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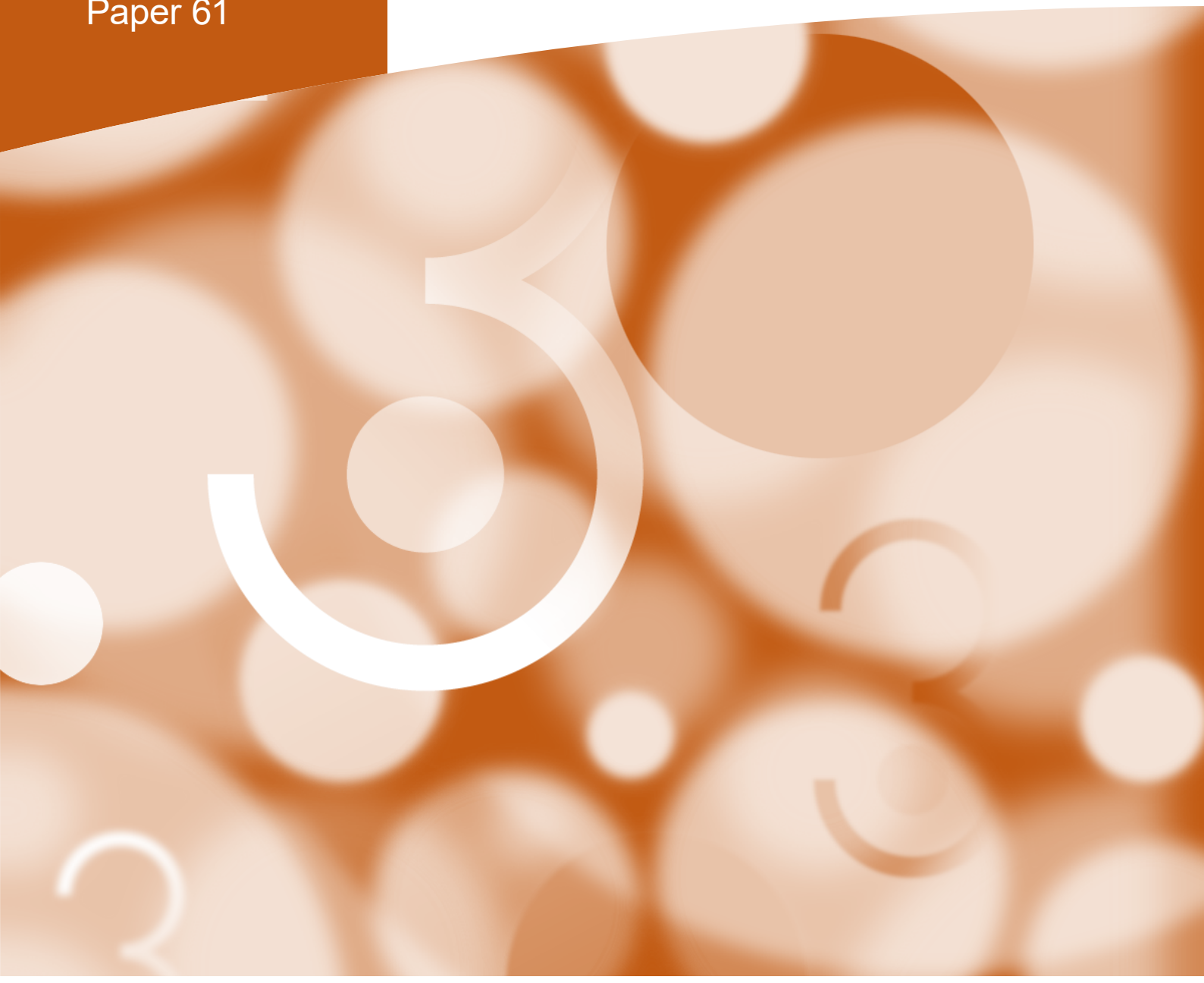
Measuring cost-effectiveness in impact evaluation

May 2024 (Last updated May 2025)

Working Paper 61



International Initiative for Impact Evaluation

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About this handbook

Measuring costs to promote cost-effectiveness in impact evaluation offers practical guidance on how to design, implement, and report on cost-economy and cost-effectiveness analyses that are embedded in experimental and quasi- experimental impact evaluations. The content of this handbook is the sole responsibility of the authors. It represents the opinions of 3ie, but not its donors, or its board members. Any errors and omissions are also the sole responsibility of the authors. All affiliations of the authors listed on the title page are those that were in effect at the time the handbook was published. This handbook has been copyedited and formatted as per 3ie style.

Suggested citation: Acharya, Arnab, Jane Hammaker, Brian Hutchinson, and Douglas Glandon. *Measuring cost-effectiveness in impact evaluation*, Working Paper 61, New Delhi: International Initiative for Impact Evaluation (3ie). Available at: DOI http://doi.org/10.23846/WP0061

Technical editor: Sebastian Martinez and Thomas Kelly
Managing editor: Tanvi Lal
Publications and web design: Akarsh Gupta
Production manager: Mallika Rao

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Acknowledgments

The authors are grateful to Elizabeth Brown, Sebastian Martinez, Alessandra Garbero, Grayson Sakos, Isabelle Stordeur, Sridevi Prasad, Monica Jain, Charlotte Lane, Shreya Banerjee, Carolyn Huang, Daniel Handel, Tanvi, Tanvi Lal, and Akarsh Gupta for their support in shaping this handbook.

Note from the Authors

We are pleased to announce the publication of 3ie's *Measuring costs to promote cost-effectiveness in impact evaluation*. This handbook is a field guide for implementing costing and cost-effectiveness analyses in impact evaluation. It aims to add value to the existing body of literature by providing 1) practical guidance on integrating costing into evaluation, including during the evaluation design, implementation, and reporting phases; 2) a case study to demonstrate empirical applications of costing and cost-effectiveness analyses, with illustrative calculations to support intuition behind key methodological steps; and 3) generalizable guidance that can be applied to multiple sectors.

This handbook remains a work in progress, and its utility is contingent on meeting the evidence needs of our partners. We will continue to refine and iterate these guidelines based on piloting and user feedback. To this end, we are currently expanding our scope to include other common cost-effectiveness analyses applications, such as scale-up decision-support, using incremental cost-effectiveness ratio (ICER) thresholds, and budget impact analysis. We welcome all inquiries, critiques, questions, and suggestions. Please write to us at info@3ieimpact.org.

Content

List of boxes, figures, and tables

Glossary

Defining the intervention and study scope

Budget*:* The budget is the monetary amount allocated for a project. The costs of resources used for project implementation may differ from the budget.

Inputs: Resources used to implement a project, such as goods, labor, and services. Inputs could include farming equipment, vaccines, community mobilizers, and awareness brochures.

Intervention activities: The building blocks of an intervention, usually shown as a series of activities. In costing, intervention activities form the key organizing principle under which to count and quantify inputs used to implement an intervention. Examples include enterprise development training or vaccination camps.

Logical framework*:* A logical framework (logframe), also known as a logic model, describes the expected pathway through an intervention will create change through production of certain outputs and achievement of outcomes (medium- and long-term). Logframes are usually organized as a matrix listing inputs, intervention activities, outputs, outcomes and impacts.

Output: The quantity of goods or services that a project delivers to participants, for example, the number of training sessions conducted, and the number of vaccinations delivered.

Outcome: A metric used as a measure of the change that is created by an intervention (e.g., in behavior). Outcomes may be positive, negative or neutral. Examples of intervention outcomes could include changes in women's incomes or the prevalence of measles.

Perspective: Perspective defines the viewpoint from which costs are considered in an analysis. Perspectives need to be defined since different costs may be relevant to different stakeholders. Common analysis perspectives include that of payers (e.g., donors), providers/implementers, government ministries, and society.

Developing the Cost Collection Template

Activity-based costing: An approach that aims to capture the costs of the inputs used in implementing intervention activities, as defined by the project theory of change or logical framework.

Cost capture: The act of collecting data on the costs of ingredients or resources used in the implementation of a project, or of estimating/projecting the costs of projects that are being considered for implementation.

Actual cost capture: Actual cost capture collects data on the real costs of an intervention. Costs may be collected in real-time by integrating cost capture with ongoing programmatic activities such as surveys and impact evaluations and/or after an intervention has been implemented (i.e. retrospectively) through review of secondary data sources such as project expenditures).

Forward-looking cost capture: This cost research relies on secondary data to project an intervention's costs, usually as a budgeting exercise, as an input to intervention design, or to conduct economic evaluations assessing the likely costs and impact of interventions (e.g., for advocacy). Forward-looking cost capture relies on existing secondary sources of data, frameworks outlining the resources used in similar interventions, published cost databases, and other sources.

Costing: Costing is an act of collecting and reporting information on an intervention's costs.

Costing template: A data collection instrument for organizing and capturing an intervention's costs.

Intervention activities: Intervention activities are the building blocks of interventions, usually defined in a theory of change as steps, actions, or strategies that are part of a process required to generate outcomes.

Ingredients-based approach: An ingredients-based approach estimates the cost of an intervention by listing all ingredients (i.e. individual inputs) required to implement the intervention and assigning them a cost. The sum of the products of each ingredient and its price is the cost of the intervention.

Collecting and Adjusting Costs

Allocating costs: Some inputs (e.g., administrative personnel, facilities) may be shared across intervention activities. Allocation refers to any method to assign and distribute a cost across the specific intervention activities in which it plays a role.

Capital goods: One-time, fixed expenses paid for assets that are used over long periods (e.g., a mammogram machine that can be used for diagnostic tests over the useful life of the equipment. If the tests rendered do not exceed the capacity limit for the mammogram machine, the cost does not change regardless of the number of women who are tested).

Contributions: goods or services that are donated are subsidized. The value of contributions either does not have a financial cost (no payment is rendered to the provider) or has a financial cost that is not reflective of the market price (e.g., in the case of subsidies). Examples may include donated textbooks, subsidized agricultural inputs, or volunteered time of program staff or program beneficiaries.

Cost adjustments: Development projects may incur costs at different times and in different places, requiring adjustments to ensure that costs are comparable across time periods and countries. Cost adjustments refer to several different time-based (e.g., discounting, inflation) and non-time based (e.g., currency conversions) methods to facilitate comparability.

Discounting: A cost-adjustment method that translates the value of receiving future benefits or paying costs in the future to their present-day equivalent.

Equivalent annual cost: A method of deriving yearly opportunity costs of owning and operating capital assets.

Exchange rate: The rate at which one country's currency can be translated to another country's currency, usually determined by market mechanisms.

Economic costs: Economic costs are inclusive of financial costs—payments made in currency for a good or service—but also refer to the "non-financial" value of *contributions* made by stakeholders that are not captured through financial transactions.

Financial costs: Financial costs refer to out-of-pocket (i.e., currency-based) payments made for goods or services.

Inflation adjustment: Development programs often occur over several years. To account for the fluctuation in the value of money over time and to standardize and report the real value of resources, prices are adjusted so that a costs are represented in a single currency year.

Opportunity Cost: The opportunity cost of a resource is defined as the best alternative usage that can be made of the resource by the user.

Price: The amount of money required to purchase a particular good in the market.

Shadow price: When no market price exists for a good or service (e.g., volunteer time), or the impact of an intervention isn't captured by market prices (e.g., the value of preserving cultural artifacts), the value is said to be hidden, or "in the shadows." Methods exist to estimate value, for example surveys asking people the price that they would pay for a given good or service ("willingness to pay").

Variable costs*:* Project inputs that change as the level of project outputs change, for example, if every trainee of a program receives a handbook, the costs of training textbooks will increase proportionate to the number of people trained within a program.

Reporting Costs and Impact

Economic evaluations: Full economic evaluations compare the costs and consequences (i.e., effects, impacts) of two or more alternative courses of action. The approach helps decision-makers to see costs and results side by side, making it easier to weigh trade-offs and choose the most efficient option. Economic evaluations may use different approaches:

Cost-effectiveness Analysis (CEA): CEAs measure costs in monetary terms and effectiveness in natural outcomes – for example, the cost per case of poverty averted or the cost per ton of carbon emissions averted. CEAs are limited to considering one outcome.

