Atle Engebø

How to Measure Effect?

An Unstructured Literature Review

Report nr. 2

Trondheim, 01.12.2021

ProsjektNorge

NTNU

Optimaltid – Rett kompetanse på Rett oppgave til Rett tid

Optimaltid Project 2020-2024

Involving the right competence at the right stage of development has great influence on public investments. It will lead to better solutions, lower operational cost and more efficient execution of infrastructure projects.

Future transport systems must become more sustainable and public finances should be utilized better. This may be the result if the right competence is engaged in planning and designing projects – at the stage when their input has optimal influence on the outcome. The involved parties have different positions, external regulations and constraints makes the necessary considerations very complex. There is currently no method for doing this right.

This research shall develop such a new method and test it in different real-life infrastructure projects to document the effect. This requires new knowledge about the early engagement of contractors. The method shall be made into a tool or a guideline available to help public owners in the transport sector evaluate the right timing of engaging contractors in planning, design and execution of these projects.

The Optimaltid project is supported by The Norwegian Research Council (NFR p. nr. 309726) through the programme Transport 2025. The project is owned by the Norwegian Public Roads Administration. In addition, the consortium includes Nye Veier, Bane NOR, Bodø municipality, Veidekke and WSP. NTNU is the academic partner and is responsible for developing the method. Project Norway is dissemination partner.

Preface

This report is a part of the ongoing research project Optimaltid (Optimal time) – a project that seeks to explore and identify the optimal time of engagement for contractors in construction projects. This particular report is devoted to examining methodological possibilities on how to measure effect – from a project management (social science) perspective. The inquire stems from preceding works on the topic of project delivery methods where it was observed that further (and future) research on the topic could be strengthening by studying causes and effects. More precisely, we (our research group) wanted to identify methods for studying the effects of specific elements associated with project delivery methods - be it contractual, organisation or cultural elements. We think there is a gap between empirical research on project delivery method (often descriptive) and the theoretical (or hypothetical) assumptions that exists (some methods are better than others).

This report is based on a rather unstructured and ambitious dive into the realm of academic literature on causality. The works presented here are a mix of studies that have implemented specific methods aimed at saying something about effects and works that are theoretical and describes the methods itself.

This report seeks to provide an outlet and a starting point for researchers curious about the study of effect. However, the report should not be read as a guide but rather as a review that provides references that again should be studied more closely if found interesting.

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1. Review of Qualitative Approaches

Qualitative research is an umbrella term for an array of attitudes toward and strategies for conducting an inquiry aimed at discerning how human beings understand, experience, interpret, and produce the social world (Mason, 1996). While quantitative methods are often preferred in the pursuit of measuring effect, quantitative methods may be selected when one seeks to analyse and explain impact (Garbarino, S., & Holland, J., 2009).

1.1 Process Tracing Methods

Process tracing is a data analysis method for identifying, validating, and testing causal mechanisms within case studies in a specific, theoretically informed way.

- Process tracing is an in-depth within-case study method for tracing causal mechanisms and how they play out within an actual case.
- Process tracing can be used to build and test theories of processes that link causes and outcomes in a bounded population of causally similar cases, in combination with comparative methods, or, when used in a more pragmatic fashion, to gain a greater understanding of the causal dynamics that produced the outcome of a particular historical case.
- Process tracing enables only within-case inferences to be made, making comparative methods necessary to enable inferences to causally similar cases.
- Comparisons make generalization possible because we can then claim that as a set of other cases are causally similar to the studied one, we should expect similar mechanisms to also be operative in these cases.
- Process tracing as a method can be broken down into three core components:

    1. theorization about causal mechanisms linking causes and outcomes,
    2. the development and analysis of the observable empirical manifestations of the operation of parts of theorized mechanisms, and
    3. the complementary use of comparative methods to enable generalizations of findings from single case studies to other causally similar cases.

Process Tracing

In: Encyclopedia of Case Study Research

Edited by: Albert J. Mills, Gabrielle Durepos & Elden Wiebe

Book Title: Encyclopedia of Case Study Research

Chapter Title: "Process Tracing"

Pub. Date: 2012

Access Date: August 26, 2020

Publishing Company: SAGE Publications, Inc.

City: Thousand Oaks

Print ISBN: 9781412956703

Online ISBN: 9781412957397

DOI: https://dx.doi.org/10.4135/9781412957397

Print pages: 735-736

Process- tracing in social science is commonly defined by its ambition to trace causal mechanisms. A causal mechanism can be defined as "a complex system, which produces an outcome by the interaction of a number of parts" (Glennan, 1996). Process- tracing involves "attempts to identify the intervening causal process— the causal chain and causal mechanism— between an independent variable (or variables) and the outcome of the dependent variable" (George and Bennett 2005). Investigating causal mechanisms enables us to go a step further when studying causal relationships, allowing us to "peer into the box of causality to locate the intermediate factors lying between some structural cause and its purported effect. A lot of the murkiness about what process- tracing is and how it should be used in practice can be cleared up by differentiating process-tracing into three variants within social science:

1. Theory – testing
2. Theory – building
3. Explaining – outcome

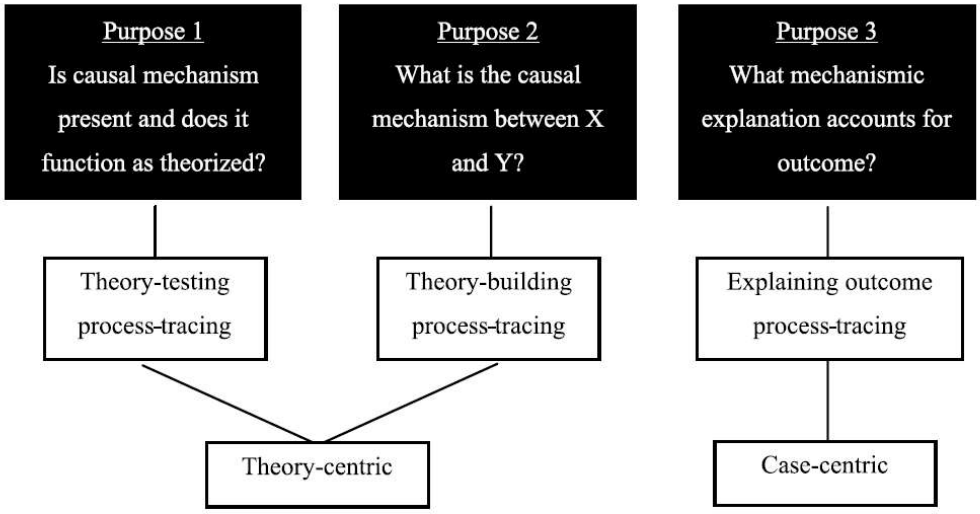

Fig. 2.1. Three different uses of process-tracing methods

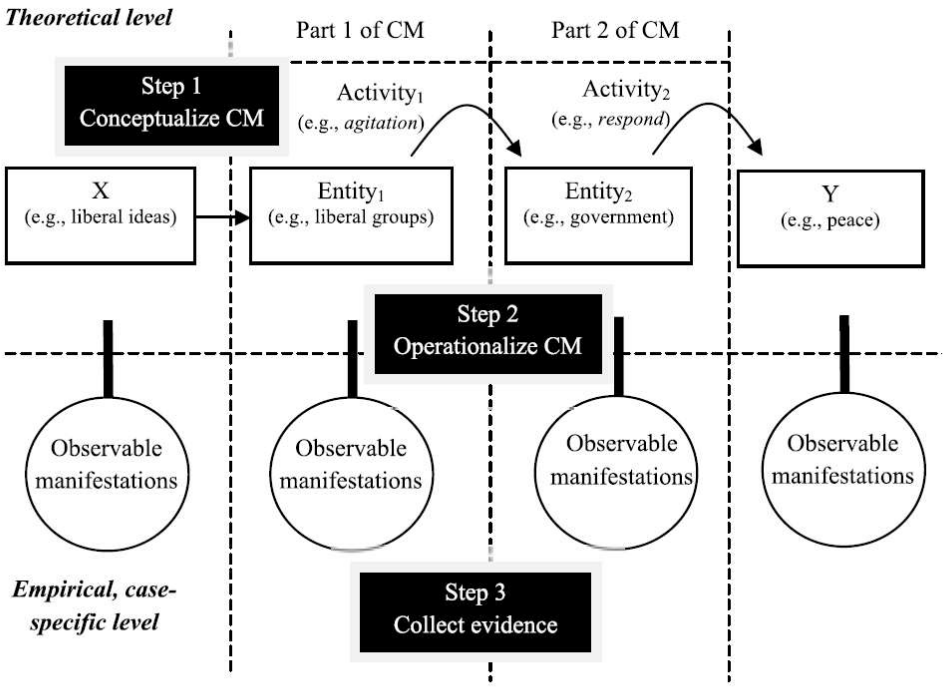

Fig. 2.2. Theory-testing process-tracing

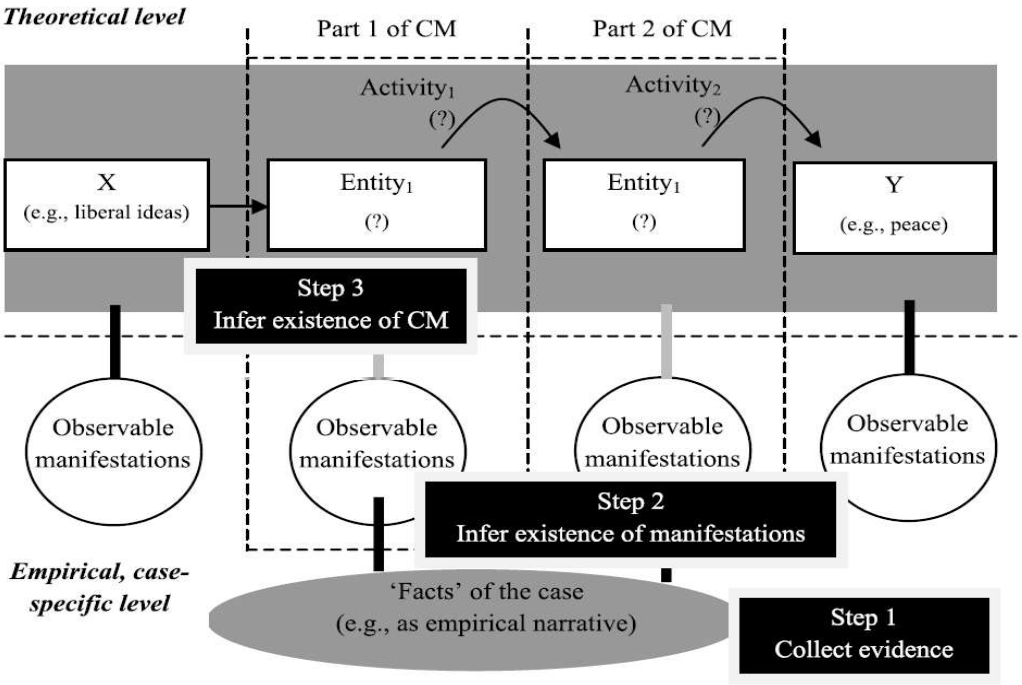

Fig. 2.3. Theory-building process-tracing. (Bold lines = direct inferences; shaded lines = indirect (secondary) inferences; shaded area = what is being traced.)

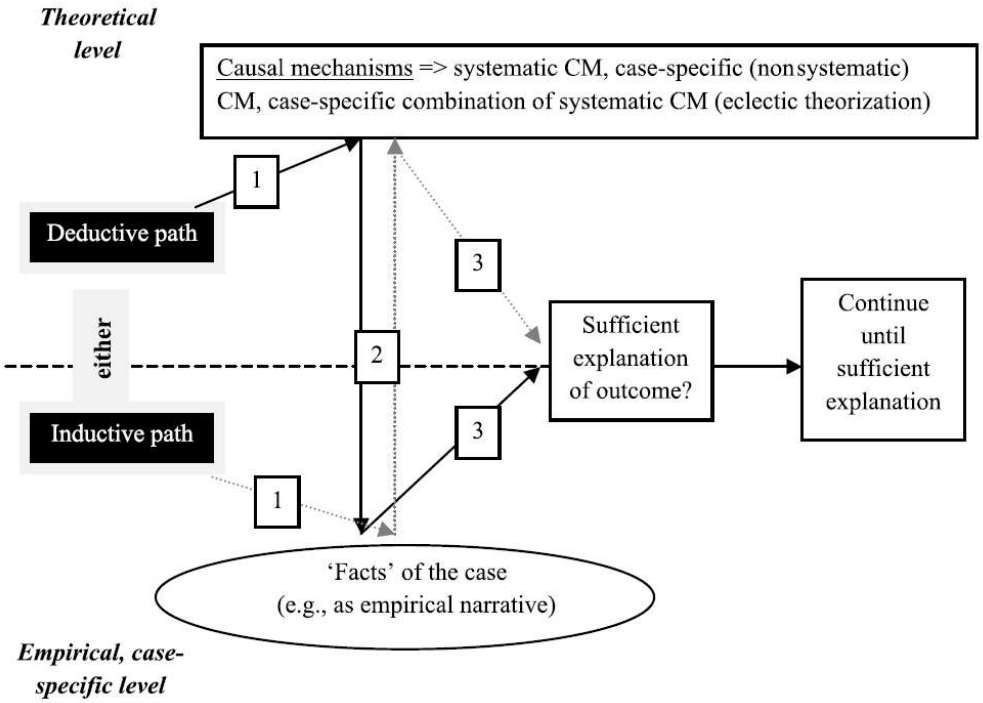

Fig. 2.4. Explaining-outcome process-tracing

1.2 Outcome Mapping

Outcome mapping (OM) is a methodology for planning and assessing projects that aim to bring about 'real' and tangible change. It has been developed with international development in mind, and can also be applied to projects (or programme) relating to research communication, policy influence and research uptake. Initially, it can seem like a complicated process, made up of numerous different elements, but once you have got to grips with it, it can be a really valuable way of planning, monitoring and evaluating a project, while also engaging stakeholders.

Figure 1. The three stages and twelve steps of outcome mapping

Outcome mapping terms

- Boundary partners: Individuals, groups or organizations with which the program interacts directly and which the program hopes to influence.
- Intentional design: The planning stage, where a program reaches consensus on the macro-level changes it wants to influence and the strategies to be used.
- Outcome challenge: Description of the ideal changes the program intends to influence in the behaviour, relationships, activities and/or actions of a boundary partner.
- Progress markers: A set of graduated indicators of changed behaviours of a boundary partner that focus on the depth or quality of the change.

Figure 2. The four basic questions of the intentional design stage

Key Resources given in the article:

- Earl, Sarah, Fred Carden and Terry Smutylo (2001). ***Outcome Mapping; Building Learning and Reflection into Development Programs***, International Development Research Centre (IDRC)
- Arnaldo Pellini (2011). ***The RAPID Outcome Mapping Approach and Project Management for Policy Change***, ODI
- John Young and Enrique Mendizabal (2009). ***Helping researchers become policy entrepreneurs***, ODI

Outcome mapping

Online article from Research to Action

Found at:

https://www.researchtoaction.org/2012/01/outcome-mapping-a-basic-introduction/

Figures from Outcome mapping: A method for tracking behavioural changes in development programs by Terry Smutylo

https://www.outcomemapping.ca/download/csette_en_ILAC_Brief07_mapping.pdf

1.3 Researching Organizational Concepts Processually

Process research implies considering phenomena as in motion, as unfolding over time, as becoming. Process researchers seek to understand and explain the world in terms of interlinked events, activity, temporality and flow (Langley et al., 2013) rather than in terms of variance and relationships among dependent and independent variables.

The article presents four different conceptions of process thinking: process as evolution, process as narrative, process as activity and process as 'withness':

Table 19.1 Four conceptions of process thinking applied to organizational identity

	Process as EVOLUTION	*Process as NARRATIVE*	*Process as ACTIVITY*	*Process as WITHNESS*
Focus	How an entity changes or develops over time	How people make sense within narrative accounts	How people negotiate understandings in situated interactions	How understandings are lived forward with research subjects
Research design and data	Longitudinal case studies with data from multiple sources	Texts or interviews incorporating narrative accounts	Naturally occurring observation of real-time interactions	Dialogic action research or auto-ethnography
Analysis	• Hierarchical coding into a unified temporal narrative • Temporal bracketing and visual mapping	• Theme analysis • Narrative analysis techniques (Boje, 2001; Czarniawska, 2004)	• Deep dive vignettes into interaction strips • Conversation analysis or other discursive methods	• Collective sense-making with research participants • Iterative temporally grounded analysis
Dilemmas and limitations	• Complexity of integrating data across space and time • Monological accounts that underplay divergence	• Need for consistency in narrative approach • Confined to understandings in individual texts (neglects interaction)	• Reaching beyond description • Snippets may generate decontextualized understanding (need for context)	• Processes increasingly hard to pin down because of ephemeral nature of observation • Fading potential for transferability
Illustrative studies relating to organizational identity	Corley & Gioia (2004); Dutton & Dukerich (1991); Howard-Grenville et al. (2013); Ravasi & Schultz (2006)	Brown & Humphreys (2006); Chreim (2005); Clegg et al. (2007); Humphreys & Brown (2002); Navis & Glynn (2011)	Drori et al. (2009); Fachin (2016); Fachin & Langley (2015); Karreman & Alvesson (2001); Ybema (2010)	Hatch, Schultz & Skov (2016); Other studies not on organizational identity: Kempster & Stewart (2010); Lorino et al. (2011)

From the conclusion:

As we move through the different approaches to process research, the nature of the research output changes also, as do the challenges associated with generating these outputs. As Langley (1999) commented, process data are always messy and making sense of them is never simple. Yet, there is now sufficient published work adopting the 'process as evolution' view that the challenge with this no longer seems insurmountable. Recently, the process as narrative and process as activity views have also been developing adherents and some strong and insightful exemplars have appeared in well-ranked journals, including some of those cited in this chapter. On the other hand, the closer we come to approaching a strong process ontology as put forward by process philosophers (and as represented by the process as witness view), the more difficult it seems to become to not only offer contributions that effectively capture the world in flight, but also in a way that is understandable, parsimonious and potentially transferable. The philosophers of process seem here to have reached somewhat beyond the understandings and capabilities of the pragmatic empiricists among us (speaking for ourselves). A perspective that considers process as witness places the researcher in motion along with the research sites they are studying, refocusing the research enterprise in rather fundamental ways. Herein, perhaps, lies the next frontier.

