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Quantifying the development effectiveness of interventions: A methodological approach

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1. Introduction

Several international initiatives advise governments, development agencies and donors in general to give due diligence to management systems that put results at the centre of the planning, implementation, and evaluation of projects. These initiatives include the following:

- The Millennium Development Goals, which were adopted by 189 countries in 2000
- The United Nations' 2002 Monterrey Conference which, among other things, reaffirmed international development goals and the need for more effective development finance
- The 2004 Marrakesh Memorandum, signed by the African Development Bank, the Inter-American Development Bank, the European Bank for Reconstruction and Development, the World Bank and the Organisation for Economic Co-operation and Development (OECD)
- The 2005 Paris Declaration on Aid Effectiveness
- The 2008 Accra Agenda for Action, a follow-up to the Paris Declaration, which committed the international community to reforming development assistance.

These initiatives contributed to a paradigm shift away from operational performance (i.e. the size of an investment) towards results (i.e. its impact and development effectiveness). This paradigm shift changed the way development agencies approach development in general. It also created a platform for a new approach to measuring the effectiveness of development interventions, known as "Managing for Development Results".

Managing for Development Results entails the evaluation of each development intervention using a set of well-defined, easy-to-interpret and quantifiable dimensions of development effectiveness. The United Nations Development Programme, the International Fund for Agricultural Development and the OECD all use four dimensions for measuring the development effectiveness of a project: its relevance, efficiency, effectiveness and impact. The International Finance Corporation uses four dimensions from a different, but compatible, perspective: financial performance; economic sustainability; environmental and social performance; and broader development impact on the private sector (IFC, 2006). Given their wide use, this paper focuses on the first set of dimensions, namely relevance, efficiency, effectiveness and impact.

Existing studies analyse each dimension of development effectiveness individually. The aim of this paper is to integrate them and thereby contribute to the ongoing debate on how the development effectiveness of a project should be measured. The paper makes the

following proposals:

- It suggests how each dimension of development effectiveness could be aligned with the operations of a development finance institution.
- It suggests ways of quantifying each dimension of development effectiveness.
- It proposes the use of a development effectiveness index for assessing the overall development effectiveness of a project.

The rest of this paper is organised as follows: section 2 discusses the four dimensions of development effectiveness, section 3 focuses on measurement, and section 4 concludes.

2. Dimensions of development effectiveness

2.1 Relevance

The first dimension of development effectiveness is relevance, which relates to the role that a development finance institution plays in the development space. This is defined by the mandate of the institution, which sets out its role in addressing certain aspects of development challenges, as well as the parameters for its operations. These parameters are normally set with *market and institutional failure* in mind. For example, when a development institution is mandated with financing projects that eradicate backlogs in electricity services, its beneficiaries are likely to be poor and in areas not served by other institutions.

This paper proposes that the relevance of a project be assessed in a manner that takes into account both the *type* of the project (i.e. within the role of the development finance institution) and its *target* (i.e. the intended beneficiaries as per the mandate).

From the perspective of national planning, defining relevance in terms of both project type and target would assist in creating a “division of labour” and reducing operational overlaps between development institutions. It would also facilitate resource coordination and enable stakeholders to assess the contribution of each institution within its mandated space. Finally, it would avoid the impression among stakeholders that each institution must deliver on every type of developmental challenge.

Some institutions define relevance only in terms of project *type*, which asks whether the project is within the bounds of the mandate. This could create bias, as these institutions might define their mandates very broadly. The use of project *target* takes into account whether the right people are being targeted within the broader mandate of the institution, and whether market and institutional failures are being addressed. The combination of

project type and project target ensures that an intervention is both within the broader mandate and addresses the developmental challenges of those who need it the most. Examples of project types and targets are included in Box 1 overleaf.

Box 1: Project relevance

A quick look at the loan book of a development finance institution might suggest that all of its projects are within the bounds of its broader mandate. Should relevance be judged merely on the basis of project type, the institution might be rated highly. Once project target is added as an additional indicator, the picture might change. The institution would get a higher (lower) rating if its interventions also targeted relatively more (less) deserving beneficiaries, in line with institutional and market failures.