Cost-utility Analysis (CUA): CUA compares an intervention's costs to a measure of utility that captures and combines two or more outcomes. For example, quality adjusted life-years (QUALYs) are a measure that captures improvements in lifespan (quantity of years) and health span (quality of years). Similarly, learning adjusted years of schooling (LAYs) measure of the number of years of schooling and the achievement within them.

Cost-benefit analysis (CBA): In CBA, all of a program's impacts are monetized to facilitate direct 1:1 comparisons between program costs and consequences. The

comparative advantage of CBA is that it can account for a wide range of impacts across sectors (e.g., health, environmental, cultural, etc.). However, when data to monetize outcomes is limited this can introduce uncertainty.

Cost-effectiveness ratio: The ratio is program costs divided by the outcome of interest.

Cost-efficiency analysis: Compares the costs per output produced by an intervention.

Ex-ante analyses: Prospective analyses of programs or policies that have not yet been implemented, often requiring modelling or forecasting.

Ex-post analyses: Retrospective analyses of programs or policies that have already been implemented.

Incremental Cost-effectiveness Ratio (ICER): The ICER calculates the difference is costs between two interventions (forming the numerator of the ratio) and the difference in effectiveness (denominator) to assess the extra expenditure incurred to produce a corresponding additional unit of impact.

Sensitivity analysis: Analyses providing assessing a plausible range of costs and outcomes that may be generated by a program, given uncertainty around key data, parameters, and other factors.

1. Introduction and Motivation

1.1 What are costs?

Broadly, within impact evaluations, costs are the value of resources expended to implement an intervention.

When costs are considered, we usually only think of *financial costs;* that is, payments for a good or service. However, in some cases, stakeholders make contributions to interventions that do not have a financial cost. Instead, goods, services, or time may be donated or subsidized. For example, an agricultural program may receive donated fertilizer. This good is free to the program, but still has value (i.e. the market price of the fertilizer). Similarly, participants in a program may attend training sessions but not be paid. Even so, there is value to the participant's time.[1] Considered together, financial costs and contributions are termed *economic costs*. A study's perspective may determine whether only financial costs or economic costs are considered.

Perspective can also determine the scope of the resources considered for costing. For example, a given intervention may have costs for design, administrative operations, monitoring and evaluation, training, engagement (e.g., advertising or outreach), service delivery, infrastructure, and other costs. A provider perspective may be interested only in the financial cost of each, since these entities may fund and/or implement a program. A government ministry perspective may omit design costs since they'll be less relevant to taking a program with demonstrated efficacy to scale but add costs of participant time to take constituents well-being into account. A societal perspective will seek to include all costs (financial and economic) while also accounting for the spillover effects of an intervention (see Section 2.1).

Within this handbook, we refer to costs as the *economic* value of all resources that are expended to implement an intervention and relevant to the study perspective.

1.2 What is cost-effectiveness analysis?

A cost-effectiveness analysis compares the economic costs of an intervention to a specified development outcome that it produces. The comparison assesses the value generated by the intervention against the money spent on it (i.e. value for money).

Cost effectiveness analyses can be ***forward-looking*** modeled projections of hypothetical interventions or **actual** assessments of interventions that have been implemented. Forward-looking cost-effectiveness analyses rely heavily on secondary data sources,

[1] The economic value of the opportunity cost is the highest value that a person would assign to an action among the set of all actions that the person forgoes to participate in a program (e.g., it may incorporate considerations such as the value of time, forgone income, out-of-pocket costs to participate). As an example, the opportunity cost of working at a job is the valuation of whichever among the alternatives (spending time with friends and family, volunteering, or doing nothing) has the worker considers of the highest value. When someone purchases dinner from a restaurant, the valuation of the alternative is the cost of ingredients of a home cooked meal and the time spent cooking.

modelling, and the assumptions of analysts. Actual assessments of programs' cost-effectiveness draw on primary data obtained through a) cost capture exercises and b) evaluations that establish a program's impact (ideally causally). They may occur in real-time as programs are implemented or retrospectively.

Cost-effectiveness analyses can – and in many cases, should – be integrated into impact evaluations.

1.3 Why include cost-effectiveness analysis in development programming?

Public resources have competing potential usages. In contexts where need is high and financial resources are scarce, it is essential to provide decision makers with information on both an intervention's costs and its outcomes to maximize social good.

Cost-effectiveness analysis is used to answer questions such as:

1. What is the marginal cost per unit of impact of a project, intervention, or policy?
2. Is the project 'worth' implementing?
3. Is the project more cost-effective than 'business as usual'?

The policy implications of bringing cost and effectiveness together are that decision makers can choose among project options and be confident that implementing a project is financially justified. With accurate data, cost analyses can also inform decisions on resource planning, budgeting for future projects, and scaling up.

1.4 What are other methods for comparing costs and effects of interventions?

Cost-effectiveness analysis is not the only method to measure intervention efficiency.

Cost-efficiency analysis measures the costs to produce a given project output. Cost-utility analyses (CUA) are an extension of cost-effectiveness analyses in which outcomes can be combined into a single utility measure to capture a wider range of impacts. Cost-benefit analyses (CBA) monetize all outcomes to create 1:1 comparisons of costs and impacts (Glandon et al., 2023).[2] CBAs are generally used as a forward-looking analysis for large, multi-component programs with multiple and different outcomes.

[2] Some evaluations use outcomes in which monetary value can be estimated or measured, such as changes in crop yield, household income, sales, access to markets, or household wealth. Other outcomes such as productivity, maintenance of the ecosystem, forestry management, household decision-making, resilience to changing weather patterns, and women's empowerment are generally challenging or not feasible to monetize. It could even be the case that the monetary value of an outcome may underestimate benefits, for example, a positive change in a monetary benefit such as women's income may not account for or underestimate changes in women's agency or influence in decision-making. CEA is a practical way to analyze ratios of costs to benefits for interventions in which monetary benefits are not easily ascertained, or even accrue far in the future. When it is possible to monetize project outcomes, CBA can be conducted.

1.5 Why conduct cost-effectiveness analyses over other methods?

Development programs often measure outcomes that cannot be combined in a single utility measure. Some outcomes may also be difficult to monetize, such as women's agency, resilience to climate change, or government accountability. Since cost-effectiveness analyses measure outcomes in natural units that are common to development programs, it is often the most appropriate method to use.[3]

1.6 How is cost-effectiveness analysis conducted?

Programs are costed by collecting data and measuring the cost of design, implementation. The *economic costs* of the program, encompassing financial expenditures and contributions (monetization of donated goods, time or services), represent the value of resources that must be expended to generate program's desired outcomes.[4] Ideally, cost capture occurs in real-time (actual cost capture), as the program is implemented.

Program effectiveness must also be captured. In the past decade, considerable advancements have been made to rigorously measure the impact of interventions using methods that establish causal attribution. Since there is extensive literature on impact evaluation methods, this handbook does not focus on methods for measuring outcomes, instead aligning itself around comparisons of costs and effectiveness.

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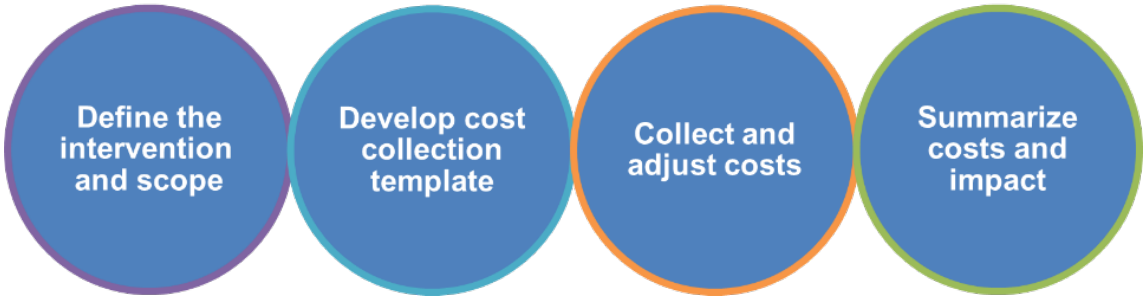
[3] Technical note on CBA vs CEA: CBA usually calculates an internal rate of return on the investment to weigh the cost of a project to its effects, presented as a 'net benefit'. It is well suited for a large investment, usually infrastructure, undertaken at time 0, the current time, yielding a stream of impacts in the future. For large infrastructure projects, analysts often assess impact at some time after implementation. This analysis would inform future decision-making processes. Cost-effectiveness analysis (CEA) is often preferable when there is reluctance to assign a monetary value to the project impact. CEAs allow comparability within the specified impact. For example, a project to empower women with certain skills may yield monetized gains; however, it may also lead to reduction in physical violence against women. It is likely that policy makers may not want to monetize such an outcome.

[4] Technical note on implementation costs: The discussion in this handbook will be limited to examining the costing of project implementation. Generally, going beyond costs for projects, there may be costs of implementation not accounted for, such as extra costs associated with implementing environmental regulations or anti-discrimination laws. It is important to be clear about distinguishing costs of project implementation from negative or positive effects (for example, externalities) of the project once it has been implemented. For example, although a CEA of environmental regulation will assess the direct costs of implementing the regulation, it will also need to include losses in certain sectors. Environmental regulation in a town can result in some job losses while improving the health of many people. Although costing of negative consequences would follow the same economic principles that will be used here, the methodology used to assess those costs are specific to the project. It is convenient to separate out resources spent for the implementation of the project from the distributive consequences of the project once implemented. The implication of this focus for the document is that methods for extracting project results are not highlighted, and we indicate that we offer an overarching method for costing which can be adapted for different types of projects that most development organizations engage in. In the later sections, where implementation costs are juxtaposed with impact, we clearly distinguish between CBA and analyses that assess costs and impacts that are not monetized.

In doing so, it breaks cost-effectiveness analyses into four key steps that form a 'CEA framework". They are: 1) defining the intervention and study scope; 2) designing a cost collection template to capture costs incurred throughout the intervention lifecycle, 3) collecting and adjusting cost data as the intervention is implemented; and 4) reporting costs and impacts (Figure 1).

Figure 1: A Framework for CEA



1.7 Learning objectives

This handbook guides users to collect cost data and interpret it alongside data on effectiveness. Its primary emphasis is on how to plan, design, develop, and implement tools to capture intervention costs.[5] It focuses on methods to inform actual cost capture, in which data is collected as the project progresses. The authors emphasize actual cost capture because project costs may differ substantially from budgeted costs or costs estimated using secondary data sources.

The goal of the handbook is to describe costing methods that can be applied to programs across development domains. It aims to:

- Acquaint researchers, implementation teams, monitoring and evaluation officers, and funders, such as government and donors, with costing and cost-effectiveness analysis to increase its inclusion in impact evaluations.
- Provide sector-agnostic guidance for impact evaluators and intervention monitoring and evaluation teams to capture and use costs as an input to CEA.
- Describe methods that are scale-independent and easy to integrate with experimental or quasi-experimental impact evaluations that are designed to measure effectiveness (or replicability of previously successful interventions).
- Ensure stakeholders account for opportunity costs of public resources.
- Assist with moving theory to practice through an illustrative case study.