Researching Organizational Concepts Processually: The Case of Identity

In: The SAGE Handbook of Qualitative Business and

Management Research Methods: History and Traditions

By: Fernando F. Fachin & Ann Langley

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1.4 Understanding "It Depends" in Organizational Research

Organizational scholars strive to develop and test theories aimed at explaining important phenomena in the workplace or other organizational contexts. In most cases, these theories are described in terms of the relationships between a set of predictors (i.e., independent) and a criterion (i.e., dependent) variable (James, Mulaik, & Brett, 1982).

- Additive models assume that various predictors independently explain variance in a particular criterion of interest.
- Nonadditive models, commonly conceptualized using the interaction between two or more variables, consider a more complex interplay among predictor variables and capture the joint effects of multiple predictors on a criterion.

Traditionally, researchers have used the term interaction to refer to the combined influence of manipulated independent variables in experimental designs, whereas the term moderation has been used to refer to the combined influence of continuous predictors in nonexperimental settings (Pedhazur & Schmelkin, 1991).

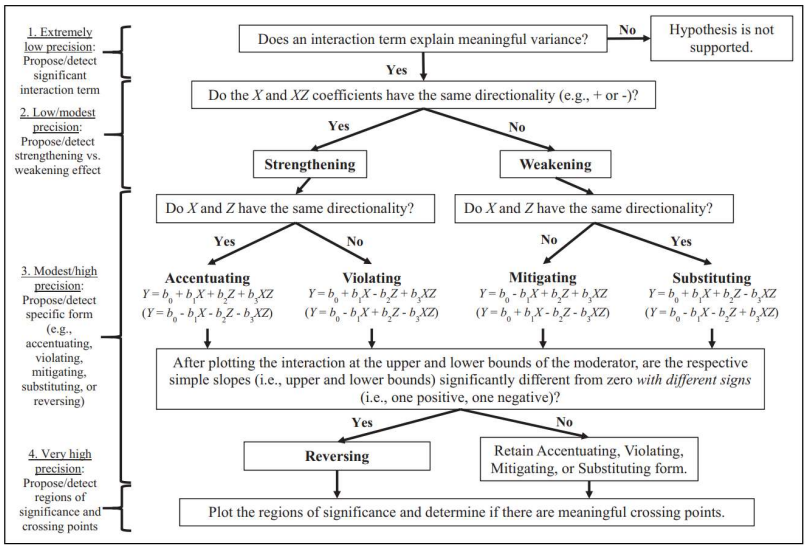


Figure 1. Decision tree for hypothesizing and interpreting interactions with greater precision.

Understanding the interplay among variables is critical to hypothesizing and interpreting interactions in organizational research. We presented a taxonomy that describes the different theoretical meanings of interaction effects, which can aid researchers in hypothesizing and interpreting interactions with greater precision.

Understanding "It Depends" in Organizational Research: A Theory-Based Taxonomy, Review, and Future Research Agenda Concerning Interactive and Quadratic Relationships
Richard G. Gardner, T. Brad Harris, Ning Li, ...
First Published May 22, 2017 Research Article
https://doi.org/10.1177/1094428117708856

Specifically, we recommended that scholars can hypothesize and interpret interaction relationships with greater precision by (a) using the taxonomy as a guide to predict what form the interaction will take, anticipate and identify meaningful values where the interaction will be operative (i.e., regions of significance) and if there will be any meaningful crossing points; (b) ensuring that there is sufficient power to detect an interaction, including consideration of the reliability of the interaction term(s); (c) comparing the results against the hypothesized form and features (e.g., crossing point, regions of significance); and (d) examining the results in greater detail to inform future research.

1.6 What is a Clinic? Relationships and the Practice of Organizational Ethnography

From the article:

This article examines the practices of ethnographers carrying out research in and, especially, on organizations.

Because ethnographers work through relationships, they must necessarily cede some control; the organization and its activities shape what aspects of the organization the researcher can and will study. For this reason, the lives of ethnographic research projects, like the lives of individuals and organizations, are likely to unfold in the manner described by Dorothy Smith (1987) and Mary Catherine Bateson (1989)—not carefully planned and executed but rather "composed" from the elements at hand, some purposefully created or gathered, to be sure, but others gleaned from the offerings of the local environment. This gap between plan and execution has been noted by others. Zussman, for instance, observed that grounded theory (Glaser and Strauss 1967) and the extended case method (Burawoy 1998), common touchstones for ethnographers, are "honored more in citations than in practice" (2004:356).

Once they have secured the raw materials for their analyses, ethnographers must indeed do the sifting, sorting, juxtaposing, abstracting, and reordering— what Dauber (1995) describes as "bureaucratizing the ethnographer's magic." It is this that allows ethnographers to learn things that people in the organization truly do not know about themselves and their organization and may even be chagrined to learn. And ethnographic accounts would be pale and wan without the ethnographic details gleaned from rubbing shoulders in the field. But fundamentally, the whole enterprise depends on constructing, exploiting, and maintaining relationships.

What Is a Clinic? Relationships and the Practice of Organizational Ethnography

Carol A. Heimer
First Published April 14, 2016 Research Article
Sociological Methods & Research
2019, Vol. 48(4) 763-800
DOI: 10.1177/0049124117746426

Table 1. Epistemological Implications of Ethnographic Tasks and Practices.

Practices/Tasks	Pressures and Blind Spots
Submitting project for ethics review (IRB)	— Ethics review requires researcher to specify who/what is being studied — Assumes bounded organization — Assumes continuity of research subject over time
Gaining access to organization and participants	— Access to "organization" is not access to individuals — Top-down approaches may close off access to or affect rapport with low-level participants — Side-in access may seem disrespectful or insubordinate to bosses
Observing/shadowing	— Organization or informants may select/exclude activities/areas for observation — Activities vary in how easily they can be observed; more collective activities tend to more observable; work with things and people more observable than work with data
Interviewing, formal and informal	— Informants can only talk about what they are aware of — Informants may give distorted accounts of events—unrepresentative, cherry-picked, defensive, or boastful
Participating in organizational life	— Organization or informants may invite ethnographers to participate in the organization's work, or "give back" in monetary or nonmonetary ways — Explicit requests for help may help identify subtle shifts of loyalty
Gathering/inspecting documents	— Documents vary in whether and how they can be accessed — Documents cannot be taken at face value; they often give official portraits of organization or policies — Documents are generally "touched" by multiple people as they are created, used, and interpreted. No single person's perspective will give full picture

Note: IRB = institutional review board.

Because "it's turtles [relationships] all the way down" (Geertz 1973:28-29), organizational ethnographers need to be clear eyed about the subtle and not-so-subtle pressures that shape their access to organizations and the relationships they are able to form.

1.7 The Architecture of Ethnographic Knowledge: Narrowing Down Data and Contexts in Search of Sociological Cases

From the article:

Building ethnographic knowledge is a tacit epistemic process involving two steps: narrowing down the framework through which ethnographers hold constant empirical units as social relationships of the same kind, and paring down the boundaries of time and space to contextualize the data as levels of analysis.

The architecture of ethnographic knowledge is built upon the back and forth configuration between narrowing down interpretations of empirical data as particular kinds of social relationships and narrowing down interpretations of formal and informal dimensions of time and space to contextualize the data. This hermeneutic and phenomenological process allows for continued access to sociological traditions of seeing, understanding, and evaluating units and levels of analysis.

All researchers encounter empirical noise as they go along. Any social setting provides multiple empirical angles and topics for advancing sociological research. As research projects develop, authors often face the issue of too much data—and too many options for analysis and themes—rather than not enough information (Vaughan 2004). Ethnographers must, at some point, demarcate the boundaries of their cases from the vast interpretive chain of historical and social circumstances (Geertz 1973). The social, temporal, and spatial connections can always extend beyond directly observed meanings and practices of a given interaction order (Baiocchi, Graizbord, and Rodríguez-Muñiz 2013; Duneier 1999; Latour 2005; Marcus 1995). Scholars must delineate when and under what conditions the circumstances under study began their process of formation and transformation (Hirschman and Reed 2014).

Mundane epistemic competencies direct researchers in how far to go in the hunt to define, clarify, and detail empirical social interdependencies that are understood as informing individual and collective lines of action. This process of narrowing down units and levels of analysis directs researchers toward distinct types of sociological questions, empirical leads, and theoretical claims. These tacit epistemic competencies, carried out consistently over time, instruct ethnographers of the same traditions to identify mutually agreeable terms of reliability for assessing the data and contexts in search of mutually agreeable terms of validity for assessing the analytic structure of sociological cases.

