15

QUALITATIVE APPROACHES FOR STUDYING INNOVATION AS PROCESS

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This chapter articulates various options for qualitatively conducting research on innovation as process. Although this quest seems straightforward, it is far from the case. Several questions must first be addressed including: *What is innovation? What is process? And, what exactly is qualitative?* It seems there are more questions than we can productively address in this short piece. Notwithstanding this challenge, even an overview of key issues can generate an informed opinion on qualitative approaches to the study of innovation as process. Consequently, we briefly explore each term to explicate how we use them.

Explicating Terms

What Is Innovation?

> Everyday, in our personal and professional lives, we innovate. Nothing matters more to our success and our survival – and yet we struggle with our understanding of the process of innovation. Sometimes it is messy; sometimes it is elegant; usually it is both and more. Our difficulty in grasping the process of innovation is vexing. Successful innovation brings us joy and confidence and well-being. It generates long-term sustainable growth. Once we've tasted this wonderful experience, we want to experience it again – but we are frequently confounded. The process is nonlinear, and it cannot be managed in traditional ways. By following our best practices and instincts, we can generate a *Post-it Note* or a valuable new pharmaceutical like imiquoimod, or we can hit a dry hole.
>
> *(Coyne, erstwhile Senior Vice President of Research and Development at 3M Corporation, 1999: vii)*

In this observation, we see at least two meanings of the term innovation. One is that of an outcome (what Coyne refers to as "successful innovation"). Indeed, most think of innovations as novel "things" that have value in use. However, the process whereby such outcomes emerge is yet another meaning associated with innovation. And, as Coyne noted, even though we all desire successful outcomes, "we struggle with our understanding of the process of innovation."

So, what lies "under the hood" of the innovation engine? Coyne offers a clue in his observation "The process is nonlinear, and it cannot be managed in traditional ways." Indeed, Coyne's

observation from the field is backed by research that details the complexities of innovation (e.g., Dougherty and Dunne, 2011; Garud et al., 2013). The process is full of ups-and-downs, false starts and dead-ends, partial victories and triumphs as bits and pieces of phenomena combine and recombine as innovation journeys unfold (Van de Ven et al., 1999).

Even as scholars accumulated such insights on the process of innovation, underlying innovation dynamics have changed. For most of the twentieth century, a dominant model of innovation conceptualized the process of innovation as one involving new product introductions during eras of ferment followed by relatively long eras of incremental change (Tushman and Anderson, 1986; Utterback and Abernathy, 1975). However, with the advent of digital technologies, the frequency of new product introductions, updates, and extensions has increased to such an extent that the boundaries between product generations have blurred (Garud et al., 2008; Yoo et al., 2012). In such a world, it is no longer sufficient to think about the *process of innovation* demarcated by a beginning and an ending. Instead, *innovation itself is a continual unfolding process* (Garud et al., 2017).

What Is Process?

We begin with a distinction that Mohr (1982) offered between variance and process. With variance, "the precursor (X) is a necessary and sufficient condition for the outcome (Y)" (Mohr, 1982: 37). In contrast, a process is: "a series of occurrences in a sequence over time so as to explain how some phenomenon comes about" (Mohr, 1982: 9). Distinguishing such a view from a variance view, Mohr noted, "The predominant flavor of a process model is that of a series of occurrences of events rather than a set of relations among variables" (Mohr, 1982: 54). The sequence of events matters, as evident in Mohr's observation,

> what comes out of a probabilistic process depends on what goes in, and what goes in almost always depends on what came out of a former one, so that their order must be faithfully rendered within the model.
>
> *(Mohr, 1982: 59–60)*[1]

The view of process as a sequence of events representing changes in things is one way of understanding the emergence of phenomena over time. Things interact with one another to generate events that can be observed (Morgeson et al., 2015). These events, when placed in chronological order, can generate an explanation of how phenomena unfold. For instance, a person could be inflicted with malaria if a mosquito that has already acquired the parasite bites him or her. But, if a mosquito first bites a person and then acquires the parasite, malaria is not the outcome. In other words, the sequence of events matters.

The temporal sequence of events as changes in things based on substantive metaphysics is one view of process (Van de Ven and Poole, 2005). Process metaphysics (Rescher, 2005) offers another. Process metaphysics views phenomena as unfolding journeys that materialize things along the way. Rescher (1996: 27) clarified that "process philosophy does not – or need not – deny substances (things), but sees them as subordinate in status and ultimately inhering in processes." In the management field, Langley et al. (2013) highlighted the differences between process and substance views on phenomena by observing,

> process and temporality … can be viewed from different ontologies of the social world: one a world made of things in which processes represent change in things (grounded in a substantive metaphysics) and the other a world of processes, in which things are reifications of processes (Tsoukas and Chia, 2002) (grounded in process metaphysics).

Not surprisingly, these two ontological positions have their epistemological counterparts. Chia and Langley (2004) noted,

> The first perspective appears dominant in much of organizational and social scientific research, and tends to be pragmatic, empirically grounded, and analytical in orientation. The latter perspective has been primarily conceptual, strongly informed by strands of process philosophy, theology and the humanities at large, following especially the lead of philosophers such as James, Whitehead, Bergson, and Deleuze.… *While the first perspective helps us observe and empirically research process, the latter enables us to appreciate the sui generis nature of process. Each one has its own strengths and weaknesses*.
>
> *(Emphasis added)*

We have deliberately emphasized the last part of Chia and Langley's (2004) observation to highlight the difficulties involved in empirically investigating phenomena from a perspective that embraces process metaphysics. Rescher's (1996: 37) observation offers one way to do so. He noted, "we humans understand change owing to the fact that *we experience change* in ourselves: we act or do things, and things happen to us" (emphasis added). From this, an empirical approach to process metaphysics is to study and report change as experienced by those engaged with phenomena.

Synthesizing observations across Mohr (1982) and Rescher (1996), for the purpose of this paper we propose two positions on how researchers might empirically study innovation as process. These are *process as observed* by researchers, and *process as experienced* by actors in the field. We do not advocate one position over the other. Instead, we want to leave it to researchers to decide which approach they would like to choose for their projects depending on their goals and the questions they want to address.

Indeed, our investigation of papers that have qualitatively examined innovation processes highlights that some scholars have chosen hybrid approaches. Hybrid approaches are consistent with the utility of embracing a paradox inherent in organizing – namely, organizational phenomena are substances and processes at the same time. As Einstein noted in his discussion of wave–particle duality in physics,

> It seems as though we must use sometimes the one theory and sometimes the other, while at times we may use either. We are faced with a new kind of difficulty. We have two contradictory pictures of reality; separately neither of them fully explains the phenomena of light, but together they do.
>
> *(Einstein and Infeld, 1938: 279)*

What Is Qualitative?

Many in our discipline tend to distinguish qualitative research by comparing it with quantitative research (Cornelissen, 2016; Golden-Biddle and Locke, 2007). Some think that the latter is research conducted with numbers whereas the former is research conducted with texts. Others conceptualize qualitative research as being exploratory and quantitative research as confirmatory. In this regard, Eisenhardt et al. (2016: 1115) equate qualitative research ("cases, interpretivist studies, and ethnography") with inductive theory building.[2] Furthermore, they note:

> Inductive research on grand challenges is more likely to flourish with multiple approaches, something that is difficult when authors must follow specific templates.

> A good example is requiring authors to follow a particular writing format which Pratt (2009) cautions against. An illustration is mandating a data structure figure. While this device may make sense for some studies, it is a force-fit for others, as its authors note (Gioia, Corley and Hamilton, 2013). In fact, given that a "data structure" displays names such as for categories or concepts and themes or constructs, but often lacks actual data, its usefulness seems modest.

Our views on the distinctive domain of qualitative process research may already be evident in the moves we have made and the turns that we have taken. For us, qualitative means appreciating the richness of phenomena by considering their relational (e.g., the bits and pieces constituting activities) and temporal (e.g., sequences, patterns, and temporal experiences of those involved) contexts. As relationality and temporality are progressively "endogenized," we step away from the realm of data and information generated by using pre-determined categories and criteria, to the realm of meaning and interpretation of phenomena as observed and experienced (Bruner, 1991). The latter implicates notions of quality endogenous to situated experiences, and not those imposed from the outside.

