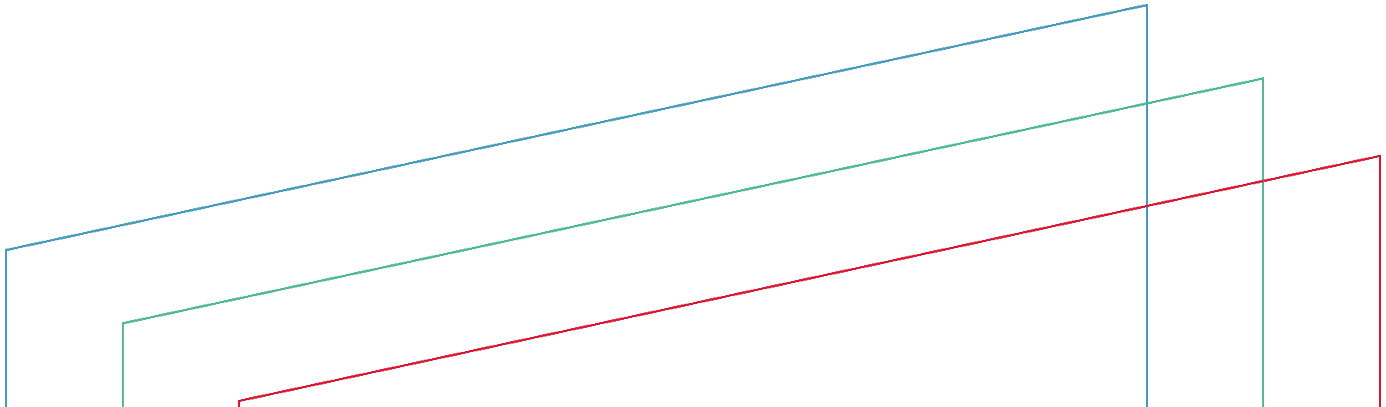
A Valuing Impact Toolkit for ICT Investment

PROTOTYPE

OCTOBER 2020



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Why valuing impact is important

Without an understanding of the social value created by ICT investments, it is difficult to make an informed decision about which investment is the most appropriate. The ICT sector is known for having social, economic, and environmental impacts that are difficult to capture. Valuing Impact methods can provide:

- Evidence for policymaking, programme design, and investment.
- Information to decide between competing priorities.
- An assessment of best value for money.
- A comparison of alternative complex investment options using common metrics.
- Evidence of success to help leverage funding for investments.

There is a growing demand from donors, implementers, and governments to apply valuing impact approaches to ICT investments. This toolkit provides a practical guide to identifying appropriate valuing impact methodologies to forecast the benefits of planned ICT investments and evaluate existing ones, particularly for digitally enabled service provision in low-income countries.

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Who this toolkit is for

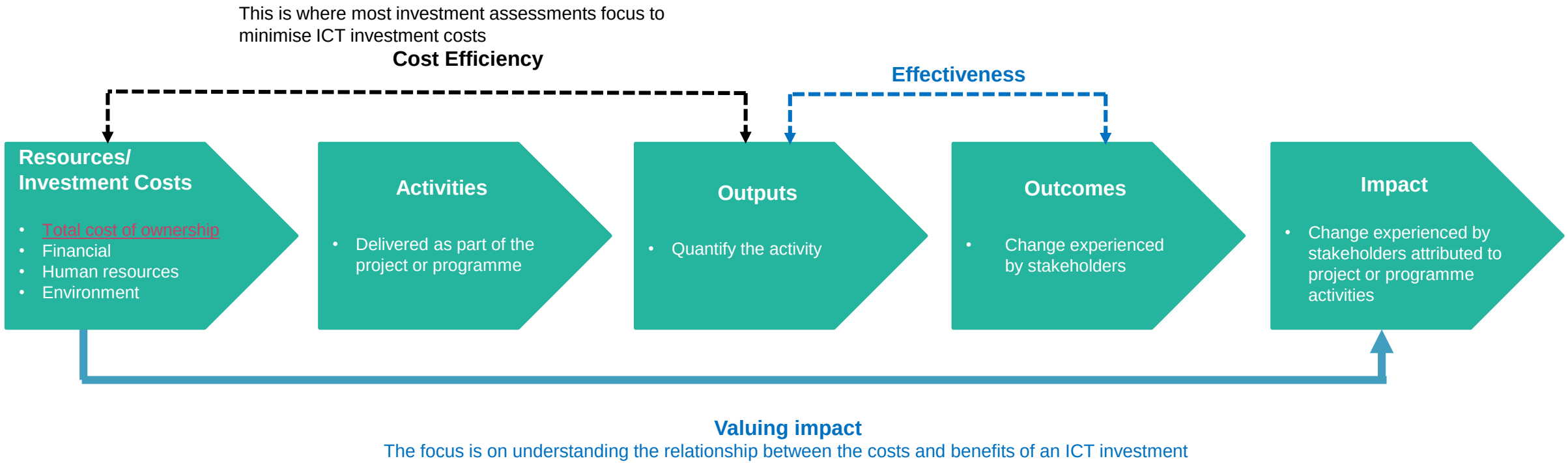
This toolkit will enable decision-makers to understand the process involved in using valuing impact methods and how the results are presented. For practitioners, this toolkit provides an overview of the methods, examples of where they have been used, and links to technical resources.

This toolkit is particularly relevant for:

- **Governments:** Forecasting returns on an ICT investment, or evaluating the impact of a project or programme.
- **Implementers:** Evaluating the impact of an ICT project or programme
- **Donors:** Forecasting returns on an ICT investment, or evaluating the impact of a project orprogramme.

Overview of the methods and what they measure

Visualising the change created by ICT investments helps understand what these methods measure.
This diagram presents how ICT investments create change by using resources to deliver digital solutions that support change for stakeholders by making systems more adaptive, efficient, and responsive.



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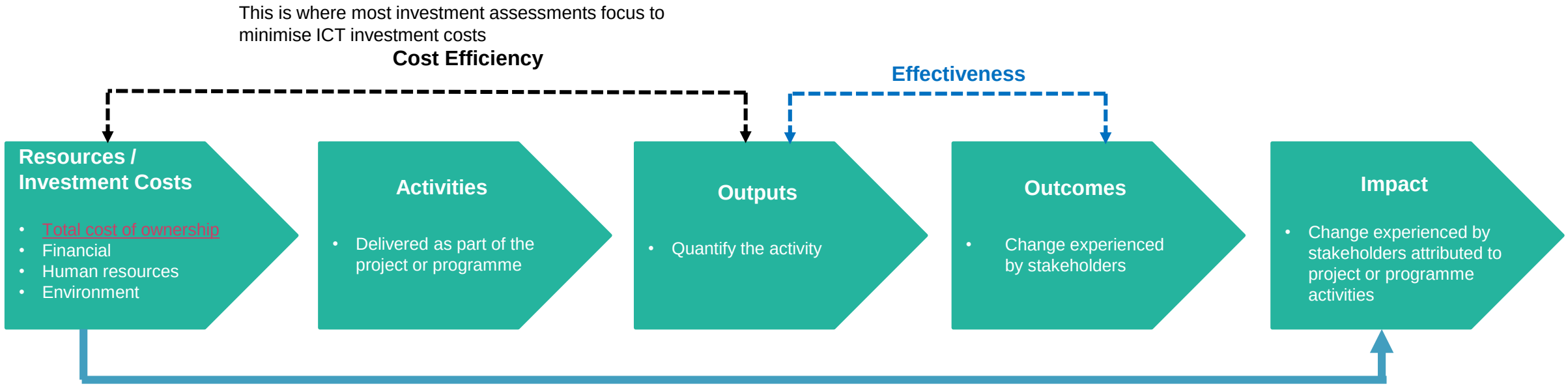
Overview of the methods and what they measure

This toolkit presents five valuing impact methods that support greater understanding of the value of ICT investments:

- **Cost Effectiveness Analysis**, **Cost Benefit Analysis**, and **Social Return on Investment** explore the relationship from investment costs through to impact.
- **Multi-Criteria Analysis** explores the relationships from activities through to outcomes.
- **Econometrics** explores the relationship from activities through to impact.



Valuing impact

The focus is on understanding the relationship between the costs and benefits of an ICT investment

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Best Practices

A set of best practice principles underpin how these valuing impact methods are applied to ICT investments and reflect the **Principles for Digital Development**.

A set of additional best practices are listed below and should also be considered when using methods highlighted in this document (adapted from the Principles of Social Return on Investment).

- Involve stakeholders
- Understand what changes
- Only include what is material
- Do not overclaim
- Be transparent
- Verify the results

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How this toolkit is structured

For each of the five methods, this toolkit provides:

- A method overview.
- A worked example in an ICT context.
- Case studies of the method's use.
- Links to technical guidance and references.

Different methods have specific attributes that make them more appropriate for certain ICT evaluations. The following questions will help you understand the scale and scope of your evaluation. A summary table is provided illustrating some of the characteristics of each method.

Questions to consider when choosing your approach (1/3)

Different methods have specific attributes that make them more appropriate for certain ICT evaluations. The following questions will help you understand the scale and scope of your evaluation. A summary table is provided (Slide 11) with some of the characteristics of each method.

- At what intervention scale is your ICT investment decision being made?
  - *This helps understand how complex your investment is. For ICT investments, this includes geographical scale (eg national or local level) and the nature of the digital architecture (eg developing a platform or a specific service).*
- What resources and technical expertise do you have available to conduct your evaluation?
  - *Certain valuation approaches require different skills, knowledge, and resources: some methods require considerable on-the-ground engagement with stakeholders, others need expertise in certain statistical techniques.*

Questions to consider when choosing your approach (2/3)

- How are you involving stakeholders directly impacted by the investment in the evaluation?
  - *Engaging people directly impacted by the investment can give you insights you might not get from desk-based research. Those closest to or most affected by a project or programme are best positioned to identify impact effects, both positive and negative. However, it is not always possible to speak directly to stakeholders due to practical constraints, such as time and budget. Think carefully before initiating an impact evaluation that does not engage these people.*
- Do you need to compare the results of your evaluation to alternative investment options or similar projects?
  - *Comparing projects or programmes can be useful to benchmark their impact. However, some methods are less suitable for comparative purposes.*

Questions to consider when choosing your approach (3/3)

- How important is it to compare the investment cost* with how much value is created from the project or programme?
    - *Some methods do not incorporate project or programme costs in their evaluation approach. As such, the results cannot be presented as a ratio that describes the value created per investment cost.*
- Does your evaluation look at one or multiple outcomes?
    - *You may want to explore the impact of only one outcome (eg educational attainment) or you may be interested in valuing multiple outcomes (eg educational attainment, improved health, increased social connectedness).*

** Costs for ICT investments refer to Total Cost of Ownership: "the costs of the system, including software as well as the necessary hardware, and hosting and support over the lifetime of the system" (USAID, 2019. Digital Investment Tool: An Approach to Incorporating Digital Development Best Practices in Your Activity).*

Valuing Impact Methods

Approach	Stakeholder involvement	Number of outcomes	Inclusion of project costs	Comparability with other projects	Resources and technical expertise required
COST EFFECTIVENESS ANALYSIS (CEA)	Low	One	Yes	Appropriate	o Evaluation expertise o Less time spent on defining outcomes o Proficiency in economic valuation techniques
ECONOMETRIC	Low	One/Multiple	Generally not included	Appropriate	o Primarily desk-based research o Often large datasets o High proficiency in statistical analysis
COST BENEFIT ANALYSIS (CBA)	Low	Multiple	Yes	Appropriate	o Evaluation expertise o Less time spent on defining outcomes o Proficiency in economic valuation techniques
SOCIAL RETURN ON INVESTMENT (SROI)	High	Multiple	Yes	Less appropriate	o Stakeholder access/field visits o Time-intensive for data collection and analysis o Evaluation expertise o Proficiency in economic valuation techniques
MULTI-CRITERIA ANALYSIS (MCA)	High	Multiple	Generally not included	Appropriate	o Stakeholder access/field visits o Time-intensive for data collection o Lower proficiency in economic valuation/ statistical analysis

CEA

Econ

CBA

SROI

MCA

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Glossary of terms

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COST EFFECTIVENESS ANALYSIS (CEA)

This section provides an overview of the method, a worked example in an ICT context, case studies of the method being used, and recommended guides on how to use CEA.

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Relevance for ICT investments (CEA)

- CEA focuses on one outcome and describes how much money was required to create the change observed in that outcome. It allows comparison between how effective different types of investment are at achieving the same outcome. This type of comparability is useful for ICT investments, as the tool can help highlight how an ICT investment is more cost effective at achieving change in a specific outcome than other types of outcomes, something that may not be apparent at face value.
- Given its focus on one outcome, CEA is best used when the intervention's aims are relatively simple. It is less effective in capturing the complexity of impact often found in ICT investments.

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CEA

Alternative suggestion
Interested in measuring more than one outcome? → CBA

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BACK TO CEA MENU

METHOD OVERVIEW (CEA)

CEA is a widely used method of assessing the effectiveness (value for money) of a programme, investment, or technology by comparing the change in a given outcome and the cost required to achieve that change.