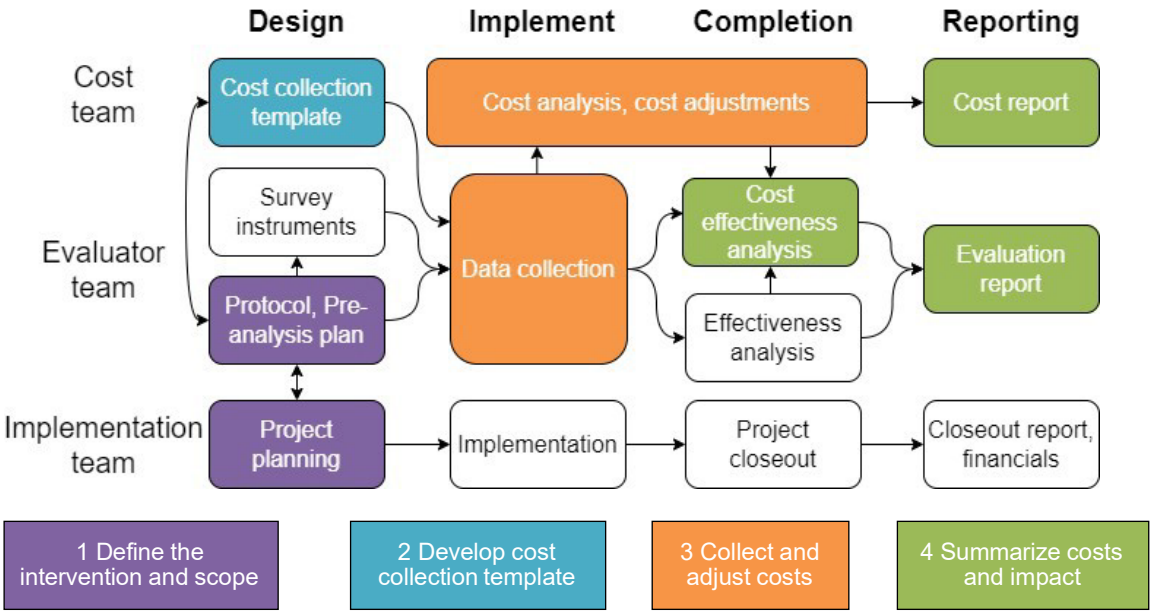
1.8 Planning for CEA in the project lifecycle

Integrating cost-effectiveness analysis with impact evaluation requires collaboration between implementation, evaluation, and costing teams. The cost team, which may include a costing subject matter expert, cost analyst, or designated team members responsible for CEA, will need to work closely with the implementation team and evaluators to coordinate cost data collection and analysis activities.

[5] There is abundant, freely available technical guidance on the estimation of project effects; this document responds to a lack of practical guidance on accounting of costs of projects

Figure 2 outlines workflow collaboration between cost, evaluation, and implementation teams through four simplified[6] phases of a typical project life cycle: Design, Implementation, Completion and Reporting.

Figure 2: Implementation, evaluation, and cost evidence processes



For instructional purposes, the diagram shows a simplified, linear representation of the basic steps involved in collecting and analyzing cost evidence as part of an impact evaluation process. Real-world practice may be more complex. For example, some programs are implemented with an adaptive approach, such that cost information may inform real-time programmatic decision-making during implementation (e.g., a cost-efficiency analysis comparing inputs to outputs).

For example, in the design phase, while the implementation team plans project activities, the cost team might contribute cost research questions to the impact evaluation pre-analysis plan or protocol documents. Conversely, the pre-analysis plans or protocols can inform the design of the cost collection template. During project implementation, the evaluation team typically leads data collection activities. In this phase, the cost team might coordinate data collection activities with the evaluation team, for example, by including a cost data capture tool in baseline surveys.

After the project is complete and the endline data collection is finalized, the cost team will conduct the final cost adjustments and calculate the total costs. Total costs, along with the effects estimated by the evaluation team in the evaluation report, will feed into the cost-effectiveness estimates. Although costing activities are separate from activities that bring about changes in the outcomes of a project, it is important that costs are carefully matched to project outputs.

The shaded boxes in Figure 2 illustrate the four tasks of the CEA framework (Figure 1) that might be conducted during that activity. For example, during project design, the cost team will be responsible for developing the scope of the cost study and developing a cost collection template. Similarly, during project implementation, the cost team will be responsible for collecting cost data which can be analyzed later.

Box 1: Guiding case study STARS Impact Evaluation

To connect theory and practice, the authors have applied the CEA framework to an illustrative case study: the impact evaluation of the fictional STARS program. While this case is based on a real intervention, many elements of the case have been simplified for learning purposes.

Stellonia has one of the lowest female labor force participation rates in the world, but many women are closely connected to the informal economy. In rural districts in a western state, for example, women commonly grow raw spices in their home gardens that they sell to 'middlemen,' who process the spices and sell them to urban grocery chains marked upwards of 400% of their purchase price on average.

The Ministry of Rural Development of Stellonia wants to support these female farmers by eliminating the 'middleman' and facilitating women's access to higher- value markets to increase their household income. Over the last year, the Ministry has conducted informal sessions on entrepreneurship through an ongoing initiative. They also conducted a market assessment to estimate the demand for processed spices in urban grocery chains. After determining that the demand is sufficient, in consultation with the farmers and local community development organizations, the Ministry will support the formation of regional collective enterprises. Each enterprise will participate in an 'incubator' and receive start-up capital that includes a centrally located processing center, spice-processing equipment, Enterprise Development and Leadership training, and market linkages for processed spices for the first two years.

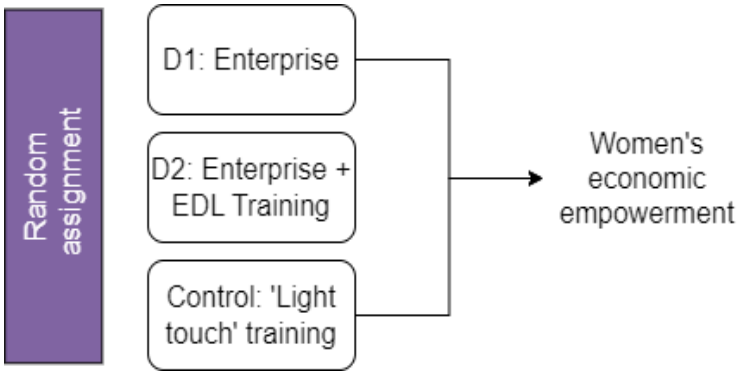
The goals of the initiative are to:

1. increase the productivity and profits of enterprises;
2. increase women's household income; and
3. increase women's economic empowerment such that an additional 40% of women are considered 'empowered' by 2030.

The Ministry needs to know: 1) What are the costs of the intervention arms, and how will costs change if the program is scaled up?; 2) Is the STARS program effective in increasing women's household income and economic empowerment?; and 3) Is the training 'worth' the additional investment? They have approached 3ie as an evidence partner to help answer these questions.

Due to limited financial resources, the Ministry cannot support economic development and leadership training for all 100 district enterprises in the first 3 years of the program. Since there is uncertainty on whether this program will work, the Ministry is interested in conducting a policy experiment. The program will be rolled out as a randomized control trial with two treatment arms: D1) participating in an enterprise, and D2) participating in an enterprise with economic development and learning. These treatment arms will be compared to the 'status quo' or similar communities who will not participate in the program but did receive the 'light touch' entrepreneurship trainings through an ongoing initiative (Figure 3).

Figure 3: STARS Treatment Arms and Outcome



2. Defining the intervention and scope of study

2.1 Defining the intervention

Many guidelines suggest thinking about cost analysis as a primary research endeavor, and so it is a key task of the process to integrate cost research questions into the design of the evaluation from the start (Dhaliwal, *et al.*, 2012; Brown and Tanner, 2019; Glandon *et al.*, 2023). The first step in the costing process is to work closely with partners to develop a clear and shared understanding of the intervention. This understanding will inform the cost, impact, and cost-effectiveness research questions.

Interventions are implemented to achieve outcomes; we can imagine the project life cycle described in Figure 2 as a production process. The production process mobilizes project inputs (the building blocks of project activities) to implement activities that generate outputs(s), which in turn lead to changes in the well-being of the intended clients or affected population (outcomes) attributed to the intervention. The pathways from inputs to outcomes are often described in the intervention Theory of Change (ToC; Box 3).[6] The

[6] A theory of change reports how project inputs influence final outputs in a step-by-step manner, and then how the final output influences the project outcome(s) and impacts. Theories of change should be accompanied by a written narrative explaining any underlying theory motivating the project design, describing the logical or evidentiary basis for the contributory relationships depicted. They typically include a visual diagram showing detailed theorized contributory relationships between various project components and intended results while also accounting for non-project and contextual factors that may influence the project's implementation and/or results. Other standard elements of theories of change include identifying the recipients and outcomes, duration of the project, the unit of coverage, and assumptions that underpin the theory, ideally including how and when they may be verified or tested. Verifying the steps in a theory of change is crucial (White, 2013) for project monitoring and evaluation, leading to improved likelihood of achieving project goals. It also reveals what actions are needed to achieve project results. However, the theory of change is not fixed, but a living document that may change during project implementation. Referring to the it during the process of implementation allows the project implementers to see what modifications are needed. These modifications can change planned activities and costs. Theories of change may be accompanied by a (usually tabular) logical framework (log frame) to outline key details about each activity or output, including targets, how and when they will be measured, etc.

theory of change also describes the assumptions or risks that influence the effect of the intervention on its expected outcomes.

Costing is the process of assigning monetary values to the activities within the theory of change that produce intervention outcomes. Costing starts by taking the theory and identifying each step of implementation. Eventually, each step will be assigned a monetary value.[7]

This handbook emphasizes that evaluation and costing should be integrated from the start of the project. In case the project has been already evaluated, cost data should be organized by aligning costs with the stages of implementation and the corresponding outputs. The costing team should carefully review the theory of change with the implementation team to develop a thorough and shared understanding of the intervention and the implementation process.[8]

How can the Theory of Change help in planning for CEA?

A theory of change reports how project inputs influence outputs, outcome(s), and impacts (White, 2013). Each step within the theory of change can be thought of as a unit to be costed. Often, it is convenient to identify the key steps in the implementation process from the project theory and calculate the cost of implementing each step, as shown in Box 3.

2.1.1 Key intervention attributes for planning CEA

The next section identifies and defines key intervention attributes that researchers (for example, evaluators and cost analysts) may need to know during the design phase of the project lifecycle to inform evaluation protocol and pre-analysis planning activities. It also includes illustrative examples from the STARS Case Study.

Participants: Participants are recipients explicitly targeted by the intervention. In some cases, those who were not explicitly targeted experience costs or benefits through externalities or spillover effects. They may also be counted as participants.

- In the case of the STARS project, participants include farmers (aged 18 and above from two regions), program managers, directors, and field staff involved in implementation.

Intervention inputs: Inputs are resources consumed to facilitate the intervention's implementation and are central to costing. Inputs contribute to the intervention's key activities that are intended to affect change in outputs and outcomes, as stated by the intervention theory of change.

[7] Many implementers of intervention develop a logical framework (log frame) for steps that lead to outcome. Each step within the log frame can be thought of as a unit to be costed. Often, it is convenient to find key steps in the implementation process from the log frame and calculate what would be the cost of implementing these steps. Process evaluations look for key features that make implementation successful; a similar effort would identify cost centers in an intervention.

[8] At each step, it important to note that there may be assumptions that affect causal linkages in the theory of change.

- Examples of inputs from STARS include materials for trainings, vehicles used for transportation, facilities to house monthly meetings, and spice-processing equipment.

Intervention outputs: Intervention inputs yield outputs that, in turn, produce outcomes. While outputs may not be directly valued, they usually are key to facilitating change in outcomes metrics.

- Examples of intervention outputs from the STARS case study include the number of participants, women farmers trained, machines procured, quantity of household spice production, and the value of farm loans.

Intervention outcomes: The intervention's outcomes (i.e. impact), are predefined metrics expected to change due to project participation. In many cases, outcomes are difficult to monetize. While the evaluation team will take up the task of measuring changes in outcomes that are causally attributed to the intervention, the costing team will use outcomes in its cost-effectiveness analysis. Researchers should agree on the units of measurement to ensure consistency across the cost and impact studies.

- Examples of outcomes from the STARS case study include changes in household decision-making and economic empowerment.
- Since these outcomes are not easily monetizable, the research team will estimate cost-effectiveness (as opposed to monetizing outcomes in a cost-benefit analysis) of the intervention.

Coverage: An intervention typically operates within defined geographic boundaries. Identifying the coverage area helps the cost team estimate the number of participants and the level of cost aggregation required. In STARS case, districts were randomly invited to participate in the program and the district is the unit of analysis in the evaluation. The Ministry is interested in exploring heterogeneity in costs at the regional level, so costs will need to be disaggregated by region.