Options for Conducting Qualitative Research on Innovation as Process

Now that we have explicated our positions on some of the key terms that form the basis for this paper, we now provide specific examples of research from the innovation management literature for illustrative purposes (Table 15.1). The columns in Table 15.1 highlight various variance and process options. From our investigation of published pieces from a range of journals, we found that process options lay across a spectrum. At one end is research based on *process as observed* as a sequence of events. At the other end is research based on *process as experienced* by those involved. And, there are hybrids in-between. The examples we offer, while indicative of the onto-epistemology positions of each approach, clearly spill over to the other approaches (see Table 15.2 for more details).

Following Allison (1971: 8), we offer a number of caveats as to how our exposition of the research ought to be read. First, each position in Table 15.1 is a "caricature, or a strawman." But, caricatures can be useful, as they allow one to think of ideal types and, in turn, hybrids. Second, fitting in empirical work into these positions is necessarily Procrustean. Phenomena, like the research studies we review, are richer than any theory or method, and can be approached from multiple onto-epistemological positions. Moreover, it is impossible to do justice to all the details of the methods used and the theories employed in the articles we reviewed. Indeed, our objective is not to conduct a comprehensive review, nor is it to offer extensive notes on how to design a study, gather data, analyze it, and report findings. Instead, our review is meant to serve a cartographic role, directing the attention of readers to different methods and theories used in process-oriented studies. Finally, in any research effort, there is always a creative leap (Klag and Langley, 2013; Weick, 1989) that cannot be fully explicated, nor should this be codified, in our opinion.

Variance Approaches

Continuing with the distinction offered by Mohr (1982) between variance and process, we begin our exploration with studies conducted from a variance perspective. Although qualitative approaches can be used for provisional theory testing (Glaser and Strauss, 1967), here we focus on exploratory studies that inductively generate hypotheses, which can then be tested across

Table 15.1 Innovation Process Inquiry Approaches

	Variance	*Process*		
		Process as Observed	←*In-between*→	*Process as Experienced*
Objectives	Generate theory by identifying efficient causation between independent and dependent variables moderated and mediated by others.	Identification of a pattern in the progression of sequence of events to appreciate innovation as a complex unfolding and emerging process involving multiple actors with different frames of reference and different levels of inclusion.	Contextualize innovation journeys and identification of motivations and strategies that were involved in framing the innovations as they emerged.	Appreciate innovation as a human endeavor involving a plenum of agencies; forces scholars to ask values-based questions as to what innovation is, for whom, and for what purpose.
Methods	Theoretically sample entities with different outcomes and then compare and contrast them to inductively understand potential causes for the differences.	Identify events either in one string or multiple strings and look for patterns such as resonance between these strings and occasions when these strings become entangled to generate new events.	A historical contextualized account based on publicly available data on events and experiences of the participants.	Track experiences through ethnographic approaches and/or following the narratives of the actors involved.
Examples	Brown and Eisenhardt (1997)	Garud and Van de Ven (1989)	Hargadon and Douglas (2001)	Garud (2008)
	Block et al. (2016)	Reymen et al. (2015)	Tuertscher et al. (2014)	Deken et al. (2016)

Table 15.2 Details of the Methods Used in the Papers Reviewed

	Variance	*Process*		
		Process as Observed	←*Hybrid*→	*Process as Experienced*
Research design	Brown and Eisenhardt (1997) • Grounded theory generating inductive insights • Multiple case design (9 cases) using replication logic (Yin, 1993) • Cases treated as independent experiments • Theoretical sampling Block et al. (2016) • Grounded theory-building • Multiple-case study (Eisenhardt, 1989)	Garud and Van de Ven (1989) • Single case • Follow the actors and events • Ongoing journey • Principle of symmetry – not to evaluate any event in and of itself Reymen et al. (2015) • Theoretical sampling (Gerring, 2007) • Multiple cases • Determining beginning and end of journey	Hargadon and Douglas (2001) • Single, revelatory case [(Yin, 1993)] • Historical analysis (Kieser, 1994) Tuertscher et al. (2014) • Longitudinal study focusing on critical technological controversies (Latour, 1987) • Embedded case design (Yin, 1993) • Zooming in and zooming out to identify micro-mechanisms and understand their role in the overall	Garud (2008) • Immersion in collective "events" • Abductive • Multiple such events, but not replicative logic Deken et al. (2016) • Aim at theory elaboration (Vaughan, 1992) • In-depth longitudinal study of single case (two years) • Narratives of episodes as embedded unit of analysis

continued

Table 15.2 Continued

	Variance	*Process*		
		Process as Observed	←*Hybrid*→	*Process as Experienced*
Data collection	Brown and Eisenhardt (1997) • Incorporated data from two to three levels of management hierarchy • Also incorporated impact of company- and industry-level forces • Real-time observations and retrospective data (interviews, questionnaires, secondary data) Block et al. (2016) • Semi-structured interviews with CEOs and business unit managers • Triangulation with archival data such as annual reports (Yin, 1993), to mitigate retrospective bias (Huber and Power, 1985) • Interviews with academic experts and industry experts	Garud and Van de Ven (1989) • Archival and real time (five years+) • From multiple sources including interviews, trade journals, attendance at conferences, scientific journals, strategic business meetings at 3M etc. [(Garud and Rappa, 1994)] • Events generated from this intensive immersion into the thick of things Reymen et al. (2015) • Retrospective interviewing (Huber and Power, 1985) • Focus on significant events (Chell, 2004) • Triangulation to ensure multiple data sources per event (Yin, 1993) • Creation of event lists to enhance reliable recollection of retrieval (Belli, 1998)	Hargadon and Douglas (2001) • Archival data • Compilations of primary data including documentation of observed events as well as experiences by involved actors (inventors, investors, and consumers) • Secondary histories of Edison and the gas lighting industry Tuertscher et al. (2014) • Twenty years archival data (meeting minutes, presentations, reports, emails, and personal notes) • Unobtrusive data collection (Webb and Weick, 1979): data were generated and archived by actors in real time for their own purpose • Archival data was complemented with six years of contemporary data (observations and interviews)	Garud (2008) • Ethnographic • Archival • Gather the bits and pieces at conferences (photographs, visiting cards, drafts of communiqués, edits, narrative snippets, rumors, etc.) Deken et al. (2016) • Ethnographic methods • Observations of various meetings, captured in field notes • Formal and informal interviews with stakeholders • Documents produced and used in routines • Focus on actions as constitutive elements of routines (Feldman and Pentland, 2003)

Data analysis	Brown and Eisenhardt (1997)
	• Grounded theory building (Glaser and Strauss, 1967)
	• First writing individual case studies and then comparing across cases to construct conceptual framework (Eisenhardt, 1989; Miles and Huberman, 1994)
	
	Block et al. (2016)
	• Structured and iterative theory building approach
	• Open coding of interview data, with some codes derived from literature
	• Combination of codes into common themes and aggregate dimensions (Gioia et al., 2013)
	• Assess inter-rater reliability of coding
	• Comparison of four cases on aggregate dimensions (Miles and Huberman, 1994)
	• Establish causal link of aggregate dimensions to innovation outcome, captured in propositions
		Garud and Van de Ven (1989)
		• Analysis of events within and across tracks [Van de Ven and Poole, 1995]
		• Patterns such as FDA cycles
		• Identification of critical events that shaped industry emergence
		
		Reymen et al. (2015)
		• Uniform definition of events [(colligation, Abbott, 1984)]
		• Iterative creation of event lists that document the chronology of cases (Van de Ven and Poole, 1990)
		• Creation of coding scheme to code distinct events (Poole et al., 2000)
		• Moving averages of event types
		• Identifying turning points as embedded unit of analysis (Lichtenstein et al., 2006)
		• Identifying necessary conditions for turning points (Mohr, 1982)
		• Within case analysis and cross-case analysis
			Hargadon and Douglas (2001)
			• Historical analysis of the interplay between design, innovation, and institutions
			• Focus on concrete details and actions of particular situations to understand the larger systems of meaning reflected in them (Geertz, 1973)
			
			Tuertscher et al. (2014)
			• Analysis of technological challenges encountered over time and how they were addressed
			• Considered events as important occurrences within a larger flow (Van de Ven, 1992), visualized in diagrams to get holistic understanding (Langley, 1999)
			• Coding for thematic content and patterns (Miles and Huberman, 1994) to identify emergent themes and explanations, corroboration with latent semantic analysis (Deerwester et al., 1990) and scientometrics (Callon et al., 1986)
			• Validation of explanations by pattern matching across embedded cases (Trochim, 1989)
				Garud (2008)
				• Collage work that involved:
				  • Looking at the lived experiences of the many different people and the translation of many different things and activities (texts, instruments, sub-events) at these conferences
				  • And juxtaposed against extant insights from relevant literature (e.g., isomorphism, collective fields, translation, immutable mobiles, etc.)
				