Outcomes measured

- A single headline outcome is selected to measure the success of the programme (eg pupils achieving fluency in English, patients receiving appropriate medical treatment, farmers adopting new agricultural practices). This is compared with the programme's cost. The findings are expressed as the cost per unit of the outcome achieved (eg $10 per pupil achieving fluency), which means little on its own but can be compared to other benchmarks.
- The term **Cost-Utility Analysis** (CUA) is sometimes used to describe studies that apply CEA where the outcome of interest is years of healthy life saved (eg in the case of a health technology used to prevent premature deaths).

Result

- Meaningful results come from comparing benchmarks of other evaluations that used the same headline outcome (eg at $10 per pupil, the programme is more cost-effective than another which reported a cost of $50 per pupil achieving fluency) or national thresholds (eg the WHO CHOICE project has considered health interventions to be highly cost-effective where the cost per year of life saved is less than the country's GDP per capita).

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METHOD OVERVIEW (CEA)

Resources (data requirements)

- Data is collected from beneficiaries before and after the programme and compared with what would have happened in the absence of any intervention (eg by collecting data from a control group or otherwise assessing the counterfactual scenario). This helps understand what change in the outcome was created by the programme.
- Alternatively, data on the change in the headline outcome may be derived from pre-existing literature or expert opinion (eg if a new manufacturing technology is known from previous testing to increase units produced per hour by 20%). This approach can also be used to forecast cost effectiveness, where the change in outcome cannot be directly measured because the programme has not started.
- Where data is sufficiently detailed, CEA can also be used to assess differences in cost effectiveness for different groups (eg dividing the sample by region or by gender), or to analyse the most important cost drivers of a programme and how these might change if the programme were scaled up.

METHOD OVERVIEW (CEA)

Resources (Expertise)

Data collection

- **Survey design:** CEA usually requires some knowledge of survey design during the data-collection stages (eg online survey use, question wording, cost templates creation).
- **Cost structure:** It is important to have an in-depth understanding of the cost structure of a programme when using CEA. Interviews with programme or finance staff may be required to help you interpret the cost data collected.
- **Research design:** Depending on the strength of the evidence required, research design may require significant resources. A randomised control trial (RCT) approach is considered the highest standard for generating evidence of a programme's causal impact. An RCT can be expensive to administer with multiple rounds of targeted data collection.

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METHOD OVERVIEW (CEA)

Resources (Expertise)

Data analysis

- **Microsoft Excel:** Once data has been collected, creating a CEA model, analysing the data, and presenting the findings requires some familiarity with Microsoft Excel, or related software. The Excel model is quite straightforward and does not require the use of any advanced features.
- **Projection modelling:** When conducting a forecastive CEA (projecting the cost effectiveness of a future project or programme), some specialised knowledge may be needed if you intend to model the expected change in your headline outcome.
- **Specifics:** Complex models are sometimes used by academics in the health sector to forecast how a technology will affect infection, disease progression, and recovery. This depends on the level of detail you choose to apply as an evaluator. It may be preferable to make broad assumptions about how your headline outcome will be affected by the programme in question (eg we assume that our text message reminders will increase the number of people receiving medical treatment by 10%) rather than spend significant resources building a sophisticated predictive model.

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METHOD OVERVIEW (CEA)

Applying measurement principles

- **Involve stakeholders:** one stakeholder group identified, and engagement not required; however, involvement can provide insights. An example of this can be found here.
- **Understand what changes:** limited to one outcome which is compared across interventions, so the full scope of change is not often explored.
- **Only include what is material:** limited to a single stakeholder and a single outcome which is compared across interventions. This may reflect material change but not the full scope of change.
- **Do not overclaim:** use of counterfactual must be as robust as possible to ensure the net impact of the programme is not overstated.
- **Be transparent:** documentation of assumptions, data sources, and methodological limitations.
- **Verify the result**: comparison to similar ICT evaluations to identify significant differences or similarities.

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WORKED EXAMPLE (CEA)

This worked example demonstrates how CEA might be used in valuing the impact of an ICT investment.

- Researchers wanted to understand the cost effectiveness of a computer-assisted learning programme, implemented by an NGO in primary schools in Vadodara, India. The programme provided four computers to each primary school in the area, allowing children to spend two hours per week playing educational mathematics games.
- The headline outcome used to measure the impact of this computer-assisted learning was a mathematics test score. Cost effectiveness was assessed based on the money spent to achieve a given increase in the average child's test score among the group receiving computers.
- Researchers used a difference-in-differences sampling approach to understand the net impact of the programme. They collected the same data on test scores before and after the programme, from 55 schools that received computers (the treatment group) and 56 schools that did not (the counterfactual group). The two groups of schools were selected to ensure that the average school in each group was similar in terms of the pupils' gender, the teaching language, and previous year's test scores. This made it easier to isolate the change in test scores that was caused by the computer-assisted learning programme and not by other factors.

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WORKED EXAMPLE (CEA)

- Researchers collected data on the cost of the programme from the NGO that delivered it and the local government that paid for the computers. This included the cost of staff to supervise the children's time on the computers, the cost of the computer hardware and software (to which depreciation was applied on a 5-year time horizon), and other administrative expenses. The total cost was divided by the number of children in the treatment group to get an average cost per student per year of 722 rupees.
- Having analysed the data, the researchers found that children in the treatment and counterfactual groups had similar maths test scores beforehand, but that after the programme had been in place for one year pupils who had been using computer-assisted learning had test scores 0.37 standard deviations higher than those in the counterfactual group.
- The programme therefore cost 1,951 rupees for every 1 standard deviation increase in test scores.

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WORKED EXAMPLE (CEA)

- This result was compared with the cost-effectiveness finding for another programme that was operating in other primary schools in the region at that time, which recruited extra teachers from the local community to provide additional maths tutoring to children. This extra teacher programme increased maths test scores less (0.25 standard deviations) but at a cost of 107 rupees per student per year was far less expensive than the computer-assisted learning programme.
- This equates to 428 rupees per 1 standard deviation increase in test scores for the extra teacher programme, making it approximately 4.6 times more cost-effective than the computer-assisted learning programme.

This worked example is based closely on Linden, L., Banerjee, A. & Duflo, E. (2003). Computer-assisted learning: Evidence from a randomized experiment. *Poverty Action Lab Paper*, *5*.

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CASE STUDIES (CEA)

This selection of case studies, where CEA has been used to value impact, is categorised by level (ie national level or programme/project level) and type (ie forecasting impact or retrospectively evaluating impact). Each case study outlines the study's goals, the outcome measured, the results, and the resource requirements.

LARGER SCALE (E.G. NATIONAL)

- **FORECASTIVE**
- **RETROSPECTIVE**

SMALLER SCALE (E.G. LOCAL PROJECTS)

- **FORECASTIVE**
- **RETROSPECTIVE**

Cost effectiveness of strategies to combat road traffic injuries in sub-Saharan Africa and South East Asia: mathematical modelling study (link)

Goals of the study

- Compare the cost and health effects of several different approaches to improving road safety at the national level (eg speed cameras, drink-driving laws, vehicle safety features), to understand which approach was the most cost effective.
- Forecast the costs and impact on disability-adjusted life years (DALYs) of five different road safety intervention strategies (as well as combinations of more than one of those five) for countries in two WHO sub-regions: sub-Saharan Africa and South East Asia.
- Make the results comparable with other interventions that have been evaluated via CEA using DALYs as the outcome (health, ICT, other sectors).

Outcomes measured

- DALYs saved under five potential road safety policies, compared with the loss of life and injuries from road traffic accidents in a do-nothing (no policy change) scenario.

Result

- Individually, the five interventions were projected to cost between $1,668 and $6,683 per DALY averted in sub-Saharan Africa and between $1,589 and $3,678 per DALY saved in South East Asia (all costs in 2005 International USD). Combining several of the interventions was found to increase cost effectiveness (lower USD cost per DALY saved).

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Cost effectiveness of strategies to combat road traffic injuries in sub-Saharan Africa and South East Asia: mathematical modelling study (link)

Resources

- No stakeholder input to designing the evaluation. CEA model was based entirely on secondary data and findings.
- Used a combination of secondary data from a large, pre-existing international database of unit costs, together with some costs direct from product manufacturers. Assumed the number of units needed for each road safety policy (eg speed cameras used per police checkpoint). Costs expressed in 2005 International USD (adjusted for purchasing power).
- Study relied on the findings of previous cost-effectiveness research, which may or may not account for complex dynamics. In terms of scope of outcomes, the focus on the direct health impact (DALYs averted via reduced road deaths and injuries) may overlook other benefits of the road safety interventions (eg improved air quality).

Resources (Expertise)

Data collection

- **Research design:** knowledge of how to construct a population model of health outcomes.

Data analysis

- **MS Excel:** some data manipulation and analysis in MS Excel.
- **Project modelling**: Monte Carlo simulation to conduct uncertainty analysis on the model findings (optional).
- **Specifics:** special subject knowledge needed to interpret and re-use existing research findings.

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Hypothetical example – Costs effectiveness of Internet access in secondary schools

Goals of the study

- Understand the impact of the installation of Internet access in all secondary schools nationwide (the *Connected* programme, which occurred over the past three years) on the number of years of schooling that the average school-age child receives.
- Consider all school-age children in each year's cohort and the total costs to the country in providing Internet access (paid in this case via the tax system, public sector expenditure, and government borrowing).
- Make the results comparable with other education interventions that use the same headline outcome (cost per additional year of schooling achieved) to allow the cost effectiveness to be compared with existing evidence from nearby countries on programmes such as teacher training, cash grants to parents, mosquito nets for children, and information dissemination to parents on the benefits of education.

Outcomes measured

- CEA headline outcome was years of schooling per young person. Net impact was estimated indirectly using:
  - Actual data for school attendance.
  - Findings from previous RCT studies of individual schools during the pilot phase (showing a significant positive impact of Internet access on years of schooling, when compared with schools that had no internet access).
  - Regression analysis of several nearby countries' data to predict what the years of schooling would have been if the *Connected* programme had never been implemented.

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Hypothetical example – Costs effectiveness of Internet access in secondary schools

Outcomes measured (continued)

- CEA focuses on only one of the potential benefits of Internet access in schools: school attendance by children. While this is a very important outcome for the young people's life chances and the country's future success, and while the findings are useful for those parts of the government where years of schooling are a key target outcome, there are other likely benefits that are excluded due to the inability of a CEA method to cover more than one outcome. These may include improved quality of education (eg test scores, as opposed to just quantity of time spent in school); improved digital skills among young people; and the positive effects of these skills for economic productivity, improved teacher competence, improved teacher wellbeing.

Results

- The government estimated that the roll-out of Internet access to all secondary schools resulted in an increase of 0.3 years of schooling on average per young person at a national level, or 3 million additional years of schooling in total for the 10 million young people who would be of school-age over the coming decade. The cost of the programme was $30 million over the same 10 years, ie its cost effectiveness was $10 per additional year of schooling achieved. This compared favourably to other interventions used in neighbouring countries, such as teacher training ($55 per additional year of schooling) or mosquito net provision to young people ($24 per additional year of schooling).

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Hypothetical example – Costs effectiveness of Internet access in secondary schools

Resources

- Costs were calculated based on public sector financial records, to measure the additional cost of providing Internet access to all schools relative to the costs per school before the *Connected* programme began. These included capital costs such as wiring and modems, as well as ongoing recurrent expenditure on maintenance of Internet equipment, technical support to schools having connection issues. As the capital costs were financed using a World Bank loan, the interest payments were also included as costs in the CEA model.
- There was no stakeholder engagement required to conduct the CEA.

Resources (expertise)

Data collection

- **Cost structure:** familiarity with the cost implications of the *Connected* programme and the various capital and recurring costs was needed to accurately collect data.

Data analysis

- **MS Excel:** some knowledge of spreadsheet software was needed to compile and analyse data, create a basic CEA model, and report the findings.
- **Project modelling**: some knowledge required construct regression models of the counterfactual scenario if the *Connected* programme had never happened.
- **Specifics:** some knowledge of economics and statistics needed to interpret previous research on the impact of the Internet in schools.

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Modelling the cost effectiveness of malaria control interventions in the highlands of western Kenya (link)

Goals of the study

- Forecast the impact of different approaches to malaria control on health outcomes in rural Kenya, to understand which approach would be the most cost effective if implemented.
- Apply the pre-existing malaria model (OpenMalaria) to the Rachuonyo South District, Nyanza Province, Kenya and use simulations from that model to look at the cost effectiveness per 100,000 of the population.
- Make the results comparable with other interventions that have been evaluated via CEA using DALYs as the outcome (health, ICT, other sectors).

Outcomes measured

- DALYs – the authors used a pre-existing model of malaria epidemiology to simulate the DALYs saved under several potential malaria control interventions, relative to the existing case management system. This was based on levels of parasite prevalence, malarial episodes, hospitalisation, and deaths in each scenario.
- The focus was on physical health outcomes in this CEA. There was no scope to cover other relevant outcomes in the model. As examples of these omitted outcomes, the paper mentions that different malaria control interventions may have different levels of acceptability among local communities and those measures involving insecticide use may affect the natural environment.

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Modelling the cost effectiveness of malaria control interventions in the highlands of western Kenya (link)

Results

- Five of the combinations of malaria control measures simulated by the researchers were predicted to save more DALYs than the current case management system. However, the current system ($4.29 per DALY saved) is slightly more cost-effective than any of the simulated malaria control measures (between $5.11 and $9.06 per DALY saved).