The Architecture of Ethnographic Knowledge: Narrowing Down Data and Contexts in Search of Sociological Cases

Andrew Deener

Sociological Perspectives

2018, Vol. 61(2) 295–313

DOI: 10.1177/0731121418755121

journals.sagepub.com/home/spx

1.8 The Analytic Lenses of Ethnography

From the article:

Our focus on analytic lenses is a departure from the customary classificatory scheme of ethnography's epistemological traditions. Tavory and Timmermans (2009, 2014) have surveyed the vast literature on how to select and analyze an ethnographic case and conclude that two alternative approaches hold tremendous sway: grounded theory and the extended case method. Grounded theory is a quintessentially inductive approach in which analytic categories and formal propositions "emerge" from deep engagement with observational data (Glaser and Strauss 1967). Conversely, the extended case method is for the most part deductive—instead of "discovering grounded theory," the researcher begins with a set of theoretically informed expectations and enters the field seeking to test whether they can explain what we observe (Burawoy 1998).

It is curious that the "inductive versus deductive" narrative persists as the master frame for delineating the possibilities of approaching and carrying out ethnographic research and analysis. After all, many ethnographers do not locate their own work within this rigid typology, and even those who rhetorically position their analysis as inductive or deductive routinely tack recursively between data and theory in practice (Tavory and Timmermans [2014] refer to this theory data dialogue as "abductive analysis," which they see as a third way).

The first set of analytic lenses we identify are tied to the ***levels of explanation*** *ethnographers explore—micro, organizational, and macro.*

- *The microsociology lens is grounded in the analytic presumption that face-to-face interaction is far more than a context where actors reproduce stable features of society by invoking readymade symbols and conforming to preestablished recipes of action. (...) This is the essence of the microsociological approach: Units of observation are movements, manners, actions, and speech acts within clearly delineated interactions; this observational focus is premised on the analytical stance that everyday situated action has an internal logic and can give rise to—not just reproduce— "structure," "culture," and other ostensibly macro forces.*
- *By contrast, adherents to the organizations approach prioritize meso-level phenomena and are attuned to how the formal, structured, and (often) hierarchical groups that actors are*

The Analytic Lenses of Ethnography

Colin Jerolmack and Shamus Khan

Jerolmack, Colin, and Shamus Khan. "The analytic lenses of ethnography." Socius 3 (2017): 2378023117735256.

routinely embedded in (e.g., the workplace) mediate the meaning and content of situated social action. (…) Instead of focusing on individual interactions, her observations are on the character of institutional life—in particular, how a set of cultural beliefs shapes individual actions.

- *Finally, the macrosociological approach draws the analyst's attention to how structural forces and institutions impinge on particular settings and groups. The level of analysis can vary tremendously but is ultimately "structural" in one way or another because this approach presumes that the patterns of social (inter)action observed in situ are for the most part shaped by factors that are exogenous to the situation—for example, symbolic, political, and economic forces.*

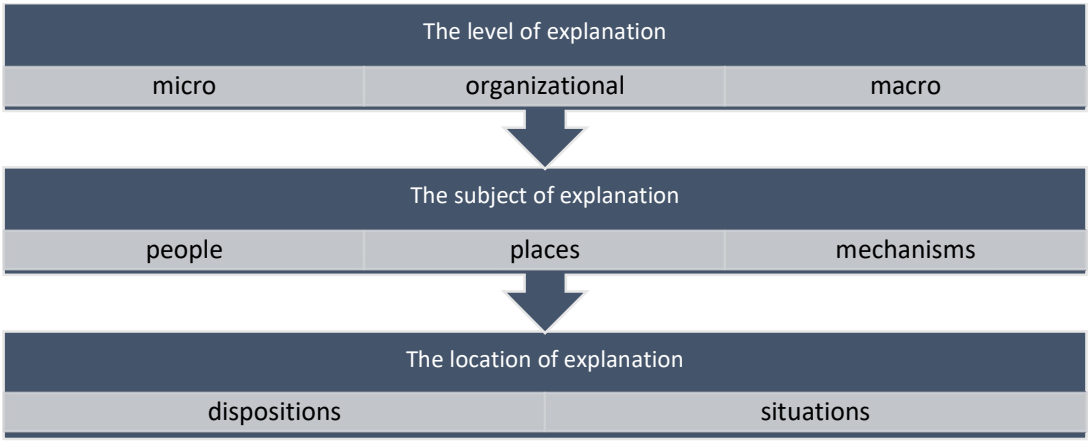
Subjects of Explanation: Character-driven Versus Process-driven Ethnography. Researchers frequently make a choice between emphasizing the biographies and character of the people and places they study or in foregrounding more abstract social processes.

- *"Characterdriven" ethnographies provide a complex portrait of participants and allow them to tell their own story. At the crux of this approach to ethnography is a subtle but important claim: "Giving voice" is not simply an act of compassion or a narrative device; it is in service of the idea that the idiosyncrasies of people's biographies shape their life course in ways that are irreducible to their social circumstances.*
- *Process-Driven Ethnography: Mechanisms. Those ethnographers who are interested in processes and mechanisms have a different relationship to showing the lives of their participants. Though some mechanism-driven ethnographies give some attention to developing people and places, in the end they are for the most part still "stand ins" that help illustrate the workings of generic social processes.*

Locations of Explanations: Dispositions and Situations. In explaining situated action, ethnographers can choose to focus on what actors bring with them to the situation or on the situational determinants of behavior. This means locating their explanations within bodies or within situations.

- *The dispositional approach—which in recent years has increasingly been called embodiment—focuses on how durable and often unconscious habits of thought and action structure situated interaction. In short, the embodied approach prioritizes how structural conditions—say, class background—are manifest in dispositional differences. This means observing the embodied tendencies of actors and grouping and comparing them across their structural variation.*
- *Situations. By contrast, those who take a situational approach are less interested in the embodied dispositions of actors and more interested in locating their explanations within local social contexts—that is, how the immediate situation influences what people do.*

Summary:

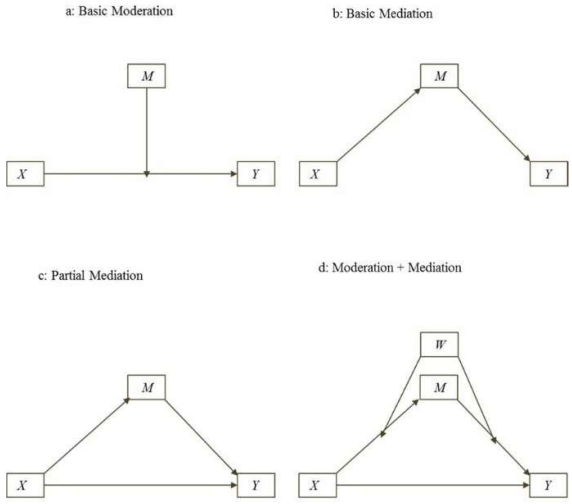

The level of explanation
micro
organizational
macro
The subject of explanation
people
places
mechanisms
The location of explanation
dispositions
situations

2. Review of Quantitative Approaches

There are two main types of quantitative research designs: experimental and nonexperimental. Experimental research design utilizes the principle of manipulating the independent variables and examines its cause-and-effect relationship on the dependent variables by controlling the effects of other variables. On the contrary, nonexperimental designs are research designs that examine social phenomena without directly manipulating the conditions that the subjects experience. There is also no random assignment of subjects to different groups. Evidence that supports the cause-and-effect relationships is mainly limited (Frey, B., 2018).

2.2 Structural Equation Modelling

Structural equation modeling is a multivariate statistical analysis technique that is used to analyze structural relationships. This technique is the combination of factor analysis and multiple regression analysis, and it is used to analyze the structural relationship between measured variables and latent constructs. This method is preferred by the researcher because it estimates the multiple and interrelated dependence in a single analysis. In this analysis, two types of variables are used endogenous variables and exogenous variables. Endogenous variables are equivalent to dependent variables and are equal to the independent variable.



From the article:

Structural equation modeling is an advanced statistical technique that has many layers and many complex concepts. Researchers who use structural equation modeling have a good understanding of basic statistics, regression analyses, and factor analyses. Building a structural equation model requires rigorous logic as well as a deep knowledge of the field's theory and prior

A Tale of Two Methods

Lawrence R. James

Stanley A. Mulaik

Georgia Institute of Technology

Jeanne M. Brett

Northwestern University

Organizational Research Methods Volume 9 Number 2 April 2006 233-244

10.1177/1094428105285144

http://orm.sagepub.com hosted at http://online.sagepub.com

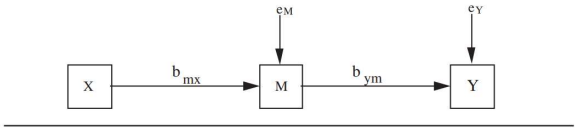
empirical evidence. This article provides a very general overview of structural equation modeling without digging into the intricacies involved.