				Deken et al. (2016)
				• Identify routines as patterns of action from event list
				• Identify episodes of routine performances, written as narratives (Langley, 1999)
				• Use of coding to develop categories of "routine work" used in episodes (Van Maanen, 1988)
				• Analysis of breakdowns in episodes (Sandberg and Tsoukas, 2011)
				• Analyzing dependencies across episodes to acknowledge temporal connectedness (Pettigrew, 1990)
				• Visualization of patterns (Langley, 1999)

continued

Table 15.2 Continued

	Variance	*Process*		
		Process as Observed	←*Hybrid*→	*Process as Experienced*
Reporting of findings	Brown and Eisenhardt (1997) • Only reporting of cross-case comparisons (individual case stories were not reported) • Differences on the "dependent variable" were juxtaposed against different patterns of the explanatory features, mostly summarized and stylized using tables Block et al. (2016) • General introduction of phenomenon • Sequential discussion of five propositions on determinants • Presentation of evidence for each of four cases • Integrated causal model	Garud and Van de Ven (1989) • Description of chronology of events within and across tracks [(Langley, 1999)] • "Petri-net" inspired diagram of industry emergence Reymen et al. (2015) • Graphs representing moving averages and turning points • Tables with turning case per case • Examples, supported with quotes • Integrated model • Illustration of model with history of one case	Hargadon and Douglas (2001) • Description of chronology of events within and across tracks [(Langley, 1999)] • Combined with quotes and narratives describing how contemporary actors experienced unfolding events • Table with timeline of key events Tuertscher et al. (2014) • Narrative of unfolding of process • Zooming into the process to explain micro-mechanisms • Quotes to convey to readers how actors experienced process • Zooming out to show overall process • Illustrations and diagrams to visualize complex relational data • Diagram of process model	Garud (2008) • Narrative style of relational and temporal unfolding and becoming • Zooming in and zooming out • Photos and textual documents from the conferences shown so as to bring the readers into these conferences Deken et al. (2016) • Narratives of selected episodes • Iterative telling and showing • Diagram of process model

Note
We have inserted citations to references used by the authors within parentheses (). Early articles employed many of these methods; only, they did not cite articles, as they were not in print at that time. Consequently, we have now inserted some cites using brackets [].

large-sample studies. Such variance research could generate "process" models that consider innovation variables such as "innovation speed" or "adoption," and the links between them. Driving such inductive research are considerations such as theoretical sampling, replication logic, generalizability, and inter-rater reliability. These issues are in no particular order, nor is the list comprehensive.

Two templates. Scholars have been using two major templates to induce theoretical insights (see Langley and Abdallah, 2011, for a comparison between the two approaches). With the "Eisenhardt" method, several cases (typically six to eight) are theoretically sampled so as to establish variations across the dependent variables (such as success or failure) and then rich case studies are written to inductively understand the potential causes for the variations in the dependent variables. In contrast, with the "Gioia" method, researchers develop a corpus of data typically based on interviews from one or more settings, which they then interpret using open and axial coding. This effort results in a "data structure" comprising first-order and second-order categories, and possibly overarching theoretical categories (Gioia et al., 2013). The first-order level captures informant-centric terms/codes and a second-order level denotes researcher-centric theoretical themes and dimensions (Rheinhardt et al., forthcoming). This approach generates an inductive model that establishes the interrelationships (typically causal) between the second-order categories.

Overview of study 1: Brown and Eisenhardt (1997) conducted a study to generate insights on phenomena that did not conform to the then predominant model of punctuated change. In their own words, Brown and Eisenhardt (1997: 2)

> chose grounded theory building because of [their] interest in looking at a rarely explored phenomenon for which extant theory did not appear to be useful. In such situations, a grounded theory-building approach is more likely to generate novel and accurate insights into the phenomenon under study than reliance on either past research or office-bound thought experiments (Glaser and Strauss, 1967).

As per the hallmarks of this "Eisenhardt" method, the authors chose a multiple-case research design that permitted a "replication logic" (Yin, 1994) in which the cases were treated as a series of *independent* experiments that confirmed or disconfirmed emerging conceptual insights. A comparison of successful and less successful firms showed that successful multiple-product innovation (a) blends limited structure around responsibilities and priorities with extensive communication and design freedom to create improvisation within current projects; (b) relies on a wide variety of low-cost probes into the future, including experimental products, futurists, and strategic alliances; and (c) links the present and future together through rhythmic, time-paced transition processes. Generalizability is a hallmark of this method, as these findings can be tested in other large-sample-based studies.

Overview of study 2: Block et al. (2016) used the "Gioia method" to induce new theory on "user-manufacturer diversification." The authors identified four cases where firms started out as user-innovators and then extended their operations to manufacture and sell the products of their innovative efforts even to competitors. In other words, these firms diversified vertically by supplying their products to others, including competitors, besides using them for their own purposes.

The authors' inductive theory development effort focused on finding explanatory variables for this outcome. Interview data were analyzed by creating a "data structure" with interview quotes, combined codes, and aggregate dimensions. Findings were summarized in a model of five antecedent variables that predict initiation and stability of user-manufacturer diversification. For instance, one of their propositions is as follows:

> A continuous stream of user innovations from the core business leads to the accumulation of deep user need and solution knowledge, which in turn favors the move toward and the success of user-manufacturer diversification through supplying product innovation ideas and generating absorptive capacity for external user needs.

Presumably, one would test this proposition (and the others) by regressing the extent to which user-manufacturer diversification is successful (the dependent variable) against the extent to which a business continues to offer a stream of user innovations (as the independent variable) mediated by the accumulation of knowledge on user needs and solutions.

Summary. The two examples we have chosen are exemplary. One, based on realism, generates insights by comparing across cases. The other, based on interpretivism, generates insights from a single case, based on interpretations offered by those involved. Both use constant comparison as an analytical technique to induce generalizable propositions. Both approaches offer models that establish causal explanations between categories that were inductively derived from grounded theorization. However, the use of the word "process" in these studies differs from the use of the term "process" as development, as noted by Van de Ven and Poole (1995: 512):

> Our developmental view of process should not be confused with two other uses of process in the management literature. Here [the latter], process refers to either (1) the underlying logic that explains a causal relationship between independent and dependent variables in a variance theory or (2) a category of concepts of organizational actions (e.g., rates of communications, work flows, decision-making techniques, or methods for strategy making). *These concepts or mechanisms may be at work to explain an organizational result, but they do not describe how these variables or mechanisms unfold or change over time.*
>
> *(Emphasis added)*

