Process Tracing as a Methodology for Evaluating Small Sample Size Interventions

Process tracing in evaluation is an approach used to assess the impacts of selected interventions based on qualitative data. It focuses on demonstrating causal inference using in-depth analysis of an intervention. In process tracing, the evaluator's main objectives are to showcase evidence of the extent to which an intervention's key targeted outcomes have materialized and to investigate the causal mechanisms responsible for the outcomes. The main difference between process tracing and other theory-based evaluations is that in process tracing, the theory of change is much more explicit and detailed, and each hypothesized causal relationship is tested using empirical evidence. In this article, the author discusses the relevance and applicability of process tracing in impact evaluations, especially when evaluating interventions with small sample sizes.

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Introduction

A number of Multilateral Development Banks (MDBs) use theory-based approaches to assess the effects of their interventions in member countries. Unfortunately, this strategy may not capture effects that can solely be attributed to those interventions, given that there is typically a myriad of factors that affect the observed outcomes. In order to claim attribution, a number of MDBs conduct impact evaluations to quantitatively estimate, using statistical techniques, the effects of their interventions. In this case, the interventions are evaluated by comparing data collected from both intervention and comparison populations, coupled with the application of statistical methods to control for observable differences between them. These so-called **counterfactual methods** may be applicable in interventions where there are quantitative indicators that can be reliably measured to demonstrate effect, i.e. where the sample size is large enough to achieve statistical significance. In some interventions, such as those that focus on governance, policy, budget support or advocacy, however, you may not have the **necessary sample size** that is needed to use statistical methods.

A qualitative causal inference method known as **process tracing**, on the other hand, may be used to assess the impact of interventions with small sample sizes. Process tracing is a qualitative research method that attempts to identify the causal processes – the causal chain and causal mechanism – between a potential cause or causes and the outcome. It is a robust technique that tests different theories of causality-in-action by examining the intervening steps. It is used to "unwrap" the causal links that connect independent variables and outcomes, by identifying the intervening causal processes. It does this by testing alternative hypotheses against the available evidence and attempting to narrow down the number of alternative explanations.

While process tracing may not be able to exclude all but one theory in a given case, it can reduce the range of possible explanations and can disprove claims that a single variable is necessary or sufficient to produce an outcome. Process tracing offers a rigorous approach to assessing causal change, and the potential for examining causality in programmes where attribution is difficult, by providing evidence on how and why an intervention led to change.

Measuring Impact of Development Interventions

Counterfactual methods are well-known in the development community for measuring the impact of interventions (Ravallion 2009). While more thorough and technical descriptions can be found elsewhere (Shadish, Cook et al. 2002; Duflo, Glennerster et al. 2008), the basics are as follows: We want to know the extent to which a particular intervention has affected a particular outcome, e.g. household income. If it were possible to know what the status of this outcome would have been in the absence of the intervention, we could compare it (known as the counterfactual outcome) with the observed outcome. The difference between the two would be the intervention's effect.

We can, of course, never really know for certain what would have happened to a particular individual, household, community, etc... had we never intervened. However, the situation is different if the number of units we are targeting is large. Specifically, if we were to randomly assign a significant number of units ▶▶

▶ to both intervention and control groups, the statistical distribution of their characteristics – particularly those that affect outcome – will be very much the same. As such, we can use the observed outcome of the control group to estimate the counterfactual outcome of the intervention group. In the language of the impact evaluation literature, both groups have the same potential outcomes (Morgan and Winship 2007).

However other impact assessment designs that do not randomize intervention exposure, such as process tracing, have also emerged and are being applied in evaluation of development interventions to generate useful evaluative information for policy makers.

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As discussed above, while counterfactual analysis may be a popular evaluation method for large *n* interventions, it may not be possible or appropriate for MDBs to apply it in all their evaluations. Even if we can overcome the ethical and political hurdles associated with randomization, such designs are expensive and often very challenging to successfully implement. However, over the last several decades, significant developments have taken place in drawing causal inferences from non-experimental or observational data (Imbens and Wooldridge 2009).