Resources

- Cost data for malaria control interventions came from secondary data from recent Kenyan field trials and unit costs from the Global Fund. Treatment costs (direct expenditure by the health system and households) were estimated from secondary literature.
- There was no stakeholder input to the evaluation.

Resources (Expertise)

Data collection

- **Cost structure**: knowledge of the case management system to accurately estimate costs.
- **Research design:** familiarity with DALYs.

Data analysis

- **Project modelling:** some data analysis required to generate the CEA results.
- **Specifics:** some knowledge required of the malaria model (OpenMalaria) to interpret health outcome findings.

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Costs and cost-effectiveness analyses of mCARE strategies for promoting care seeking of maternal and newborn health services in rural Bangladesh (link)

Goals of the study

- Use a cost-effectiveness analysis to look at the impact of a mobile application (mCARE) on maternal and newborn health outcomes in rural Bangladesh.
- Evaluate one mobile health project, implemented in Gaibandha district of Bangladesh (population 2.4 million).
- Make the results comparable with other interventions that have been evaluated via CEA using DALYs as the outcome (health, ICT, other sectors).

Outcomes measured

- DALYs – based on age of death (maternal or neonatal) relative to average life expectancy in Bangladesh.
- Outcomes not directly evaluated include improved communication, increased worker empowerment, and more efficient and timely data collection.

Result

- Headline figure of $31 per DALY averted (with a 95% confidence interval of $19–$81); can be compared with local GDP per person to put cost effectiveness into context.

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Costs and cost-effectiveness analyses of mCARE strategies for promoting care seeking of maternal and newborn health services in rural Bangladesh (link)

Resources

- Four years of financial records provided by two implementing agencies, and interviews with key programme staff to help categorise costs; excludes costs paid by beneficiaries.
- No stakeholder input to designing the evaluation.

Resources (Expertise)

Data collection

- **Survey design:** familiarity with DALYs concept; data collection (surveys).
- **Cost structure:** basic cost data collection and analysis.
- **Research design:** sampling design (quasi-experimental).

Data analysis

- **Project modelling:** knowledge of confidence intervals required; Monte Carlo analysis for confidence interval optional.

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GUIDANCE (CEA)

Approach to conducting CEA

Bergmo T. S. (2015). How to measure costs and benefits of eHealth interventions: An overview of methods and frameworks. *Journal of Medical Internet Research*, *17(11), e254*. Retrieved from https://doi.org/10.2196/jmir.4521

- This open-access resource goes into more detail than our toolkit on practical considerations in the eHealth sector. It covers CEA and CBA..

Dhaliwal, I., Duflo, E., Glennerster, R. & Tulloch, C. (2013). Comparative cost-effectiveness analysis to inform policy in developing countries: a general framework with applications for education. *Education Policy in Developing Countries*, *285-338*. Retrieved from https://www.povertyactionlab.org/sites/default/files/research-resources/CEA%20in%20Education%202013.01.29_0.pdf

- This open-access academic resource provides considerable additional detail on the issues to consider when applying CEA in developing country policy settings, citing numerous examples of evaluations conducted in the field of development economics.

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GUIDANCE (CEA)

CEA in the health sector

Hutubessy, R., Chisholm, D. & Edejer, T. (2003). Generalized cost-effectiveness analysis for national-level priority-setting in the health sector. *Cost Effectiveness and Resource Allocation*, *1(1), 8.*

- Offers some guidance on comparative CEA at national level, with suggested approaches to generating country-level estimates and a discussion of the challenges in interpreting the results.

Leech, A., Kim, D., Cohen, J. & Neumann, P. (2018). Use and misuse of cost-effectiveness analysis thresholds in low- and middle-income countries: trends in cost-per-DALY studies. *Value In Health*, *21(7), 759-761*. Retrieved from https://www.sciencedirect.com/science/article/pii/S1098301518300160

- A meta-analysis that assesses the use of cost-effectiveness thresholds in interpreting CEA results in developing country health studies.

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REFERENCES (CEA)

Examples of CEA in ICT projects

- Piper, B., Jepkemei, E., Kwayumba, D. & Kibukho, K. (2015). Kenya's ICT policy in practice: The effectiveness of tablets and e-readers in improving student outcomes. *FIRE: Forum for International Research in Education, 2(1).* Retrieved from http://dx.doi.org/10.18275/fire201502011025
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- Dillon, D.G., Pirie, F., Rice, S., Pomilla, C., Sandhu, M.S., Motala, A.A. & Young, E.H. (2014). Open-source electronic data capture system offered increased accuracy and cost-effectiveness compared with paper methods in Africa. *Journal of clinical epidemiology*, *67(12), 1358-1363.*

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ECONOMETRICS

This section provides an overview of the method, a worked example in an ICT context, case studies of the methodology being used and recommended guides on how to use econometrics

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Relevance for ICT investments (Econometrics)

- While econometrics only focuses on measuring one outcome, the method incorporates various variables to deal with the complexity of the factors that cause change. This is useful for evaluating ICT investments.
- Scalability is a significant aspect of ICT interventions. For example, the scope of an intervention can expand to cover a wide geographical area. Econometrics techniques are well-suited to scale-up to capture the expansion of impact (if the data is available).
- A focus on large datasets and less emphasis on stakeholder engagement makes econometrics methods suitable for national level interventions.

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ECONOMETRICS

METHOD OVERVIEW

WORKED EXAMPLE

CASE STUDIES

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REFERENCES

Alternative suggestions

Can't access technical expertise required?

→ CEA

Interested in more than one outcome?

→ CBA, SROI

BACK

METHOD OVERVIEW (ECONOMETRICS)

Econometric analysis is a statistical approach to understand whether there is any change in an outcome due to an intervention. This could be at project, programme, or national level. The researcher usually selects a headline outcome (eg increase in productivity) and uses statistical or modelling tools to assess the impact of an intervention on the selected outcome.

Outcome measured

- The headline result from an econometric analysis can take different forms. Results could be presented as the percentage increase in an outcome due to the intervention (eg access to broadband Internet increases consumption by 10%). Results can also be presented as a unit change (eg access to broadband Internet increases consumption by $10 a week).
- If the outcome is non-monetary, a proxy can be used to value it. A monetary value can then be compared with costs of an intervention to assess value for money.

Resources

- Data on the outcome is collected for before and after the intervention. This is usually compared with what would have happened in the absence of any intervention (eg by collecting data from a control group or otherwise assessing the counterfactual scenario).
- To focus on the attribution, isolating the effect of an intervention from other factors that could impact the outcome, the researcher also incorporates data on these external factors (eg an increase in educational attainment could cause productivity rates to rise).

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METHOD OVERVIEW (ECONOMETRICS)

Resources (Expertise)

Data collection

- Econometrics usually requires knowledge of data collection including secondary data collection, for example from public resources, such as national surveys (secondary data), or producing the data by running surveys or through observations (primary data).
- In-depth knowledge on ICT and the topic may be necessary for modelling to provide context on other factors that could impact the outcome. This allows the evaluator to gather all the necessary data.
- Depending on the strength of the evidence required, research design may require significant resources. An RCT approach is considered the highest standard for generating evidence of a programme's causal impact. An RCT can be expensive to administer with multiple rounds of targeted data collection.

Data analysis

- Specialised software is often required to perform the analysis. Some software packages are free but a high level of knowledge of that software will be necessary.
- Evaluators need advanced skills in economics and modelling. Once the data has been collected, preforming econometric analysis requires high technical knowledge of the econometric tool used, although it does depend on the level of detail you choose to apply as an evaluator.
- To forecast the impact of an intervention, econometric analysis uses a modelling approach to predict the impact of an evaluation. This is usually informed by expert opinion (eg ICT specialists and economists). It may also apply analysis from similar interventions to the county, region or community in question.

BACK

NEXT

BACK TO ECONOMETRICS MENU

METHOD OVERVIEW (ECONOMETRICS)

Applying measurement principles

- **Involve stakeholders**: little engagement with stakeholders to define outcomes.
- **Understand what changes**: headline outcome selected which is compared across interventions, so the full scope of change is not often explored.
- **Only include what is material**; focus on limited number of outcomes, so may reflect material change but not the full scope of change.
- **Do not overclaim:** robust counterfactuals (eg randomised control trials) ensure the net impact of the programme is not overstated.
- **Be transparent:** documentation of assumptions, data sources, and statistical approaches used.
- **Verify the result**: comparison to similar ICT evaluations to identify significant difference or similarities.

BACK

WORKED EXAMPLE (ECONOMETRICS)

This worked example demonstrates how econometrics might be used in valuing the impact of an ICT investment.

- A government was thinking of introducing policy to make ICT classes mandatory for all children above the age of 11. The aim was to increase ICT literacy and boost GDP by increasing productivity. The government also wanted to know how long it would take to see returns on the investment.
- The evaluator decided to use econometrics to carry out the analysis because it focuses on one key quantitative outcome and there was limited scope to involve stakeholders. Additionally, econometric analysis could look at change over various time periods and might offer more accurate information on the length of time needed to see the return on investment.
- Evaluator skills and resources needed included knowledge in ICT, secondary data collection, and advanced skills in economics and modelling. Statistical software was needed to run the analysis. This was free (eg R or Python) or paid for (eg STATA or Matlab). The evaluator needed to know how to use the selected software.
- The evaluator identified a comparable country that had implemented a similar policy in the northern region of the country 10 years previously. They were aware that data on labour, education, and GDP was available through the World Bank database.
- The evaluator planned to evaluate the impact of this policy on productivity for the northern region and used the southern region as the comparator to carry out a difference-in-difference regression. They then applied the results to their country using a model to account for differences between the countries.

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BACK TO ECONOMETRICS MENU

WORKED EXAMPLE (ECONOMETRICS)

- Necessary data was collected from the World Bank Open Data, such as GDP, labour force, human capital. They also collected data on demographics by region, such as age and gender, to account for these differences. Additionally, there was a need for some research to understand the differences between the policy analysed and the new policy the government was planning to introduce.
- Using the software and the data collected, the evaluator ran the regression that resulted in the change in productivity due to the policy and how long it took for the change to occur (eg those who received IT classes were 2% more productive and it took a minimum of four years for changes in productivity to be observed). From the results they applied it to the country in question and worked out the impact on GDP were the intervention to be rolled out across the whole country.
- Throughout the process, there were high levels of assumptions (eg no other factors were in play impacting productivity differently between the north and south regions). For robustness, the evaluator also carried out a sensitivity analysis.
- The estimated impact to GDP and how long it would take for the change to occur could be expressed as a percentage change in GDP or a value change (eg 1% increase in GDP every year for 10 years). The results did not identify other impacts from the policy. Although the results did not incorporate policy costs, they could be compared with the estimated costs of the policy.
- Different econometric methods can be used to forecast the impact of the policy. For example, by just using a modelling approach, it would not be necessary to evaluate a policy elsewhere. Instead it would be based on informed assumptions.

BACK

BACK TO ECONOMETRICS MENU

CASE STUDIES (ECONOMETRICS)

This selection of case studies, where econometrics has been used to value impact, is categorised by level (ie national or programme/project level) and type (ie for forecasting impact or retrospectively evaluating impact). Each case study outlines the study's goals, the outcome measured, the results, and the resource requirements.

LARGER SCALE (E.G. NATIONAL)

FORECASTIVE

RETROSPECTIVE

SMALLER SCALE (E.G. LOCAL PROJECTS)

RETROSPECTIVE

Mobile, fixed line, and Internet service effects on global productive efficiency (link)

Goals of the study

- Investigate if access to the Internet affects productivity.
- Analyse data on telecommunication growth and human capital from 93 countries (to measure productivity).
- Make the results comparable across regions, as well as between high- and low-income countries, to determine which regions obtain greater gains from Internet service. The results predict which regions would benefit most from increased Internet access.

Outcomes measured

- Increase in the productive potential of an economy due to growing telecommunications sector by measuring human capital.
- It does not account for the costs of implementing telecommunications services.

Results

- No headline figure, various figures on unit change in productivity but the results focus on the type of countries that have greater efficiency gains from telecommunications – lower-income countries with low productivity a majority of which are in Africa.
- The method captures some complexity of other factors that impact productivity, including education attainment and economic freedom index. It does not capture other outcomes that may be of interest from a growing telecommunications sector.

NEXT

BACK TO CASE STUDY MENU

Mobile, fixed line, and Internet service effects on global productive efficiency (link)

Resources

- World Bank and ITU data.
- Statistical software to carry out the analysis.
- No stakeholder input to designing the evaluation.

Resources (Expertise)

Data collection

- Required: World Bank and ITU data, no need to run an experiment.
- Data was disaggregated to compare different regions.

Data analysis

- Required: advanced economic theory and modelling knowledge (academic level).
- Required: a model to estimate the production frontier based on several economic theories and econometric methodologies.
- Required: statistical software and knowledge to run the analysis.

BACK

Going digital: credit effects of land registry computerization in India

Goals of the study

- Use the gradual roll-out of the computerization of land registry systems in India as a quasi-experiment based on the theory that improved property titling and registration will enhance credit access. .
- Compare regions which initially computerized their land registries to those that did not, use econometric analysis to look at the credit effects.
- Compare with studies of similar programmes in other countries, or between rural and urban regions.

Outcome measured

- Captured the effect of the programme to computerize land registry, separating urban and rural.
- It does not account for the costs of computerizing land registry or banks taking this into consideration in their systems.