- Some overhead costs may occur for monitoring activities across districts. Costing teams will need to account for these and use transparent methods for allocating the overhead costs to specific districts.

Implementation schedule: Awareness of intervention activity timing is crucial for evaluation. Some projects, such as infrastructure, incur costs and have effects far into the future. Implementation teams and researchers should understand how far into the future interventions need to be evaluated and at what points expenditure will occur (O'Mahony, Newall and van Rosmalen, 2015).

- The STARS project involves three days of training in month two of implementation, with refresher courses planned in month six and month nine. The cost team will plan to meet with the program manager in months seven and ten to discuss the breakdown of project expenses by region.

Sample information: Assessing heterogeneity in an intervention's costs by region or other characteristics may necessitate data collection using sampling. Purposeful sampling can ensure representation of costs across demographic groups.

- STARS participants who live far away from the enterprise spice-processing facilities may incur higher travel costs. A purposeful sampling strategy will need to be deployed to ensure that cost data is representative of hard-to-reach districts.

Intervention alternatives or comparator: Intervention costs and outcomes are typically compared to one or more alternatives. Alternatives may include continuation of the existing status quo, in which no intervention is in place or an intervention is in place but is being considered for replacement. Alternatives may also include intervention arms under evaluation in the immediate study.

Many cost-effectiveness analyses ignore the status quo. Where feasible, researchers should present status quo costs and outcomes for comparison with intervention alternatives (note: the 'status quo' may have zero costs). Without them, CEA studies may not provide insight on whether to move from existing to new practices (Elliott *et al.*, 2014).

Results of a program cost-effectiveness analysis can also be compared to the universe of other cost-effectiveness evidence on similar programs. In addition, criteria such as cost-effectiveness thresholds or cash benchmarking standards can serve as a comparator, providing perspective on whether an intervention's cost-effectiveness ratio is low enough to meet established recommendations for implementation (see Section 5.4.2 for further detail).

- The STARS intervention is tested to possibly replace 'light touch' enterprise trainings conducted as part of an existing program.
- The intensity of participation is also of interest, so the STARS evaluation compares two modalities of the program: D1: participation in an enterprise, and D2: participation in an enterprise and economic development and learning training.

Perspective: Costs are a matter of perspective. Common perspectives used in analyses include that of payers (e.g., donors), providers/implementers, government ministries, and society. A cost to one entity is not necessarily seen as a cost to another. For example, intervention design costs may be relevant to a donor or provider implementing a pilot project, but not relevant to a government ministry seeking to scale the same program once it has demonstrated high efficacy and is adaptable to many contexts. Ultimately, the costing perspective determines "which costs to count and how to value them" (Neumann 2016).

In economic evaluation, it is generally considered best practice to measure costs from the societal perspective. The argument is that the evaluation should account for the costs and effects of the intervention on the welfare of the whole of society, and not only on the individuals or implementation organizations directly involved (Byford and Raftery, 1998; Levin and McEwan, 2001). Another advantage is that since the societal perspective encompasses all other perspectives, it is possible for analysts to break down and re-analyze data using a lower-order perspective at a future date.

Practically, using a societal perspective means accounting for all resources consumed to implement an intervention (financial and economic costs), as well as tracking and quantifying the downstream costs caused as consequences of those expenditures (i.e., spillovers). For example, spending to implement alcohol control policies is likely reduce demand for beer, wine, and liquors as a proximate outcome. But, several other

downstream distal outcomes may result. For example, alcohol-induced disease morbidity, traffic accidents (and related injuries and deaths), and crime may decrease. Each of these has related costs that could theoretically be tracked (or modelled); though the burden on analysts can become immense. In practice, analysts should seek to be as inclusive as possible in accounting for costs, while balancing feasibility and funding.

- In the case of STARS, costs are estimated from the societal perspective because the project's government partner is accountable to their constituents.
- 'Participant time', a contribution, is an example of a type of cost that may be included under a societal perspective that accounts for costs borne by all stakeholders. In STARS case, intervention participants attend trainings, but they are not compensated for lost wages. The cost of participants' time could be accounted for using an average local hourly wage. (Advice for adjusting intervention costs for price distortions which are not revealed through prices and accounting for opportunity costs is given in section 3.2.).

Whose perspective to cost from?

While this handbook promotes costing from a societal perspective, it recognizes that it may not always be feasible. For large- scale and complex interventions, tracking all costs or benefits to society may be difficult (Cohen, 2020). There could be disagreement on the economic value of donated or subsidized goods, or opportunity costs incurred in the implementation of an intervention. Data availability can also be a challenge, especially for costs incurred by stakeholders outside the scope of study (Levin and McEwan, 2001).

Since, the choice of perspective can have significant implications for the interpretation of cost effectiveness analyses, the study perspective should be documented as part of the methodology (Kim *et al*., 2020). Multiple costing perspectives can be considered, and analysts should break out and label costs that may accrue to different stakeholders where possible (for example, by comparing programmatic costs and societal costs as part of sensitivity analyses).

2.2 Developing cost and cost-effectiveness research questions

Economic evaluations can help implementers, policymakers, and evaluators answer important questions about an intervention's feasibility, scalability, efficiency, and impact.

Costing research questions may investigate comparative costs of interventions, seek detailed breakdowns of resource use across interventions or demographic groups, and/or aim to understand how costs may change as interventions scale. Cost-effectiveness research questions aim to investigate if an intervention or policy is 'worth' implementing. These questions are inherently comparative and are usually answered relative to a comparator that will vary based on the evaluation design. It may be important to interpret the cost-effectiveness of an intervention relative to a control group, the 'status quo' policy, another implementation model, treatment arms, or similar programs (see Section 5.2 for a discussion of cost-effectiveness thresholds and benchmarks).

Research questions should be selected based on the learning priorities of evaluation stakeholders. Box 2 provides examples of research questions based on illustrative examples from the STARS case study.

Box 2: Developing research questions for the STARS Program

During an evaluation design workshop, Stellonia policymakers, evaluators, and cost analysts formulated research questions.

Examples of impact evaluation questions:

- What is the effect of the STARS program on outcomes of interest?
- Can the impact be scaled to other districts?
- Do the impacts last beyond two years?

Examples of cost analysis questions:

- What is the total cost of the comparator and treatment arms?
- Within each arm, what are the cost drivers?
- Do costs vary by region?

Examples of cost-effectiveness analysis questions:

- What is the cost per unit of impact of an intervention?
- Which STARS intervention modality is relatively more cost effective?
- Should the Ministry of Rural Development invest additional resources in STARS?

3. Developing the cost collection template

3.1 Organizing costs around intervention activities

Once cost analysts have developed a set of cost research questions and thoroughly understand the intervention, they should work together with implementation partners to build a cost collection template to answer the research questions. The purpose of the cost collection template is to identify and track the inputs used to implement the intervention (Brown, 2022).

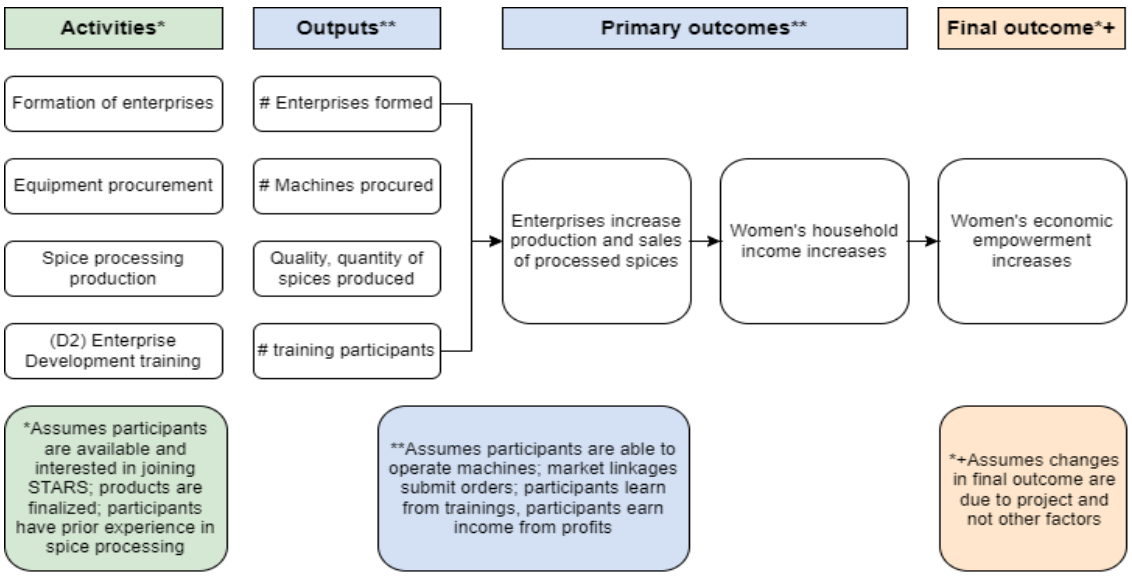
Analysts should organize information in a way that can be readily combined with impact. This handbook advocates for organizing and tracking costs around the intervention components that are usually detailed in the theory of change (see illustrative example in Box 3).

Box 3: Identifying key intervention activities in the STARS Program

STARS key intervention activities are outlined in the project theory of change. They include: 1) forming enterprises, 2) procuring spice processing equipment, 3) producing and selling spices, and 4) for the second treatment arm only (D2), implementing economic development and learning training. These activities are assumed to produce outputs that can be verified by several metrics, including the number of enterprises formed or the amount and quality of spices produced.

The four intervention activities form bases from which to organize costing efforts. Analysts may identify sub-activities and tasks, and then the resource ingredients required to implement each. Other facilitative costs, such as administrative and monitoring and evaluation costs, are not represented in the theory of change. Depending on the study perspective, analysts may also track costs in these categories (e.g., for project management, capturing costs incurred on operations and office equipment for field staff), keeping them separate or transparently allocating them across other intervention activities.

Figure 4: Example Theory of Change from the STARS Project



This method, known to cost-specialists as activity-based costing, costs intervention activities, and sub-activities—which are events, discrete units of work, or tasks with a specific goal. Activity-based costing draws attention to tasks or milestones that need to be completed for the intervention to be implemented. It also serves to help organize the costing task.

For example, in an intervention that provides sustainable land management training to farmers, key tasks or activities might be mobilizing participants, preparing training materials, implementing training, and monitoring or management activities. Some other aspects of the intervention may be overarching. Monitoring, evaluation, and learning and administrative resources are often shared across the entire intervention, rather than assigned to a specific intervention component. Examples include the office costs of the

field manager who oversees field activities, a vehicle used by staff that has multi-usage within the office, as well as field visits to monitor multiple intervention activities. Analysts should work to identify these cross-cutting, shared costs and develop methods to allocate costs across activities or track these costs separately.

Once each intervention's components and sub-components are identified, each needs to be linked to resource use. Analysts should list all the resources and inputs used to implement each discrete component. These are the 'ingredients' required for implementation (Levin and McEwan, 2001; McEwan, 2011). Treating an intervention's inputs and resources as ingredients means that analysts have a deep understanding of how the intervention is made. This can lead to increased understanding of program efficiencies and inefficiencies and help to identify which resources are cost drivers.

3.1.1 Developing a template to capture the quantity and price of ingredients

This section summarizes five steps to develop a cost collection template.

Step 1: Identify key intervention activities and sub-activities: As described above, evaluators, cost analysts, and the implementation team should work together to identify the key intervention activities and sub-activities.

Step 2: Assign cost ingredients: For each component, the cost analyst should assign cost ingredients (resources, inputs) that are used to implement the intervention (Box 4). Examples of cost ingredients include staff time, participant time, transportation, rent of capital goods, training materials, product marketing fees, or official and legal fees. Analysts can identify likely ingredients by reviewing published studies of other similar interventions, reviewing the study design, and conducting interviews with affiliated staff.

