PROCESS TRACING

OVERVIEW

Process tracing can be defined as:

'the analysis of evidence on processes, sequences, and conjunctures of events within a case for the purposes of either developing or testing hypotheses about causal mechanisms that might causally explain the case.' (Bennet & Checkel 2015, p. 7)

Process tracing is a methodology that combines pre-existing generalisations with specific observations from within a single case to make causal inferences about that case (Mahoney 2012). It involves the examination of 'diagnostic' pieces of evidence within a case to support or overturn alternative explanatory hypotheses (Bennett 2010). Identifying sequences and causal mechanisms are central (Bennett 2010).

KEY ELEMENTS OF METHODOLOGY

Ricks and Liu (2018) set out a series of steps involved in process tracing:

1. Identify hypotheses
2. Establish timelines
3. Construct a causal graph
4. Identify alternative choices or events
5. Identify counterfactual outcomes
6. Find evidence for the primary hypothesis
7. Find evidence for rival hypotheses

Each of these is described in more detail below.

Step 1: Identify hypotheses

The evaluator draws on broader generalisations and evidence from within the case to generate a series of (preferably competing) testable hypotheses about how an intervention may connect to an outcome. A theory of change exercise that has preceded the process tracing might provide a useful starting point for the generation of hypotheses. Broader generalisations that the evaluator draws upon might simply be elementary understandings of associations that are nearly universally accepted as true or inferences derived from previous research (Mahoney 2012).

When developing hypotheses it is important to cast the net widely for alternative explanations (Bennett & Checkel 2015). Bennett and Checkel (2015) suggest that a useful criterion for ensuring this is to ask whether any major theoretical categories of social explanation have been omitted giving examples such as actor's use of power, institutional constraints, social norms and legitimacy. Similarly, they suggest considering whether both agent-based and structural explanations have been considered.

Ricks and Liu (2018) emphasise the importance of constructing competing or rival hypotheses. For each hypothesis the evaluator should specify what should be observed if the hypothesis is true or false (White and Phillips 2012). Hypotheses must therefore be very specific. The level of granularity required will often be much greater than is found in many theories of change for instance. In other words the theory of change will have to include a level of detail sufficient to generate testable hypotheses.

Step 2: Establish timelines

Evaluators should then sequence events in a timeline. The conclusion of the timeline will be at or shortly after the outcome of interest and it will go back far enough to capture the emergence of the theorised causal variable (Ricks and Liu 2018). Ricks and Liu (2018) identify several purposes for the time line. First it clarifies the researcher's thought processes. Secondly it establishes temporal precedence. Thirdly, it provides a 'face-validity' test for the hypotheses being tested. Fourthly it helps to identify major events that could have shaped the outcome of interest.

Step 3: Construct a causal graph

A causal graph visually depicts the causal process through which X causes Y and follows the timeline. It identifies the independent variable(s) of interest and provides structure to the process of enquiry by showing all the moments when the concerned actor (an individual, an organisation or a group) made a choice that could have affected the result (Ricks and Liu 2018).

Step 4: Identify alternative choices or events

At each relevant moment in the causal graph, a different choice could have been made and these alternatives should be identified and should be theoretically grounded (Ricks and Liu 2018).

Step 5: Identify counterfactual outcomes

Counterfactuals are vital to process-tracing, as Ricks and Lui (2018: 844) explain:

> *'When treating hypothetical predictions, it is imperative that another outcome was possible. If there is no plausible theory-informed alternative outcome, then no real choice or event has taken place. Thus, the link between the input and the outcome was predetermined; hence, process-tracing provides little value added.'*

Ricks and Liu (2018) emphasise that it is important that steps 1 through 5 be conducted before data collection.

Step 6: Find evidence for the primary hypothesis

There is no single type of data collection method specified for Process Tracing. Data collection should be designed to match the evidence specified in the hypotheses that are being tested. Data collection involves in-depth case study analysis and so is likely to be predominantly qualitative, including historical reports, interviews and observations, but quantitative data might also be used. Evaluators should be relentless in gathering diverse and relevant data (Bennett & Checkel 2015). It is particularly important that data is diverse and that there are independent streams of evidence. Diversity helps with triangulation of data, but ensuring that there are independent streams of data is also important because if all or most data derives from one source triangulation can be misleading and disguise selection bias (Bennett & Checkel 2015).

