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LONGITUDINAL FIELD RESEARCH METHODS FOR STUDYING PROCESSES OF ORGANIZATIONAL CHANGE*

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Study of organizational change tends to focus on two kinds of questions.

(1) What are the antecedents or consequences of changes in organizational forms or administrative practices?
(2) How does an organizational change emerge, develop, grow or terminate over time?

Although the vast majority of research to date has focused on the first question, recently there has been a growing interest in studying the second question. The "How" question is concerned with describing and explaining the temporal sequence of events that unfold as an organizational change occurs. Process studies are fundamental to gaining an appreciation of dynamic organizational life, and to developing and testing theories of organizational adaptation, change, innovation, and redesign. This special issue of *Organization Science* focuses on longitudinal field research methods to study processes of organizational change.

In terms of an input-process-output model, the first question focuses on the inputs and outcomes of change, while the second examines the process of change. The first question usually entails a "variance theory" (Mohr 1982) explanation of the input factors (independent variables) that statistically explain variations in some outcome criteria (dependent variables). The second question requires a "process theory" explanation of the temporal order and sequence in which a discrete set of events occurred based on a story or historical narrative (Abbott 1988). In terms of causality, the first question requires evidence of covariation, temporal precedence, and absence of spurious associations between the independent and dependent variables (Blalock 1972), while the second question explains an observed sequence of events in terms of some underlying generative mechanisms or laws that have the power to cause events to happen in the real world and the particular circumstances or contingencies when these mechanisms operate (Tsouskas 1989).

A few examples will clarify these and other important distinctions between the two questions and how researchers often address them. A typical formulation of the first question might be, "Do yearly increases in R & D funding (an input) increase organizational innovativeness (an outcome)?" To answer this question, R & D funding and innovativeness are operationalized as independent and dependent variables, respectively, which are measured on numerical scales at different points in time. Changes in states of these variables can be calculated as the differences between scores obtained at various points in time on each variable. As Monge suggests in this issue, these change scores on a variable can be examined in terms of their continuity, magnitude, rate of change, trend, periodicity, and duration. Then one can use a

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variety of dynamic models to examine how changes in one or more of these dimensions of R & D investment precede similar changes in a lagged innovativeness variable.

However, Monge importantly distinguishes this class of so-called "process theories" about changes in variables over time from another class of process theories which focuses on sequences of events or stages to understand our second question. For example, with this second question we might ask, "Do product innovations develop through a characteristic sequence of events or stages, such as invention, prototype development, testing, commercialization, and so on?" To address this question, one would gather data on the chronological sequence of activities or steps that occurred throughout an organizational change period—here the development of product innovations. The observed activities could be coded as indicators of a discrete set of events about product development stages. The order and sequence of these events for each innovation could then be identified, and compared with the event sequences of different product innovations. As Abbott discusses in his paper, these comparisons could be made with a variety of pattern matching methods for examining various characteristics of event sequences, such as event categories, duration, order and recurrence. Further comparisons could involve subsequences or reoccurring strings of events (i.e., stages) in the overall product innovation event sequences.

In this example, one could decompose the product development process into a series of input-output analyses by viewing each event as a change in a variable (i.e., as the difference between nonexistence at the beginning state and existence at the ending state of each event), and then examining if changes on each of these dichotomous variables are explained by some other independent variables (such as R & D investment in our first example). From this perspective, events represent changes in variables and these changes are the building blocks of process in an input-process-output model. But since our process question is not whether, but *how*, a change occurred, we first need a story that narrates the sequence of events that unfolded as the product innovation emerged. Once the sequence or pattern of events in a developmental process is found to exist, one can turn to questions about what the causes or consequences are of the events within the process pattern. In general, to understand how an organizational change occurs, Abbott suggests that researchers alter their typical methods of analysis. Rather than first generalize in terms of variables, he states one should first generalize in terms of a narrative history or a story. Only in this way will the key properties of order and sequence of events be preserved in making theoretical generalizations about processes of organizational change. Of course alternative processes can lead to the same change outcomes, an application of the Principle of Equifinality.