Consider an institution whose mandate is to finance projects to eradicate rural poverty. Any rural project would rate highly in terms of project type, but a project may end up empowering only the rural elite. Such a project would be rated poorly in terms of target. This is why both the type and the target need to be considered in assessing the relevance of a project.

2.2 Efficiency

Efficiency is the second dimension of development effectiveness. It occurs when resources (inputs) are optimally transformed into outputs. Figure 1 illustrates the measurement of efficiency: in terms of production economics, efficiency means operating at point A, along line B and curve C, using a combination of R1 and R2 resources.

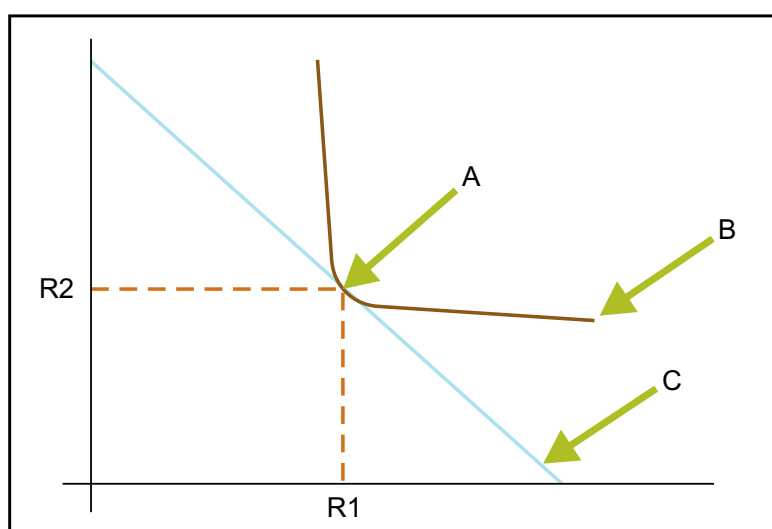


Figure 1: Optimal transformation of inputs into outputs

In the figure, point A represents an optimal combination of inputs and outputs, line B is the budget line representing the total cost of the project, and curve C is the isoquant (or same-quantity curve) representing the quantity of goods produced by the project. The curve could be expressed in terms of the number of households benefiting from water, electricity, sanitation or other services. Using the construction of a tarred road in a rural municipality as an example, efficiency might require a R1 million investment to translate into at least 1,2 kilometres of tarred road (see Table 2 for a list of thresholds). A similar amount may be obtained by dividing the kilometres of roads tarred (C) by the total cost of the project (B), i.e. the ratio of C to B.

2.3 Effectiveness

Effectiveness, like efficiency, measures the performance of a project as part of its overall development effectiveness. It assesses the extent to which a project has achieved the desired outcomes stipulated in the project documentation, independent of its costs (UNDP, 2001). A project may also generate desired outcomes that were not originally anticipated and hence not covered in the project documentation. These outcomes would not be considered as part of the effectiveness criterion. The same holds for unanticipated and undesirable outcomes. Project outcomes (whether desired or undesirable) are social benefits and costs that may affect both the target group and society at large. The next dimension of development effectiveness, impact, examines these social benefits and costs.

2.4 Impact

Broadly defined, impact constitutes both the direct and the indirect effects of a project. Here, direct effects are defined as the intended outcomes of the project and indirect effects as those that are not directly related to the project but arise because of it (see Box 2). In addition to the target groups, indirect effects influence various other groups of society – households, firms, government and the environment.

Consider a road project. Production units (*firms*) might benefit from the impact of the project on the efficiency of production. The road is likely to reduce the cost of transportation, which in turn lowers the cost of production and results in higher quantities being produced with the same resources. *Households* (consumers) might be affected by the welfare distribution effect of the project: should the road promote business development, property prices along it might rise. The *government* could be affected in the form of revenue foregone, for example, if it exempted the construction industry from import duties on construction materials. Finally, the *environment* could be adversely affected because of air and noise pollution caused by traffic on the new road.