Through the analysis the evaluator develops an explicit chronology of events, setting out the hypothesised causal link between each stage. The evidence gathered is then used to overturn or substantiate the rival hypotheses with the aim of establishing whether the causal mechanisms at work fit with those predicted (White and Phillips 2012).

It is important to be equally tough on all of the alternative hypotheses (Bennett & Checkel 2015). This does not mean going into all explanations in equal depth. If a hypothesis can be quickly and decisively dismissed it should be and then remaining hypotheses investigated in more detail. Bennett and Checkel warn against confirmation bias. One way this can occur is if an unduly privileged status is given to one hypothesis with process tracing being performed on one hypothesis first and others only being introduced to address anomalies facing the privileged first mover (Bennett & Checkel 2015). For example, if it is hypothesised that an intervention operates by increasing self-confidence among participants and the evaluation effort focused on measuring and testing self-confidence without also considering alternative hypotheses such as the intervention increasing self-efficacy or the intervention creating a different organisational culture.

Researchers should distinguish between evidence that is unavailable and evidence that is contrary to a hypothesis:

- Where evidence is unavailable this lowers the upper limit of probability one can attach to the likely truth of the explanation.
- Where evidence is contrary to a hypothesis and the hypothesis is re-formulated or modified, the bigger the modification, the more important it is to generate and test new observable implications. This is to 'guard against 'just so' stories that explain away anomalies one at a time.' (Bennett & Checkel 2015: 19).

Where evidence is missing it is also important to make a judgement about whether 'absence of evidence' constitutes 'evidence of absence' (Bennett & Checkel 2015). Bennett and Checkel use the example of feeling for change in our pocket to make the point that sometimes, failure to find something constitutes strong evidence that it does not exist (Bennett & Checkel 2015).

Process tracing involves several different kinds of empirical tests of causation, which distinguish evidence with differing probative value. Van Evera (1997) distinguished four tests based on the degree to which a hypothesis uniquely predicts the evidence, and the degree to which it is certain in doing so (Figure 7).

Figure 7: Four tests for causation used in Process Tracing (based on Van Evera 1997 and Bennett 2010)

		Is evidence sufficient (uniquely able) to establish causation?	
		No	**Yes**
Is evidence necessary (certain) to establish causation?	**No**	**Straw in the Wind** Passing affirms the relevance of hypothesis but does not confirm it. Failing suggests the hypothesis may not be relevant, but does not eliminate it.	**Smoking gun** Passing confirms hypothesis Failing does not eliminate it.
	Yes	**Hoop** *Passing affirms relevance of hypothesis but does not confirm it.* Failing eliminates it.	**Doubly Decisive** Passing confirms hypothesis and eliminates others. Failing eliminates it.

- Hoop tests involve evidence that is certain not unique (Bennett & Checkel 2015, Van Evera 1997). Hypotheses must 'jump through the hoop' to remain under consideration and therefore hoop tests provide a necessary but not sufficient criterion for accepting an explanation (Bennett 2010, Van Evera 1997). Failing a hoop test eliminates a hypothesis but passing it doesn't greatly increase confidence in a hypothesis (Bennett & Checkel 2015). Hoop tests are therefore most useful in excluding alternative hypotheses.
- Smoking gun tests are unique, but not certain (Bennett & Checkel 2015, Van Evera 1997). Thus passing a smoking gun test strongly affirms a hypothesis, but failure to pass such a test does not eliminate it. Smoking gun tests therefore provide sufficient but not necessary criterion for confirmation.
- Doubly decisive tests use evidence that is both unique and certain (necessary and sufficient) to confirm one hypothesis and eliminate all others (Bennett & Checkel 2015, Bennett 2010, Van Evera 1997)
- Straw in the wind tests provide weak or circumstantial evidence that is neither unique nor certain (Bennett & Checkel 2015, Van Evera 1997). Straw in the wind tests are therefore neither necessary nor certain (Bennett 2010, Van Evera 1997).

