations by beneficiary for example, are based on complex calculations. A well thought-out and adapted matrix will be the major asset for ensuring the robustness and replicability of the exercise.

> ✂ **Focus Uganda case study:** A matrix was designed for the specific needs of the cost analysis and is available [here](#) or on request.

- **Keep in mind currencies change rates, especially if you work with different currencies**

If the cost analysis is based on costs in different currencies, please pay specific attention to address inflation & exchange rates in the year of the analysis. Some websites may be quite useful[4].

4-Produce and share costs related findings

Any report includes study context, design, data collection & analysis procedures, limitations and provides cost figures (a minima total and breakdowns per cost category). An analysis should follow, for example to identify the higher cost categories and determine savings alternatives. That is why this is crucial to be transparent and present clearly all assumptions and choices made to enable third parties to understand what was assessed (and how) and identify potential options for modifying costs.

> ✂ **Focus Uganda case study:** The research includes additional analyses, such as cost per patient or cost per type of orthoses and provides alternatives to modify these figures.

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[4]https://ec.europa.eu/info/funding-tenders/procedures-guidelines-tenders/information-contractors-and-beneficiaries/exchange-rate-inforeuro_fr

Finally, this is necessary to identify an effective diffusion strategy. First, findings will probably need to be adapted to the profile, knowledge and motivation of the targeted stakeholders. Then, the best format for the diffusion of findings will need to be identified, to create an enabling environment for negotiations.

Finally, cost analysis is…

- Attractive, as a starting point to launch a discussion with a third party to convince
- Essential, as a strategic argument to convince a third party to invest in a solution
- Not simple, as it is based on a crazy number of assumptions to complete the analysis
- Data lovers, as it requires a lot of detailed information
- Difficult to implement, as accurate cost data are hard to collect (several possible reasons: sensitive data, financial monitoring more or less updated etc)
- Resource consuming, as it requires time (from experts and partners), expertise and a budget itself
- Dependent, as reliant on how a program/solution is implemented
- Adaptable, as there is no one right way… as long as the procedure is transparent

To find out more

- Please see the research report: **Cost analysis of 3D printing services implementation into public services to produce orthoses**.

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