Box 2: Determining the social costs and benefits of a project

Electrification

In a hydroelectric power project, the direct or desired outcomes could be the number of houses connected to electricity. Its indirect or unintended outcomes could include the following:

- The project could become a catalyst for other activities in the project area, possibly because access to electricity enables people to open businesses, which in turn create job opportunities.
- Schools might offer evening classes to working adults and thus improve adult literacy rates in the area.
- Unanticipated safety concerns at the newly constructed dam might mean that additional community members have to be relocated to safer areas.

Funding for black economic empowerment

In a project that funds rural entrepreneurs to set up a manufacturing firm that uses local resources, the direct effect could be that the firm has been established and provides employment opportunities to local black entrepreneurs. In addition to these desired outcomes, reflected in the project document, the project may well be credited with outcomes such as the following:

- Its demonstration effect, which promotes corporate best practices, efficient technology and better management in existing firms; this could improve the efficiency of local firms.
- The firm could create a market for existing firms by forging backward linkages with input suppliers; these may result in improved economies of scale among suppliers.

Figure 2 illustrates direct and indirect effects. Indirect effects can be seen as the costs incurred by and the benefit accruing to society, over and above the direct private costs and benefits of the project. The middle circle represents the desired outcomes of the project, as measured under the effectiveness criterion, for instance through the financial rate of return. The outer circles represent the socioeconomic effects of a project, which are measured through the economic rate of return. The indirect effect of a project can be seen as the difference between the financial and the economic rate of return. In other words, it is the sum total of the indirect effects on producers, households, the government and the environment.

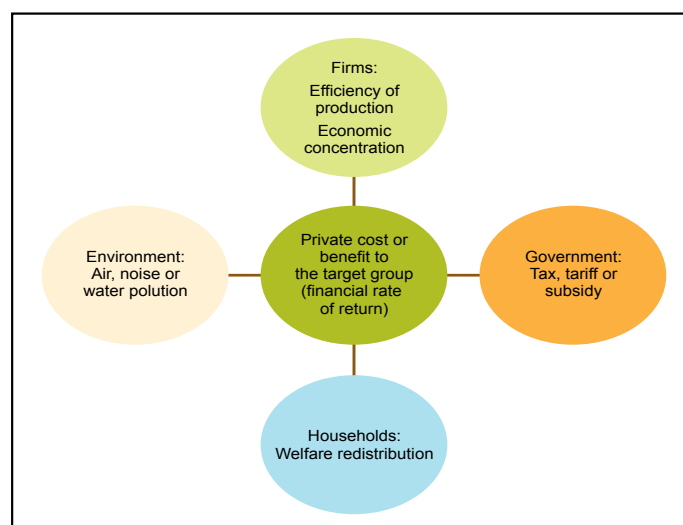


Figure 2: Framework for assessing indirect effects

To measure the effectiveness and impact of a project, baseline data is required. In practice, however, many projects have limited baseline data or the data has insufficient coverage. This may require statistical techniques such as statistical matching to reconstruct comparison groups, known as *counterfactuals*. The counterfactual refers to what would have happened to project beneficiaries in the absence of the project. Statistical matching techniques for constructing counterfactuals include propensity score matching, design of post-test cross-sectional project and comparison groups, and cluster analysis, as outlined in Table 1. Non-quantitative methods may also be used; these include judgement matching, pipeline designs and intensity score analysis (Bamberger, 2009).

Table 1: Statistical methods for constructing comparison groups

Statistical method	Objective	Type of experiment	Method	Sources of data
Propensity score matching	Create comparison groups	Quasi-experimental design	Logistic regression	Survey data: Census Community surveys
Post-test cross-sectional project and comparison group design	Match project and comparison groups		Regression analysis	
Cluster analysis	Create comparison groups		Cluster analysis	General household survey, etc.