It is clear that the RCT design is inappropriate when the number of units being targeted is small, e.g. policy, budget support or advocacy interventions in country X. Large numbers of units need to be randomly assigned to intervention and control groups, so that both groups are statistically equivalent. In fact, the more heterogeneous the population, the greater the number required. If we were only targeting a few units, randomly assigning

their exposure to a given intervention would be futile from a causal inference point of view; the two groups would, more than likely, simply be too dissimilar to be comparable.

Fortunately, the counterfactual outcomes framework is not the only approach to credible causal inference (Brady 2004; Hedström 2008). There are other approaches that are more appropriate for small n interventions, one of which is Process Tracing.

The best-case scenario is when counterfactual and mechanism-based approaches are used together, i.e. where there is both a rigorous estimation of what would have happened in the absence of the intervention, and strong evidence of what mechanisms were at work to bring about the change (Reynolds 1998). Unfortunately, as mentioned above, the former approach is not suitable for small n interventions. Such interventions, then, must rely primarily on the latter, and this is the impact assessment approach that MDBs such as the African Development Bank may pursue for their governance, budget support, policy influencing, advocacy and advisory/technical assistance interventions.

Evaluation Questions in Process Tracing

It is important that we ask "What evidence would we expect to find if change happened in the ways we predicted, and did we see it?" Process Tracing tries to understand how change happened rather than simply validating the Theory of Change. What outcomes/impacts have actually materialized? Is there evidence that we contributed? And what can we learn about the significance of our contribution? Process Tracing focuses on the following:

◼ Were the activities carried out?. What evidence is there that the activities were conducted? ▶▶

- Were the relevant outputs produced?. What evidence is there that the relevant outputs were produced?

- What evidence is there for the achievement or otherwise of the intended outcomes?

- What evidence is there for the intervention's contribution to these outcomes?

- How significant is this contribution, compared with other possible contributing factors?

The end goal is to see whether results are consistent with the program theory (theory of change) and/or to see whether alternative explanations can be ruled out.

Methodological Considerations

The Methodology of Process Tracing

Process tracing involves evidencing the specific ways in which a particular cause produced (or contributed to producing) a particular effect. An important component of process tracing is the consideration of alternative, competing explanations for the observed outcome in question, until the explanation(s) most supported by the data remains (Patton 2008a). If these alternative explanations have already been identified, "process verification" is directly undertaken. This involves considering, specifying, and documenting what kinds of evidence, if found, would either validate or exclude each of these alternative explanations.

However, in many cases, some or all of the possible and plausible explanations for the observed outcome will not have been identified in advance. Then "process induction" is undertaken first. This involves undertaking exploratory, inductive research to identify plausible alternative explanations, which are then

developed into explanations that are more thorough, i.e. into hypotheses that can be tested via "process verification," as explained above.

Process tracing is a qualitative method that seeks to evaluate impact through establishing confidence in how and why an intervention worked and for whom. A distinctive feature of process tracing is that it draws on a generative framework to provide a detailed description of a causal mechanism that led to a specific effect, and by doing so demonstrate the causal relation.

"Process tracing is a qualitative research method that attempts to identify the causal processes – the causal chain and causal mechanism – between a potential cause or causes and the outcome"

In process tracing, the purpose of the evaluation is not simply to focus on only one explanation for an observed outcome-level change. Rather, the approach is more nuanced and should accomplish three things: 1) shortlist one or more evidenced explanations for the outcome in question; 2) rule out alternative, competing explanations incompatible with the evidence; and 3) if more than one explanation is supported by the evidence, estimate the level of effect each has had on bringing about the change in question.