Process Approaches

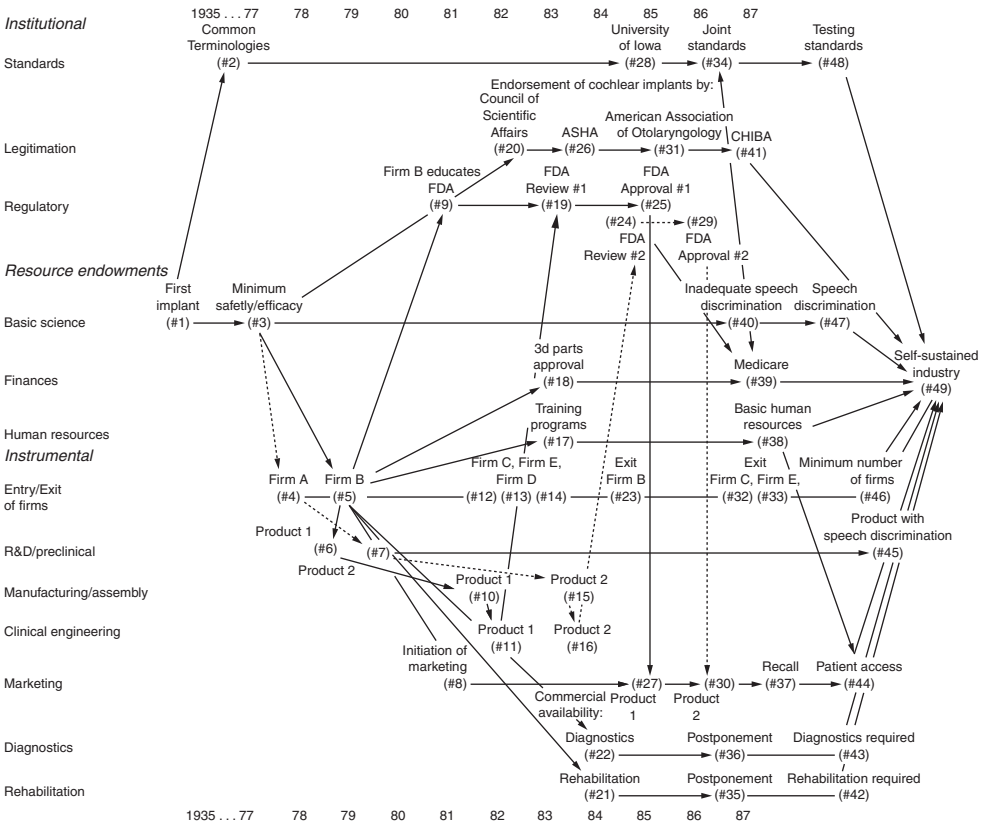
These observations serve as a transition to notions of process that lie closer to those articulated by Mohr (1982) and Rescher (1996). Such an approach structures and analyzes data over time, rather than across cases or constructs. We will discuss various approaches ranging from studies exemplifying process as observed, to process as experienced. We also explore hybrids that embrace the substance/process duality. For each approach, we provide examples to illustrate the methodological diversity that exists.

Process as observed. One approach is to identify the *events* that unfold in-between idea conception (which marks a beginning) and commercialization (which marks an ending). The significance of any single event is not readily evident in and of itself. Instead, and consistent with Mohr's suggestions, an innovation journey is understood by finding patterns in a sequence of events. Indeed, such sequencing of events in-between beginnings and endings generates a rich understanding of the challenges involved in taking an idea from conception to commercialization (Van de Ven et al., 1999).

Overview of study 1: Research from the Minnesota Innovation Research Program (MIRP) offers one such event sequence approach. Events were conceptualized as changes in ideas, people, transactions, contexts, and outcomes as expressed by participants involved with innovation journeys (Van de Ven et al., 1999). In addition, considerable contextual data were gathered from sources such as articles in trade and scientific journals, media articles, interviews, ethnographic observations, patents, etc. (Garud and Rappa, 1994). These data made it possible for the

researchers to track the progression of events across several categories of interest. For instance, one study on the emergence of the cochlear implant industry (Garud and Van de Ven, 1989) examined the sequence of events across various industry ecosystem categories that had been generated by researchers by iterating between literature and data. Figure 15.1 is a depiction of a sequence of events unfolding across multiple industry ecosystem sub-elements tracks. Clearly, it looks complicated, and so it should, as the emergence of an industry ecosystem is not a straightforward linear process, which is precisely what we were trying to show with this figure.

This effort led to further analysis driven by questions such as, *What happened within a track? How did the events in one track influence events in another? When did events across tracks become entangled?* The researchers found that one sequence of events dominated all the others. Companies had to follow a sequence of events to conduct clinical trials of their devices, as the widespread acceptance of any product in the marketplace is conditional upon receiving pre-market FDA approvals. The interaction of this sequence of events with others (across proprietary product



Note: Each new product has to pass through the FDA route twice before receiving FDA approval for commercial sale. First, for an investigational device exemption (IDE) which permits the researcher to conduct clinical trials, and second, for approval for marketing the device on a commercial basis (PMA). So far, the FDA has granted 6 IDEs and 2 PMAs. The paths connecting R&D and FDA for the IDEs have not been shown as this complicates the chart enormously. The PMA route is the most significant and important of the two and has been shown for the two products with PMA.

Figure 15.1 Sequence of Events in the Emergence of the Cochlear Implant Industry

Note

This figure shows events that unfolded across different tracks during the emergence of the cochlear implant industry as it appears in Garud and Van de Ven (1989).

development and market acceptance tracks) created a particularly difficult environment for firms. For instance, efforts by multiple firms to develop different kinds of cochlear implants generated considerable ambiguity (Garud and Van de Ven, 1992). As firms continued with their efforts to seek FDA approvals, others would pre-announce the future availability of superior devices. As a result, potential users took a "wait-and-see" attitude (what Rosenberg, 1982, has labeled "anticipatory retardation") resulting in sales that were less than anticipated. In addition, members of the deaf community rejected cochlear implants, as these devices threatened their culture. Eventually, the entanglement of events across the tracks led to the self-destruction of the emerging cochlear implant industry.

Overview of study 2: Whereas the cochlear implant study from MIRP examined events across tracks, the paper by Reymen et al. (2015) on the drivers of the innovation process in new ventures looked within one track. Specifically, they asked, *How do innovators decide what to do next, and how to move forward?* In this regard Sarasvathy (2001) proposed an effectual logic wherein actors start from their existing means to conceive potential ends and contrasted it with causal logic wherein actors take goals as primary and then select means. Reymen et al. (2015) reasoned that decision making is an iterative process with outcomes of one effort creating the conditions for new actions and decisions (Sarasvathy and Dew, 2005). To explore this empirically, the researchers reconstructed the histories of nine technology-based ventures by tracking events (defined as actions or decisions taken by the entrepreneurial team). Following procedures explicated by Poole et al. (2000), all events were coded for effectuation and causation dimensions using a detailed *coding scheme* and checking for inter-rater reliability.

The coded event sequences allowed the researchers to map the use of causation and effectuation over time showing that innovators typically relied more on effectual decision making early in the process and causal decision making later. The analysis also revealed that ventures made notable decision-making shifts along the journey. Further analysis revealed that these "turning points" were triggered by changes in stakeholder pressures, market uncertainty, and resource constraints. Overall, this analysis enabled the refinement and blending of process models to understand subtle changes in the use and combination of logics.

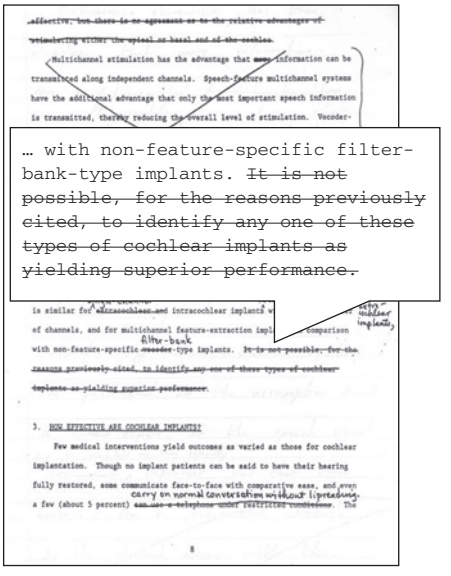
Summary. The two examples provide a deeper understanding of processes as observed during innovation journeys. One explores events across tracks within one context, whereas the other, within a single track across contexts. Both subscribe to the notion of symmetry in reporting and theorizing about successes and failures (Bijker et al., 1987). Although opening up the innovation black box, the event sequence approach that underlies both studies does not fully capture the journey as experienced by the participants. To understand how this could be accomplished, we examine other studies that embrace an experience-based view.