Thus far, impact has been seen as the direct and indirect consequences of a project. The next step is to establish the relationship between *impact* and *effectiveness*. The *effectiveness* criterion, according to the definition above and depending on how the objectives of a project are stated, captures the direct effects of a project, while *impact* is defined as the direct and indirect effects. Thus, impact encompasses effectiveness.

Is it more accurate to assess the individual dimensions of development effectiveness separately, to use the framework of the economic rate of return or to use some combination of the two? Assessing the criteria individually does not provide a “snapshot” of the overall development effectiveness of a project. A project may perform well on one dimension but not on the other, for example. This paper proposes to combine these criteria into a single measure, called the development effectiveness index. To avoid double counting, it views impact only as the indirect effects of a project, while the direct effects are measured through the effectiveness criterion.

3. Issues of measurement

This section outlines various options for quantifying the four dimensions of development effectiveness, introduces a methodology for calculating indices for each dimension, and combines these into a development effectiveness index.

3.1 Relevance

The first dimension to be quantified is relevance. It has two subdimensions: project type and project target. Project type assesses whether a project falls within the mandate of a development institution. Project target considers whether it is targeting the right people.

To measure project type (here designated as “*type*”), assign a value of 2 to projects that are of the right type, 1 to borderline or ambiguous projects, and 0 to projects that fall unequivocally outside the mandate [1]. Note that categories within a subdimension can be adapted in line with the specific mandate of a development institution.

$$[1] \text{ type}_i = \begin{cases} 2 & \text{if within} \\ 1 & \text{if ambiguous} \\ 0 & \text{outside} \end{cases}$$

Where subscript ‘*i*’ stands for a project

To measure project target (here designated as “*target*”), consider whether the project in question is located within priority areas. These priority areas are defined to ensure that the development institution addresses market and institutional failure. Thus, whether the project targets deserving communities depends largely on whether it addresses market and institutional failure. For example, assume a development institution funds infrastructure in

poor municipalities. Should the institution finance a water project in a less-poor municipality, it may get a rating of 2 on the scale of *type* but 0 or 1 on the scale of *target*, depending on the relative wealth of the municipality.

The variable *target* may be quantified using [2] below:

$$[2] \text{ type}_i = \begin{cases} 2 & \text{if very poor} \\ 1 & \text{if poor} \\ 0 & \text{other} \end{cases}$$

If the two subdimensions under relevance are quantified as set out above, they may be indexed as follows [3]:

$$[3] \text{ type } I_i \text{ or target } I_i = \frac{\text{actual value} - \text{minimum value}}{\text{maximum value} - \text{minimum value}}$$

Where *type i* stands for *type index* and *target i* for *target index*

Next, values from [3] are used to compute an index for relevance ("*relevance I*") as the aggregated indices of the *type* and *target* variables [4]:

$$[4] \text{ relevance } I_i = \alpha (\text{type } I_i) + (1 - \alpha)(\text{target } I_i)$$

The symbol α represents weights for each subdimension; these weights are flexible. For example, should stakeholders wish to assign a stronger weight to *target* than to *type*, the combination may be changed to 0,25 and 0,75 or to 0 and 1. The latter does not consider *type* at all: relevance depends only on *target*. Should stakeholders regard the two dimensions as equally important, the combination of 0,5 and 0,5 may be chosen. In this way, the weights can be manipulated to conduct a sensitivity analysis.

Based on the relevance index, projects may be classified into three groups (high, medium or low) or only two (high or low). The former requires a subjective decision on the upper and lower cut-off points. They could be equally spaced (i.e. 0,33 and 0,66), generously spaced (0,25 and 0,75) or conservatively spaced (0,5 and 0,75). The second option above (i.e. of two groups) minimises subjectivity as only one cut-off point is needed: 0,5.

3.2 Efficiency

Efficiency is about the optimal conversion of inputs into outputs (see section 2.2). In monetary terms, it is defined as the number of households connected to services for each R1 million spent (or the unit cost of the connection), if the level of technology remains the same. This is given by the ratio of C to B in Figure 1.