The evaluator seeks evidence of the extent to which the intervention's key targeted outcomes have materialized; investigates the causal mechanisms responsible, i.e. how the observed outcome change came about; and, in light of an evidenced understanding of competing explanations, draws conclusions about the significance, if any, of the intervention's ▶▶

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▶ contribution. This evaluation method uses secondary sources, key informant interviews, and community focus group discussions as sources of evidence. Furthermore, the evaluator develops a data collection matrix, which specifies the outcome, method of data collection and data sources.

Process tracing therefore works through affirming explanations that are consistent with the facts and rejecting those that are not. This is much like a detective who pursues possible suspects and clues, "constructing possible chronologies and causal paths both backward from the crime scene and forward from the last known whereabouts of the suspects" (Bennett 2008).

The Process Tracing Protocol

While not intended to be a mechanical sequence of linear steps of how the research exercise should proceed, the following eight steps form the core of the process tracing protocol.

1. Undertake a process of (re)constructing the intervention's theory of change, in order to clearly define the intervention being evaluated – what is it trying to change (outcomes), how is it working to effect these changes (strategies/streams of activities) and what assumptions is it making about how it will contribute to these changes (key assumptions).

2. Work with relevant stakeholders to identify up to three intermediate and/or final outcomes considered by stakeholders to be the most significant for the evaluation to focus on (central to the intervention's theory of change, and useful for learning/forward planning).

3. Systematically assess and document what was done under the intervention to achieve the selected targeted outcomes.

4. Identify and evidence the extent to which the selected outcomes have actually materialized, as well as any relevant unintended outcomes.

5. Undertake 'process induction' to identify salient plausible causal explanations for the evidenced outcomes.

6. Gather required data and use 'process verification' to assess the extent to which each of the explanations identified in Step 5 are supported or not supported by the available evidence. Looking at these sources in terms of the sequence and structure of events can serve as evidence that a given stimulus caused a certain response in a case.

7. Write a narrative analytical report to document the above research processes and findings.

8. Summarize aspects of the above narrative analysis by allocating project/campaign 'contribution scores' for each of the targeted and/or associated outcomes.

The advantages of using the process tracing approach are that: 1) it offers a rigorous approach to assessing causal change and 2) the potential for examining causality in programmes where attribution is difficult, by providing evidence on how and why an intervention led to change. In terms of limitations of this approach, we note that the evaluator has less control, resulting in a process which is more unpredictable and context-dependent. As a result, in spite of the evaluation team's best efforts, results might still be inconclusive if the evidence collected cannot fully support a causal sequence. To thoroughly test alternative hypotheses, the evaluator needs to have access to a range of stakeholders, data sources and to published and unpublished material. ▶▶

▶ **Application of the Process Tracing Methodology in the evaluation of the ACCRA project**

The application of the above protocol is illustrated in the evaluation of the African Climate Change and Resilience Alliance project in Ethiopia (the ACCRA project) by Oxfam GB. The main goal of this project was to promote local adaptive capacity development by advising governance changes at a system level. The following strategies were used in implementing the intervention:

▮ Policy advice by being accepted as trusted advisers and long-term partners.

▮ Systemic intermediation – seeking to strengthen and/or realign vertical and horizontal connections within the disaster risk reduction governance system.

▮ A responsive and flexible approach to capacity building.

▮ Action research and learning.

Overall, the impact evaluation focused on three key questions:

▮ What evidence is there for the intended transformation (of governance systems in Ethiopia in order for them to support climate adaptive capacity development, and also become more gender-sensitive and people-centred)?

▮ What evidence is there for a contribution to this transformation, if any, by ACCRA?

▮ How significant is this contribution, compared with other possible contributing factors?

It identified two concrete outcomes selected and agreed between ACCRA Ethiopia and the ACCRA International Programme. For purposes of illustration, we shall use one outcome (outcome 1).

Outcome 1: Adaptive capacity building and frameworks mainstreamed into Disaster Risk Reduction governance, supporting a more decentralized and participatory approach. ▶▶

▶ During a participatory workshop with Oxfam GB Ethiopia team members, the following steps were undertaken.