Process as experienced. The objective of such research is to appreciate innovation as a human endeavor. Experiences cannot be reduced to atomistic events, but instead must be understood as relational-temporal complexes that are formed and re-formed through actors' attempts at generating meaning. A strategy is to track experiences through ethnographic methods, and by following the narratives of the actors involved. Findings are reported in the form of "thick descriptions" of experiences (Geertz, 1994; Jarzabkowski et al., 2017). We provide two examples.

Overview of study 1: The first study is a spillover of one of the studies from the MIRP program. It is a study of how actors involved in the development of cochlear implants experienced their journeys during collective engagements. In this study, "events" are not changes in ideas, people, transactions, and outcomes *over* time (i.e., a departure from existing affairs), but instead a gathering of people and things *within* time (i.e., convergence of humans, artifacts, symbols, etc.).[3] Among other activities, it is during such moments that people express themselves formally and informally, articulate their positions publicly and privately, engage with one

another intensely, produce communiqués that may serve as speech acts, and demonstrate their products. Consequently, such gatherings are prime occasions for researchers to appreciate the experiences of the people involved.

This ethnographic study captures the narratives of the actors involved during and across conference settings. A researcher always enters phenomena "in the middle" (i.e., *mid res*), an actor-network theory position that this study explicitly adopts. Translation rather than diffusion characterizes the links that are made, broken, and constituted between social and material elements (Callon, 1987). Insights are abduced (Pierce, 1965) by juxtaposing the bits and pieces of lived experiences reported by participants and observed/recorded by the researcher against the bits and pieces of observations from academia. We show an example of such *collage work* in the form of a picture and text, which are reproduced from this study (Figure 15.2).



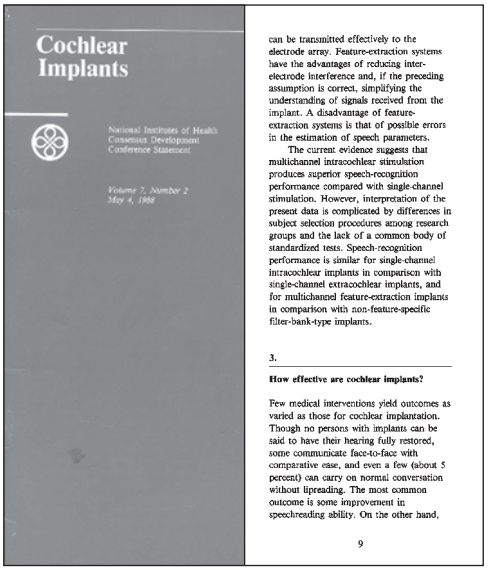


Figure 15.2 Demonstrations and Texts at Cochlear Implant Conferences

Notes
The first image is a photograph of demonstration activities unfolding during the XIII Otolaryngology Conference appearing in Garud (2008).
The second image is a copy of text that was circulated and edited to create an "immutable mobile" appearing in Garud (2008).

Overview of study 2: The second study examines an automotive company's 15-year journey to extend its automobile products with information-based services (e.g., using sensors measuring vehicle performance to advise drivers on fuel efficiency). One researcher followed the development of this program over two years using ethnographic methods (observing formal meetings and informal conversations, having interviews with all key actors involved, and collecting documents and artifacts). The company had well-established product development routines that resembled stage-gate processes (Cooper, 1990). Building on the performative perspective (Feldman and Pentland, 2003), these routines were not studied as entities or stable structures but as ongoing accomplishments in which some performances got temporarily stabilized (e.g., a new "tree routine"). Yet, there were differences in how the actors experienced the novelty of the program based on their past experiences, interests, and future aspirations. What some experienced as a necessary divergence from existing ways of working was considered by others as just a "sloppy performance." Such differences in how actors experienced current events in light of past routine performances appeared problematic, as routines were a means to engage and enroll other actors. Moreover, novel approaches appeared to have consequences for "downstream" routines (e.g., purchasing routines). Consequently, innovators had to anticipate intertemporal consequences for others. Overall, this study illustrates how experiences (comprising actions and events) stretch beyond discrete moments to invoke the past and the future.

Summary. Both studies use ethnographic methods to appreciate the lived experiences of the participants. This places an additional burden on researchers. What should they report and how? Any over-theorization does violence to the lived experiences of those involved. At the same time, reporting the raw experiences of innovation participants without any editorial work is also problematic as such an assemblage can clearly overwhelm readers.

Here, we see two different strategies employed by the authors of the two papers we reviewed. The first paper offers a *collage* of the experiences (as narrated by those in the field and observed by the researchers) juxtaposed against insights from academia. Such *collage work* by researchers must have some degree of internal coherence and some degree of external resonance with its audiences (both practitioners and academicians) so as to establish verisimilitude (Bruner, 1991). The second also takes a relational perspective, but the experiences of those involved are not presented as a collage. Instead they are used to develop an analytical scheme of different types of routine work to develop a process model of progression and breakdowns.

Hybrid approaches. In between process-as-observed and process-as-experienced approaches are studies that are hybrids. These are typically historical studies based on publicly available data (see Vaara and Lamberg, 2016, for different historical approaches for example). Specifically, they demonstrate how historical accounts can be used to "zoom in and out" (Nicolini, 2009) to open up the innovation black box. In doing so, they contextualize innovation journeys by identifying the motivations and strategies of engaged actors who took decisions and framed innovations as they emerged. Such studies are becoming all the more feasible with the availability of digital traces of what happened when, and who was involved (Garud et al., 2008; Pink et al., 2015). We believe that such techno-ethnography will become all the more prevalent over time (e.g., see Manning and Bejarano, 2016, on crowdfunding campaigns).

Overview of study 1: The paper by Hargadon and Douglas (2001) examines actors' framing based on historic data on the emergence of electrical lighting. The authors make a case for historical case studies, as they provide a perspective that covers the decades often necessary to observe an innovation's emergence and stabilization. At the same time, historical studies offer opportunities to examine emergent processes. Exploring innovations carefully highlights "the reciprocal links between the concrete actions of innovators and the social forces of the institutions they overturn" (Hargadon and Douglas, 2001: 480).

The authors note the possibility of distortion of facts and stories over time, or the problem that arises when concrete details that shape and constitute actions are not available or neglected. However, to the extent that events are well documented, as was the case with Edison's introduction of incandescent lighting, it is possible to examine the concrete details and actions of particular situations to understand the larger systems of meaning reflected in them. Indeed, the authors drew on data from a wide range of sources including compilations offering primary data on Edison's early efforts and newspaper accounts, secondary histories of Edison, and histories that tracked technological changes covering the demise of the gas industry and the concurrent rise of the electric industry.

This approach is well suited for the question asked on the interactions between institutions and innovations. Normative, cultural and regulatory institutions provide forces for continuity, whereas innovations act as forces for change. How these two forces interact provides an interesting tension that this paper explores. Other examples of historical studies include Leonardi's (2010) history of innovation in automotive safety testing, and several studies contained in the *Social Construction of Technological Systems* book (Bijker et al., 1987), such as Pinch and Bijker's (1987) story of the emergence of bicycles. The authors in this book locate themselves at unfolding moments in time during innovation journeys, so that their accounts could be written from the point of view of the actors who did not know future outcomes.

Overview of study 2: The second paper is a longitudinal study of critical events that unfolded over a 20-year period during the development of the ATLAS Experiment at CERN. The longitudinal analysis, which was based on archival data (generated in real-time by participants) led to an understanding of how "cycles of contestation and justification" made it possible for interdependent groups of scientists to make co-oriented technological choices in the development of this complex system.

To understand the process from the perspective of the people involved, the authors analyzed controversies they identified from meeting minutes, emails, and personal notes of scientists involved, much of it maintained in electronic form. Such zooming in (Nicolini, 2009) with the help of electronic records helped the authors make sense of the experiences of the people involved. To enable this analysis, the authors also zoomed out to establish connections between different events, which were not readily apparent by merely studying one temporal sequence. For example, such an approach made it possible to identify diachrony in the use of ideas that were not immediately useful but turned out to be solutions to problems encountered in a different context later.