While clearly different in substances and method, our two introductory questions are highly related, and both are important for understanding organizational change. To answer the first question, one typically assumes or hypothesizes an answer to the second question. Whether implicit or explicit, the logic which underlies an answer to the first question inevitably consists of a process story about how a sequence of events unfold to cause an independent (input) variable to exert its influence on a dependent (outcome) variable. For example, to say that R & D investment causes organizational innovativeness is to make important assumptions about the order and sequence in which R & D investment and innovation events unfold in an organization. Thus, one way to significantly improve the robustness of answers to the first question (which has been the most frequent kind of question examined by organization scientists), is to explicitly examine the process theory that is assumed to explain why an independent (input) variable causes a dependent (output) variable. To do so requires opening the proverbial "black box" between inputs and outcomes, and to take process seriously by examining temporal sequences of events.

Continuing with the relatedness of the introductory questions, we note that process studies which provide answers to the second question tend to be either meaningless or irrelevant without an answer to the first question. Indeed, as Pettigrew argues in his paper, theoretically sound and practically useful research on change should explore the contexts, content, and process of change together with their interconnections through time. Just as change is only perceptible relative to a state of constancy, an appreciation of a temporal sequence of events requires understanding the starting (input) conditions and ending (outcome) results. In short, answers to both questions are needed to appreciate the inputs, processes, and outcomes of organizational changes being studied.

A basic problem, however, is that while methods for examining the first question are well known and codified in standard research methodology texts, relatively little attention has been given to developing methods for conducting research on the second question. Few guidelines are available to researchers interested in studying processes of change in organizations. As a consequence, researchers undertaking process studies have been developing their own methods through trial-and-error. With the growing interest in developmental processes, we believe it is time to articulate the results of experience, to carefully assess their scientific standards, and make them available to others about to undertake longitudinal field studies of organizational change processes.

This and the next issue of *Organization Science* contain eight papers that are grouped into two areas: (1) five papers appearing in this issue (Volume 1, Number 3) focus on the design and conduct of longitudinal research in the field, and (2) three papers that will appear in Volume 1, Number 4, deal with methods to analyze and interpret process patterns in longitudinal data collected in the field. The five papers in this issue feature the theory of method and practice of researchers engaged in longitudinal field studies aimed at understanding processes of organizational change. The first two of these papers describe studies being undertaken by individual researchers engaged in tracking processes of technology adoption (Barley) and transfer (Leonard-Barton). The next three papers describe large research programs involving multiple teams of researchers studying processes of strategic corporate change (Pettigrew), organizational redesign (Glick, Huber, Miller, Doty, and Sutcliffe), and innovation (Van de Ven and Poole) in many different sites.

While there is some inevitable overlap, each of the five papers emphasizes a different set of methodological issues involved in conducting longitudinal field research on organizational processes. Among the methods that can be used to observe organizational processes in the field, this special issue includes papers which focus on ethnographic methods (Barley), longitudinal and comparative case studies (Leonard-Barton and Pettigrew), event history analysis (Glick, et al.), and real-time tracking of events as they occur over time (Van de Ven and Poole). The papers also address various methods and analytical procedures that can be used to tabulate, code, and interpret both quantitative and qualitative longitudinal data collected in the field. Taken together, they provide rich insights into the practical problems and methods experienced in conducting longitudinal field work and in analyzing data to empirically examine processes of organizational change. In this regard, we asked authors of these papers to be especially revealing and evaluative of their methodologies, to make their work open for scrutiny so that readers could profit from what the authors learned.

Design and Conduct of Longitudinal Research in the Field

Papers on the five longitudinal field studies can be arrayed on a continuum, from the Barley paper that describes how an investigator serves as the observer and interpreter of the process, to the Glick, et al. paper that describes how investigators

use participants as observers and interpreters of the process. In either case, the investigator faces the problems of the observer's perceptual and cognitive limitations, and also the problem of the observer not being aware of some key events. Both of these problems occur, of course, whether the observer is the investigator or a participant in a change process. In addition, each approach has unique problems. The investigator-as-observer faces the problems of influencing the system being observed and of correctly interpreting what is observed. Barley and Leonard-Barton candidly discuss these matters in the context of their studies. In contrast, the investigator as the user of participants as key informants faces the problems of identifying the best informants and ensuring that they correctly understand the investigator's queries and that they provide veridical answers. Glick and his associates candidly discuss these matters in the context of their study.

Longitudinal data collection exacerbate a variety of inherent weaknesses in field observation methods. As the paper by Barley makes explicit, if you are sensed by a social system, then you are part of it. If you are part of it, you affect it. If you affect it, you cannot observe the system in its natural state and can report only the processes of a disturbed system. This is the social science equivalent of the Heisenberg Principle, a "fact" universally accepted in the physical sciences as having no exceptions. It is, of course, much more of a problem in social sciences, where one's presence is so apparent. Barley, in particular, describes how he minimized it under difficult circumstances.