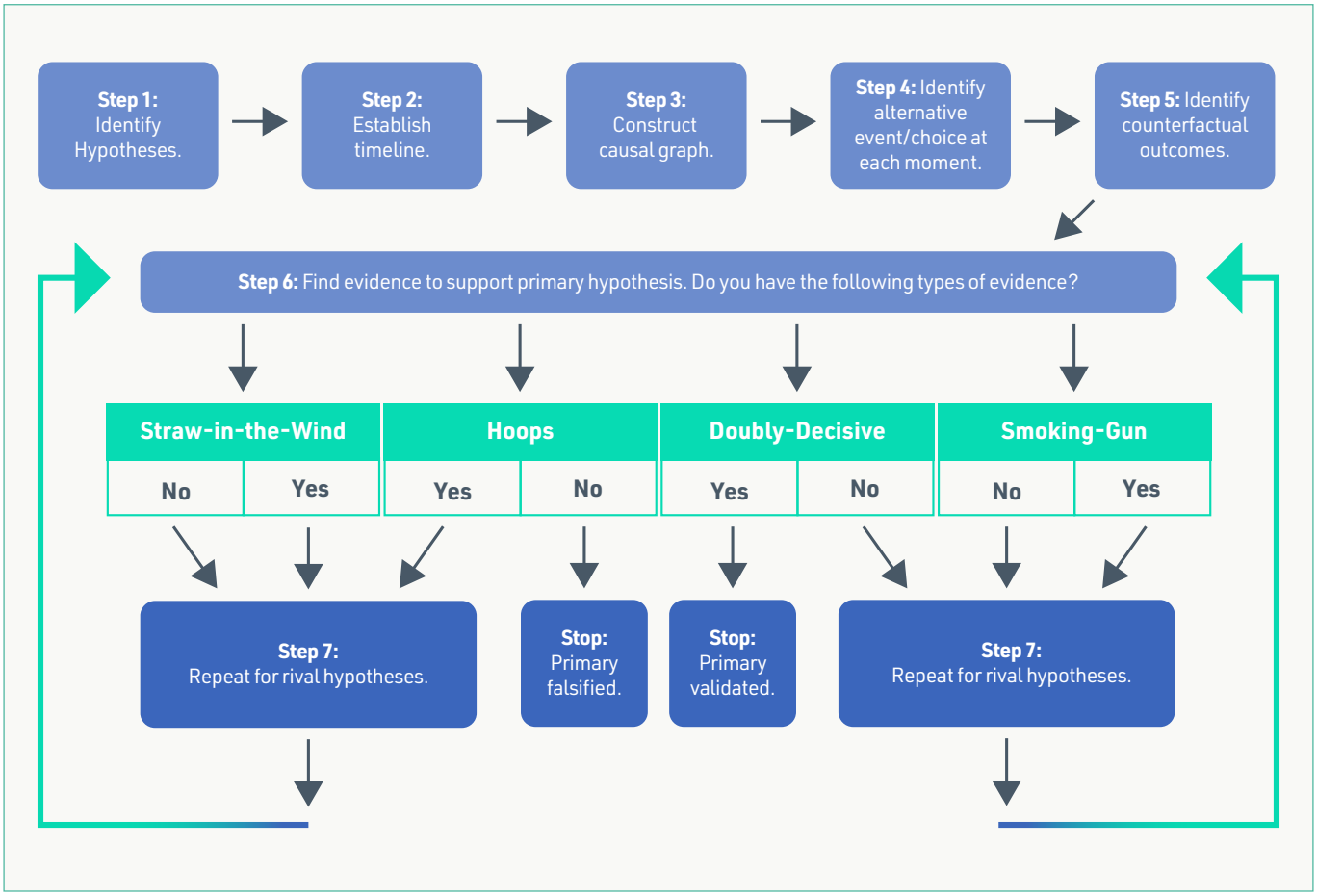
The tests associated with process tracing can help a researcher establish that: (1) a specific event or process took place, (2) a different event or process occurred after the initial event or process, and (3) the former was a cause of the latter (Mahoney 2012). Doubly decisive tests are rare and so the two main types of tests used to achieve these goals are hoop tests and smoking gun tests (Mahoney 2012). Hoop tests eliminate hypotheses and smoking gun tests confirm hypotheses. Taken together they can therefore both confirm a hypothesis and eliminate alternative ones. Where they cannot decisively do one or other of these things they become straw in the wind tests (Mahoney 2012).

Step 7: Find evidence for rival hypotheses

The final step is to repeat step 6 for each alternative explanation.

Ricks and Lui (2018) summarise the different steps in process tracing in a diagram (Figure 8).