Results

- Computerization had no credit effect in rural areas but led to increased credit-supply in urban ones. These results are supported by the marked increase in registered urban mortgages due to computerization. Results also suggest that without further changes in the property rights system, impacts of computerization will remain marginal.
- It can capture large amounts of data across a long time period do understand the various factors that affect credit access. It does not capture other outcomes that may be material from the computerization of land registry systems or the costs.

NEXT

BACK TO CASE STUDY MENU

Going digital; credit effects of land registry computerization in India

Resources

- Credit data from India's Central Bank, quarterly from 1997 to 2007.
- Data on when registry offices were computerized by region, number of registered land transactions, and Census of India for share of urban population.

Resources (Expertise)

Data collection

- Required: data collection from secondary sources.
- Required: knowledge of economic theory to know the necessary data to build the model.
- Required: ability to disaggregate data by region to see where the programme was most effective and identify other factors that could hinder it.

Data analysis

- Required: statistical software and knowledge to run the analysis.
- Required: advanced economic theory and modelling knowledge (academic level).

BACK

BACK TO ECONOMETRICS MENU

GUIDANCE (ECONOMETRICS)

Management Study Guide. *Applied econometrics - Steps to carry out an empirical study.* Retrieved from https://www.managementstudyguide.com/applied-econometrics.htm

- A useful step-by-step guide for basic econometrics for those who have little technical knowledge.

World Bank. (2010). *Handbook on Impact Evaluation: Quantitative Methods and Practices.* Retrieved from https://openknowledge.worldbank.org/bitstream/handle/10986/2693/520990PUB0EPI1101Official0Use0Only1.pdf?sequence=1&isAllowed=y

- An extensive guide to various econometric methods used to evaluate policies. Also includes example exercises for statistical software (Stata). Aimed at those who already have some technical knowledge.

Pischke, J-S. (2005). *Empirical methods in Applied Economics.* Retrieved from http://econ.lse.ac.uk/staff/spischke/ec524/evaluation3.pdf

- Detailed and technical guide to differences-in-differences. Useful for those who have statistical knowledge but have not carried out a difference-in-difference analysis.

Abadie, A. & Cattaneo, M. (2018). *Econometric Methods for Program Evaluation*. Retrieved from https://economics.mit.edu/files/14922

- Detailed and technical guide for a range of econometric methods for programme evaluation. Aimed at those with technical knowledge.

BACK TO ECONOMETRICS MENU

REFERENCES (ECONOMETRICS)

Thompson, H. & Garbacz C. (2007). Mobile, fixed line and Internet service effects on global productive efficiency. *Information Economics and Policy 19(2):189-214.* Retrieved from https://www.researchgate.net/publication/222697850_Mobile_fixed_line_and_Internet_service_effects_on_global_productive_efficiency .

Deiningeret, K. & Goyal, A. (2010) Going digital; credit effects of land registry computerization in India. *Policy Research working paper no. WPS 5244.* Washington, DC: World Bank. Retrieved from http://documents1.worldbank.org/curated/en/401841468267331457/pdf/WPS5244.pdf

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COST BENEFIT ANALYSIS (CBA)

This section provides an overview of the method, a worked example in an ICT context, case studies of the methodology being used, and recommended guides on how to use CBA.

NEXT

Relevance for ICT investments (CBA)

- The incorporation of investment costs is central to CBA, which emphasises the value for money generated from an investment. A key characteristic of ICT investments is their scalability, where a pilot's scope can expand quickly to impact issues not within the original scope. With this can come higher investment costs. CBA allows the capture of both the expanded impact and the associated expanded costs.
- A CBA approach is applicable across the long timelines involved in ICT. As the scope of an ICT investment expands, incorporating new information on types of impact and costs is straightforward.
- The focus of CBA on multiple outcomes makes it useful to capture the complexity of impact often found in ICT investments. However, the method involves minimal stakeholder engagement, so might not capture all the complexity of intended or unintended impact from an ICT intervention.

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CBA

Alternative suggestion

Interested in stakeholder engagement?
→ SROI

BACK

METHOD OVERVIEW (CBA)

CBA is a widely used methodology for comparing the benefits and costs of a given project or programme to understand whether it offers good value for money.

Outcomes measured

- In CBA, the researcher can measure a programme's benefits using as many outcomes as they choose, provided that these outcomes are materially affected by the intervention being evaluated (eg a biometric ID system for payments may yield multiple benefits in the form of saved time, saved money, and reduced corruption). Some of these outcomes may already be measured in monetary units (eg improved income, increased revenue), and all non-monetary outcomes need to be assigned a financial value or proxy. This valuation process can follow various approaches (eg stated preference, revealed preference), which are outlined in greater detail elsewhere, and is subject to the judgement of the evaluator to some extent.
- Traditionally, economists have used CBA to focus on already monetised outcomes such as income, profit, and tax revenues. CBAs that broaden the scope to include valuation of non-monetary outcomes (eg personal wellbeing, new skills acquired, or environmental benefits) are referred to as examples of social cost benefit analysis. CBA may be used to evaluate a project or programme that has already occurred, or in a forecastive way to project the costs and benefits that would occur if a certain project or programme was implemented. The methodology is most used at the project or programme scale but is also occasionally applied at the national level.

NEXT

METHOD OVERVIEW (CBA)

Result

- The headline finding from a CBA can be expressed as a benefit-cost ratio (BCR) (eg a programme generated benefits equivalent to $30,000 at a cost of $10,000, yielding a CBR of 3.0 to 1) or as a net benefit (eg the benefit net of costs was $30,000 - $10,000 = $20,000). This allows comparison between different programmes that may not necessarily share the same outcomes (eg a digital health programme with a BCR of 4.5 to 1 is considered better value for money than a mobile-based education tool with a BCR of 3.2 to 1).
- There is no set rule for what constitutes a high BCR, although some national benchmarks are in use (eg the UK government considers transport projects with a BCR above 2 to 1 as offering high value for money). Projects or programmes for which the costs exceed the benefits (ie BCR < 1) are generally considered to offer poor value for money.

Resources

- To perform a CBA, data is typically collected on the level of each relevant outcome before and after the project or programme (to assess how much change occurred). CBA also requires data on what would have happened in the absence of any intervention (the counterfactual), to isolate the change that occurred as a result of the project or programme (and not due to other factors).
- This is combined with data on the cost of the project or programme.
- The headline finding of a CBA will usually be sensitive to certain assumptions made in the modelling process, so it is good practice to conduct a sensitivity analysis to understand how these assumptions affect the overall conclusion of the research.

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METHOD OVERVIEW (CBA)

Resources (Expertise)

Data collection

- Undertaking an evaluative CBA (ie evaluating something that has already occurred) as opposed to a forecast CBA requires good quality and relevant data. Some resources need to be devoted to planning and undertaking data collection (eg via surveys or interviews). Some knowledge of survey design (eg online survey use, question wording, cost template creation) is advisable.
- Depending on the strength of the evidence required, research design may require significant resources. An RCT approach is considered the highest standard for generating evidence of a project or programme's causal impact. An RCT can be expensive to administer with multiple rounds of targeted data collection.

METHOD OVERVIEW (CBA)

Data analysis

- Analysing collected data, building a simple CBA model, and reporting the findings of that model typically require some knowledge of Microsoft Excel or similar spreadsheet software, although CBA does not necessarily require any advanced Excel features.
- Some specialised knowledge is required if you intend to monetise non-economic outcomes (ie social or environmental) in a CBA, for example wellbeing or ecosystems services. Similarly, non-financial costs may need to be monetised to capture the full value of a programme's inputs (eg the value of the additional labour time someone puts in to use a new technology, which may be monetised by applying the average hourly wage that they could have otherwise earned during that time). The inclusion of non-economic outcomes and economic costs is not essential in CBA (in contrast with SROI) but may help to give a fuller picture of a project or programme's effectiveness.
- If you are conducting a forecastive CBA (projecting the costs and benefits of a future project or programme), some specialised knowledge may be needed to accurately estimate the future levels of outcomes. This kind of forecasting can be done through sophisticated modelling (eg climate change projections for a place) or through simpler assumptions (eg we expect a new ICT programme to hit its target by increasing school attendance by 10%). The number of assumptions in a CBA model may affect the robustness of your findings, so it is important to ensure that such assumptions are reasonable and as accurate as possible given existing evidence.

BACK

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BACK TO CBA MENU

METHOD OVERVIEW (CBA)

Applying measurement principles

- **Involve stakeholders**: little engagement with stakeholders to define outcomes.
- **Understand what changes**: by seeking multiple outcomes in its scope, the method can capture a broad range of positive and negative changes.
- **Only include what is material:** lack of stakeholder engagement risks that outcomes chosen to value may not be material.
- **Do not overclaim:** robust use of net impact parameters such as counterfactual, attribution, and displacement reduces the chance of overclaiming.
- **Be transparent:** documentation of assumptions, data sources, and financial proxies used.
- **Verify the result**: comparison to similar ICT evaluations to identify significant difference or similarities.

BACK

WORKED EXAMPLE (CBA)

This worked example demonstrates how CBA might be used in valuing the impact of an ICT investment.

- Researchers conducted a forecast CBA to determine the benefits and costs at the country level if Qatar switched to Net-Zero Energy Housing (NZEH). Switching to NZEH would require three changes to houses: improved thermal insulation, solar power generation, and solar water heating.
- The benefits of each of these three changes came in the form of reduced spending on household electricity bills. The paper estimated this reduction in electricity bills using technical data on the impact of insulation and solar power on electricity usage, together with some modelling assumptions (eg the floor space of the average household and the number of occupants) and other secondary data (eg average household power consumption, average monthly temperature data for Qatar). A standard per unit price of electricity was then applied to express the benefit of reduced electricity use in monetary terms.
- The counterfactual in this case (what would have happened in the absence of the switch to NZEH) assumed that households continued to use existing technologies, for example non-insulated rooms, buying electricity from the grid, and using electric water heaters. The savings offered by the switch to NZEH were calculated relative to this business-as-usual scenario.

NEXT

BACK TO CBA MENU

WORKED EXAMPLE (CBA)

- To forecast the cost that households would have to pay to switch to NZEH, the researchers assumed that households would take out a loan from banks in-country to fund the installation of insulation and solar power equipment, with an assumed interest rate of 4% and length of loan linked to the useful life of the equipment (10 to 20 years).
- The per-household costs and benefits were then multiplied by the total number of houses to estimate the equivalent figures at the country level.
- Researchers found that the costs of switching to thermal insulation exceeded the benefits of doing so (the net benefit was negative). However, for solar power generation and solar water heating, they found net benefits per household per annum of 109 and 190 Qatari Riyals (QAR), respectively. On this basis, they estimated that the net benefit of moving to NZEH (with all three changes) for the country as a whole was approximately QAR 21 million.
- It is worth noting that the choice of outcomes considered by this CBA was relatively narrow and focused on the economic benefits of adopting NZEH. A broader, social CBA or SROI analysis would likely have included the environmental benefits of reduced energy usage.

- Gowid, S., Musharavati, F., & Hamouda, A. (2019). Cost benefit analysis of a net-zero energy housing in Qatar. *Journal of Clean Energy Technologies*, *7*(3).

BACK

BACK TO CBA MENU

CASE STUDIES

This selection of case studies, where CBA has been used to value impact, are categorised by level (ie national level or programme/project level) and type (ie for forecasting impact or retrospectively evaluating impact). Each case study outlines the study's goals, the outcome measured, the results, and the resource requirements.

LARGER SCALE (E.G. NATIONAL)

FORECASTIVE

RETROSPECTIVE

SMALLER SCALE (E.G. LOCAL PROJECTS)

FORECASTIVE

RETROSPECTIVE

Liquefied natural gas as an alternative fuel: a regional-level social CBA (link)

Goal of the study

- Analyse country-level costs and benefits to Portugal of the switch to using liquefied natural gas instead of other fuels in the country's marine transport sector.
- Note: Including public willingness to pay instead of a more standard measure of costs means that this result can only be compared to other countries where a similar willingness to pay survey has been conducted. The BCR to the Portuguese public is comparable with other government or industry initiatives that are being considered in that country.

Outcomes measured

- A broad range of benefits from switching fuel use in marine transport to natural gas mortality reduction from three categories of air pollution emitted by standard fuels: reduced contribution to climate change (via reduced CO2 emissions); reduced damage to crops from emissions; reduced damage to materials (eg local buildings and monuments) from emissions.
- The inclusion of different categories of benefits (health, climate, non-health) captures a fuller picture of the damage caused by existing fuel use, when compared with a traditional approach to CBA that would have focused on the economic benefits. This analysis omits the economic costs or benefits to the shipping industry itself, which may be an important consideration if trying to enact this policy.

NEXT

Liquefied natural gas as an alternative fuel: a regional-level social CBA (link)

Result

- Switching to natural gas was found to have benefits of €1.07 billion to Portugal as a country, whereas the population is willing to pay at most €143 million to fund this switch. On this basis, the authors project that the switch would have a net benefit of €927 million and a BCR of 7.5 to 1, ie for every €1 that the public is willing to pay, there would be benefits created worth approximately €7.50.