And article:
Structural equation modeling can be defined as a class of methodologies that seeks to represent hypotheses about the means, variances, and covariances of observed data in terms of a smaller number of 'structural' parameters defined by a hypothesized underlying conceptual or theoretical model.

From "A Tale of Two Methods":

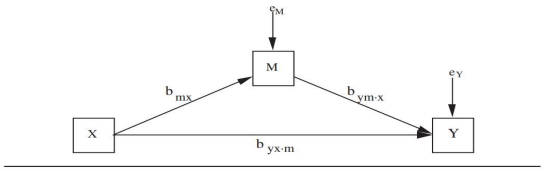
The primary problem with tests for mediation evolves from the fact that different statistical strategies are available. Mediation is a hypothesized causal chain in which one variable affects a second variable that, in turn, affects a third variable.

Figure 1
Complete Mediation Model



This is the most basic and parsimonious mediation model and is shown in Figure 1, where X is the antecedent, M is the mediator, and Y is the consequence. In the complete mediation model, all the effects of antecedent X on the consequence Y are transferred through the mediator M.

Figure 2
Partial Mediation Model



The partial mediation model differs from the complete mediation model by the addition of a direct effect from X to Y. This addition connotes that part of the causal effect of X on Y is direct, whereas a separate part of the X to Y causal effect passes through the mediator M. Example of use:

- Early and Mosakowski (2000)[1] tested the hypothesis that the relationship between team heterogeneity (X) and team performance (Y) would be mediated by team identity (M1), team efficacy (M2), and intrateam communication (M3).

[1] *Early, P. C., & Mosakowski, E. (2000). Creating hybrid team cultures: An empirical test of transnational team functioning. Academy of Management Journal, 43, 26-49.*

2.3 Boundary Conditions: What They are, How to Explore Them, Why We Need Them, and When to Consider Them

From the article:

Theories provide answers to the ''what,'' ''how,'' and ''why'' questions (Dubin, 1978; Whetten, 1989). What refers to the variables that are involved in a causal model, how denotes the effects that relate these variables to another, and why identifies the causal mechanisms that explain the connection between these variables. Boundary conditions relate, most importantly, to boundaries in time, space, and the researcher's values (Bacharach, 1989) and describe the limits of generalizability of a theory (Whetten, 1989).

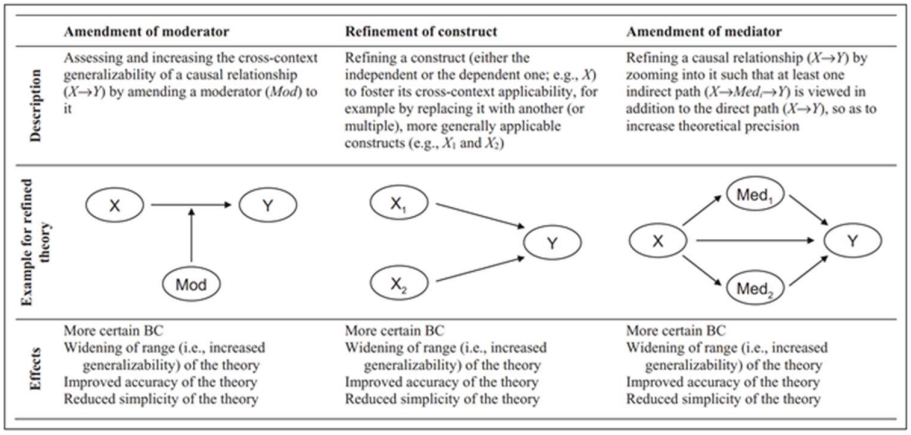


Figure 3. Theoretical tools for establishing boundary conditions (BC).
Note: A simple X→Y relationship was chosen as initial theory, for the sake of simplicity.

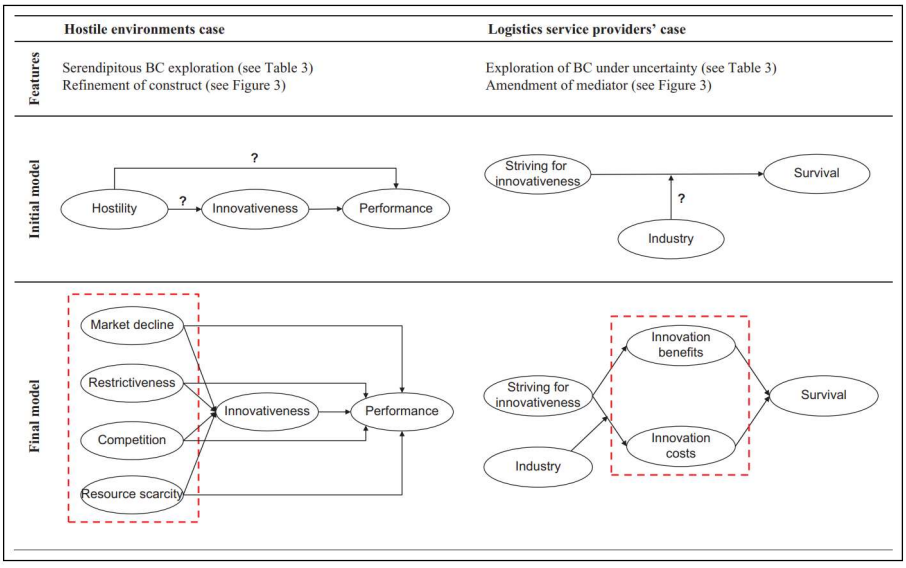


Figure 4. Boundary conditions (BC) exploration in illustrative case examples.
Note: Question marks denote the focus of the research questions in the initial models. Dashed lines indicate BC-related model refinements in the final models. All models are simplified to emphasize issues related to BC.

Christian Busse, Andrew P. Kach, Stephan M. Wagner
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Research Article
https://doi.org/10.1177/1094428116641191

With respect to the processes of exploring BC, the study suggests that the theoretical methodological ‘‘armory’’ comprises at least three tools, the amendment of moderators, the refinement of constructs, and the amendment of mediators. Each facilitates the exploration of BC and has the same effects on the respective theory (in terms of increasing accuracy, increasing generalizability, and decreasing simplicity).

2.4 How to Make a Decision: The Analytic Hierarchy Process

How to make a decision: The Analytic Hierarchy Process

Available online 13 January 2011.

https://doi.org/10.1016/0377-2217(90)90057-I

From the paper (Saaty,1990):

This paper serves as an introduction to the Analytic Hierarchy Process - A multicriteria decision making approach in which factors are arranged in a hierarchic structure. The principles and the philosophy of the theory are summarized giving general background information of the type of measurement utilized, its properties and applications.

1. ***How to structure a decision problem:*** *Perhaps the most creative task in making a decision is to choose the factors that are important for that decision. In the Analytic Hierarchy Proc- ess we arrange these factors, once selected, in a hierarchic structure descending from an overall goal to criteria, subcriteria and alternatives in successive levels.*

2. ***Scales of measurement- Avoiding mere number crunching:*** *A standard scale for a property is always out there ready to be called into use. More significantly, a relative scale is essential to represent priority or importance if one is generating the scale by making direct ob- servations and judgments about the property under study. It is also useful when one is interpreting what the data from a standard scale really signify. Relative scales are always needed to represent subjective understanding.*

3. ***Paired comparisons as ratios:*** *The Analytic Hierarchy Process (AHP) is how to derive relative scales using judgment or data from a standard scale, and how to perform the subsequent arithmetic operation on such scales avoiding useless number crunching. The judgments are given in the form of paired comparisons [6,7,8]One of the uses of a hierarchy is that it allows us to focus judgment separately on each of several properties essential for making a sound decision. The most effective way to concentrate judgement is to take a pair of elements and compare them on a single property without concern for other properties or other elements. This is why paired comparisons in combination with the hierarchical structure are so useful in deriving measurement. We also note that sometimes comparisons are made on the basis of standards established in memory through experience or training.*

Summary of principles: *The AHP generates relative ratio scales of measurement. The measurements of a set of objects on a standard scale*

can be converted to relative scale measurements through normalization. Only in a very localized way can a relative set of measurements have a unit, obtained by dividing the entire set by the smallest measurement. The normalization and composition of weights of alternative with respect to more than a single criterion measured on the same standard scale leads to nonsensical numbers, because normalizing separate sets of numbers destroys the linear relation among them. The weights must first be composed with respect to all such criteria and then normalized for AHP use. We can interpret such composition as we did in Section 8 as a special kind of weighting of the particular criteria. Thus, the AHP, with its relative measurement offers no guide on the outcome of manipulations based on combining different measurements from a standard scale such as a criterion of benefits and a criterion of costs, both measured in dollars, and used to select a best alternative.

2.5 AHP – Analytical Hierarchy Process: An Analytical Hierarchy Process Based Procurement Selection Method

From Article:

The use of the AHP technique enables the decision-maker to structure a complex problem in the form of a simple hierarchy and to evaluate a large number of qualitative and quantitative factors in a systematic manner under multiple criteria. It is a logical way for people to make decisions.