Summary. These two studies show how it is possible to understand innovation processes as observed and as experienced simultaneously. Following Pepper (1942), events that have unfolded and their sequences provide the context for subsequent unfolding of actions. Both studies take a historical approach, which makes it possible to examine events over a period of time. In both cases, because experiences were recorded, the authors of these papers were able to report actors' experiences. In the ATLAS study, these included the experiences of the many different scientists and engineers from around the world. The Edison case, in contrast, examined how a central actor framed the innovation to deal with institutional forces. A comparison across the two highlights the increased demands being placed today on scholars to articulate the qualitative methods they used.

How Should We Decide Which Approach to Use?

Paraphrasing Korzybski (1958), the map that has emerged so far based on the various alternatives that we have reviewed is clearly not the territory. As may be evident, it is impossible to cover

all the nuanced details of the many different qualitative studies on innovation processes in this short piece. More importantly, our investigation of the articles highlights that there is no one method that suffices to fully understand innovation as process. Which then begs the question: *How should researchers decide which method to use?*

Clearly, what the researcher wants to know is one consideration. This is typically evident in the research questions asked. If the questions pertain to the causal factors underlying the emergence of innovation as outcomes, a variance approach is probably best suited for the purpose at hand. Exploring efficient causation between independent and dependent variables results in the generation of testable hypotheses and generalizable knowledge. However, if questions center on *how* innovation unfolds and/or the experiences of the people involved, then process methods might be more appropriate. For instance, tracking events and/or the narratives of the people involved can offer a contextualized understanding of the motivations and experiences of those engaged with innovation journeys.

In sum, the kinds of questions researchers pose (in variance or process terms for instance) influence their methods. Science and technology studies (STS) scholars note that the reverse is also true. That is, the methods we use to probe the world around us constitute and reinforce the assumptions that we have about phenomena, which Latour and Woolgar (1979) labeled "moments of inversion," i.e., rather than neutral mediators of the world as experienced, these methods constitute and reinforce the assumptions that we have about phenomena.

In other words, ontology and epistemology come in packages, and thus serve as a second consideration in the choice of methods. Researchers must be reflexive about such packages, as otherwise there is a potential for a mismatch between ontology and epistemology when the methods employed to explore phenomena are not suited for addressing the ontological positions implicit in the questions raised. One example is what Thompson (2011: 759) labeled the "fallacy of reification."

> Reification describes the attribution of entitative existence to processes – or transforming a social construct (such as an institution) into a thing with unquestioned, separable ontological existence and "phantom objectivity" (Lukács, 1967). Such a fallacy is described as a form of ontological drift since the ontological claims have drifted out of alignment with the appropriate epistemological lens.

In other words, the fallacy of reification occurs when researchers subscribe to process ontology, but use methods from an entity/substance epistemology. For instance, a study rooted in process ontology (e.g., innovation process being non-linear) that captures ups and downs of the innovation process by a survey item measuring the level of "bumpiness" could lead to a fallacy of reification. At the same time, there might also be a tendency to subscribe to entity/substance ontology while employing methods from a process epistemology. Thompson (2011: 760) noted that such misapplications generate a "fallacy of processification."

The scholarly conversation that researchers want to join is a third consideration in the choice of methods to employ. Problems may emerge when critics/reviewers subscribing to one onto-epistemology evaluate a study based on another. In other words, there might be a mismatch in the quality criteria in use by the authors as opposed to those used by reviewers. For instance, critics/reviewers who use criteria from variance theory may not favorably receive studies that document innovations as experienced. To accommodate the former, researchers may be tempted to adopt variance methods even while subscribing to process ontology (see Arend et al., 2015, for such a recommendation). But, such a "fallacy of reification" ends up contorting the phenomenon of innovation as process (Garud and Gehman, 2016). Instead, those who subscribe to

innovation as process must more forcefully articulate their onto-epistemological assumptions such as "verisimilitude" (Bruner, 1991), and the value of stories (Dyer and Wilkins, 1991), thereby signaling the criteria that must be applied to evaluate their scholarship.

A fourth consideration is axiology. Whereas ontology refers to our assumptions about phenomena, and epistemology about how we know phenomena, axiology refers to the values involved in our knowing, i.e., the ethics and aesthetics of the research we conduct (Rescher, 2005). For instance, is there a case to be made that innovation scholars have focused their attention to frame and address innovation studies around firm survival, and in the process ignored the wider ramifications of continual innovation on communities and societies at large? Posed in a different way, has the relentless process of creative destruction (Schumpeter, 1942) now resulted in destructive creation? Axiological considerations suggest that researchers must examine how their research methods and findings impact the communities they study, given that inquiry about phenomena can end up constituting them. Such performativity can be problematic, as it could do violence to the lived experiences of the people. Consequently, researchers must generate some reflexivity about the theories they deploy and methods they use.

Looking Back to Move Forward

Our examination of some of the past research reveals a variety of qualitative methods available to study the many different facets of innovation. We found that, even within a specific onto-epistemological package, researchers have to apply methods creatively to do justice to their settings. Going further, new research questions on innovation as distributed processes may require a re-examination of existing methods. In addition, researchers must consider the value statement implicit in the research they conduct from any specific onto-epistemological package.

For instance, looking forward, we might see more research that is reflexive of the values embedded in the onto-epistemological approaches we adopt. The recognition of grand challenges (Colquitt and George, 2011; Ferraro et al., 2015) such as sustainability and the innovations that ensue call for research that examines the lived experiences of the people involved. Such research efforts are all the more possible, given the availability of digital traces of people's experiences recorded on online social media, which can help researchers understand the experiences of people from all walks of life, including those at the bottom of the pyramid (Prahalad, 2006). In our opinion, onto-epistemological positions such as actor-network theory (Callon, 1987; Latour, 2005), narratives (Czarniawska, 1998; Vaara et al., 2016), and design approaches (Boland et al., 2008; Liedtka, 2015) that have the capacity to embrace the substance–process duality are required to capture the gradual but steady shifts that different communities can make and are making in meeting grand challenges such as sustainability.

Acknowledgments

Each author has contributed significantly to the development of this paper. We thank Mohammad Rezazade Mehrizi for his comments on an earlier draft of this paper. We offer a special note of thanks to Sanjay Jain and Raza Mir for their comments on an earlier version of this paper. We also thank many colleagues and collaborators who have influenced the ideas in this paper including Robert Chia, Joep Cornelissen, Fleur Deken, Joel Gehman, Marleen Huysman, Peter Karnoe, Arun Kumaraswamy, Ann Langley, Anup Nair, Barbara Simpson, Hari Tsoukas, Andy Van de Ven, members of the KIN Research Group at VU Amsterdam, and the Process Organization Studies (PROS) community that convenes each year in one of the Greek Islands to discuss and debate process research. The responsibility for the views expressed in this paper lies with its authors.

Notes

1 The distinction offered by Mohr obscures a complication that arises because of the polysemy associated with the term "process." The specific complication arises because scholars who conduct variance studies also use the term "process" when referring to models establishing causality between independent and dependent variables.
2 Our views on these issues are as follows. The qualitative/quantitative dimension is orthogonal to the inductive/deductive dimension. Data mining and pattern recognition can be driven by an inductive logic, for instance, and the provisional tests of a hypothesis using qualitative data (Yin, 1994) can be based on deductive logic. Besides, most research is a combination of induction, deduction and abduction.
3 The data collected during MIRP studies were such that they could allow for analysis from multiple onto-epistemological perspectives.

References

Abbott, A. 1984. Event sequence and event duration: Colligation and measurement. *Historical Methods: A Journal of Quantitative and Interdisciplinary History*, 17(4): 192–204.

Allison, G. T. 1971. *Essence of Decision: Explaining the Cuban Missile Crisis*. Boston, MA: Little, Brown and Company.

Arend, R. J., Sarooghi, H., and Burkemper, A. 2015. Effectuation as ineffectual? Applying the 3E theory-assessment framework to a proposed new theory of entrepreneurship. *Academy of Management Review*, 40(4): 630–651.