Step 3: Identify the quantities and prices of each ingredient: Data should be collected on all ingredient usage as well as the prices paid for each cost ingredient. Quantity and price should be collected as the project is implemented (e.g., through review of financial records, surveys, or time and motion studies). Analysts may simultaneously classify ingredients, for instance by indicating whether they are variable or fixed.

- *Variable costs* stem from the use of additional intervention ingredients to produce more outputs within the current production system. The most common variable input is labor. For example, the number of trainers required could increase as the number of participants trained increases. Material costs may also be variable, for example, training inputs such as booklets or refreshments will also be responsive to changes in the number of participants.
- *Fixed costs* are inputs that do not change when levels of production output change. For example, if a program uses large spice-processing machines, most likely, servicing one more farmer will not require the purchase of additional equipment. As another example: adding an additional village to an agricultural extension program may not require the purchase of another vehicle. However, adding 20 more villages might require the purchase of another vehicle. Common fixed inputs include buildings, vehicles, machinery, and equipment. When fixed inputs are rented, then analysts may record their rental prices. If they are purchased, their longevity or the duration of usage and depreciation values should be noted at the time of cost enumeration.

Prices, such as wages, and quantities, such as days worked, should be clearly stated for all fixed and variable ingredients. If relevant, the date of purchase should also be stated. For some ingredients it may be necessary to know the origin and year of the make of the product. Each ingredient has a unit, such as participant hours or the number of machines. For equipment and supplies, brand names and product names should ideally be listed. This process allows for identifying imported goods. Ingredients should always be associated with a unit (see Box 4 for an example).

Step 4: Account for missing data: When costs are collected in real-time, there may still be missing or difficult-to-access data—for example, the price paid for a building from years ago, or confidential salary information. Community inputs are also frequently hard to collect. Costing templates should enumerate the need for these types of data. When not found, this data should be listed as missing. If price data is missing, it may be possible to find proxy prices from other studies or geographical vicinity. If ingredients are missing for a particular activity, one may rely on costing of that activity from other studies. If missing data is substituted through some means it should be described clearly, but the need for imputing data statistically is unlikely.

Step 5: Follow good reporting practice: The collation of collected material should be clear and well documented, with data clearly labeled and variables defined. Although it is a good idea to have a costing template at the beginning of any project, it is possible that revision will be needed, or that there are redundancies in activities and goods purchased. Changes to the template should be documented.

Bringing it all together: When steps one to five are complete, additional adjustments are made to the input and price list, as described in the following sections. After these adjustments are made, the prices of inputs can be added to estimate the cost of each cost center. How the final costs are presented will depend on the output of interest. An illustrative example is in Box 4.

Box 4: Listing Cost Ingredients for the STARS Program

Bringing together activities and cost ingredients, here is an excerpt from the STARS cost collection template using the 'Formation of enterprises' cost center. Minimally, it gathers the following for each cost ingredient:

1. **Unit of time**: identifies how the ingredient is measured. For example, the 'staff time' ingredient could be measured in days, while 'travel' is measured in trips per year.
2. **Data collection sources**: identifies where the cost of the ingredient will come from. For example, the program manager or finance officer will share monthly expense reports that document staff time, travel and administrative costs.
3. **Timeline**: identifies when cost data is reported or collected. For example, aligning cost data collection with the evaluation baseline and endline.

To report cost summaries by region, cost ingredients will need to be broken down further. For example, to account for differences in STARS staff wages in two regions, an additional column will be added to the sheet to reflect 'Wage Region 1' and 'Wage Region 2.'

Table 1: Excerpt from STARS Cost Collection Template

Cost center	Description	Cost ingredients	Cost description	Unit of time	Data collected from?	Data source	Timeline
Formation of enterprises	Setting up business administration, mobilizing farmers to sign-up	Staff time	Wage	Day	STARS Program Manager (PM)	Expense report	Baseline
		Travel	Cab, Train, Hotel	Year	STARS PM	Expense report	Baseline
		Administrative cost	License fee	Year	STARS PM	Expense report	Baseline, Endline
		Participant time	Wage	Day	Evaluation team	Household listing	Baseline

4. Collecting and adjusting costs

4.1 Planning for cost data collection

Implementation and research teams should work together to develop a strategy for collecting data. Cost capture can be incorporated into quantitative survey instruments, existing monitoring activities, or as part of qualitative data collection. The research team should identify how and who should collect data during project implementation. The next section answers some frequently asked questions on cost data collection and outlines a few guiding principles for collecting cost data in impact evaluation.

4.1.1 Who provides the data?

Cost data should be collected from the stakeholder who incurs the cost of implementing the project, intervention, or policy. Collecting data during implementation will require close collaboration between the evaluation team, monitoring team (if separate from researchers), cost team, and implementation partners. There is a risk of burdening

partners with time-consuming data collection. To mitigate this risk, integrate cost data collection with existing monitoring processes to the extent possible. It is important to note that data recorded as costs of project activities may vary based on cost accounting practices in any given context, such as government agencies or NGOs.

If data for a specific cost category is not available, costing teams may want to sample specific sites or intervention activities to estimate costs, and then use information to extrapolate costs to the wider program. In such cases, data must be collected from representative sites. Purposive sampling may be required to ensure representative data is collected across locations and demographic groups.

How can cost data collection fit into impact evaluation?

If implementing a mixed method impact evaluation, one way to collect cost data is as part of qualitative data collection. Key-informant interviews with program staff can provide opportunities to identify cost centers or collaborate on the cost collection template, which may abate the double-burden of data collection.

4.1.2 When will the data be collected?

As discussed, actual cost capture is recommended as the project is implemented. The timing can be planned according to steps in the project theory of change. The evaluation pre- analysis plan should clearly outline how data will be collected. The plan should indicate who collects the data and when, and should be mindful that implementation often differs at least somewhat from what was planned.

4.1.3 Is it recommended to collect costs for the comparator or control group?

To interpret the results of CEA, it is essential to identify comparable alternatives to the intervention under evaluation. In some cases, the intervention will replace another

intervention. The cost team will need to collect information to assess the relative change in costs for the 'new' intervention. Most impact evaluation studies will measure the effects of the intervention by estimating changes in outcomes in intervention and counterfactual groups. Similarly, costs should be estimated for the counterfactual condition so that relative costs and effects can be compared in the CEA. In other cases, the 'status quo' policy is no intervention. When the intervention under evaluation does not replace another program, a comparator will still need to be identified to estimate an ICER; otherwise, a threshold or valuation in terms of currency of the social cost of the extra outcome of interest may need to be considered (see Section 5.4.3).

4.1.4 Can we just use budget data?

In many preliminary or back-of-the-envelope cost analyses, budgets are taken to be the cost of the interventions.

Though budgets can provide useful framing and data for costing activities, the budget rarely accurately reflects the cost of the implementation of an intervention. For example, budgets may not capture certain economic costs, including donated services and goods and opportunity costs. In addition, a budget does not account for externalities of intervention spending. For these and other reasons described in the box below, costing should focus on actual resources used in the implementation process. As such, direct

cost-collection by costing teams as well as thorough, selective review of direct reporting of financial expenditures are likely the best sources to inform costing work.

How is costing different than budgeting?

There are a few reasons why budgets alone are not enough for accurate cost analysis:

1. Budgets are guess-estimates based on past cost accounting. Unless expected values are replaced with actual costs, actual and expected intervention spending may vary.
2. Budgets are not written from a social perspective. Relying on the budget may under-report the costs of the intervention. For example, budgets may not include information on wages forgone (opportunity cost) to participate in a training or donated resources. Budgets seldom reflect opportunity costs.
3. Budgets typically are not granular enough to give insight into equity in spending, including variation by location (for example, remote or hard-to-reach villages) or by demographic group.
4. Budget headers may not clearly align with intervention activities, making it difficult to bucket costs into appropriate intervention categories and to examine cost data in ways that can answer key cost research questions.

4.2 Adjustments to costs

Generally, two kinds of adjustments to prices will be needed for the data reported in the costing template: (1) time-based (e.g., for inflation, discounting future costs) and (2) non-time price adjustments (e.g., currency conversions, accounting for shared costs across multiple cost centers).

4.2.1 Time-based adjustments

This section describes time-based adjustments for inflation, discounting, and to calculate the equivalent annual cost of capital goods.

Adjustment for Inflation: Programs implementing interventions often exist over several years, meaning goods are bought and used at different times. To account for the changing purchasing value of money (i.e., inflation or deflation), it is recommended that analysts convert costs that occur in separate years into a single currency year (e.g., 2020 USD), ideally the most recent year possible. Nearly all governments publish adjustment factors (e.g., consumer price indexes) that are indexed to a base year. The example box below shows how prices can be adjusted from one year to another.

Example 1: Adjustment for inflation

Consider a project implemented from 2018 to 2021. The costs and impacts of the project will be reported at the end of the project in 2021. For comparison, all project costs need to be reported in 2021 currency value. For example, a good bought for $100 in 2018 would be adjusted using inflation index values in 2018 and 2021; suppose that the factors are 238 and 250 respectively. The adjustment for $100 is $100 × (250 ÷ 238) = $105. Alternately, if all you knew was the 2021 value of the good, to convert 2021 prices to 2018 prices, you would use the equation $105 *(238 ÷ 250).

Applying a discount rate: Discounting is distinct from inflation. Discounting is related to the notion of time preference, wherein people prefer to have money now so that they can use it to invest and attempt to grow returns. They also prefer to have it now because of the risk and uncertainty inherent in money that is owed as opposed to owned (*Cost-Benefit Discounting*, 2014). Within economic evaluations, discounting is recommended to consider stakeholder time preferences and convert future earnings and costs into what they would be valued at today.

Rates of time preference differ. Practically, analysts should first seek to understand if involved stakeholders (e.g., a country government) uses or recommends a specific discount rate. If not, analysts may update published country-specific rates using available evidence (Ochalek 2018), rely on general advocacy to use three to five percent rates depending on a county's income status (Haacker 2020), or use a county's GDP growth rate as a proxy for the discount rate. Discounting costs at the rate of growth or at the prevailing interest rate reflects the market opportunity cost in time for consumable goods.

Example 2: Adjustment for Discounting

Assume a project has costs of 100,000 in year 1 (2018), 110,000 in year 2, and 120,000 in year 3. Using a discount rate of four percent, the present value of costs in 2018 USD is given as:

$$Present\ value\ in\ 2018\ USD = 100{,}000 + \left(\frac{110{,}000}{1+0.4}\right)^{1} + \left(\frac{120{,}000}{1+0.4}\right)^{2}$$

$$= 100{,}000$$

The equivalent annual cost of capital expenditures: In economic evaluations, it is recommended that analysts convert intervention costs into annual expenditures to facilitate comparisons of interventions that are implemented over different durations or that have different cash flows (e.g., large capital expenditures that occur in different years) (Vassel et al., 2017). Practically, this means that expenditures for capital assets (e.g., facilities, vehicles)—which produce a stream of benefits over their expected useful life—are annualized over their lifetime of use. Example 3 describes methods for deriving the equivalent annual cost of fixed goods using a prevailing discount rate, the cost of the item, the intended period of usage (i.e., expected useful life) and the depreciation rate.

Example 3: Obtaining the equivalent annual cost of a facility

Consider a building purchased at a given point in time with usage expected over, say, ten years. Analysts can convert the total cost of the building into an equivalent annual cost. Let *C* be the cost of the item when purchased, δ be the depreciation rate, *N* be duration of use of the item (e.g., useful life), and *r* the interest rate.

It is assumed that the facility can be sold in the future for whatever is left of the good after depreciation. As the sale occurs in the future, it must be discounted. The formula to obtain the current value of the good purchased is the following:

$$V = C - \frac{Ce^{-\delta N}}{(1+r)^N}$$

where *e* is the Euler number 2.718. Supposing the item costs $30,000 with a depreciation rate of 10% and the prevailing interest rate (discount rate) is 5% per annum, the depreciated present value of the item is V = $23,225.