Resources

- As this is a hypothetical future change in government policy, the costs of switching to natural gas are not estimated directly (a shortcoming of the study). Instead, the authors conducted a survey to estimate how much the population of Portugal would be willing to pay to avoid the health and climate change consequences of not switching to natural gas in marine transport. This estimate of €6.80 per person was multiplied by the adult population to yield a country-level feasible cost of €143 million, representing the amount the Portuguese public would be happy to pay through taxation to fund a switch to natural gas fuel in marine transport
- The outcomes included in the CBA model were selected based on a literature review, without any direct input from stakeholders. Because of the choice to use a willingness-to-pay survey to estimate costs data, interviews were required to pilot the willingness-to-pay survey with respondents.

BACK TO CASE STUDY MENU

Liquefied natural gas as an alternative fuel: a regional-level social cost benefit appraisal (link)

Resources (Expertise)

Data collection

- **Survey design:** some survey design and data collection skills.
- **Cost structure:** specialised knowledge of willingness-to-pay data collection was used on the costs side.

Data analysis

- **Project modelling:** some knowledge of data analysis required to interpret the data collected, develop a CBA model, and report the findings
- **Specifics**: knowledge of and ability to interpret the subject literature on emissions from marine transport required.

BACK

Hypothetical example – Costs and benefits of an online business registration system

Goals of the study

- Understand the impact of the move from a paper-based to an online registration of new businesses (enacted two years ago).
- Conduct a CBA conducted at national level (costs and benefits to the country as a whole) by aggregating the costs and benefits for all businesses, the public sector, and the wider economy.
- Compare public investment in an online business registration system to against other public projects that were more typically subject to CBA assessment (eg road and bridge construction).
- Note: There were few other projects in the Ministry of Enterprise to compare to as CBA was not being used widely at the time, but the strong evidence of the value for money offered by the online registration system offered by this CBA was helpful in making the case to the Ministry of Finance that the maintenance of the online system needed to be properly funded in the coming years.

Outcomes measured

- Cost (time and money) to businesses to register.
- Cost to the public sector per business registered.
- Gross value added to the economy from new businesses setting up.
- Note: Cost savings to businesses and the public sector were included on the benefits side as they represented financial resources that could be re-spent on more productive activities (eg investing in the new businesses, paying wages, public sector spending on health and education). The CBA focused on three outcomes, so it may have overlooked some parts of the impact of the change. For example, improvement in staff wellbeing under the new system and reduced environmental impact due to fewer paper forms. The narrow focus on the cost saving to the public sector may have had negative implications that are not covered by a relatively narrow CBA (eg redundancies at the registration office because of the change).

NEXT

Hypothetical example – Costs and benefits of an online business registration system

Result

- The researchers estimated that the benefits at the country-level per annum were as follows: cost saving to businesses ($5.5 million), cost savings to the public sector ($0.2 million), gross value added from additional new businesses created ($15.2 million). This implied total benefits of $20.9 million per annum. Costs to set up the online system initially were $2.2 million, with a cost of $0.1 million per annum in the following years to run and maintain it (all costs expressed relative to the cost of the old, paper-based system). With benefits equivalent to $90.5m (in present value) and costs of $2.4m, the benefit cost ratio over the 5 years was 37.2 to 1, suggesting the switch to online registration was very good value for money for the country. Even excluding the benefits from gross value added (which were more uncertain and potentially prone to overclaiming) the cost savings alone suggested a benefit-cost ratio of 10.1 to 1, or $10.14 of cost savings for every $1 spent on the online system.

Resources

- The costs of changing to online registration were sourced from public sector financial records. These included the cost of hiring consultants to design the online system and website, the cost of database software for the Ministry of Enterprise, ongoing costs to maintain and run the website and marketing costs to make businesses aware of the new website. As two civil servants from the Ministry worked full time on the switch-over for a year, their salaries for that year were included in the costs.
- There was no direct stakeholder engagement needed to design the CBA model. However, the researchers interviewed key staff at the business registration office at the scoping stage, in order to understand which outcomes were most likely to have been affected by the change to online registration.

BACK TO CASE STUDY MENU

Hypothetical example – Costs and benefits of an online business registration system

Resources (Expertise)

Data collection

- Required: some survey design, data collection and data analysis skills to survey businesses to understand the time and money required to register a business under the old paper-based system and the new online system.

Data analysis

- Required: basic MS Excel to measure the cost saving to the public sector by analysing the financial records of the business registration office before and after the switch to an online system. The costs and benefits were converted to net present value over a 5-year period, using the national discount rate of 5% (as used by the country's central bank).
- Required: specialised knowledge of economics and statistics to interpret previous research into the wider economic benefits of quicker business registration, to estimate the increase in gross value added from new businesses setting up (who would otherwise not have set up under the paper-based system due to the higher costs).
- Researchers had general but imprecise evidence on the impact of online registration of businesses on the number of new businesses created, and the resulting impact on gross value added across the economy. To recognise the uncertainty around the extent of this impact, they conducted a sensitivity analysis, demonstrating how the overall net benefit of the online system changed based on different assumptions of the impact on gross value added.

BACK

A socio-economic evaluation of community-based adaptation: a case study in Dakoro, Niger (link)

Goals of the study

- Evaluate a 5-year programme run by an NGO in Niger, which developed community-led practices to adapt to climate change.
- Look at the results achieved in the first few years of the programme (evaluative CBA) and project the impact over a 10-year period if these results persisted (forecastive CBA).
- Interpret the headline figures (net benefits created, benefit-cost ratio) on their own or compared with other projects evaluated using CBA, SROI, or ROI approaches.
- Check the assumptions used in the CBA model when making such comparisons – if the assumptions differ significantly from the assumptions of other evaluations, then a comparison becomes less valid.

Outcomes measured

- Economic: revenue from crops, revenue from livestock, money saved on stock.
- Social: quality-adjusted life years gained, school years of education gained, social capital, increase confidence of farmers in making adaptation decisions, empowerment of women within households.
- Environmental: land degradation and deforestation avoided.
- Note: The inclusion of a wide variety of outcomes was based on what stakeholders said changed for them as a result of the programme. In this way, this particular CBA is similar in approach to an SROI and does a good job of capturing the broad range of types of value created by the programme.

NEXT

A socio-economic evaluation of community-based adaptation: a case study in Dakoro, Niger (link)

Result

- Estimated that the programme created net benefits of at least £129,330 from 2010 to 2013, or a BCR of at least 4.19 to 1. This means that for every £1 invested in the programme, benefits worth £4.19 were created in that period.
- As the benefits were expected to last for several more years, a forecastive CBA was produced for the period 2010-2020. The results of this varied based on assumptions on climate change during the decade. The forecast estimated that the net benefit over ten years would be between £166,000 and £230,000 and the BCR between 4.4 to 1 and 6.1 to 1.

Resources

- Financial costs for the NGO running the programme (programme costs and management costs) were included using data from the NGO.
- Some stakeholder engagement in Dakoro, Niger, although usually optional for CBAs. The purpose was to understand the programme's impact, to determine the outcomes to include in the model, and to test the data collection tools.

BACK TO CASE STUDY MENU

A socio-economic evaluation of community-based adaptation: a case study in Dakoro, Niger (link)

Resources (Expertise)

Data collection

- **Survey design**: specialised knowledge required of survey design with non-standard outcomes (eg wellbeing).
- **Research design**: optional, but required in this particular study: knowledge of stakeholder engagement in the communities to facilitate workshops to determine the outcomes to include in the CBA.

Data analysis

- **MS Excel:** some Excel use was needed to analyse data and create the CBA model.
- **Project modelling:** specialised knowledge of monetisation techniques to assign financial values to the varied set of outcomes used in this CBA and survey design experience to collect appropriate primary data.
- **Specifics:** some subject knowledge (climate change, adaptation) to inform the forecasting process, combined with some broad assumptions about future variables.

BACK

Mobile'izing agricultural advice: technology adoption, diffusion and sustainability

Goals of the study

- Conduct a CBA of a low-cost, mobile-phone based information and advice service (named Avaaj Otalo or AO) for farmers in rural India, to understand the impact it has on crop productivity and income.
- Evaluate one mobile-based agricultural advice programme, collecting data at the household level across 40 villages in Gujarat, India.
- Ensure the findings (BCR, and net social benefit in USD) are comparable with all other interventions that have been evaluated with a CBA (provided these other interventions make reasonable assumptions when applying monetary values to outcomes).

Outcomes measured (broken down by stakeholder)

- Farmers with access to the service: increased crop yield (cotton); Increased crop yield (cumin).
- Farmers without access to the service: reduction in crop losses from pests (cotton).
- Note: the CBA only focused on a subset of outcomes, reflecting the areas the researchers were most interested in. Among the outcomes not included were improved farming knowledge, improved crop yields among farmers without access to the service (via spillovers of knowledge), environmental benefits, and disbenefits of changes in fertiliser use.

NEXT

BACK TO CASE STUDY MENU

Mobile'izing agricultural advice: technology adoption, diffusion and sustainability

Result

- The mobile-based advice service had a headline benefit-cost ratio of 11.55 to 1, or a return of $11.55 for every dollar invested in the service. A net social benefit of approximately $10,000 was expected if the service was implemented by a private firm, or $194,000 if the service was subsidised by 91%.

Resources

- Costs per farmer were calculated from programme financials (from the implementer).

Resources (Expertise)

Data collection

- **Data survey:** ability to design and implement data surveys required.
- **Research design:** some specialised knowledge of sampling design (the study used a randomised control trial).

Data analysis

- **MS Excel**: some Excel use to analyse data and create the CBA model.
- Note: all three of the outcomes included in this CBA had a direct impact on farmers' revenue from selling crops, meaning that it was relatively straightforward to monetise the benefits based on data on the actual price paid for foodstuffs in the local area.

BACK

BACK TO CBA MENU

GUIDANCE

Approach to conducting a CBA

HM Treasury. (2018). *The Green Book: Central Government Guidance on Appraisal and Evaluation.* Chapter 5. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf

- The UK government's official guide to evaluation, including CBA, offers extensive detail on how CBA can be applied in the public sector.

Converting outcomes into monetary values

HM Treasury. (2018). *The Green Book: Central Government Guidance on Appraisal and Evaluation.* Chapter 6 (monetising costs and benefits) and Annex A.2 (monetising non-market outcomes). Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf

- The UK government's official guide to evaluation, including CBA, offers extensive detail on how CBA can be applied in the public sector.

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GUIDANCE

Converting outcomes into monetary values (continued)

Baker, R. & Ruting, B. (2014). *Environmental Policy Analysis: A Guide to Non-Market Valuation.* Productivity Commission Staff Working Paper, Canberra. Chapter 2 (valuation methodologies). Retrieved from https://www.pc.gov.au/research/supporting/non-market-valuation/non-market-valuation.pdf

- A discussion of the various approaches to the valuation of non-market outcomes, including the arguments in favour of and against certain approaches.

Nicholls, J., Lawlor, E., Neitzert, E., & Goodspeed, T. (2009). *A guide to social return on investment*. Office of the Third Sector, Cabinet Office. Section 3.4 (monetisation): Retrieved from http://www.socialvalueuk.org/app/uploads/2016/03/The%20Guide%20to%20Social%20Return%20on%20Investment%202015.pdf

- Although this guide is aimed at evaluators using the SROI methodology, the section on monetisation is also relevant to applying CBA where non-market outcomes need to be converted to monetary values.

BACK TO CBA MENU

REFERENCES

Application of CBA in ICT

- Muralidharan, K., Niehaus, P. & Sukhtankar, S. (2016). Building State Capacity: Evidence from Biometric Smartcards in India. *American Economic Review, 106(10), 2895-2929.*
- Cole, S.A. & Fernando, A. (2016). ‘Mobile’izing agricultural advice: technology adoption, diffusion and sustainability. *Harvard Business School Finance Working Paper*, *13-047.*

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SOCIAL RETURN ON INVESTMENT (SROI)

This section provides an overview of the method, a worked example in an ICT context, case studies of the methodology being used, and recommended guides on how to use SROI.

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Relevance for ICT investments (SROI)

- The incorporation of costs is central to an SROI, which emphasises the value for money generated from an investment. A key characteristic of ICT investments is their scalability, where a pilot's scope can expand quickly to impact issues not within the original scope. With this can come higher investment costs. An SROI allows the capture of both the expanded impact and the concomitant expanded costs.
- The comprehensive nature of an SROI approach is also well-suited to capture the non-linear aspects of ICT intervention when projects are scaled-up. For example, if only a few people have access to a phone there is not much impact on communication, but phones become increasingly beneficial the more people gain access to them.
- An SROI approach is applicable across the long timelines involved in ICT. As the scope of an ICT investment expands, incorporating new information on types of impact and costs is straightforward.
- The significant importance placed on stakeholder engagement makes this method particularly suited to capturing the complexity of impact often found in ICT investments. Hearing from those impacted can ensure all the intended and unintended consequences stemming from ICT intervention are accounted for.

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SROI

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METHOD OVERVIEW (SROI)

SROI is an outcomes-based impact evaluation that captures the full value for money of an investment through a high level of stakeholder engagement. It is more often used for retrospective evaluations.

Outcomes measured

- An SROI approach actively seeks to incorporate a large breadth of outcomes across a range of stakeholders with the aim of capturing the total value created, economically, environmentally, and socially. This includes intangible hard-to-measure outcomes (eg increased confidence from volunteering). Through engaging with stakeholders, an impact map, or theory of change, which shows the relationship between inputs, outputs, and outcomes is developed.