Table 2 provides examples of thresholds for measuring the efficiency of projects in electricity, water, telecommunications and roads. According to Table 2, for each R1 million spent,

278 rural or 323 urban households could be connected to electricity; 235 rural and 267 urban households to water; and 40 rural and 500 urban households to fixed telecommunication lines. In addition, it shows that R1 million is sufficient to tar 1,2 kilometres of road.

Table 2: Threshold matrix

Focus area	Indicator	Unit cost	Units per R1 million	
			Rural	Urban
Electricity	Number of houses connected	R3 100 – R3 600	278	323
Water	Number of houses connected	R3 500 – R4 500	235	267
Telecommunications	Number of fixed line or mobile phones	R2 000 – R25 000	40	500
Roads	Kilometres of road tarred	R825 000 – R850 000	1,2 km	

Source: DBSA, 2005:22.

Using the above benchmarks, a project could be rated as highly, medium or poorly efficient. Electricity is used as an example below; different categories may be used where required.

For electricity:

$$[5] \text{ type}_i = \begin{cases} 2 & \text{if } \left(\frac{C}{B}\right) \text{ is higher than } 323 \text{ for urban and } 278 \text{ for rural} \\ 1 & \text{if } \left(\frac{C}{B}\right) \text{ is closer than } 323 \text{ for urban and } 278 \text{ for rural} \\ 0 & \text{if } \left(\frac{C}{B}\right) \text{ is lower than } 323 \text{ for urban and } 278 \text{ for rural} \end{cases}$$

These benchmarks are not fixed and must be adjusted whenever the price of inputs change or new technology is developed.

A project may be rated medium when the actual cost is reasonably close to the benchmark. What constitutes reasonably close? This could either be a subjective judgement or an objective criterion based on the frequency distribution of the output-cost ratios of related projects. The three categories of efficiency (high, medium and low) may thus be formed using the mean (μ) and the standard deviation of the frequency distribution (σ).

The assumption of “no technical change” implicit in Figure 1 is important, and can be accommodated by ensuring that the frequency distribution and the project are from the same technical “generation”.

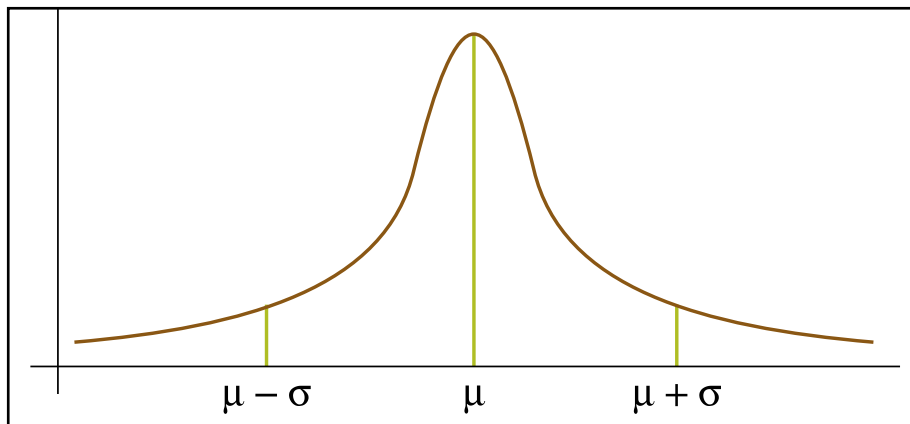


Figure 3: Frequency distribution of similar projects

Figure 3 shows the distribution of similar projects within a specified period. A project may be regarded as highly efficient if its actual output-cost ratio is greater than or equal to $\mu + s$, medium if the ratio falls between $\mu - s$ and $\mu + s$, and poor if it is less than or equal to $\mu - s$. An alternative to use is to use only two categories, high and low: projects with an output-cost ratio higher than or equal to the benchmark are rated as efficient and those below as inefficient.