Table 3 AHP pairwise comparison matrix for procurement selection criteria (Saaty, 1980)

Intensity of importance	Definition	Explanation
1	Equal importance	Two criteria are of equal importance
3	Weak importance of one over another	Experience and judgement slightly favour one criterion over another
5	Essential and strong importance	Experience and judgement strongly favour one criterion over another
7	Very strong and demonstrated importance	A criterion is strongly more important than the other
9	Absolute importance	The evidence favouring one criterion over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between adjacent scale values	When compromise is needed
Reciprocals of above nonzero	If activity i has one of the above nonzero numbers assigned to it when compared with activity j, then j has the reciprocal value when compared with i	A reasonable assumption

Example: If Speed is very strongly more important than Certainty, then the rating assignment in the matrix should appear as:

Criteria/Criteria	Speed	Certainty	Flexibility	Quality level	Complexity	Risk avoidance	Price competition	Responsibility
Speed	1	7						
Certainty		1						
Flexibility			1					
Quality level				1				
Complexity					1			
Risk avoidance						1		
Price competition							1	
Responsibility								1

Essentially, the technique employs pairwise comparisons of selection criteria so as to enhance objectivity and downplay too much subjectivity (Saaty, 1988). Pairwise comparison forces the decision maker to compare each criterion with all the remaining ones. Table 3 presents the pairwise comparison matrix used in this study. For example, considering the second row, pairwise comparison involves comparing the criterion of speed with that of certainty, then with that of flexibility and so on across the row in a scale of importance. The scale of importance used in this study is also shown in Table 3. As an illustration, if speed is considered to be very strongly important compared with certainty in the selection of a procurement strategy for a project, a '7' is inserted in the juncture cell between speed and certainty. The shaded portion of the comparison matrix need not be completed because these cells should be the reciprocals of the corresponding cells in the non-shaded portion.

2.6 Evaluating Integrated Project Delivery Using the Project Quarterback Rating

From the paper:

This paper presents the development, validation, and implementation of an innovative comprehensive project performance metric specifically developed for architecture, engineering, and construction (AEC) projects. The project quarterback rating (PQR) combines key performance metrics of a project into a single number to provide a basis for quantifying project success. The combined performance areas include customer relations, schedule and budget compliance, quality and safety statistics, financial metrics, and communication among the different project stakeholders. The existing literature is analyzed to identify key performance metrics. A data-collection instrument is developed and then used to gather quantitative performance data from recently completed projects. Data are collected from industry professionals across the United States, and multivariate data analysis techniques are used to validate the model. PQR can compare the overall performance for different AEC projects, in addition to the performance of various project delivery systems. In this paper, PQR scores are calculated for projects completed under different delivery systems. The results clearly show differences in performance for projects delivered with design-bid-build (DBB), construction management at risk (CMR), design-build (DB), and integrated project delivery (IPD). This paper offers three major contributions to the construction engineering and management literature: (1) it presents the development and validation of the comprehensive performance model; (2) it provides the first comparison of project delivery systems through a single comprehensive metric; and (3) it offers an evaluation of the emerging IPD system, demonstrating superior overall performance when compared with other delivery systems.

Evaluating Integrated Project Delivery Using the Project Quarterback Rating

Mounir El Asmar, Ph.D., A.M.ASCE; Awad S. Hanna, Ph.D., F.ASCE; and Wei-Yin Loh, Ph.D., A.M.ASCE

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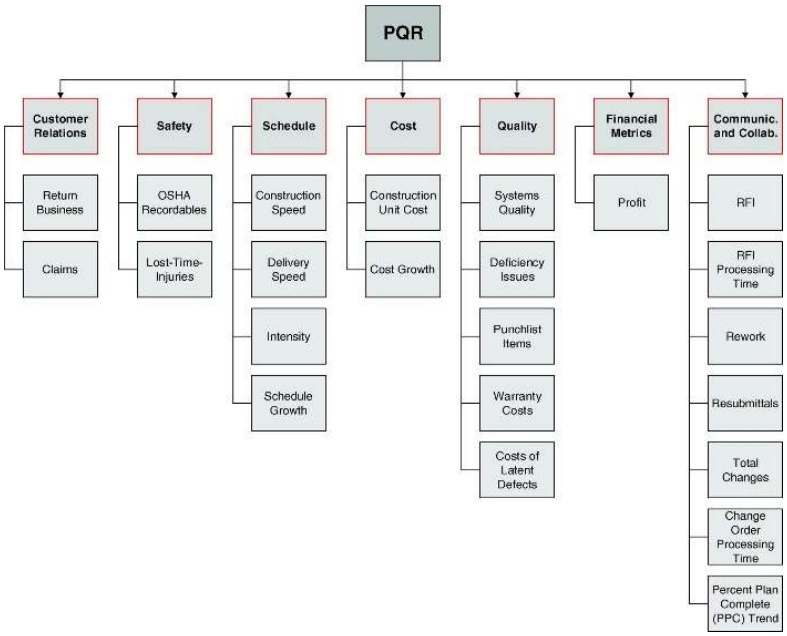
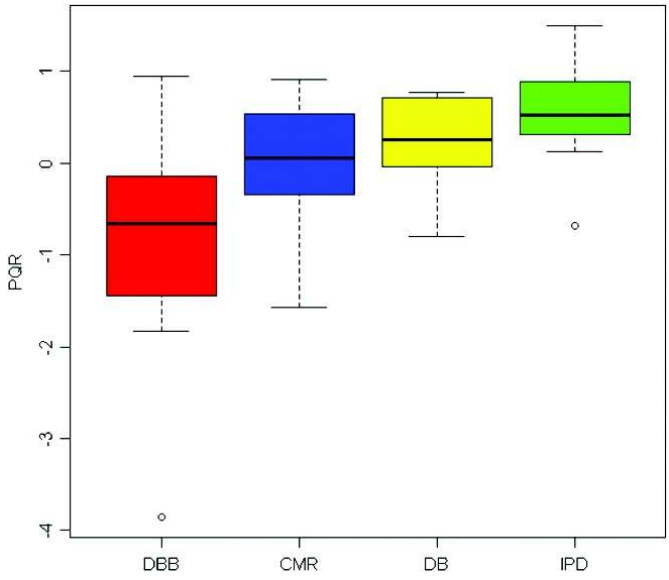


PQR structure



Overall project performance for major project delivery systems

- A survey that includes the identified metrics was developed and then used to collect project performance data from industry participants, specifically the general contractor or construction manager of each targeted project
- The survey was supplemented with structured interviews of respondents and yielded quantitative performance data for several construction projects.
- The presented model computes for each project j a corresponding project quarterback rating PQR.
- The rationale behind using a linear model lies in its simplicity and the fact that it allows for the addition of several performance metrics. The underlying assumption is that an overall comprehensive project performance rating PQRj exists and depends only on the performance areas i. In this model, the performance score PQRj is calculated as the weighted average of the different performance areas sij. Moreover, these scores sij for each of the seven areas also combine many components as shown in Fig. 3.
- The weights for each of the seven performance areas must be identified. The weights quantify the level of importance for individual performance areas. One example is whether the cost performance of a project is more important than its safety or schedule performance, and if so, by how much.
- A section of the data collection survey was designed specifically for this purpose and prompted respondents for information regarding the performance metrics considered when evaluating project success.

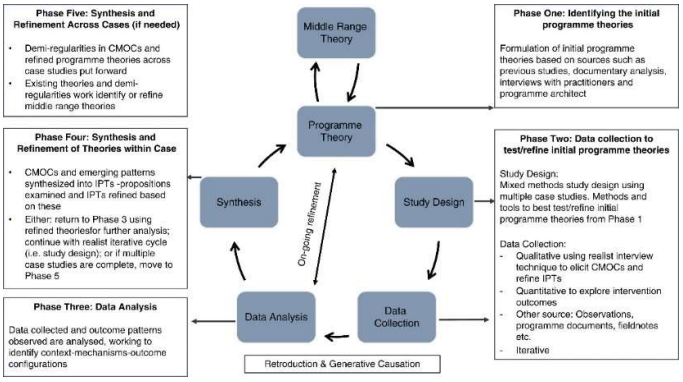
3. Review of Mixed Approaches

While quantitative methods produce data that can be aggregated and analysed to describe and predict relationships, qualitative research can help probe and explain those relationships and explain contextual differences in the quality of those relationships (Garbarino, S., & Holland, J., 2009). The relevance of using qualitative assessment of the context and perceptions and a quantitative assessment of implementation and proximal effect of change processes seems to speak for a methodological approach where both methods are used to approximate the details of the intervention process in question (Abildgaard et al., 2016).

3.1 Realist Evaluation

From the paper:

Realist evaluations are increasingly used in the study of complex health interventions. The methodological procedures applied within realist evaluations however are often inexplicit, prompting scholars to call for increased transparency and more detailed description within realist studies. This publication details the data analysis and synthesis process used within two realist evaluation studies of community health interventions taking place across Uganda, Tanzania, and Kenya. Using data from several case studies across all three countries and the data analysis software NVivo, we describe in detail how data were analyzed and subsequently synthesized to refine middle-range theories. We conclude by discussing the strengths and weaknesses of the approach taken, providing novel methodological recommendations. The aim of providing this detailed descriptive account of the analysis and synthesis in these two studies is to promote transparency and contribute to the advancement of realist evaluation methodologies.