The cost for a particular period A is given as:

$$A = V - \frac{r(1+r)^N}{(1+r)^N - 1}$$
$$= 23{,}325\ x\ \frac{0.08144}{0.6288}$$

Using the above formula (which may also be executed through public software such as Excel ('pmt' function)), the yearly cost of $3,008.

Calculating the total overall time adjustment*:* Example 5 demonstrates how to combine multiple time-based adjustments to costs that are reported for a single time period. Amortized values use a fixed interest rate, and the value *A* from Example 5 is a constant for the period. Appropriately, it should be both adjusted for inflation and discounted. It is convenient to determine the yearly costs with *A* along with all other costs in the period, then adjust for inflation and the discount rate to obtain a present value.

Example 4: Calculating the overall time adjustment

Consider a three-year project a capital expenditure with an equivalent annual value of 3,000 and additional labor costs are 5,000, 5,200, and 5,300 in years 1-3 respectively. We will determine the present value of the project at year 0. The following illustrates the total cost calculations for an inflation index of 200, 205, 207, and 210 for four years, respectively, with a discount rate of 5%.

The total cost for each of the three years at the yearly prices are the labor costs plus the amortized fixed cost. The inflation adjustments are 0.975, 0.966, and 0.952, respectively. The full cost of the project is the following at the time project decision making process, year 0:

$$Full\ cost = \frac{0.975\ x\ 8{,}000}{(1+0.5)^1} + \frac{0.966\ x\ 8200}{(1+0.5)^2} + \frac{0.953\ x\ 8300}{3}$$
$$= 7{,}433 + 7{,}186 + 6{,}828 = 21{,}447$$

4.2.2 Non-time-based adjustments

Some prices may not reflect actual costs or opportunity costs. Examples include imported goods that are priced through distorted exchange rates, wages that are under- or over-valued, donated goods that are not priced, transfer payments, and government fees averted for NGOs. Because most CEAs are conducted using the societal perspective, adjustments may be needed to capture opportunity costs and report economic costs. In this section, we provide examples of common non-time-based adjustments (price distortions) that analysts may encounter.

Pricing labor: It is necessary to appropriately price labor, especially in countries where unemployment of unskilled workers is common. Pricing labor value involves considering the opportunity cost of labor, distinguishing between unskilled and semi-skilled workers, and evaluating the wages paid during the intervention.

For instance, in settings where unskilled workers make up a significant portion of the labor force and face high unemployment rates, the opportunity cost of labor may be close to zero. In such cases, wages in these programs might be perceived as transfer payments that are like cash transfers. On the other hand, some interventions may employ semi-skilled workers who possess alternative employment options, and thus their wages could impose social costs.

Example 5: Pricing labor

To address the complexities surrounding labor value pricing, one solution is to cost labor at the intervention's marginal productivity, which could be approximated by the wages paid to the workers.

For example, consider a project that provides guaranteed employment to laborers for 100 days per year. Since there is significant unemployment in this setting, the opportunity costs of labor may be very low. Yet, some notion of efficiency wage may apply. It is recommended that unskilled labor be priced at the marginal productivity, which is likely to be the wages actually paid in the project.

Another example is volunteer labor. Volunteer labor can be priced at actual wages that would be paid if the labor was not voluntarily provided. If a highly qualified person volunteers, the price can be set at the wage of the commensurably skilled person within the context.

However, this approach should be used cautiously. Skilled workers, for example, might be underpaid relative to their productivity, thus skewing the analysis. Hence, researchers should perform sensitivity analysis to explore different scenarios, adjusting labor value from the actual wages paid during the intervention. Conducting sensitivity analysis allows for a more robust evaluation of the intervention's cost-effectiveness and provides insights into the potential impact of varying labor value assumptions.

Currency value and import duties: In most cases, official exchange rates are sufficient for converting one currency to another**.** However, analysts may become aware of parallel exchange rates – one that is official, and another where informal exchanges take place at a different rate. In such cases, the official exchange rates should be adjusted, consulting

documents from the World Bank and the International Monetary Fund for assistance (Rompaey, Metreau and Kouame, 2021).

In many low- or middle-income countries, domestic currencies are undervalued. Undervalued or overvalued currencies impose opportunity costs. Organizations such as the International Monetary Fund (IMF) suggest adjustment values. Further, the price paid within the country reflects import duties imposed on the international border price of the good. Prices of imported goods should be adjusted to the international price and adjusted by other shadow costs.

Community inputs and volunteer: Interventions may employ community labor and voluntary labor from different sources, including highly skilled labor that may have been funded by sources outside the domestic public sphere. The labor should be priced according to the skill level of the activities. These rates can be obtained by consulting recipients or using proxy estimates or wages by skill level from country or international databases. If the volunteer opportunity is viewed as something akin to an element of citizenship, the labor can be priced at zero.

Fees to government: Fees to the government, although they may be considered a transfer, *can* be costed, as governments may incur costs (for example, in issuing licenses). However, in most cases, the fee may simply be a tax payment without any effort. In that case, they can be treated as transfer payments.

Spillovers: Spending on an intervention may generate positive or negative externalities, which may have implications for the costs (or effect sizes) estimated by the analyses. If the intervention generates spillovers, the externality should be documented and implications for cost estimates should be examined. In practice, this may need to occur through modeling, given the significant burden of tracking costs beyond the programmatic sphere. For example, an HPV immunization program will prevent future cases of cancer, lowering healthcare costs. However, because they occur in the future they cannot be directly tracked. Analysts may consult hospital expenses, published cost literature, or build models to incorporate these—if feasible.

Overhead costs: Interventions are situated within an organization. An organization will likely implement interventions simultaneously, presenting the opportunity for resources to be shared. An organization may also view integrated intervention implementation as an efficient way to implement interventions. For example, labor can be shared for interventions where labor time is devoted across interventions (Lopetegui *et al.*, 2014); equipment can be shared in terms of time; and a classroom can serve as a learning environment or meeting space. Annexure B provides further detail on approaches to allocating overhead costs.

4.3 Uncertainty and sensitivity

How should we manage uncertainty in cost data? Should we consider alternative assumptions for adjustment parameters? At the time of design, project planners should anticipate uncertainties during project implementation, for instance, that certain portions of project sites will incur different costs, and that costs may change during implementation.

Often, the total costs in a costing analysis will contain information that is based on assumptions, for which alternative assumptions are feasible or data are obtained from samples. The cost analyst should report the base parameters for assumptions, including point estimates for costs obtained using base assumptions and mean values.

Cost analysts should also conduct sensitivity analyses around discount rates and exchange rates (McEwan, 2011). Occasionally, depreciation values as well as the longevity of capital goods should be varied. If researchers are concerned that parameters are likely to be wrong, then sensitivity analysis should be conducted. Usually only two or three parameters will be adjusted. If there are values that were obtained from a sample, then confidence intervals should be noted. Uncertainty and sensitivity analyses provide ranges for the true costs of a project.

5. Reporting costs and impact

5.1 Cost methods

As with any impact study, cost studies should contained detailed methodologies documenting cost perspective, data sources, adjustments, and assumptions. Clearly presenting sources and assumptions provides a roadmap for others to follow and replicate and potentially generalize to other contexts. Analysts may benefit from adopting or adapting reporting guidelines for economic evaluations (e.g., CHEERS).

5.2 Cost summaries

Table 2 shows how cost data can be summarized and presented to stakeholders. Illustrative summaries for the STARS Case Study are in Box 7.

Table 2: Summarizing cost data

Total cost	Total costs are the value of all costs. Costs can be reported for the entire intervention, or for some small units of the intervention that are representative of the larger implementation (see Section 1.2.1, 'Unit of coverage') or at a regional level. The sampling strategy and sample size should be noted. An example would be the total costs to the state for a vaccine program implemented at the district level.
Average cost	Costs may vary, so it can be informative to report the average costs per unit; for example, the average cost of a vaccine program per district, or the average cost per 1,000 children vaccinated.
Costs by intervention component	Costs can also be organized by intervention component. Total costs for the major activities of the intervention should be presented and can be a critical planning resource for future programming, for example, the costs per vaccine camp set-up.
Costs by category	For program planning purposes, it may be helpful to report costs by the type of cost to understand the cost drivers, for example, reporting total and average labor costs, capital costs, variable costs, etc.

Box 5: Cost summaries for the STARS Cost Analysis

The STARS program was successfully implemented, and the evaluation team has finalized end line data collection. The team is ready to compile and analyze cost and effectiveness data to answer the research questions developed in Box 2.

To answer our first research question, we report our cost estimates. RQ1: What is the total cost of the STARS program?

	D0	D1	D2
Total cost	$600,000.00	$700,000.00	$1,000,000.00
Number of participants	10,000	8,000	6,000
Average cost per participant	$60	$87.50	$166.66

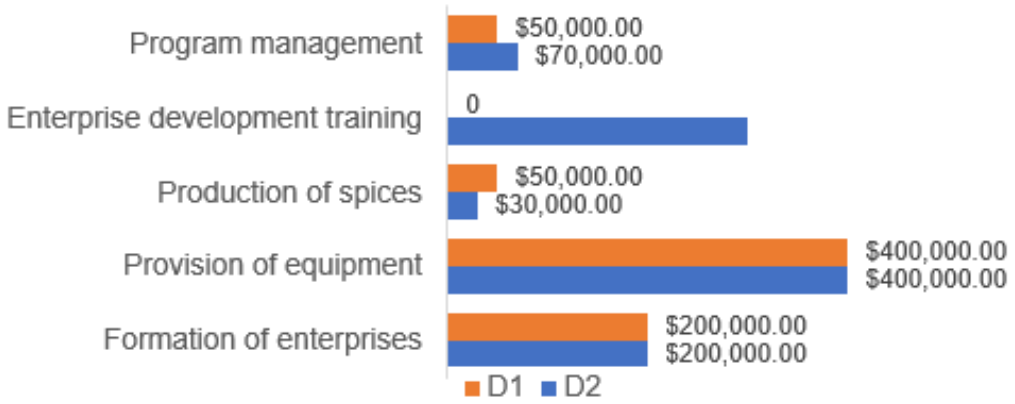
STARS D2 (which both forms enterprises AND conducts economic development learning training) is much more expensive than both the comparator ('light touch' training) and D1 (forming enterprises) due to the training component of the program.

Our Ministry partners also expressed interest in disaggregating STARS costs by region. Because the costs we captured were disaggregated by region (Box 4), we can report total costs and average costs per participant by treatment arm and region. An illustrative example of regional disaggregation for D1 is in the table below.

	Region 1	Region 2	Total
Cost (D1)	$300,0000	$400,000	$700,000.00
Number of participants	5,000	3,000	8,000
Average cost per participant	$60	$133.33	$87.50

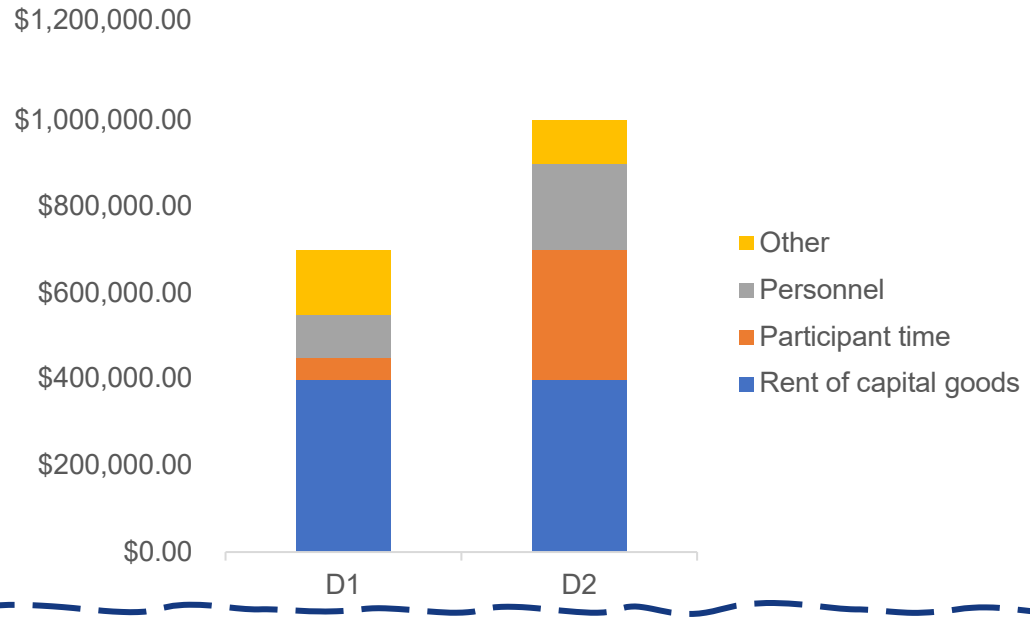
Costs can also be presented by intervention component. For example, we observe that STARS D1 and D2 made identical investments in the 'formation of enterprises' and 'provision of spice processing equipment.'