Result

- In its simplest form, an SROI calculates a ratio that represents the total social value created for every unit price invested. This can also be presented as a percentage or a net present value amount.

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METHOD OVERVIEW (SROI)

Resources

- Data on the levels of outcomes among beneficiaries before and after the intervention is collected and compared with what would have happened in the absence of any intervention (eg by collecting data from a control group or otherwise assessing the counterfactual scenario) to understand what change in that outcome was created by the intervention in question.
- A fundamental part of an SROI involves developing indicators to measure the extent of change for an outcome and then assigning proxy financial values to these outcomes. Developing indicators and finding suitable proxies can prove challenging. This is especially the case when the outcome is intangible and hard-to-define (eg wellbeing outcomes such as improved self-esteem). Often, financial proxies are taken from previous studies or other secondary sources, something known as a Benefit (Value) Transfer.

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METHOD OVERVIEW (SROI)

Resources (Expertise)

Data collection

- **Survey design**: some knowledge of survey design during the data collection stages (eg use of online surveys, question wording, creation of cost templates).
- **Cost structure**: it is important to understand the full cost of a programme/project in when doing an SROI, so some interviews with programme or finance staff may be required to aid your interpretation of the costs data collected.
- **Research design:** time, resources, and access to a range of stakeholders to form focus groups at different stages of the evaluation.
- Depending on the strength of the evidence required, research design may require significant resources. An RCT approach is considered the highest standard for generating evidence of a programme's causal impact. An RCT can be expensive to administer with multiple rounds of targeted data collection.

Data analysis

- **MS Excel:** once data has been collected, analysing the data and presenting the findings requires some familiarity with Microsoft Excel. The Excel model required for an SROI is relatively straightforward and does not require the use of any advanced features.
- **Project modelling:** if you are conducting a forecastive SROI (projecting the future SROI for a project or programme), some specialised knowledge may be needed if you intend to model the expected change in your outcomes.

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BACK TO SROI MENU

METHOD OVERVIEW (SROI)

Applying measurement principles

- **Involve stakeholders**: stakeholder engagement is an essential component of this method.
- **Understand what changes**: by seeking multiple outcomes in its scope, the method can capture a broad range of positive and negative changes.
- **Only include what is material:** stakeholder engagement helps to identify material outcomes chosen to value that may not be material.
- **Do not overclaim:** robust use of net impact parameters such as counterfactual, attribution, and displacement reduces the chance of overclaiming.
- **Be transparent:** documentation of assumptions, financial proxies, data sources, and stakeholders engaged.
- **Verify the result**: comparison to similar ICT evaluations to identify significant difference or similarities.

BACK

WORKED EXAMPLE (SROI)

This worked example demonstrates how SROI might be used in valuing the impact of an ICT investment.

- An NGO had been running the Childcare Support (CS) programme in Ecuador for two years where a mobile app was used to give childcare advice and support to parents in rural communities. The CS app connected young parents with local trainers who could help them build their knowledge of their child's nutritional, emotional, and cognitive development, leading to positive outcomes for children. Participating parents each received regular training via the CS app for a period of one year.
- The NGO chose to evaluate CS using an SROI approach, as they knew the programme affected a wide variety of outcomes for the parents, children and communities that participated. They also wanted to hear directly from these stakeholders (another feature of SROI), in order to make sure they did not accidentally omit any of the programme's benefits.
- To understand what changed as a result of the CS programme, evaluators held a one-day theory of change workshop, attended by programme staff from the NGO, three mothers who had received training via the CS app the previous year, and two trainers who had trained parents via the CS app the previous year. At the workshop, a theory of change was created based on the changes that these attendees had observed the previous year.
- The CS app was found to have created change in six outcomes the previous year, for three groups of stakeholders:
  - For the **parents** receiving training, there had been an **increase in their knowledge of childcare** and early childhood development, and an improvement in their **self-esteem** (they felt more confident and capable as parents).
  - For the **children** of these parents, there had been **improved physical development** and **improved emotional development**.
  - For the **trainers,** there had been an **improvement in employment prospects** after leaving the programme and an **improvement in their self-esteem** (they felt more positive about their own ability to help others in their community).

NEXT

WORKED EXAMPLE (SROI)

- The evaluators then collected data from the new cohort of parents, children, and trainers (in the third year of the programme's existence). For each of the six outcomes, an indicator was developed. For example, the indicator for a child's physical development was their weight (relative to the average healthy weight for a child their age). The indicator for parents' self-esteem was a survey question asking, "How confident did you feel in your ability to care for your child?" (on a 1-to-10 scale).
- A built-in survey feature on the CS app was used to collect data from parents (speaking both for themselves and for their children) and trainers. Data was collected once at the beginning of the 12-month period (to form a baseline), and again with the same survey questions at the end of the 12 months (the endline).
- There were other programmes happening at the same time as CS that may have affected the same outcomes to some extent. For example, the government had launched a free system of food vouchers a few months earlier, aiming to improve infant nutrition and physical development. To understand the change that would have happened anyway had the programme never existed, researchers surveyed parents in a community 30km away who had not participated in the CS programme, using the same four outcomes for parents and their children. As there were no trainers in this other community, they surveyed people of a similar age, gender, and background to the CS trainers, using the same two outcome indicators as used for the CS trainers (employment prospects and self-esteem).
- Having analysed this data, researchers found that the six outcomes of interest had seen a significantly larger improvement in the communities using the CS app, compared with the change seen in the comparator community where there was no access to the CS app. This was evidence of the positive net impact of the CS programme.

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WORKED EXAMPLE (SROI)

- The evaluators used a variety of methods to place monetary values on the six outcomes. The trainers' improved employment prospects were valued based on the income that they earned from other sources of employment during the 12-month period. The improvement in self-esteem for parents and trainers was monetised using willingness-to-pay findings from previous academic literature, adjusted for local price levels. The increase in parents' knowledge was equivalent to the knowledge they would have gained from an expensive parenting course in the capital city, so that the outcome was monetised using the actual fee that would have been required to attend that course. The improvements in physical and emotional development among the children were known from past literature to lead to better adolescent health and reduced medical expenses as a consequence, so that the outcomes were monetised based on future savings in medical expenditure for the children and their parents.
- Researchers collected financial costs data from the NGO's annual accounts, including the head office costs of administration for the CS programme, salaries for the trainers, app development costs and transport costs for programme staff. There was another, non-financial cost of the CS programme: parents had also committed two hours per month of their time to receive training on the CS app. This time was monetised using the average hourly wage rate of a sample of participating parents, on the understanding that if they had not spent those two hours using the CS app, they would have been able to earn additional income in that time (the opportunity cost of using the app).

BACK TO SROI MENU

WORKED EXAMPLE (SROI)

- The total cost of the CS programme (including financial and non-financial costs) was $25,000 for the 250 parents who participated. However, the economic and social value (benefits) created by CS for parents, their children, and the trainers was estimated at $100,000 in total. On this basis, the CS programme had an SROI ratio of 4 to 1, meaning that for every $1 invested in the programme, an estimated $4 in economic and social value was created.
- The evaluators also reported the benefits of the CS programme broken down by outcome and by stakeholder. This highlighted some unexpected findings: the improvement in employment prospects for the trainers after they left the programme was much greater than the NGO had expected. This evidence of the broader benefits of the CS approach was helpful to the NGO, allowing them to make the case for rolling out the CS app to a larger number of communities to donors and the Government of Ecuador.

BACK

BACK TO SROI MENU

CASE STUDIES (SROI)

This selection of case studies, where SROI has been used to value impact, is categorised by level (ie a national level or programme/project level) and type (ie for forecasting impact or retrospectively evaluating impact). Each case study outlines the study's goals, the outcome measured, the results, and the resource requirements.

SMALLER SCALE (E.G. LOCAL PROJECTS)

- **FORECASTIVE**
- **RETROSPECTIVE (1)**
- **RETROSPECTIVE (2)**

Training adults who work with 7-16-year-olds to provide activities in online game design, app development, and programming, to deliver innovative clubs and curriculum programmes, UK (SROI)

Goals of the study

- Forecast the SROI for a project that trains adults in online game design, app development, and programming, to deliver innovative youth clubs and curriculum programmes in the UK. The programme has various aims from increasing awareness of health and wellbeing to promoting science, technology, engineering, and mathematics (STEM) subjects and bringing different social groups together. Carrying out a forecastive SROI captures these multiple outcomes across a range of stakeholders and shows how the value will be created.
- Note: it would be possible to compare with an SROI of a similar project but given how bespoke the analysis can be it may not be a useful comparison.

Outcomes measured

- Seven of the outcomes focused on the children and young people who participate in the apps club: (1) feeling happier, (2) discovering hidden skills, (3) forming friendships outside their usual peer group, (4) feeling they have more career prospects, (5) becoming more confident, (6) feeling good about themselves through helping others, (7) and experiencing less stressful periods at home.
- It also captures multiple outcomes across a range of other stakeholders and can predict the return on investment.
- Additionally, accounts for deadweight and displacement, as well as valuing non-monetary outcomes.

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BACK TO CASE STUDY MENU

Training adults who work with 7-16 year olds to provide activities in online game design, app development and programming, to deliver innovative clubs and curriculum programmes, UK (SROI)

Resources

- Includes estimates of total project costs (both fixed and variable).
- Involved stakeholders which represented a cross section of the whole group. Engagement was carried out through questionnaires. Stakeholders included participants (young people), mentors, schools and families.

Resources (Expertise)

Data collection

- **Survey design**: data collection for expected outcomes (surveys).
- **Cost structure:** basic cost data collection and analysis required.
- **Research design:** sampling design and secondary research to identify financial proxies.

Data analysis

- **MS Excel**: ability to carry out data manipulation and analysis in Microsoft Excel required.
- **Project modelling:** knowledge of how to construct an SROI and perform a sensitivity analysis.

BACK

SROI for ICT for Youth Employability training course in Kampala, Uganda (link)

Goals of the study

- Carry out an SROI evaluation for a project in Uganda entitled “ICT for Youth Employability”, which aims to increase youth employability through the development of advanced ICT skills.
- As part of the evaluation, capture the social and economic impact it has had on a range of stakeholders, including training participants, course staff, recruiting partners and employers.
- Note: it would be possible to compare with an SROI of a similar project but given how bespoke the analysis can be it may not be a useful comparison.

Outcomes measured

- Multiple outcomes including increasing employability, networking, access to resources, reducing risk of STDs and unplanned pregnancies, improved ICT training and delivery, and improved self-confidence.
- Additionally, it aims to account for deadweight and displacement, as well as valuing non-monetary outcomes.

Result

- The analysis shows the project has an SROI of 3.48, which indicates that 1 UGX invested produces 3.48 UGX of social value.

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SROI for ICT for Youth Employability training course in Kampala, Uganda (link)

Resources

- Includes high-level project costs (both fixed and variable).
- Stakeholder engagement part of the development of the impact map and outcomes, developing outcome indicators, collecting outcomes data, identifying financial proxies, deadweight, displacement and attribution. Carried out through questionnaires and focus groups.

Resources (Expertise)

Data collection

- **Survey design:** knowledge of data collection for outcomes (surveys).
- **Cost structure**: basic cost data collection and analysis.
- **Research design**: sampling design (quasi-experimental) and secondary research to identify financial proxies; interviews and focus groups (identifying stakeholders and outcomes).

Data analysis

- **MS Excel:** ability to carry out data manipulation and analysis in Microsoft Excel required.
- **Project modelling**: knowledge of how to construct an SROI and perform a sensitivity analysis required.

BACK

ICT WACAS Programme (empowering women Nepal)

Goals of the study

- Perform an SROI on the ICT WACAS Programme (empowering women Nepal).
- Note: although multiple outcomes are identified for the participants there is limited data available which results in various outcomes being excluded from the return on investment calculations. The evaluation of the programme can capture outcomes for the 307 participants in Nepal and the volunteers from Denmark. The results demonstrate significant increase in income for the women in the programme and show where the value is being created. It would be possible to compare with an SROI of a similar project but given how bespoke the analysis can be it may not be a useful comparison.

Outcomes measured

- For participants: increasing employability, networking, access to resources, reducing risk of STDs and unplanned pregnancies, improved ICT, improved quality of life, education, increased income (only one captured in the SROI for participants).
- For volunteers: relevant experiences and improved quality of life.
- Contributors: financial input training and delivery, and improved self-confidence.
- Additionally, it aims to account for deadweight and displacement, as well as valuing non-monetary outcomes.

Result

- The analysis shows the project has an SROI of 2.38:1 after 5 years. They also calculate that the payback period is 1 year and 9.5 months and that at 20 years the SROI is 8.81:1.

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ICT WACAS Programme (empowering women Nepal)

Resources

- Includes high-level project costs (both fixed and variable).
- Stakeholders considered: women participants, contributors, volunteers, management and families of the participants.
- Participants and volunteers fill out a survey at the beginning of the programme and at the end.

Resources (Expertise)

Data collection

- **Survey design:** No need for data collection as WACAS had already developed their own digital data system.
- **Cost structure:** basic cost data collection and analysis required.
- **Research design:** sampling design (quasi-experimental) and secondary research to identify financial proxies.

Data analysis

- **MS Excel:** ability to carry out data manipulation and analysis in Microsoft Excel required.
- **Project modelling:** knowledge of how to construct an SROI and perform sensitivity analysis required.