After the efficiency of a project is quantified as set out above, the next step is to calculate an efficiency index (*efficiency I*) using equation [3].

3.3 Effectiveness

As with the other dimensions, the effectiveness of a project may be classified as high, medium or low depending on whether the actual outcomes compare with the desired ones. The classification is subjective. A high rating could be assigned if the project met expectations in all desired outcomes, a medium one if proportionally more expected outcomes were met, and a low one if a proportionally higher number of outcomes remained unmet. After effectiveness is quantified as [6], an effectiveness index (*effectiveness I*) may be calculated using equation [3].

$$[6] \text{ effectiveness}_i = \begin{cases} 2 & \text{if high} \\ 1 & \text{if medium} \\ 0 & \text{low} \end{cases}$$

The efficiency and effectiveness indices may be combined to calculate a performance index [7]. The weighting would again be subjective.

$$[7] \text{ performance } I_i = \beta (\text{efficiency } I_i) + (1 - \beta)(\text{effectiveness } I_i)$$

A procedure similar to the one outlined in section 3.1 could equally be applied here to classify projects as high, medium, or low in terms of performance (or simply as high or low).

3.4 Indirect impact

This section reviews ways to assess the indirect benefits of a project. Indirect benefits are the effects of a project on society, excluding the direct and desired effects on the target groups, which are assessed under the effectiveness criterion.

$$[8] \text{ impact}_i = \begin{cases} 2 & \text{if net indirect benefit is positive} \\ 1 & \text{if net indirect benefit is zero} \\ 0 & \text{if net indirect benefit is negative} \end{cases}$$

Indirect socio-economic effects include a project's social costs and benefits and other considerations such as its contribution to capacity building and its sustainability (see Box 2). Capacity building and sustainability are in principle expected to feature in the financial rate of return. However, in practice, these important effects are often overlooked in the stated aims of a project and are then not measured under the effectiveness criterion. Hence, they are considered separately here.

Information on the overall indirect effects of a project may be obtained from the *ex post* economic rate of return, if available, or estimated using methods outlined in Table 1. This information may be quantified on the basis of the sign of the net indirect effect (i.e. the difference between social benefits and social costs).

If indirect effects are treated as above, a project may be rated, using [8], as high (2) if the net indirect benefit is positive, neutral (1) if it is zero, and low (0) if it is negative.

$$[8] \text{ impact}_i = \begin{cases} 2 & \text{if net indirect benefit is positive} \\ 1 & \text{if net indirect benefit is zero} \\ 0 & \text{if net indirect benefit is negative} \end{cases}$$

On the other hand, if the various indirect effects are treated individually, each can be quantified as [8] and indexed as [3].

3.5 Development effectiveness index

The development effectiveness index ("DEI") is computed based on the indices for relevance, performance (efficiency and effectiveness), and indirect effects (impact) using [9] below.

$$[9] \text{ DEI}_i = \gamma (\text{relevance } I) + \delta (\text{performance } I_i) + \vartheta (\text{impact } I)$$

Next, the development effectiveness index computed using [9] may be used to classify projects as high, medium or low in terms of effectiveness, or only as high or low (as per the end of section 3.1). In summary, Figure 4 illustrates the steps for calculating the development effectiveness index.