Figure 5: STARS Cost by Cost Center



Another suggestion for presenting costs is by resource category. For example, one of the cost-drivers of the STARS D2 program, compared to D1, is the cost of participant time. D2 was time-intensive for participants and involved traveling upwards of 30 kilometers to training in centralized locations. We observe that much of the additional expense of D2 is driven by participant time.

Figure 6: STARS Costs by Resource Category



5.3 Analyses comparing costs and consequences – advantages and shortcomings

Several types of analyses—e.g., cost-efficiency, cost-effectiveness, and cost-benefit analyses—compare costs and consequences of programs (Figure 7). Each technique relies on rigorous and accurate collection and analysis of cost data, while examining consequences from a slightly different angle.

For example, cost-efficiency analyses assess the ratio of project costs to outputs. As such, they can provide insight into production efficiencies, with potential application for examining how production costs differ across localities or demographic groups, or how alternative delivery platforms change costs when employed for interventions. Cost-efficiency analyses, however, do not provide insight into outcomes (e.g., they can identify a cost per person trained, but say nothing about the training's efficacy in helping the person to gain knowledge).

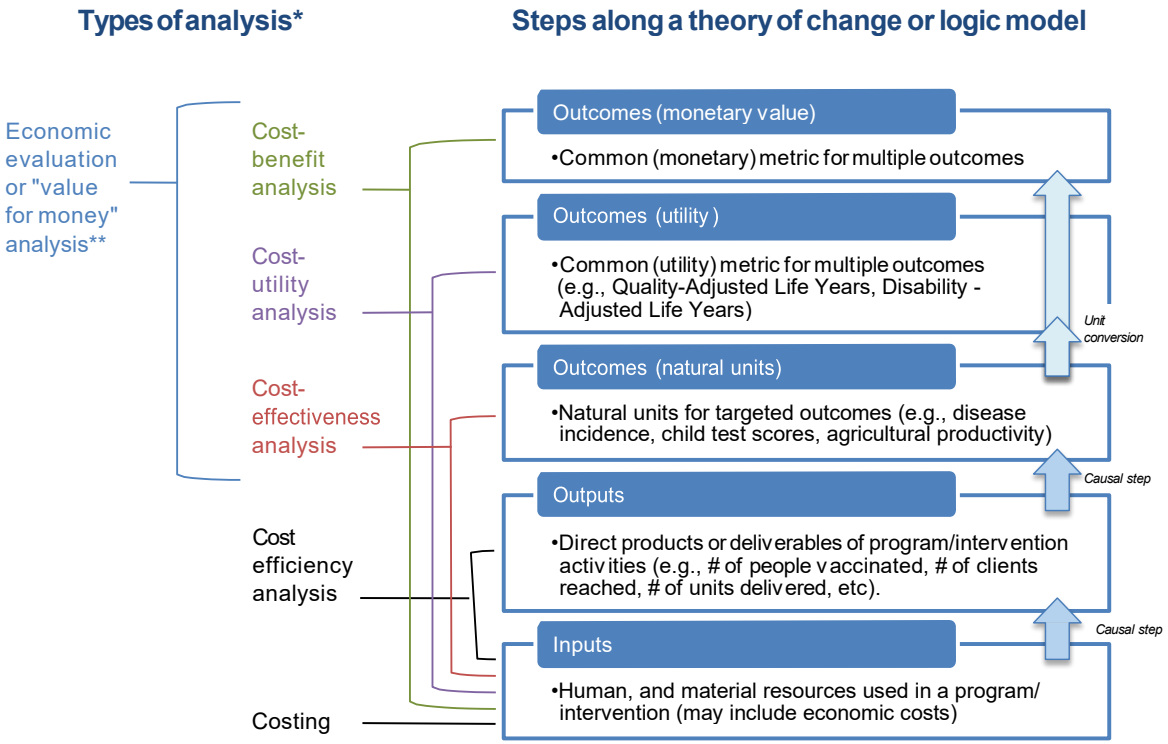
These kinds of insights are better learned through cost-effectiveness analyses, which compare the cost per unit of change in a natural outcome of interest—e.g., the cost to increase agricultural production yield by one ton or to save one life (Drummond *et al.*, 2015). Such information is useful for comparing which interventions deliver high value for money and may assist decision-makers to allocate resources efficiently.

However, with cost-effectiveness analyses, useful comparisons cannot easily be made between interventions that produce different outcomes—such as, say, Intervention A's cost

per one ton increase agricultural yield and intervention B's cost per 1 additional student graduating from secondary school. Here, cost-benefit analysis steps in by monetizing the outcomes of interest, placing a currency value on the one ton of crop yielded and on the societal value of an individual graduating from school. By translating outcomes into like terms, money, cost-benefit analysis facilitates the comparison of all types of programs.

Within this handbook, our focus is on cost-effectiveness analysis given its ready application to international development programs with evaluations that usually measure outcomes in natural units. However, cost-effectiveness is a steppingstone to cost-utility and cost-benefit analyses, and it is entirely appropriate to include both cost-effectiveness and cost-benefit analysis activities where feasible.

Figure 7: Analysis techniques using costs as an input



*all listed analyses may either be ex ante (modeling/predicting a future intervention) or ex post (characterizing a completed intervention)
**outcomes for these analyses should be causally attributed to the intervention based on construct of a valid counterfactual

Source: Glandon et al., 2023

5.4 Cost-effectiveness analyses - Bringing costs and consequences together

Impact evaluations assess the effectiveness of competing, alternative courses of action (i.e. interventions) for one or more outcomes of interest. Cost analyses quantify how much the status quo and each course of action costs to implement.

Cost-effectiveness analysis draws outputs from these two activities together. As such, researchers must agree on units of measurements that are consistent across both the cost and impact studies. Measures should come from the same sites and the same time period. Ideally effect measures should be supported by research supporting causal attribution, with appropriate citation of limitations to the analysis if they are not.

With the best available data on costs and consequences of relevant interventions, decision makers may compare alternatives using cost-effectiveness ratios.

5.4.1 The incremental cost-effectiveness ratio

Incremental cost effectiveness ratios (ICER) are a summary measure used to compare interventions and create a decision rule about whether, considering economic criteria alone, one intervention should be adopted over another.

The ICER compares the difference in costs and effects generated by two interventions, given as the change in cost divided by the change in effect between one intervention (A) and its comparator (B):

$$ICER = \frac{Cost_A - Cost_B}{Effect_A - Effect_B}$$

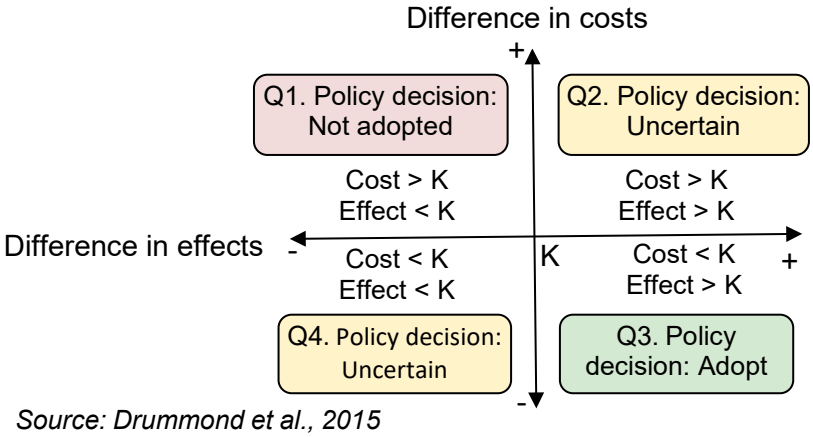
For example, assume that an organization spends $100,000 on a program that produces an outcome in 1,000 people. A new program will cost $95,000 and produce an outcome in 1,100 people. The incremental cost- effectiveness ratio is the following:

$$ICER = \frac{\$95{,}000 - \$100{,}000}{1{,}100 - 1{,}000} = \frac{-5{,}000}{100} = -\$50$$

The new program is less expensive than the old program and produces greater outcomes. That is, for $5,000 less in costs, it was observed that an additional 100 people were being helped.

The cost-effectiveness plane (see Quadrant 3, Figure 8) shows that this is an easy decision; the new program should be automatically adopted. However, other possibilities exist. The new program could have had greater costs and lower effectiveness compared to the comparator, another easy decision for decision makers (Q1, no adoption), Or, it could have mixed effects with either both costs and effects being greater (Q2)[9] or lesser (Q4), in which case additional criteria are required to make adoption decisions (see section 5.4.2).

Figure 8: The cost-effectiveness plane



The cost-effectiveness plane maps the incremental costs and effectiveness of an intervention in relation to a comparator, K (which lies at the intersection of the quadrants).

Source: Drummond et al., 2015

[9] It is possible for interventions to have produced statistically significant improvements and still be seen as inefficient. For example, modest gains that have been seen from the "Millennium Villages" interventions, implemented in some parts of rural sub-Saharan Africa, have yet to be seen to have warranted the costs of the interventions (Masset, Hombrados and Acharya, 2020).

Box 6: Calculating the ICER, STARS Case Study

The evaluation team worked with the ministry to develop a tool to estimate women's economic empowerment in the treatment and control groups using a point score test. Women who score above a certain threshold level of the scale are, for the purpose of this example, considered 'empowered'. The impact evaluation reports the change in the proportion of women in our sample who are 'empowered'. This change can be causally attributed to the STARS program.

- RQ 1: What is the total cost of the STARS program?

To answer the first research question, cost estimates for D0 (the 'light touch' training), D1 (forming enterprises), and D2 (forming enterprises and conducting EDL training) are reported. As discussed in Box 5, we find that D2 is much more expensive than D1.

Program	D0	D1	D2
Cost	$600,000.00	$700,000.00	$1,000,000.00
Number of participants	10,000	8,000	6,000
Average cost per participant	$60	$87.50	$166.66

- RQ 2: What is the effect of the STARS program on women's economic empowerment?

The impact evaluation collected data on women's economic empowerment (WEE), reported as the number of women considered 'empowered,' measured at both baseline and endline, for the comparator (D0) and intervention groups (D1, D2). The primary outcome of interest was the change in WEE attributable to each intervention (D1 and D2), relative to the comparator.

Program	D0	D1	D2
Proportion of women empowered at baseline [95% CI]	40% [38.8%, 41.9%] (4,000/10,000)	40% [37.5%, 42.5%] (3,200/8,000)	40% [36.9%, 43.1%] (2,400/6,000)
Proportion of women empowered at endline [95% CI]	50% [49.1%, 50.9%] (5,000/10,000)	60% [58.2%, 61.6%] (4,800/8,000)	70% [68.8%,71.9] (4,200/6,000)
Change in proportion (and number) of women empowered (Endline – Baseline) **[95% CI]**	10% (1,000) [9%, 11%]	20% (1,600) [17.2%, 21.2%]	30% (1,800) [28.2%, 31.5%]
Change in WEE attributable to STARS (D1, D2) relative to D0* [95% CI]	--	600 [536,698]	800 [692,890]

- RQ 3: Which STARS treatment arm is relatively more cost effective?