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BACK TO SROI MENU

GUIDANCE (SROI)

The SROI Network. (2012). *A guide to social return on investment.* Retrieved from http://www.socialvalueuk.org/resources/sroi-guide/

- Extensive user-friendly SROI guide, available in 10 languages. The page also has links to supplementary material to help build an SROI. No need for SROI knowledge.

Social Value Bank. (2014). Starting out on SROI. Retrieved from http://www.socialvalueuk.org/resource/guidance-on-starting-out-on-sroi-2/

- A beginners' guide to SROI, less detailed but useful for those with limited knowledge on ROI evaluations.

The SROI Network. (2016). *The seven principles of SROI.* Retrieved from http://www.socialvalueuk.org/app/uploads/2016/03/SROI-Principles_singles_28A.pdf

- Details of the seven principles of SROI, useful to refer back to throughout your evaluation.

BACK TO SROI MENU

REFERENCES (SROI)

Gibbs, W. (2013). *Forecast Social Return on Investment Report of Excite-ed CIC Activities*. Insipre2Enterprise. Retrieved from http://www.socialvalueuk.org/app/uploads/2016/04/Forecast-SROI-Report-Excite-ed-AMENDMENDED-V4-.pdf

Gaeta, N. & Bustamante, S. (2019). *Evaluation of the project C18-364 ICT For Youth Employability Kampabits*. The Commonwealth of Learning. Retrieved from http://oasis.col.org/bitstream/handle/11599/3199/SROI final report_COL_Kampabits_28June2019.pdf?sequence=4&isAllowed=y

Lind Invest. (2017). *Social Return on Investment Report for WACAS 2017.* Retrieved from http://www.socialvalueuk.org/app/uploads/2017/04/Wawcas-SROI-Report-2017.pdf

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MULTI-CRITERIA ANALYSIS (MCA)

This section provides an overview of the method, a worked example in an ICT context, case studies of the methodology being used, and recommended guides on how to use MCA.

NEXT

Relevance for ICT investments (MCA)

- MCA's stakeholder engagement makes this method particularly suited to capture the complexity of impact often found in ICT investments. Hearing from those impacted can ensure all the intended and unintended consequences stemming from ICT intervention are accounted for.
- MCA involves assigning impact with different levels of importance. This is useful in an ICT context, as given the wide range of impacts these interventions can have, some outcomes will be of more importance than others in terms of the intervention's aims.
- MCA does not usually account for costs of the project and is not specifically designed for valuing impact in monetary terms.

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MCA

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Alternative suggestion

No access to stakeholders? →

Econometrics

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METHOD OVERVIEW (MCA)

MCA evaluates an intervention by establishing preferences between several possible options assessed against defined criteria. MCA is particularly suitable for structuring and providing a consistent approach when handling large amounts of complex and intangible information. It can aid decision-making by forming preferences when comparing between interventions or options within an intervention. A key feature of MCA is its emphasis on judgement. This involves stakeholder engagement to establish objectives, criteria, and their relative importance. Although quantitative data and methods can be included, MCA does not necessarily result in a monetary value.

Outcomes measured

- MCA usually evaluates various outcomes (both tangible and intangible) and sorts them in terms of importance/ preference to be able to compare.

Result

- MCA results vary by the method used but generally result in a preference of one option over another. Carrying out MCA prior to an intervention allows the evaluator to prioritise options to decide the best route to achieve the desired outcomes. As an evaluation tool, MCA can compare interventions and define which performed best, depending on the criteria for success.

Resources

- Data on the levels of outcomes among beneficiaries before and after the intervention is collected if doing an evaluative MCA.
- For a forecastive MCA, estimates of the expected change in outcomes are necessary.
- MCA required identifying the criteria that will measure success of each outcome in addition to weights for these criteria (how important they are). These are identified through stakeholder engagement and may require data collection (eg low variable costs may be a criterion, would need data on these costs). Necessary data will depend on the MCA technique used.

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METHOD OVERVIEW (MCA)

Resources (Expertise)

Data collection

- **Survey design:** MCA usually requires some knowledge of survey design during the data collection stages (eg use of online surveys, question wording, creation of cost templates). Surveys can be used to collect data on outcomes or information on criteria and preferences.
- **Cost structure:** Cost can be one of the criteria the intervention is being judged against, but it is not an essential part of an MCA.
- **Research design:** As another tool to involve stakeholders, MCA is likely to identify outcomes and priorities through interviews and focus groups. This engagement can require time, resources and access to a range of stakeholders. Depending on the strength of the evidence required, research design may require significant resources. An RCT approach is considered the highest standard for generating evidence of a programme's causal impact. An RCT can be expensive to administer with multiple rounds of targeted data collection.

Data analysis

- **MS Excel:** once data has been collected, analysing the data and presenting the findings requires some familiarity with Microsoft Excel. The Excel model required for an MCA is relatively straightforward and does not require the use of any advanced features. Some MCA techniques are more complex and may require statistical software and knowledge.
- **Specifics:** if you are conducting a forecastive MCA, technical experts in the topic will be required to make assumptions and predictions on future change.

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METHOD OVERVIEW (MCA)

Applying measurement principles

- **Involve stakeholders**: stakeholder engagement is an essential component of this method.
- **Understand what changes**: by seeking multiple outcomes in its scope, the method can capture a broad range of positive and negative changes.
- **Only include what is material:** stakeholder engagement helps to identify the material outcomes chosen to value may not be material.
- **Do not overclaim:** more vulnerable to overclaiming than other methods.
- **Be transparent:** documentation of assumptions, data sources, and stakeholder that were engaged.
- **Verify the result**: comparison to similar ICT evaluations to identify significant difference or similarities.

BACK

WORKED EXAMPLE (MCA)

This worked example demonstrates how MCA might be used in valuing the impact of an ICT investment.

- A government was thinking of introducing a national finance app for business which would allow them to see all their finances and make it easier to access loans. There were technology providers that could offer off-the-shelf solutions but there was also the option to build the app. The government was unsure which option was best. They decided to carry out an MCA to evaluate their choice.
- Some evaluator skills and resources were needed, such as knowledge of ICT, potential secondary data collection, and Microsoft Excel. Access to stakeholders was also needed. Other more complex methods of MCA required software to run the analysis. This was free (eg R or Python) or paid for (eg STATA or Matlab). The evaluator needed to know how to use the selected software.
- The evaluator first defined the decision opportunity. The goal was to develop a finance app for businesses. The decision-maker, the government, had to decide between building an app or buying one off the shelf.
- Next, stakeholder interests were identified. Stakeholders included businesses, banks, and government. Their interests were the cost of implementing app, the cost of maintaining the app (including technology upgrades), and the need for the app to be interoperable with other technology (eg bank apps for loan information or government systems for tax and loan purposes). The app also needed to be scalable to meet the long-term aim of incorporating offers from international banks and able to offer the app to households not just businesses. It needed to be able to adapt to new technology, to be secure, and to be easy to use.

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WORKED EXAMPLE (MCA)

- Through stakeholder engagement, the evaluator rated the two options as to how well they satisfied each interest identified. This needed input from technical experts (eg asking technology providers the difference in cost of maintaining an app depending on which option they go for). Involving technical experts is an important way of capturing the complexity of some ICT interventions that may be hard to measure or give a value to scale, but experts can explain which option may be better for scaling up
- Two common rating scales used in MCA:
  - **Relative scale**. Each alternative is rated relative to the others in satisfying a particular interest. For example, among the 4 alternatives, assign each a 1, 2, 3, or 4 depending on which satisfies the interest: the best = 4; second best = 3; third best = 2; and the worst at satisfying the interest = 1.
  - **Ordinal scale**. Using a scale of your choosing (eg a 5-point scale, or a 10-point scale) assign each alternative a rating for how well it satisfies a particular interest. For example, a 5-point scale might be: 5 = excellent; 4 = good; 3 = satisfactory; 2 = below average; 1 = poor.
- Through stakeholder engagement, weights were assigned to the identified interests. This is where personal preferences mattered. Decision-makers are often involved at this stage, in this case the government, as they were the ones deciding between the options.

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BACK TO MCA MENU

WORKED EXAMPLE (MCA)

- For example, they may have decided that adapting to new technology was more important than keeping maintenance costs low. It is this stage that makes MCA useful for evaluating ICT interventions, as there is complex information that is hard to measure or compare but still important to the decision process. For example, being able to focus on the importance of scale.
- The preferred option was identified by multiplying the weights of the interests by the corresponding value. Summing the score yielded the preferred option.
- It is worth discussing the results and ensuring that the weights and values given appear appropriate before deciding. This may involve further stakeholder engagement.

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BACK TO MCA MENU

CASE STUDIES (MCA)

This selection of case studies, where MCA has been used to value impact, is categorised by level (ie national level or programme/project level) and type (ie for forecasting impact or retrospectively evaluating impact). Each case study outlines the study's goals, the outcome measured, the results, and the resource requirements.

LARGER SCALE (E.G. NATIONAL)
FORECASTIVE

SMALLER SCALE (E.G. LOCAL PROJECTS)
RETROSPECTIVE

Alternative transport options for South Wales: an options re-appraisal in light of the Well-being of Future Generations (Wales)

Goal of the study

- Evaluate two investments that cost the same but have different outputs and outcomes. One is a black route investment; the other is a green alternative transport option.
- Forecast the ROI at a national level for each option. The preferred option depends on different criteria identified which contain wellbeing and environmental objectives.

Outcomes measured

- Health and resilient ecosystems.
- Climate change adaption.
- Compatibility with local wellbeing objectives.
- Implications for socioeconomic inequality.
- Provision of and access to training and education.
- Provision and access to sport, art and recreation.
- It was able to capture several criteria and assess both options being compared against the identified criteria and preferences.

Result

- Performance of the green route was much higher compared to the black route when assessed against the identified criteria.
- The black route does better if just focusing on one criterion, which is to reduce congestion near the airport; it does not consider other wellbeing factors.

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Alternative transport options for South Wales: An options re-appraisal in light of the Well-being of Future Generations (Wales)

Resources

- Includes estimates of total project costs.
- Consultation with stakeholders and experts to identify and measure criteria.

Resources (Expertise)

Data collection

- **Survey design**: none required; data collected from secondary sources (2011 Census data, National Transport Survey for England).
- **Research design**: included consultation with field experts.

Data analysis

- **MS Excel:** ability to carry out data manipulation and analysis in Microsoft Excel required.
- **Project modelling**: some knowledge on how to construct an MCA required.

BACK

Assessing the online learning environment at a University in Uganda

Goals of the study

- Apply an ICT-specific MCA to an online learning environment at a university in Uganda.
- Focus on whether the e-learning tool improved students' access to learning.
- Provide results on how the initiative performed across different outcomes.
- Note: it does not provide a single figure explaining the overall performance of an intervention as that is not the aim. It compares between different outcomes of the project, but results are not particularly useful to compare with another project.

Outcomes measured

- Seventeen outcomes overall. At a high level, these included access to the course, participation in discussions, and contextual factors. It also included tangible and intangible factors.
- It captures complexity in terms of the number of outputs and outcomes as well as stakeholder preferences.

Result

- It does not provide a value explaining the overall performance of an initiative as that is not the aim. The results showed the importance of the contextual factors and highlighted outcomes that needed improvement.

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Assessing the online learning environment at a University in Uganda

Resources

- It does not account for the costs of implementing the online learning services.
- The weights were developed through consultation with experts in the field – lecturers and administrators – who assessed the relative importance of the criteria. For the outcome scores, survey responses were elicited from students who had used the online environment for at least a year or more.

Resources (Expertise)

Data collection

- **Survey design:** data collection for outcomes (surveys).
- **Research design**: consultation with field experts – lecturers and administrators – required; sampling design (quasi-experimental) also required.

Data analysis

- **MS Excel:** ability to carry out data manipulation and analysis in Microsoft Excel in addition
- **Project modelling:** some knowledge on how to construct an MCA.
- **Specifics:** access to and knowledge of DecideIT (decision support tool).

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GUIDANCE (MCA)

Geneletti, D. (2013). Multi-criteria analysis. LIAISE Toolbox. Retrieved from http://beta.liaise-toolbox.eu/ia-methods/multi-criteria-analysis.

- Specific for impact assessment with detail on the different MCA methods and a list of software that can be used for MCA. Aimed at those with limited MCA knowledge.

Department for Communities and Local Government. (2009). *Multi-Criteria Analysis: A Manual*. Retrieved from: http://eprints.lse.ac.uk/12761/1/Multi-criteria_Analysis.pdf

- Extensive manual specifically for government policy with a detailed overview of MCA techniques and several case studies. MCA knowledge not necessary but useful.

Nameere Kivunike, F., Ekenberg, L., Danielson, M. & Tusubira, F. (2014). Towards a structured approach for evaluating the ICT contribution to development. *International Journal on Advances in ICT for Emerging Regions (ICTer), 7(1).* Retrieved from https://www.researchgate.net/publication/270058259_Towards_a_structured_approach_for_evaluating_the_ICT_contribution_to_development

- Academic paper that develops a specific MCA to evaluate ICT4D. Aimed at those with some MCA knowledge.