1. Defining the outcome the campaign was seeking to bring about (outcome 1);

2. Assessing whether there is evidence to suggest that the desired outcome actually materialized and to what degree;

3. Identifying salient causal stories that explain how the desired outcomes may have been realized;

4. Assessing the ACCRA's contribution to the achievement of the observed outcome, considering other plausible, alternative factors.

Based on coding of key informant interviews and secondary sources, the following causal stories or alternative hypotheses were identified as potential causal explanations for the realized outcome 1.

■ Causal story 1: The ACCRA interventions played a leading role in the realization of outcome 1

■ Causal story 2: The World Food Programme played a leading role in the realization of outcome 1

■ Causal story 3: Other members of the ACCRA consortium played a leading role independently of ACCRA in the realization of outcome 1

5. Causal story 4: Systemic contribution by a combination of actors played a leading role in the realization of outcome 1

Empirical evidence was collected on each of these four causal stories or hypotheses to determine their relative contributions to outcome 1. Based on the quality and strength of the evidence, the four stories were assigned contribution scores based on the key below:

Evidence based on interviews with key informants as well as secondary sources suggested that the first causal story or hypothesis offered an important explanation for how Outcome 1 materialized, and it was given a contribution score key of 5. The evidence further found that the other hypotheses contributed little to the realization of the outcome, and so they were assigned lower contribution scores.

Even though several actors including the World Food Programme and Save the Children (independently from ACCRA) played some role, their role was not sufficient for the realization of outcome 1 based on the empirical evidence collected. ACCRA appears to have played a key role in brokering a joint understanding between the Ministry of Environment, Forest and Climate Change and the Disaster Risk Management and Food Security Sector of the value of collaborating, focusing this on the value of mainstreaming Climate Resilient Green Economy and Disaster Risk Reduction together into woreda Annual Development Plans. ▶▶

Score key	Specific Contribution of intervention
5	Outcome realized in full Evidence that intervention made a crucial contribution
4	Outcome realized in part and evidence that intervention made a crucial contribution Outcome realized in full and evidence that intervention made an important contribution
3	Outcome realized in part and evidence that intervention made an important contribution
2	Outcome realized in part and evidence that intervention made some contribution Outcome realized to a small degree and evidence that intervention made an important contribution
1	Outcome realized, to any degree, but no evidence that intervention made any contribution

▶ **Validity of Findings in Process Tracing**

In process tracing, the validity of evaluation findings is ensured by triangulating evidence from a range of data generation methods and sources: document analysis, in-depth interviews, focus group discussions, sense-making meetings with implementing partners, staff and beneficiaries, and workshop meetings with stakeholders, as in the above example.

Data interpretation is also theory-informed, and draws on the experiences of the evaluators using retroductive analysis. Potential biases in analysis are managed and curtailed through the use of feedback processes that involve stakeholders, staff and beneficiaries. Finally, the validity of findings is enhanced through the evaluator holding an inception meeting with the client to develop a common understanding of the assignment and establishing and utilizing a client-evaluators reflection and feedback platform through which they share progress, methodological reflections and changes that grow out of field-based experiences.

Conclusion

Process tracing involves tracing causal mechanisms using in-depth case studies that provide within-case, mechanistic evidence of causal processes. It involves theory testing, theory building and explaining the outcome.

Theory-based impact evaluation cannot rival the rigour with which well-designed counterfactual impact evaluation addresses issues of attribution. However, done 'right', process tracing can tackle the issue of attribution and provide evidence to back up causal claims in interventions with small sample sizes. By emphasizing that the causal process leads to certain outcomes, process tracing lends itself to validating theoretical predictions and hypotheses.

However, there is the possibility that the evidence available will not be sufficient to verify or eliminate all investigated explanations. It is possible, then, for the findings of such studies to be inconclusive. Hence the importance of using various lines of evidence and involving stakeholders throughout the process. eVALU

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Author's profile

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