Figure 8: Process Tracing flow chart (reproduced from Ricks and Lui 2018: Appendix, Figure 0)



Some commentators have suggested that hoop, smoking gun and straw in the wind tests can provide greater insight than is sometimes assumed:

- Hoop tests are most useful in excluding alternative hypotheses. However, Mahoney (2012) notes that where a hypothesis passes a very rigorous hoop test this does provide some positive evidence in favour of the hypothesis[1]. The difficulty relates to how frequently the condition necessary for the hypothesis to be valid is found. If it is always present or common the test is easy to pass, if it is rare the test is hard to pass (Mahoney 2012).
- Passing a smoking gun test strongly affirms a hypothesis, but failure to pass such a test does not eliminate it. However, Mahoney (2012) notes that where a hypothesis fails an easy smoking gun test this does provide some evidence supporting its elimination. An easy test is one in which the condition whose presence is sufficient to prove the validity of the hypothesis is frequently present (Mahoney 2012).
- Although no one straw in the wind test is decisive, a series of such tests that all or mostly point in the same direction can increase or decrease confidence in a hypothesis (Mahony 2012).

[4] Mahoney (2012: 576) argues that 'Just as some hoops are smaller than others, and thus more difficult to jump through, some hoop tests are more demanding and thus harder to pass. While failing a hoop test will eliminate a hypothesis regardless of whether the test is easy or hard, passing a hoop test will lend positive support for a hypothesis in proportion to the degree that it is a difficult test.'

MULTI-METHOD APPROACHES

Process tracing hypothesises causal mechanisms to arrive at causal explanations. Its mechanistic approach and assumption that explanation should combine social and institutional structure and context with individual agency and decision-making means that epistemologically and ontologically it is closely related to scientific realism (Bennett & Checkel 2015) and could be seen as a specific analytical process that fits within the broader scientific realist framework. However, process tracing could align with approaches to evaluation grounded in other epistemologies and ontologies such as pragmatism or constructivism (Bennett & Checkel 2015).

Although process tracing is a within-case methodology (i.e. it takes place within a single case) it can be combined with case comparisons where this is feasible (Bennett & Checkel 2015). For example, in a most-similar case comparison process tracing can help establish the role of the single independent variable that differs between the cases in explaining the outcome.

Befani and Mayne (2014) have noted that Contribution Analysis and Process Tracing are similar, both seeking to make causal inferences using non-counterfactual approaches, based on causal mechanisms and theories of change. They also note that a potential limitation of Contribution Analysis is that 'it is an approach, and does not spell out detailed steps to follow in data collection or discuss explicitly the types and strength of evidence used.' (Befani and Mayne 2014: 25). They therefore suggest combining the two approaches so that the evaluator follows the logic of Contribution Analysis but uses the various tests developed in Process Tracing to provide an indication of what evidence to look for and what criteria to use to judge the strength of the evidence.

Process Tracing can be combined with quantitative approaches in mixed-method designs, for example where a few cases from a statistical analysis are selected to clarify the direction of causal inference (Bennett & Checkel 2015). Another example would be where agent-based modelling is used to check the plausibility of inferences about mechanisms derived from process tracing (Bennett & Checkel 2015).

RESOURCES REQUIRED

Evaluator skills and experience

Process tracing can draw on a range of data collection and data analysis approaches. Commonly, these will include reviewing documents, interviewing key informants, undertaking observations and analysing performance management and programme monitoring data. The evaluator should therefore have a postgraduate level of research methods training in a range of commonly used qualitative and quantitative research skills.

Process tracing also requires other knowledge and experience:

- Evaluators will need to acquire a deep knowledge of the case from which evidence is drawn and for sufficient evidence to be gathered from the case to distinguish between competing and incompatible hypotheses. Whether this is historical, archival data or data collected through interviews, observations or ethnographies, the evaluator using process tracing will require the skills appropriate to the chosen methods of data collection.
- The evaluator will need knowledge of the pre-existing evidence base relevant to the case being evaluated, which in turn implies good knowledge of wider practice in the sector because this will provide context for the case.

Actors, whether historical or contemporaneous may go to great lengths to obscure their actions and motivations, so biasing available evidence (Bennett 2010). The literature on process tracing often uses the metaphor of a detective solving a case or a doctor diagnosing a medical condition. These metaphors hint at the 'soft' skills that evaluators using process tracing require if they are to successfully sift the evidence and discover 'whodunnit'. As well as the analytical skills of a Holmes, they might also need the guile and resilience of a Columbo or a Poirot such that they are confident to cast the net widely for

alternative explanations, be relentless in gathering diverse and relevant evidence and can consider potential bias in different evidentiary sources (Bennett & Checkel 2015). In some instances, this might point to the need for an external evaluator.