Belli, R. F. 1998. The structure of autobiographical memory and the event history calendar: Potential improvements in the quality of retrospective reports in surveys. *Memory*, 6(4): 383–406.

Bijker, W. E., Hughes, T. P., and Pinch, T. J. (eds.). 1987. *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. Cambridge, MA: MIT Press.

Block, J. H., Henkel, J., Schweisfurth, T. G., and Stiegler, A. 2016. Commercializing user innovations by vertical diversification: The user-manufacturer innovator. *Research Policy*, 45(1): 244–259.

Boland, R. J., Collopy, F., Lyytinen, K., and Yoo, Y. 2008. Managing as designing: Lessons for organization leaders from the design practice of Frank O. Gehry. *Design Issues*, 24(1): 10–25.

Brown, S. L. and Eisenhardt, K. M. 1997. The art of continuous change: Linking complexity theory and time-paced evolution in relentlessly shifting organizations. *Administrative Science Quarterly*, 42(1): 1–34.

Bruner, J. 1991. The narrative construction of reality. *Critical Inquiry*, 18(1): 1–21.

Callon, M. 1987. Society in the making: The study of technology as a tool for sociological analysis. In W. E. Bijker, T. P. Hughes, and T. J. Pinch (eds.), *Social Construction of Technological Systems*. Cambridge, MA: MIT Press, 83–104.

Callon, M. N., Law, J., and Rip, A. 1986. *Mapping the Dynamics of Science and Technology: Sociology of Science in the Real World*. London: Macmillan.

Chell, E. 2004. Critical incident technique. In C. Cassell and G. Symon (eds.), *Essential Guide to Qualitative Methods in Organization Studies*. London: Sage.

Chia, R. and Langley, A. 2004. The first Organization Studies summer workshop: Theorizing process in organizational research (call for papers). *Organization Studies*, 25(8): 1486.

Colquitt, J. A. and George, G. 2011. Publishing in AMJ – Part 1: Topic choice. *Academy of Management Journal*, 54(3): 432–435.

Cooper, R. G. 1990. Stage gate systems: A new tool for managing new products. *Business Horizons*, 33(3): 44–53.

Cornelissen, J. P. 2016. Preserving theoretical divergence in management research: Why the explanatory potential of qualitative research should be harnessed rather than suppressed. *Journal of Management Studies*, 54(23): 368–383.

Coyne, W. E. 1999. Foreword. In A. H. Van de Ven, D. E. Polley, R. Garud, and S. Venkataraman, *The Innovation Journey*. New York: Oxford University Press, vii–viii.

Czarniawska, B. 1998. *A Narrative Approach to Organization Studies*. Thousand Oaks, CA: Sage.

Deerwester, S., Dumais, S., Furnas, G. W., Landauer, T. K., and Harshman, R. 1990. Indexing by latent semantic analysis. *Journal of the American Society for Information Science*, 41(6): 391–407.

Deken, F., Carlile, P. R., Berends, H., and Lauche, K. 2016. Generating novelty through interdependent routines: A process model of routine work. *Organization Science*, 27(3): 659–677.

Dougherty, D. and Dunne, D. D. 2011. Organizing ecologies of complex innovation. *Organization Science*, 22(5): 1214–1223.

Dyer, W. G. and Wilkins, A. L. 1991. Better stories, not better constructs, to generate better theory: A rejoinder to Eisenhardt. *Academy of Management Review*, 16(3): 613–619.

Einstein, A. and Infeld, L. 1938. *The Evolution of Physics*. Cambridge: Cambridge University Press.

Eisenhardt, K. M. 1989. Building theories from case study research. *Academy of Management Review*, 14: 532–550.

Eisenhardt, K. M., Graebner, M. E., and Sonenshein, S. 2016. Grand challenges and inductive methods: Rigor without rigor mortis. *Academy of Management Journal*, 59(4): 1113–1123.

Feldman, M. S. and Pentland, B. T. 2003. Reconceptualizing organizational routines as a source of flexibility and change. *Administrative Science Quarterly*, 48(1): 94–118.

Ferraro, F., Etzion, D., and Gehman, J. 2015. Tackling grand challenges pragmatically: Robust action revisited. *Organization Studies*, 36(3): 363–390.

Garud, R. 2008. Conferences as venues for the configuration of emerging organizational fields: The case of cochlear implants. *Journal of Management Studies*, 45(6): 1061–1088.

Garud, R. and Gehman, J. 2016. Theory evaluation, entrepreneurial processes, and performativity. *Academy of Management Review*, 41(3): 544–549.

Garud, R. and Rappa, M. A. 1994. A socio-cognitive model of technology evolution: The case of cochlear implants. *Organization Science*, 5(3): 344–362.

Garud, R. and Van de Ven, A. H. 1989. Technological innovation and industry emergence: The case of cochlear implants. In A. H. Van de Ven, H. L. Angle, and M. S. Poole (eds.), *Research on the Management of Innovation: The Minnesota Studies*. New York: Harper and Row, 489–535.

Garud, R. and Van de Ven, A. H. 1992. An empirical evaluation of the internal corporate venturing process. *Strategic Management Journal*, 13: 93–109.

Garud, R., Gehman, J., Kumaraswamy, A., and Tuertscher, P. 2017. From the process of innovation to innovation as process. In A. Langley and H. Tsoukas (eds.), *The Sage Handbook of Process Organization Studies*. Thousand Oaks, CA: Sage, 451–465.

Garud, R., Jain, S., and Tuertscher, P. 2008. Designing for incompleteness and incomplete by design. *Organization Studies*, 29(3): 351–371.

Garud, R., Tuertscher, P., and Van de Ven, A. H. 2013. Perspectives on innovation processes. *The Academy of Management Annals*, 7(1): 775–819.

Geertz, C. 1973. *The Interpretation of Cultures*. New York: Basic Books.

Geertz, C. 1994. Thick description: Toward an interpretive theory of culture. In M. Martin and L. C. McIntyre (eds.), *Readings in the Philosophy of Social Science*. Cambridge, MA: MIT Press, 213–231.

Gerring, J. 2007. *Case Study Research: Principles and Practices*. Cambridge: Cambridge University Press.

Gioia, D. A., Corley, K. G., and Hamilton, A. L. 2013. Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational Research Methods*, 16(1): 15–31.

Glaser, B. and Strauss, A. 1967. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago, IL: Aldine.

Golden-Biddle, K. and Locke, K. 2007. *Composing Qualitative Research*. Thousand Oaks, CA: Sage.

Hargadon, A. B. and Douglas, Y. 2001. When innovations meet institutions: Edison and the design of the electric light. *Administrative Science Quarterly*, 46(3): 476–501.

Huber, G. P. and Power, D. J. 1985. Retrospective reports of strategic-level managers: Guidelines for increasing their accuracy. *Strategic Management Journal*, 6(2): 171–180.

Jarzabkowski, P., Lê, J., and Spee, P. 2017. Taking a strong process approach to analyzing qualitative process data. In A. Langley and H. Tsoukas (eds.), *The Sage Handbook of Process Organization Studies*. Thousand Oaks, CA: Sage, 237–253.

Kieser, A. 1994. Why organization theory needs historical analyses: And how this should be performed. *Organization Science*, 5(4): 608–620.

Klag, M. and Langley, A. 2013. Approaching the conceptual leap in qualitative research. *International Journal of Management Reviews*, 15(2): 149–166.

Korzybski, A. 1958. *Science and Sanity: An Introduction to Non-Aristotelian Systems and General Semantics*. Lakeville, CT: Institute of General Semantics.

Langley, A. 1999. Strategies for theorizing from process data. *Academy of Management Review*, 24(4): 691–710.

Langley, A. and Abdallah, C. 2011. Templates and turns in qualitative studies of strategy and management. In D. D. Bergh and D. J. Ketchen (eds.), *Building Methodological Bridges*, Research Methodology in Strategy and Management, 6. Bingley, UK: Emerald, 201–235.

Langley, A., Smallman, C., Tsoukas, H., and Van de Ven, A. H. 2013. Process studies of change in organization and management: Unveiling temporality, activity, and flow. *Academy of Management Journal*, 56(1): 1–13.