- *Realist evaluation starts with theory and ends with theory. In other words, the purpose of a realist evaluation is as much to test*

Data Analysis and Synthesis Within a Realist Evaluation: Toward More Transparent Methodological Approaches

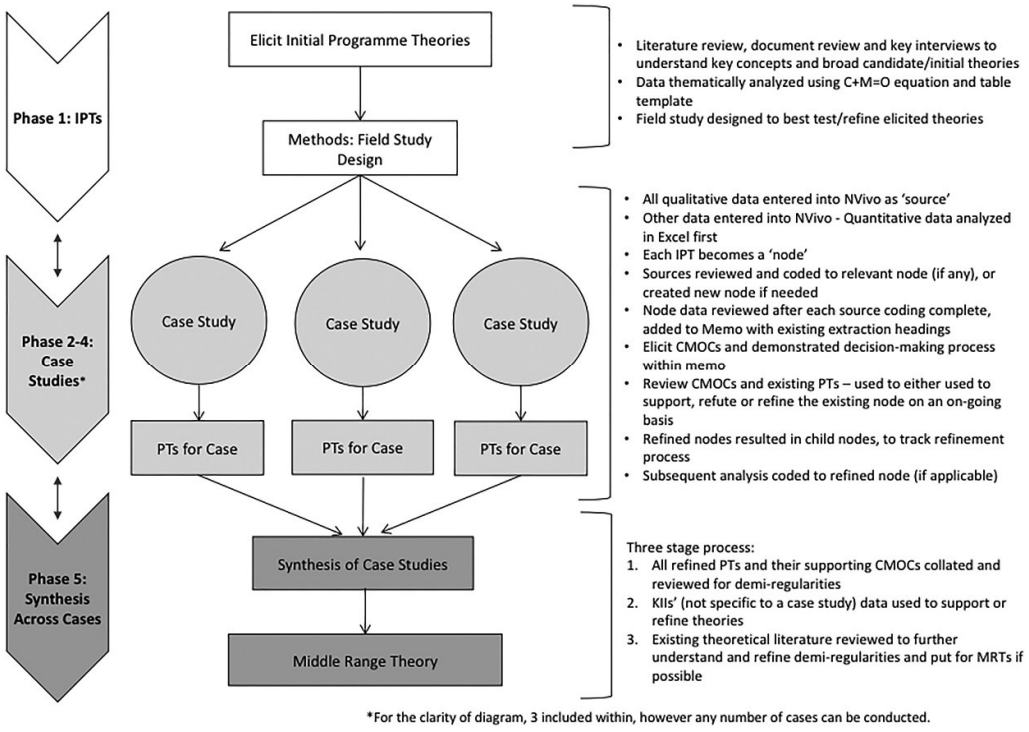
Gilmore B, McAuliffe E, Power J, Vallières F

Analysis and Synthesis Within a Realist Evaluation: Toward More Transparent Methodological Approaches. International Journal of Qualitative Methods. January 2019.

doi:10.1177/1609406919859754

and refine the programme theory as it is to determine whether and how the programme worked in a particular setting.

- *Usually, both quantitative and qualitative data are collected in a realist evaluation, often with quantitative data being focused on context and outcomes and qualitative data on generative mechanisms.*
- ***Generative mechanisms:** By exploring these mechanisms of change, realist evaluations aim to understand how a programme works or is expected to work within specific contexts, and what conditions may hinder or promote successful outcomes. Realist evaluations therefore seek to explain generative causation within the social world by identifying particular patterns of interactions.*
- *Realist data analysis is driven by the principles of realism: realist evaluation explains change brought about by an intervention by referring to the actors who act and change (or not) a situation under specific conditions and under the influence of external events (including the intervention itself).*



- *Because realist evaluation uses the idea of generative causality (i.e. mechanisms only fire when the context is conducive), realists are modest in their claims, stating that an evaluation cannot produce universally applicable findings. At best, evaluation can make sense of the complex processes underlying programmes by formulating plausible explanations ex-post.*
- *It can indicate the conditions in which the intervention works (or not) and how they do so. This realistic specification allows decision makers to assess whether interventions that proved successful in one setting may be so in another setting, and assists programme planners in adapting interventions to suit specific contexts.*

- *A realist evaluation yields information that indicates how the intervention works (i.e., generative mechanism) and the conditions that are needed for a particular mechanism to work (i.e., specification of contexts) and, thus, it is likely to be more useful to policymakers than other types of evaluation.*

3.2 Success Case Method

From the article:

The Success Case Method, developed by Robert O. Brinkerhoff, is a quick and simple process that combines analysis of extreme groups with case study and storytelling. The essential purpose of a Success Case study is to find out how well some organizational initiative (e.g., a training program, a new work method) is working. A Success Case study also identifies and explains the contextual factors that differentiate successful from unsuccessful adopters of new initiatives.

The Success Case study process has two fundamental parts.

1. *First, the evaluator identifies the few program participants who were the most (and least) successful. This is usually accomplished with a brief 3 to 5-item survey. That is, all participants are surveyed through self-report to determine to what extent they are using the new methods and tools a new initiative intended them to use and what, if anything, they are accomplishing.*
2. *Survey respondents are sorted into those few that are most and least successful. The evaluator then selects a random sample from among the most and least successful and, interviewing these people (usually by telephone), "digs deep" into their experience to determine the exact nature and extent of their success. More specifically, the evaluator seeks to discover the following:*
    a. *Exactly what they used, when they used it, how, when, and so on*
    b. *What results they accomplished*
    c. *How valuable the results are (e.g., in dollars)*
    d. *What environmental factors enabled their application and results*

The results of a Success Case study are communicated in "story" form. That is, the evaluator finds the most compelling and descriptive examples of success the program has achieved, then documents these examples in a few brief but richly detailed stories.

The Success Case Method differs from typical, more quantitative methods in that it does not seek to learn about the "average" or modal participant in an initiative. It intentionally seeks the very best that a program is producing, to help determine whether the value a program is capable of producing is worthwhile and whether it may be possible to leverage this to a greater number of participants. A "success story" is not a testimonial or a critical review. It is a factual and verifiable account—citing evidence

Success Case Method

In: Encyclopedia of Evaluation

Edited by: Sandra Mathison

Book Title: Encyclopedia of Evaluation

Chapter Title: "Success Case Method"

Pub. Date: 2011

Access Date: August 27, 2020

Publishing Company: Sage Publications, Inc.

City: Thousand Oaks

Print ISBN: 9780761926092

Online ISBN: 9781412950558

DOI: https://dx.doi.org/10.4135/9781412950558

that would "stand up in court"—that demonstrates how and how valuably a person used some new method or tool or capability.

The Success Case study process has two fundamental parts:

1. *First, the evaluator identifies the few program participants who were the most (and least) successful. This is usually accomplished with a brief 3to 5-item survey. That is, all participants are surveyed through self-report to determine to what extent they are using the new methods and tools a new initiative intended them to use and what, if anything, they are accomplishing.*

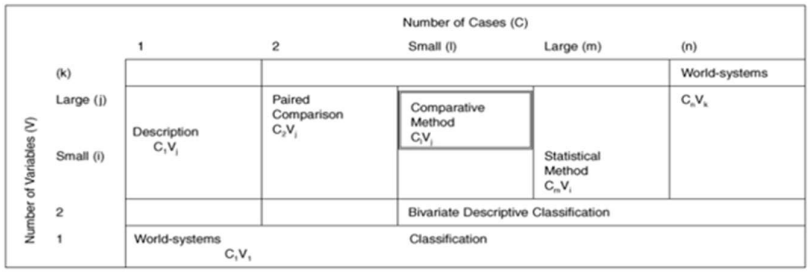
3.3. Qualitative Comparative Analysis (QCA) as an Approach

From the article:

Methods thus are concerned with the systematic matching and contrasting of cases in order to establish common causal relationships by eliminating all other possibilities.

- ***Method of agreement:*** *The first refers to eliminating all similarities but one: "If two or more instances of the phenomenon under investigation have only one circumstance in common, the circumstance in which alone all the instances agree is the cause (or effect) of the given phenomenon" (p. 390)*
- ***Method of difference.*** *Establishes the absence of a common cause or effect, even if all other circumstances are identical If an instance in which the phenomenon under investigation occurs, and an instance in which it does not occur, have every circumstance in common save one, that one occurring only in the former; the circumstance in which alone the two instances differ, is the effect, or the cause, or an indispensable part of the cause, of the phenomenon. (p. 391)*

Rather than merely adopting insights from largescale quantitative inquiries or simply increasing the number of cases as much as possible, QCA follows a different path with several distinct emphases.