To compare cost-effectiveness, the relative cost effectiveness of each treatment arm must be calculated. The following formulas are used to calculate ICERs for D1 and D2:

ICER D1*: Comparing cost-effectiveness of D1 and D0.

$$\frac{Cost\ of\ D1\ (\$700{,}000) - Cost\ of\ D0\ (\$600{,}000)}{Effect\ of\ D1\ (1{,}600) - Effect\ of\ D0\ (1{,}000)}$$

- Investing an additional $100,000 on D1 is expected to empower 600 additional participants
- D1 costs $167 per additional woman empowered.

ICER D2*: Comparing cost-effectiveness of D2 and D0

$$\frac{Cost\ of\ D2\ (\$1{,}000{,}000) - Cost\ of\ D0\ (\$600{,}000)}{Effect\ of\ D2\ (1{,}800) - Effect\ of\ D0\ (1{,}000)}$$

- Investing an additional $400,000 on D2 is expected to empower 800 additional participants
- D1 costs $500 per additional woman empowered.

Relative to D0, both D1 and D2 are more expensive and more effective (Costs > 0; Effects > 0) and both ICERs are mapped to Q2 of the ICER plane (Figure 8).

However, when compared to D0, we observe that D1 is more cost effective than D2.

Because STARS is both more effective and more expensive than 'business as usual,' additional analyses may help policymakers to determine whether the initiative is worthwhile. Box 7 provides a few examples of possible interpretations of the ICER. Though beyond the scope of this guide, it may be useful to consult resources on conducting willingness-to-pay analysis (Gabor and Granger, 1979), budget impact analysis (Sullivan *et al.*, 2014) and others. Below, we summarize findings from the cost-effectiveness analysis.

Category	D0	D1	D2
Total cost	$600,000	$700,000	$1,000,000
Number of participants	10,000	8,000	6,000
Change in proportion (and number) of women empowered (Endline – Baseline) [95% CI]*	10% (1,000) [9%,11%]	20% (1,600) [17.2%, 21.2%]	30% (1,800) [28.2%, 31.5%]
Marginal cost per woman empowered, relative to D0	--	$167	$500

*For instructional purposes we report nominal difference in observed change between treatment arms and control groups. In practice the attributable effect will be calculated based on the econometric specifications.

Box 7: Additional interpretation of findings from the STARS Cost Analysis

What should we recommend to our government partners? In this box, a few possibilities are presented for applying findings from the STARS cost-effectiveness analysis results. Note that this analysis has been simplified for learning purposes and is not exhaustive. Interpretation will vary by stakeholder interests and the scope of cost study as defined in the 'Define the Intervention' phase.

1. Heterogeneity in costs

As discussed in Section 4.2 (Box 7), it is observed that participant time and personnel costs were cost drivers for D2. D2 was much more expensive than D1 because it required hundreds of hours of respondent participation, resulting in lost wages. D2 also cost more per participant because fewer participants were mobilized.

There is also heterogeneity in costs by region. Region 2 was harder to reach than Region 1, and the implementation team incurred higher costs and reached fewer people. These differences should be accounted for in subsequent analyses, including scale-up modeling.

2. Comparing costs and effects

Both iterations of the STARS intervention significantly increased the number of participants empowered relative to the D0 'light touch' intervention. After dividing the total cost of each intervention by the number of participants empowered, the average cost per empowered participant is greater for D0 than D1 or D2.

When presenting this information, we may encourage the ministry to consider replacing the status-up (D0) program with one of the STARS interventions, but caveats should also be presented. For example, D2 reached fewer participants than D1 or D0, and additional analyses will be required to determine how the effectiveness of the program will change if the program is scaled. Average costs should be presented using sensitivity analyses (see Section 3.3).

3. Interpreting the ICER: D1 vs D2

D1 is more cost-effective than D2 as the intervention costs less per additional woman empowered, but caveats should again be presented. Both STARS interventions are more effective and more expensive than the status quo, and per the ICER plane (Figure 7), the decision to adopt is 'uncertain' (see Section 4.3.2). The cost team may need to work with the decision-maker to determine if this additional investment is valued by the ministry stakeholders, possibly by conducting additional scale-up or sensitivity analyses to explore how estimated costs and effects will change over time.

For example:

- When defining the cost analysis scope, the ministry stated their commitment to increasing women's economic empowerment by 40% by 2025 (Box 1).
- In this scenario, the STARS D2 alternative may be the stronger choice because in two years, it is expected to empower 30% of participants, while D1 only reaches 20%.
- This target could be used to help ministry decision-makers determine whether they value the gain in women's economic empowerment more than the additional investment ($500 per woman empowered).

5.4.2 To adopt or not? Thresholds, cash benchmarks, and other considerations to inform decision-makers

Realistically, many projects do not automatically warrant an 'adopt' decision as suggested by Q3 of the ICER plane. Any decision regarding whether to adopt or reject an intervention falling in Q2 or Q4 involves consideration of whether the resources used to implement the intervention could be better used elsewhere (Drummond *et al.*, 2015).

Where sufficient data exists, an intervention's cost-effectiveness can be compared to the cost-effectiveness of other interventions in the same thematic area. However, in many cases, we may not have information on the cost-effectiveness of interventions that aim to improve the same natural outcomes.

As cost-effectiveness analyses becomes common, more exhaustive comparative opportunities will emerge. Indeed, in some geographic contexts, where sufficient data exists, governments have set cost-effectiveness thresholds. These thresholds establish a normative threshold to identify whether the new intervention is a good value-for-money (Thokala *et al.*, 2018). For example, based on reams of cost-effectiveness research, the National Institute for Health and Clinical Excellence in the United Kingdom has set a cost-effectiveness threshold range between 20-30,000 pounds sterling per quality adjusted life year gained (McCabe 2008)—meaning, in that context, health interventions that exceed that threshold should likely not be adopted if only economic criteria are considered. However, these threshold values are sometimes contested (that is, reasonable and informed people can disagree as to what the values should be), and various values have been proposed in different contexts (Hirth *et al.*, 2000; Hyewon and Levine, 2012). Practically, it may be challenging to expect policymakers to identify a threshold to justify adaptation of a policy. If used, the approach to determining an appropriate threshold should be evidence-informed (Culyer *et al.*, 2007).

Where thresholds have not been established, researchers rely on other indicators to establish cost-effectiveness and the merits of intervention adoption at scale. For example, cash benchmarking research is establishing how the outcomes of traditional development programs perform against unconditional cash transfers to households. Since cash has been shown to significantly improve a range of outcomes with relatively low costs of distribution, it is a salient comparison point (USAID, n.d.). If a traditional program outperforms the cash transfers in cost-effectiveness, it is considered an intervention that offers good value for money. In the health sector, similar methods have been established, on a country-by-country basis, showing how much health general investments in the healthcare systems can buy (Ochalek, 2018). Interventions with cost-effectiveness that outperform general investments are considered worthwhile.

5.5 Scaling-up

Cost-effectiveness analyses are often initially conducted at a smaller scale to evaluate the impact of interventions. During this phase, it is crucial to perform a thorough process evaluation to determine the replicability of the program. If the cost-effectiveness ratio proves favorable, decision-makers might consider expanding the program, replicating it in new locations, or maintaining the current level of intervention.

Within a sufficient timeframe, economists usually assume that any production process can be repeated or that learning-by-doing reduces costs. However, there may be some constraints, such as hard-to-reach participants, skilled labor or environmental and resource constraints that prevent economics of scale. Accurate and disaggregated costing can inform modeling or forecasting (these methods are not discussed in this handbook). In such efforts, modelers must consider how inputs and resource use may change as programs scale. For example, scaling an intervention could require tapping into a limited pool of human resources with specialized skills. As a result, labor costs could rise as scaling up takes place. These types of repercussions may be considered in modelling and forecasting of scale up.

5.6 Multiple outcomes

In recent years development strategies have increasingly emphasized multi-sectoral collaboration (Glandon *et al.*, 2019). It has been recognized that interventions implemented simultaneously can induce a 'take-off' or 'big push' for change in well-being. On smaller scales, the literature suggests that integrating multi-sectoral interventions regionally can create synergy and efficiencies that reduce costs and improve outcomes (Banerjee *et al.*, 2015; Gelman *et al.*, 2022). It is also possible that an intervention yields multiple outcomes. For instance, education interventions contribute to changes in outcomes related to student health, income, and civic participation.

Integrated or complex interventions involving multiple sectors may yield cost savings or produce multiple outcomes.

6. Conclusion

In a world of resource scarcity, comparing the impacts of policies or projects without considering costs "is like one hand clapping" (Gaarder and Linn, 2023). Despite its potential for informing policy and program design, cost evidence is often not incorporated into impact evaluations (Brown & Tanner 2019).

This handbook focuses on cost-effectiveness analyses conducted using data from actual cost capture in international development implementation programs. This approach is essential as actual costs can vary significantly from budgeted, expected or secondary cost data sources.

The CEA framework developed in this handbook comprises four empirical tasks: 1) defining the intervention and scope of study; 2) designing a cost collection template to capture costs incurred throughout the intervention lifecycle, 3) collecting and adjusting cost data as the intervention is implemented; and 4) reporting costs and impact. The key steps of each task are summarized in Annex 1.

The hope is that these resources will contribute to more transparent cost reporting, facilitate better resource allocation, and strengthen the credibility of policy decisions. By standardizing cost analysis methods, policymakers can more reliably compare the cost-effectiveness of different interventions, leading to more informed decisions that optimize resource use and impact.

Appendix A: Costing Checklist

Key Tasks of CEA in IE		Project Lifecycle			
		D	I	R	
1 Define the project and study scope					**Project resources needed:**
	Develop research questions	X			• Impact evaluation design • Pre-analysis plan • Theory of Change
	Identify cost metrics to be generated by the analysis	X			
	Identify evaluation design				
	Develop project Theory of Change	X			
	Define comparator	X			
	Define perspective	X			
	Define unit of coverage	X			
	Define time horizon				
	Define scope of costs to be included in the analysis	X			
2 Develop cost collection template					**Project resources needed:**
	List cost centers	X			• Implementation partner to co-develop cost centers and ingredients
	List cost ingredients	X			
	Specify cost data sources, data collection timelines	X			
	Identify cost adjustments	X			
3 Collect and adjust costs					**Project resources needed:**
	Incorporate cost collection in IE data collection	X			• CEA Expert to support cost adjustments
	Conduct time adjustments		X		
	Conduct non-time adjustments		X		
	Allocate shared costs		X		
	Account for uncertainty		X		
	Conduct sensitivity analyses			X	
4 Report costs and impact					**Project resources needed:**
	Report cost summaries			X	• Effect sizes estimated by IE
	Incorporate impact; calculate CER or ICER			X	
	Scale-up			X	
	Multiple outcomes			X	

D - Design; I - Implementation; R - Reporting

Appendix B: Overhead costs

For many projects some inputs will be shared with other projects. It is also possible that some outputs that would have been produced separately would be produced jointly.

Production processes can impose externalities, both negative and positive. This section does not examine externalities, only uses of joint inputs are examined. Although any sharing of inputs can be thought of as a joint production, this will most likely involve substantial usage of shared inputs.

Inputs when not completely used up in a production process can be thought of as a club good or a public good – the good can be used for some other purpose without being non-rivalrous. An input can be used for some other purposes when there is excess capacity. Dividing the cost of jointly used inputs can be a complicated topic (Acharya *et al*. 2022). A brief introduction is made here.

Dividing by use intensity: One can measure how much of an input is used toward different purposes. Some analysts (Drummond *et al.*, 2015) consider as a natural example of cost sharing overhead costs in a hospital that can be divided across the many health interventions that are undertaken within the hospital. For example, if the total housekeeping cost in a hospital is known, it can be divided by the floor space that each cluster in the hospital occupies.

Some have suggested taking the total cost of input and apportionment of the costs equally to each usage that it has (Shepherd, Zeng, and Nguen 2015).

For many sharing of labor inputs time and motion studies can be useful. Studies take place to enumerate detailed data on the duration and movement required to accomplish a specific task. The portions used are assigned to a project or activity.

One should note that when input or a production process is used for multiple outputs there is joint production that must induce cost savings in comparison to production processes where outputs are stand-alone products.

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