Latour, B. 1987. *Science in Action: How to Follow Scientists and Engineers through Society*. Cambridge, MA: Harvard University Press.

Latour, B. 2005. *Reassembling the Social*. New York: Oxford University Press.

Latour, B. and Woolgar, S. 1979. *Laboratory Life: The Social Construction of Scientific Facts*. Beverly Hills, CA: Sage.

Leonardi, P. M. 2010. From road to lab to math: The co-evolution of technological, regulatory, and organizational innovations for automotive crash testing. *Social Studies of Science*, 40(2): 243–274.

Lichtenstein, B. B., Dooley, K. J., and Lumpkin, G. T. 2006. Measuring emergence in the dynamics of new venture creation. *Journal of Business Venturing*, 21(2): 153–175.

Liedtka, J. 2015. Perspective: Linking design thinking with innovation outcomes through cognitive bias reduction. *Journal of Product Innovation Management*, 32(6): 925–938.

Lukács, G. 1967. Reification and the consciousness of the proletariat. In G. Lukács (ed.), *History and Class Consciousness*. New York: Pegasus, 240–269.

Manning, S. and Bejarano, T. A. 2016. Convincing the crowd: Entrepreneurial storytelling in crowdfunding campaigns. *Strategic Organization*. https://doi.org/10.1177/1476127016648500.

Miles, M. B. and Huberman, A. M. 1994. *Qualitative Data Analysis: An Expanded Sourcebook*. Thousand Oaks, CA: Sage.

Mohr, L. B. 1982. *Explaining Organizational Behavior: The Limits and Possibilities of Theory and Research*. San Francisco, CA: Jossey-Bass.

Morgeson, F. P., Mitchell, T. R., and Liu, D. 2015. Event system theory: An event-oriented approach to the organizational sciences. *Academy of Management Review*, 40(4): 515–537.

Nicolini, D. 2009. Zooming in and out: Studying practices by switching theoretical lenses and trailing connections. *Organization Studies*, 30(12): 1391–1418.

Pepper, S. C. 1942. *World Hypotheses: A Study in Evidence*. Berkeley, CA: University of California Press.

Pettigrew, A. M. 1990. Longitudinal field research on change: Theory and practice. *Organization Science*, 1(3): 267–292.

Pierce, C. S. 1965. *Collected Papers of Charles Sanders Peirce, vols. 1–8*. Cambridge, MA: Belknap Press.

Pinch, T. J. and Bijker, W. E. 1987. The social construction of facts and artifacts: Or how the sociology of science and the sociology of technology might benefit each other. In W. E. Bijker, T. P. Hughes, and T. J. Pinch (eds.), *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. Cambridge, MA: MIT Press, 17–50.

Pink, S., Horst, H., Postill, J., Hjorth, L., Lewis, T., and Tacchi, J. 2015. *Digital Ethnography: Principles and Practice*. Thousand Oaks, CA: Sage.

Poole, M. S., Van de Ven, A. H., Dooley, K. J., and Holmes, M. E. 2000. *Organisational Change and Innovation Processes: Theory and Methods for Research*. Oxford: Oxford University Press.

Prahalad, C. K. 2006. *The Fortune at the Bottom of the Pyramid*. Upper Saddle River, NJ: Wharton School Publishing.

Pratt, M. G. 2009. From the Editors: For the lack of a boilerplate: Tips on writing up (and reviewing) qualitative research. *Academy of Management Journal*, 52(5): 856–862.

Rescher, N. 1996. *Process Metaphysics: An Introduction to Process Philosophy*. New York: SUNY Press.

Rescher, N. 2005. *Value Matters: Studies in Axiology*. Frankfurt: Ontos Verlag.

Reymen, I. M. M. J., Andries, P., Berends, H., Mauer, R., Stephan, U., and van Burg, E. 2015. Understanding dynamics of strategic decision making in venture creation: A process study of effectuation and causation. *Strategic Entrepreneurship Journal*, 9(4): 351–379.

Rheinhardt, A., Kreiner, G. E., Gioia, D. A., and Corley, K. G. Forthcoming. Conducting and publishing rigorous qualitative research. In C. Cassell, A. L. Cunliffe, and G. Grandy (eds.), *The SAGE Handbook of Qualitative Business and Management Research Methods*. Thousand Oaks, CA: Sage.

Rosenberg, N. 1982. *Inside the Black Box: Technology and Economics*. Cambridge: Cambridge University Press.

Sandberg, J. and Tsoukas, H. 2011. Grasping the logic of practice: Theorizing through practical rationality. *Academy of Management Review*, 36(2): 338–360.

Sarasvathy, S. D. 2001. Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of Management Review*, 26(2): 243–263.

Sarasvathy, S. D. and Dew, N. 2005. New market creation through transformation. *Journal of Evolutionary Economics*, 15(5): 533–565.

Schumpeter, J. A. 1942. *Capitalism, Socialism, and Democracy*. New York: Harper & Row.

Thompson, M. 2011. Ontological shift or ontological drift? Reality claims, epistemological frameworks, and theory generation in organization studies. *Academy of Management Review*, 36(4): 754–773.

Trochim, W. 1989. Outcome pattern matching and program theory. *Evaluation and Program Planning*, 12: 355–366.

Tsoukas, H. and Chia, R. 2002. On organizational becoming: Rethinking organizational change. *Organization Science*, 13(5): 567–582.

Tuertscher, P., Garud, R., and Kumaraswamy, A. 2014. Justification and interlaced knowledge at ATLAS, CERN. *Organization Science*, 25(6): 1579–1608.

Tushman, M. L. and Anderson, P. 1986. Technological discontinuities and organizational environments. *Administrative Science Quarterly*, 31(3): 439–465.

Utterback, J. M. and Abernathy, W. J. 1975. Dynamic model of process and product innovation. *Omega: International Journal of Management Science*, 3(6): 639–656.

Vaara, E. and Lamberg, J.-A. 2016. Taking historical embeddedness seriously: Three historical approaches to advance strategy process and practice research. *Academy of Management Review*, 41(4): 633–657.

Vaara, E., Sonenshein, S., and Boje, D. M. 2016. Narratives as sources of stability and change in organizations: Approaches and directions for future research. *The Academy of Management Annals*, 10(1): 495–560.

Van de Ven, A. H. 1992. Suggestions for studying strategy process: A research note. *Strategic Management Journal*, 13: 169–188.

Van de Ven, A. H. and Poole, M. S. 1990. Methods for studying innovation development in the Minnesota Innovation Research Program. *Organization Science*, 1(3): 313–335.

Van de Ven, A. H. and Poole, M. S. 1995. Explaining development and change in organizations. *Academy of Management Review*, 20(3): 510–540.

Van de Ven, A. H. and Poole, M. S. 2005. Alternative approaches for studying organizational change. *Organization Studies*, 26(9): 1377–1404.

Van de Ven, A. H., Polley, D., Garud, R., and Venkataraman, S. 1999. *The Innovation Journey*. New York: Oxford University Press.

Van Maanen, J. 1988. *Tales of the Field: On Writing Ethnography*. Chicago, IL: University of Chicago Press.

Vaughan, D. 1992. Theory elaboration: The heuristics of case analysis. In C. C. Ragin and H. S. Becker (eds.), *What Is a Case? Exploring the Foundations of Social Inquiry*. Cambridge: Cambridge University Press, 173–202.

Webb, E. and Weick, K. E. 1979. Unobtrusive measures in organizational theory: A reminder. *Administrative Science Quarterly*, 24(4): 650–659.

Weick, K. E. 1989. Theory construction as disciplined imagination. *Academy of Management Review*, 14(4): 516–531.

Yin, R. K. 1993. *Applications of Case Study Research*. Thousand Oaks, CA: Sage.

Yin, R. K. 1994. *Case Study Research: Design and Methods* (2nd ed.). Thousand Oaks, CA: Sage.

Yoo, Y., Boland, R. J., Lyytinen, K., and Majchrzak, A. 2012. Organizing for innovation in the digitized world. *Organization Science*, 23(5): 1398–1408.