Resource implications

Although process tracing is a within-case method it also requires both diverse and deep evidence. Where decisive evidence is not available and straw-in-the-wind tests are being relied on process tracing can be very time consuming (Bennett & Checkel 2015). There is no prescribed amount of evidence gathering required for process tracing. However, data will be drawn from multiple sources and Bennett & Checkel (2015) suggest that data collection should continue on any given stream of evidence until it becomes repetitive i.e. a saturation point is reached.

CASE STUDY

The Modernisation of Public Action (MAP) was an endeavour to make evaluation the main instrument of reform of public policies at State level in France. Eighty evaluations were launched between 2012 and 2017 by the French government and Delahais and Lacouette-Fougère (2019) led an evaluation of the impact of the programme. Having undertaken an initial assessment of 65 of the evaluations, focusing on their quality, the authors chose eight 'best case' evaluations for in-depth analysis. The study described here focused on those eight evaluations and assessed the probability that they had an impact on the evolution of the policy that they evaluated. Delahais and Lacouette-Fougère started by constructing a theory of change to explain how the evaluations might impact on policy. They then used Process Tracing to build operational tests to support an assessment of causal inference. One of the challenges with Process Tracing is envisaging how to 'operationalise' the four types of empirical tests: 'straw-in-the-wind', 'hoop', 'smoking gun' and 'double-decisive'. Delahais and Lacouette-Fougère's approach is interesting because they developed 'real-world' indicators that would match the Process Tracing empirical tests. In all Delahais and Lacouette-Fougère constructed 10 such tests that combined to answer three sub-questions: is the contribution of the evaluation to the observed changes possible, probable, or intense? Considering intensity was a way of avoiding giving too much importance to real, but marginal, contributions. For each case study, 5 to 13 stakeholders were interviewed. The findings showed the diversity of impact pathways leading to reform (or lack thereof), including unexpected ones and stressed the importance of context and attitude of stakeholders on the impacts that could be expected. Also of interest is the way in which elements of Contribution Analysis were used alongside Process Tracing.

Reference

Delahais, T. and Lacouette-Fougère, C. (2019) 'Try again. Fail again. Fail better. Analysis of the contribution of 65 evaluations to the modernisation of public action in France', *Evaluation*, DOI: 10.1177/1356389018823237

RESOURCES

Web resources

Ricks and Lui, as an accompaniment to their 2018 article on Process Tracing, have placed a number of worked examples on-line. These follow the same steps as set out in their article and can be accessed at: https://static.cambridge.org/content/id/urn:cambridge.org:id:article:S1049096518000975/resource/name/S1049096518000975sup001.pdf

Key reading

For a detailed overview of the development of Process Tracing and its application a good starting point is:

Bennett, A & Checkel, J. (2015) 'Process tracing: from philosophical roots to best practice' in Bennett, A & Checkel, J. (Eds.) *Process Tracing: From Metaphor to Analytic Tool*, Cambridge: Cambridge University Press

For a shorter overview of Process Tracing see:

Bennett, A. (2010) 'Process Tracing and Causal Inference' in Brady, H. and Collier, D. (Eds.) *Rethinking Social Inquiry*, Rowman and Littlefield

For a practical guide to undertaking process tracing:

Ricks, J.I. & Liu, A.H., 2018. Process-tracing research designs: a practical guide. *PS: Political Science & Politics*, 51(4), pp.842-846

An important paper that has moved on thinking about the different tests used in process tracing:

Mahoney, J. (2012) 'The Logic of Process Tracing Tests in the Social Sciences', *Sociological Methods and Research*, 41(4) pp. 570 - 597

Further references

Bennett, A & Checkel, J. (2015) 'Process tracing: from philosophical roots to best practice' in Bennett, A and Checkel, J. (Eds.) *Process Tracing: From Metaphor to Analytic Tool, Cambridge:* Cambridge University Press

Bennett, A. (2010) 'Process Tracing and Causal Inference' in Brady, H. and Collier, D. (Eds.) *Rethinking Social Inquiry*, Rowman and Littlefield

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Ricks, J.I. and Liu, A.H., 2018. Process-tracing research designs: a practical guide. *PS: Political Science & Politics*, 51(4), pp.842-846

Van Evera, S. (1997) *Guide to Methods for Students of Political Science*, New York: Cornell University Press

White H and Phillips D (2012) *Addressing Attribution of Cause and Effect in Small n Impact Evaluations: Towards an Integrated Framework, Working Paper* 15, International Initiative for Impact Evaluation.