Source: Adapted from "Die Vergleichende Methode in der Politikwissenschaft," by F. H. Aarebrot and P. H. Bakka, in *Vergleichende Politikwissenschaft: Ein Einführendes Studienhandbuch* (4th ed.), p. 65, by D. Berg-Schlosser and F. Müller-Rommel (Eds.), 2003, Wiesbaden, Germany: VS-Verlag.

In the process of configurational comparative analysis, the researcher engages in a dialogue between cases and relevant theories. Indeed, the choice of the variables (conditions and outcome) for the analysis must be theoretically informed.

QCA develops a conception of causality that leaves room for complexity, referred to as ***"multiple conjunctural causation."***

Qualitative Comparative Analysis (QCA) as an Approach

In: Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques.

Dirk Berg-Schlosser, Gisèle De Meur, Benoît Rihoux & Charles C. Ragin

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Print pages: 1-18

It is a conception of causality according to which:

> Most often, it is a combination of causally relevant conditions that generates the outcome (AB → Y).
> Several different combinations of conditions may produce the same outcome (AB + CD → Y, + indicates a Boolean *or*[4]).
> Depending on the context, a given outcome may result from a condition when it is present and also when it is absent (AB → Y but also aC → Y). In this example, [A] combined with [B] produces the occurrence[5] of the outcome, but its absence [a] combined with [C] also produces the outcome.

Without the ambition to generalize, in the search for explanations, research would produce only tautologies and descriptions. This is not to say that more interpretive or "thick" descriptive work is devoid of value—indeed such work can yield very useful insights to grasp phenomena, to understand their deeper mechanisms, to gain an understanding of complex cases (Gerring, 2006; Ragin & Becker, 1992). But it is crucial to recognize the importance of producing new conjectures and to take the risk of confronting them with new data.

A good index of the quality of research results could be precisely their ability to withstand refutation when confronted with new cases. In this respect, we should remember that a theory maximizes its robustness when it avoids individualizing explanations—that is, when it avoids providing a specific "explanation" for each specific case (it is then only an accumulation of "descriptions," and not an "explanation").

QCA require that each case be broken down into a series of features: a certain number of condition variables and an outcome variable. For instance, if we consider athletes as cases, if the outcome is the ability to throw a discus beyond 60 meters, then some conditions could be being tall (versus not tall), being fast (versus slow), being muscular (versus thin), and so on. Then we could measure these attributes for each "case" (athlete): Case 1 could be tall, fast, and muscular; Case 2 not tall, fast, and thin; and so on. This means that, as with statistical analyses, QCA techniques allow one to develop an analytical strategy. However, this segmentation into variables does not affect the perception of each case as a whole. The aim here is to allow for major concerns of both quantitative (defining variables) and qualitative (keeping in touch with the holistic perspective) approaches. Having done so, one will be able to compare cases as "whole units," each one of these being defined as a combination of features.

Five Types of Uses of QCA Techniques:

1. *Summarizing data*
2. *Checking coherence of data*
3. *Checking hypotheses or existing theories*
4. *Quick test of conjectures*
5. *Developing new theoretical arguments*

Some definitions:

- *Concept = a mental representation of an empirical property*
- *Concepts = «sets»*
- *Sets = «Data container»*
- *Crisp sets = binary i.e. it is, or it is not.*
- *Fuzzy sets = Fuzziness is due to conceptual boundaries that are not sharply defined rather than imprecise empirical measurement.*
- *Fuzzy sets allow for degrees of membership, thus differentiating between different levels of belonging anchored by two extreme membership scores at 1 and 0 (Ragin 2000: 154; Ragin 2008b).*

Table 1.1 Verbal description of fuzzy-set membership scores

Fuzzy value	The element is …
1	Fully in
0.9	Almost fully in
0.8	Mostly in
0.6	More in than out
0.5	Crossover: neither in nor out
0.4	More out than in
0.2	Mostly out
0.1	Almost fully out
0	Fully out

Adapted from Ragin (2000: 156)

Further reading, see for example:
A Commented Review of Applications
Crisp-Set Qualitative Comparative Analysis
Multi-Value QCA (mvQCA)
Qualitative Comparative Analysis using Fuzzy Sets (fsQCA)
Qualitative Comparative Analysis (QCA) as an Approach

4. Summary and Concluding Remarks

This report is devoted to examining methodological possibilities on measuring effect from project management (social science) perspective. The inquiry stems from preceding works on project delivery methods where it was observed that we could strengthen research on the topic by studying causes and effects. More precisely, we wanted to identify ways for studying the effects. This report is an outcome of a relatively unstructured and ambitious dive into the realm of academic literature on causality. The works presented here are a mix of studies that have implemented specific methods to say something about effects broadly categorised after their approach: qualitative, quantitative, or mixed. Thus, it may serve as a starting point for researchers curious about researchable phenomena' effect (or impact). However, the report should not be read as a guide but rather as a glimpse into the realm of methodological approaches that provide references that should be studied more closely if found interesting.

> The word *effect* is associated with the act of *measuring* the result of something. These words refer to something that happens or exists because of something else. One of the most common words for this is the result. The result of an influence is an effect. The word consequence is used mainly when an action or situation is bad or inconvenient. Outcome and upshot are alternative wordings. The result of a process or series of events is the result (Cambridge English Thesaurus © Cambridge University Press).
>
> Effect – the result of something

4.1 Measuring Something Qualitatively

- **Process tracing** is a data analysis method for identifying, validating, and testing causal mechanisms within case studies in a specific, theoretically informed way.
- **Outcome mapping (OM)** is a methodology for planning and assessing projects that aim to bring about 'real' and tangible change. behaviour, actions or relationships that can be influenced by the team or program.
- **Success Case Method**, see for example Brinkerhoff (2003;2005). The Success Case Method (SCM) is a process for evaluating the business effect of training that is aligned with and fulfills the strategy discussed. May also be mixed method approach.

4.2 Measuring Something Quantitatively

- **Structural equation modeling:** might be the most promising method but at the same time the most methodological challenging as it is a methodology designed primarily to test substantive theory from empirical data. I.e., used to identify which variables among interacting variables affect the outcome.
- **Boundary conditions:** Boundary conditions relate, most importantly, to boundaries in time, space, and the researcher's values and describe the limits of generalizability of a theory. A concept worth knowing about when looking at effects in complex environment.
- **AHP – Analytical Hierarchy process:** The use of the AHP technique enables the decision-maker to structure a complex problem in the form of a simple hierarchy and

to evaluate a large number of qualitative and quantitative factors in a systematic manner under multiple criteria. Seems like an systematic and quantitatively way of looking at complex decision-making but maybe not the right tool for measuring effects.

- **Quarterback Rating:** A specific method for measuring effects. The PQR model approach combines seven performance areas, as identified by survey respondents of this research, into one score for each project.

4.3 Mixed Approaches

- **Realist evaluation: seems like a good tool for studying generative mechanisms i.e.,** exploring how a variable or a mechanism works or is expected to work within specific contexts, and what conditions may hinder or promote successful outcomes.
- **The success case:** The results of a Success Case study are communicated in "story" form. I think this method is very close to how we already approach case studies.
- **Qualitative Comparative Analysis (QCA)** seems promising – it takes a qualitative case a step further by breaking each case down into a series of features: a certain number of condition variables and an outcome variable. Might be a step in the right direction.

4.4 The Challenge: Causal Explanations

The authors quick reflection (Engebø):

Projects shares some characteristics that make it hard to measure effect:

- Unique
- Includes a lot of variables
- It consists of a lot of mechanisms at play
- It consists of a lot of randomness's
- Various stakeholders and participants (effect for whom)

All factors make studies on effects challenging. First, one could measure effects on a macro level – did the project succeed on set criteria? Then, the challenge is to link the success to a specific mechanism, i.e., isolate variables and link them to the outcome. This is possible, but one will encounter another challenge when arguing for the causality between the variable (the specific mechanism) and the outcome. Are we (as researchers) sure that this mechanism yielded this result – did not randomness play a role? Did not other variables interfere? Etc. Another challenge here is the lack of a control group (all projects are unique), as found in experimental designs where one can control the effects of other variables.

The value of causal explanation in qualitative research is identifying differences and similarities and relating these to other differences and similarities. For quantitative studies, the causal explanation is concerned with the dependent variable or outcome factor represented by a mathematical combination of independent variables (Riffenburgh, 2006).

Consequently, one could use a quantitative method such as done with the quarterback rating to study the following cause-effect relationship:

- Project Delivery method (Dependent variable) -> Project success (outcome)

To study mechanism on a "micro" level (i.e., beyond looking at phenomena's such as project delivery methods as a whole) will require another level of methodological approach:

- One particular mechanism in the Project Delivery method (one of many variables) à A quantifiable effect on the project outcome.

Here, one needs to implement a rigorous quantitative method, a substantial data sample and analytical methods such as regression analysis. Even then, one could not be sure that there is a "true" causality between one quantified mechanism and the quantified outcome (again randomness).

Disclaimer: *These last few paragraphs are just my (rather unqualified) reflections regarding this challenging topic. In other words, I am sorry if this comes out as complete nonsense*.

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