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REFERENCES (MCA)

Chapman, A. (2018). Alternative transport options for South Wales: An options re-appraisal in light of the Well-being of Future Generations (Wales) Act 2015. Retrieved from https://nefconsulting.com/wp-content/uploads/2018/09/Alternative-Transport-Options-for-South-Wales-report-September-2018.docx.pdf

Nameere Kivunike, F., Ekenberg, L., Danielson, M. & Tusubira, F. (2014). Towards a structured approach for evaluating the ICT contribution to development. *International Journal on Advances in ICT for Emerging Regions (ICTer)* 7(1). Retrieved from https://10.4038/icter.v7i1.7152

BEST PRACTICES

Involve stakeholders

Stakeholders are any group or individual which can affect, or is affected by the ICT investment

As stakeholders experience change as a result of the activity, they are best placed to describe that change. This principle means that stakeholders need to be identified and then involved in consultation throughout the analysis, so that the value, and how it is measured, is informed by those who experience change.

Those most affected need to be identified. First, list all those groups of people who might be affected by the investment's activities, whether the change is positive or negative, intentional or unintentional. Then, prioritise the list by identifying which stakeholders have/will experience material change.

The context will drive the selection of stakeholders. Digital-focused stakeholders generally include four broad groups[1].

- **Government ministries**: different ministries intersect with digital technologies in various ways.
- **Implementing partners:** private sector and/or NGO partners implementing digital investments can help to understand the digital environment.
- **Donors:** donors help to understand the potential for partnership and leveraging existing systems.
- **Target users:** discussions with the intended end users of the intervention in which digital tools are used to understand the need for or the change experienced from their perspective.

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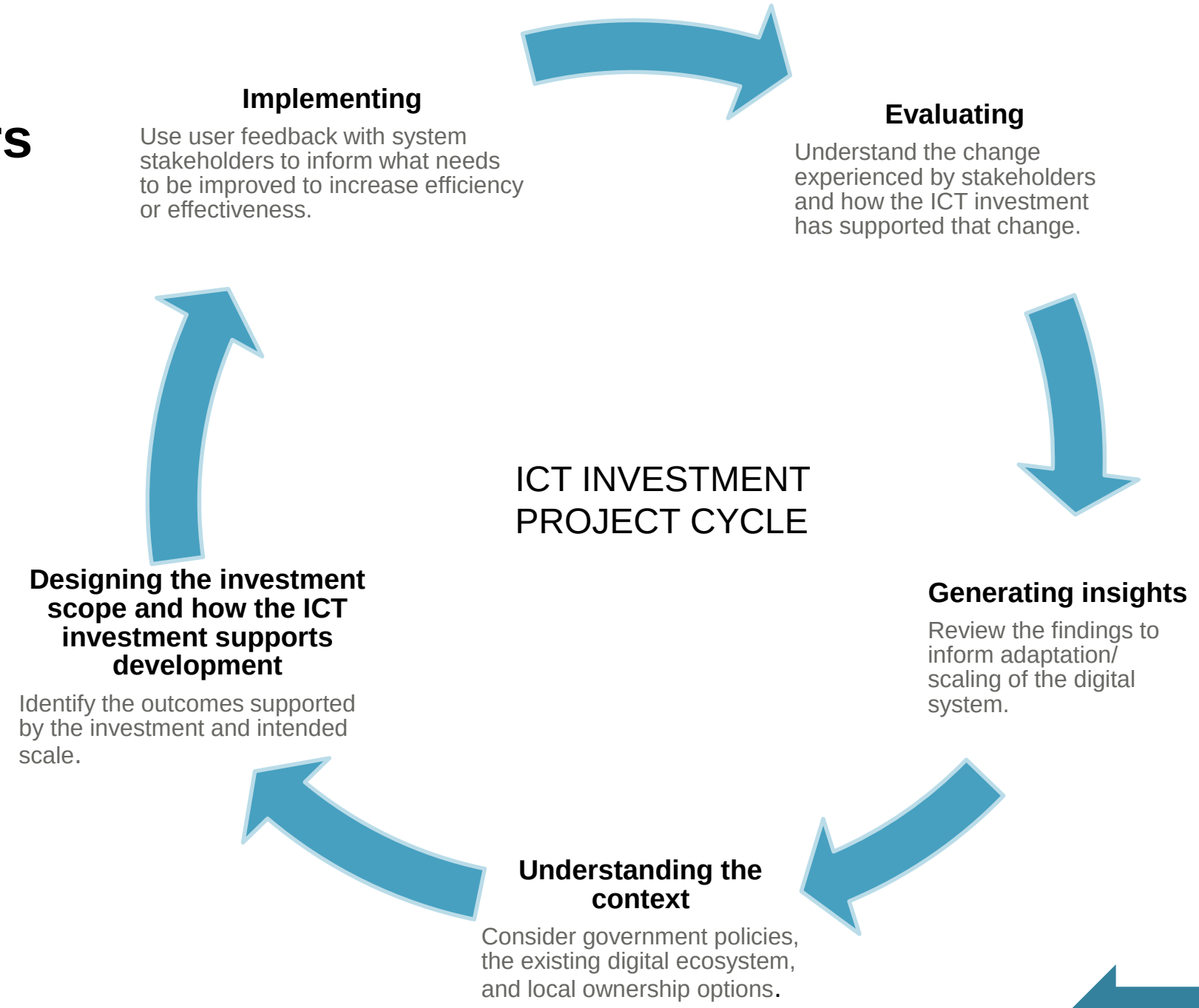
Involve stakeholders

Stakeholders can provide valuable insights at each stage of the ICT investment project cycle. Different stakeholder groups may be involved at different points.

Stakeholders who affect or might be affected by the activities within the scope of the investment need to be identified.

Developing a stakeholder engagement plan will clarify who is engaged, how and when they are engaged, the resources needed to engage them, and likely barriers to engagement.



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Relevant principle for digital development

Understand what changes

State how change is created and evaluate this through evidence gathered, recognising positive and negative changes as well as those that are intentional and unintentional.

Value is created for or by different stakeholders as a result of different types of change, ie changes that the stakeholders intend and do not intend, as well as changes that are positive and negative. This principle requires a theory of how these changes are created to be stated and supported by evidence.

These changes are the outcomes of activity, made possible by stakeholders' contributions. They can be identified as social, economic, or environmental outcomes. These outcomes should be measured to provide evidence that a change has taken place.

How the ICT investment supports development can be clarified through a theory of change, which can be validated by referring to research evidence.

Relevant principle for digital development

Only include what is material

Determine what information and evidence must be included to give a true and fair picture, such that stakeholders can draw reasonable conclusions about the impact of the investment.

This principle requires an assessment of whether a person would make a different decision about an activity if a piece of information were excluded. This includes decisions about which stakeholders experience significant change, as well as information about the outcomes. It is important to justify choices about what information is included or excluded.

For digital investments, you will need to distinguish between what is directly impacted by your intervention and what is not and establish an agreed scope for the intervention and time period under consideration.

Relevant principle for digital development

Do not overclaim

Only claim the value that activities are responsible for creating.

This principle requires reference to trends and benchmarks to help assess the change caused by the activity, as opposed to other factors, and to account for what would have happened anyway. It also requires consideration of the contribution of other people or organisations to the reported outcomes to match the contributions to outcomes.

Relevant principle for digital development

Be transparent

Demonstrate the basis on which the analysis may be considered accurate and honest and show that it will be reported to and discussed with stakeholders.

This principle requires that each decision relating to stakeholders, outcomes, indicators, and benchmarks; the sources and methods of information collection; the different scenarios considered; and the communication of the results to stakeholders, should be explained and documented as a key element of the analysis process.

This information should be documented in a technical appendix to the analysis so that the results can be challenged and verified.

Verify the results

Understanding the value being created by an activity inevitably involves subjectivity. Appropriate verification is required to help stakeholders assess whether the decisions made by those responsible for the analysis were reasonable.

Compare your analysis to similar ICT evaluations or studies to see how your results compare.

Identify significant differences or similarities to test how robust your results are.

Digital principles

Design with the user

Understand the existing ecosystem

Design for scale

Build for sustainability

Be data driven

Use open standards, open data, open source, and open innovation

Reuse and improve

Address privacy and security

Collaborate

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Attribution	An assessment of how much of the outcome was caused by the contribution of an intervention.
Beneficiaries	Those who derive advantage from an intervention, for example the users of a service, programme, or technology.
Disability-adjusted life year (DALY)	A standard indicator measuring health impacts, closely linked to the QALY. A DALY combines years of life lost (eg as a result of premature death from a disease) and years lived with a disability (ie years living with a disease, with each year weighted using QALYs to reflect the reduced quality of life as a result of the disease). DALYs are widely used in health evaluations and cost-effectiveness analysis.
Deadweight (counterfactual)	A measure of the amount of an outcome that would have happened if the intervention had not taken place.
Difference in differences	A statistical technique used in econometrics that attempts to mimic an experimental research design using observational study data. It studies the differential effect of a treatment on a 'treatment group' versus a 'control group' in a natural experiment.
Disaggregate	To separate something into component parts, for example data split by ethnicity or gender.
Discounting	The process by which future financial costs and benefits are recalculated to present-day values.
Displacement	A substitution effect that occurs when the benefits claimed by a programme participant are at the expense of others outside the programme.

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Economic model	A simplified version of reality that allows us to observe, understand, and make predictions about economic behaviour. It is a simplified, often mathematical, framework designed to illustrate complex processes.
Effectiveness (value for money)	The degree to which something is successful in producing a desired result. In evaluation, effectiveness refers to how the outputs of a programme lead to changes in its outcomes, as opposed to efficiency (which is the relation between a programme's inputs and its outputs).
Evaluative	Refers to an evaluation of the impact of a programme that has already occurred, as opposed to a forecastive evaluation of a programme that has not yet happened.
Forecastive	A tool that can predict or estimate outcomes.
Impact	The difference made by an organisation or intervention.
Impact map	A table that captures how an activity makes a difference, ie how it uses its resources to provide activities that then lead to particular outcomes for different stakeholders.
Indicator	Information that allows performance to be measured. This usually takes the form of a statistical value which links an organisation's activities to its outputs and outcomes.
Inputs	Resources used to run the activity, such as money, people, facilities, and equipment. This is the investment against which the value of the impact will be compared.
Material change	Outcomes are material if omission has the potential to affect the readers' or stakeholders' decision. Materiality has two dimensions: relevance and significance. Which stakeholders experience change as a direct result of your ICT activities, and the most significant change, relative to the other stakeholders on your list.

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Monetary Value	The value of something in terms of how much money it is worth.
Monetise	To assign a financial value to something.
Net present value	The value in today's currency of money that is expected in the future minus the investment required to generate the activity.
Non-monetary	Not usually measured using money or currency.
Outcome	Changes resulting from the activity for individuals, a community, or other stakeholders. For example, a new job leads to increased income or community cohesion.
Outcome indicator	A well-defined measure of an outcome.
Output	A way of describing the activity in relation to inputs.
Primary data source	An original data source in which the data is collected first-hand by the researcher for a specific research purpose or project.
Proxy	An approximation of value where an exact measure is impossible to obtain. In a CBA or an SROI evaluation, a proxy refers to the financial value applied to an outcome that is usually not expressed terms of money or currency.
Qualitative research	Explores people's beliefs, experiences, attitudes, behaviours, and interactions. It asks questions about how and why people want to stop smoking, for example, rather than asking how many people have tried to stop. It generates non-numerical data, such as a person's description of their pain rather than a measure of their pain.

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Quality-adjusted life year (QALY)	A measure of the state of health of a person or group in which the benefits, in terms of length of life, are adjusted to reflect the quality of life. One QALY is equal to 1 year of life in perfect health. QALYs are calculated by estimating the years of life remaining for a patient following a particular treatment or intervention and weighting each year with a quality-of-life score (on a scale of 0 to 1). It is often measured in terms of the person's ability to carry out the activities of daily life, and freedom from pain and mental disturbance.
Quantitative research	Generates numerical data or data that can be converted into numbers. An example is research using clinical trials. Another example are national population surveys that count people and households.
Quasi-experimental study	Meets the first criterion of a true experimental design (manipulation of a variable factor between two or more groups), but it does not meet the second because patients are not randomly assigned to groups. This design is frequently used when it is not feasible, or not ethical, to conduct a randomised controlled trial.
Randomised control trial	A study in which several similar people are randomly assigned to two (or more) groups to test an intervention. One group (the experimental group) has the intervention being tested; the other (control group) has no intervention at all. The groups are followed up with to see how effective the experimental intervention has been.
Secondary data	Refers to data that is collected by someone other than the user.
Sensitivity analysis	A means of exploring uncertainty in the results of economic evaluations. There may be uncertainty because data is missing, estimates are imprecise, or there is controversy about methodology. A sensitivity analysis can also be used to see how applicable the results are to other settings. The analysis is repeated using different assumptions to examine the effect of these assumptions on the results.

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Socio-economic	Of, relating to, or involving a combination of social and economic factors. For example, a new job can bring both economic (eg increased income) and social (eg improved life stability) benefits.
Stakeholders	People, organisations, or entities that experience change, whether positive or negative, as a result of the activity that is being analysed.
Theory of change	Develops an understanding of how and why a given intervention is going to make change. Involves the mapping, understanding, testing and refining the links between an intervention, its context and the desired impacts. The framework helps to logically think through the pathway of change (short-, medium-, and long-term outcomes), that built up to long-term changes (positive and negative outcomes).

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