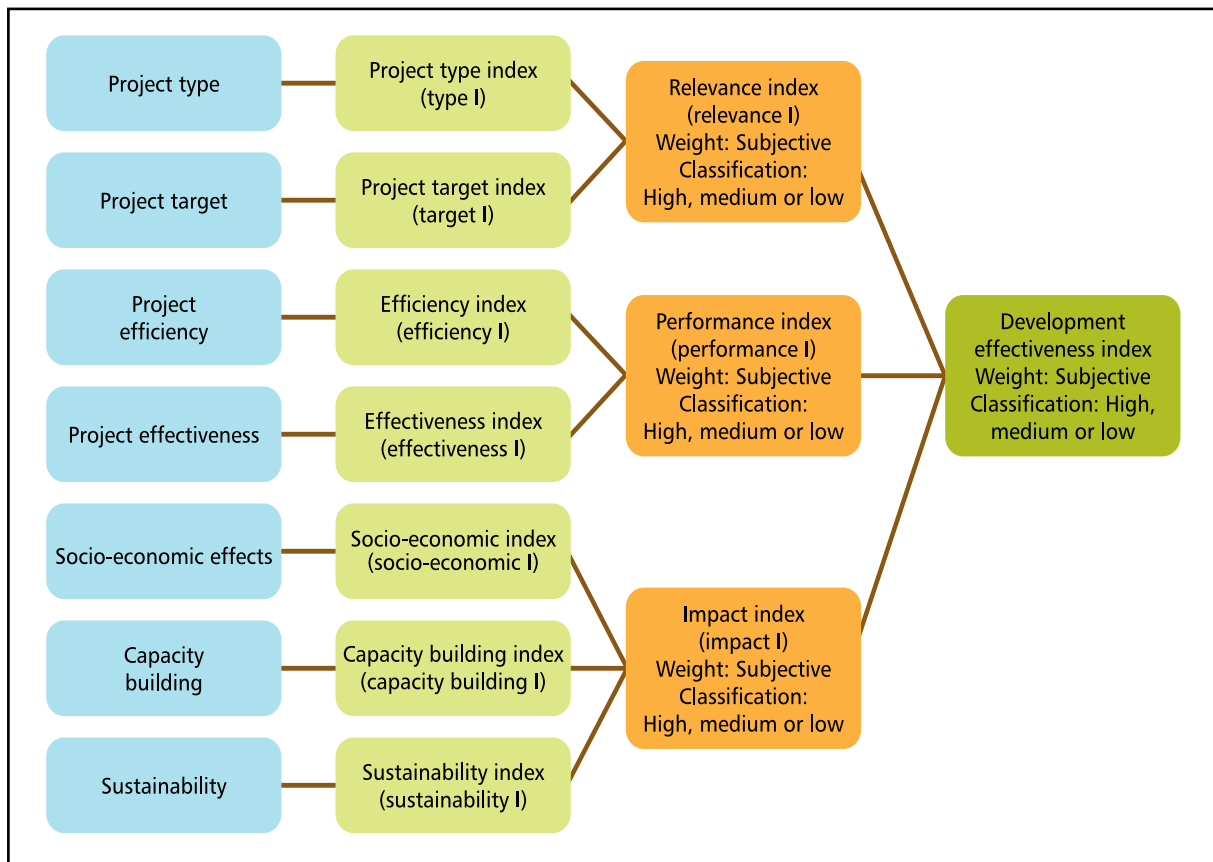


Figure 4: Framework for the development effectiveness index

4. Conclusion

This paper identified four dimensions of development effectiveness from the literature: relevance, efficiency, effectiveness and impact. It showed how relevance is aligned with the mandate of a development institution and proposes that the relevance of a project be assessed based on both its type and its target. This will avoid bias in measurement caused by an overly broad definition of the mandate. Considering a project’s target along with its type will provide a more robust assessment of relevance by ensuring that the project is within the mandate of an institution and targets deserving beneficiaries. This approach can be useful at a national level for enhancing resource coordination and avoiding mandate creep between development institutions.

Concerning the impact dimension of development effectiveness, this paper argued that it can broadly be defined as encompassing both the direct and indirect effects of a project. The direct effects are commonly measured in terms of the effectiveness criterion. To avoid double counting, it is proposed that the impact dimension be redefined to account only for the indirect socioeconomic effects of the project.

The next issue was measurement. The four dimensions of development effectiveness are qualitative in nature. To enable a quantitative assessment, categories can be created for each dimension (or subdimension) to represent different scenarios, and then quantified according to their order of importance.

This enables the calculation of a development effectiveness index, which combines the measurement of all four dimensions. Most development institutions and empirical works measure each dimension of development effectiveness individually. A generally accepted collective measurement, as proposed in this paper, would address an important gap in the literature.

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