A host of additional important theoretical and practical problems need to be addressed in conducting longitudinal field research. They include questions of how to deal with time, site selection, choices about data collection and degrees of involvement, the importance of clarifying research outputs, audience, and presentation, and finally handling the problems of complexity and simplicity associated with longitudinal comparative studies on change. As a consequence, the mobilization of ongoing support and participation in a longitudinal field study requires researchers to develop an extensive set of craft skills. Based on his experiences in carrying out longitudinal field studies for a score or more years, Pettigrew discusses his evolving theory of method which articulates these craft skills required to study organizational change while in the field.

The sheer labor intensity required to observe an organizational change process over time limits a researcher's capabilities to study more than a few cases at a time. As a result a serious question is often raised about the generalizability of an in-depth case study, and what kinds of inferences can be drawn not only to a larger population but also to a process theory being examined in the research. And given the fact that qualitative event data are slippery and ambiguous symbols, problems of researcher bias and replicability loom quite large.

To address these problems, Leonard-Barton describes a "case replication" methodology to test the generality of particular findings from a single longitudinal case study by examining if these findings are present in other cases studied retrospectively. Such an approach attempts to minimize the limitations and maximize the benefits of longitudinal and retrospective case studies, when conducted separately. While this methodology makes it possible for a single researcher to generalize key findings and economize field work, Leonard-Barton addresses two thorny problems with this method: (1) selecting other cases on spatial and temporal criteria that permit meaningful comparisons with the findings from the longitudinal case, and (2) comparing process findings obtained from real-time observations with retrospective observations.

An alternative approach is to maximize the generalizability of a longitudinal field study by obtaining retrospective event histories on hundreds of organizational changes

and sacrificing in-depth knowledge of how individual changes unfolded. This approach was adopted by Glick et al. in their longitudinal study of a wide variety of changes in a diverse set of organizations and industries. As the authors report, this large scale nomothetic research strategy was chosen to address our first introductory question; namely what are the antecedent conditions and consequences of changes across a variety of organizational forms, contexts, and leaders. Retrospective event histories were obtained through periodic interviews to capture the major events in each change process, and their antecedents and consequences were examined with longitudinal data on organization forms, contexts, and leaders.

Examining Temporal Processes in Longitudinal Field Data

Whatever sampling strategies and data collection methods are used to observe change processes in the field, all the authors report that over time data mount astonomically and are beyond the information processing capacity of even a trained human mind. Rigorously drawing inferential links between these data and theory requires methods which go beyond subjective "eyeballing" of raw qualitative data to identify process patterns. Unfortunately, data anlaysis methods are rarely reported in detail in published case studies or ethnographic reports. One cannot ordinarily follow how a researcher got from 5,000 pages of field observations to the final conclusions, even though they may be sprinkled with vivid—yet idiosyncratic—quotes from organizational participants. Given the sheer volume of data amassed in a typical longitudinal study of an organizational change process, most research reports violate a basic canon of scientific reporting which demands presentation of the data as distinct from analyses and inferences drawn from those data.

The papers by Van de Ven and Poole in this issue, as well as those by McPhee, Monge, and Abbott in the next issue, address methods and standards for analyzing longitudinal data. Based on their experiences in the Minnesota Innovation Research Program, Van de Ven and Poole focus on methods for transforming raw data obtained from longitudinal field studies into a form useful for examining process theories of innovation development. They propose seven specific steps to tabulate and code qualitative data into a chronological event sequence, and to transform these qualitative data into a quantitative form which permits the application of well-established methods of time series analyses to systematically examine time-dependent patterns of relationships among event sequences and stages.

Whereas these steps provide a systematic way to examine the order and sequence of events over time *within* a given case, McPhee addresses the problem of how to draw comparisons *between* different cases of organizational innovation or change. While methods for comparing different cases are relatively straightforward when they simply represent different data points that all fit the same research model, McPhee addresses the more complex and interesting situations when the cases were studied by different research teams who had different explanations or conceptual images in mind when designing and conducting their studies. The latter situations are particularly relevant where multisite, multimethod, and multiteam programmatic research are undertaken, such as in Pettigrew's research centre on the management of strategic change, Huber and Glick's program of research on change in organizational design and effectiveness, and Van de Ven's Minnesota Innovation Research Program. McPhee proposes three different approaches for comparing and integrating cases, and a useful set of diagnostic methods for determining the possibilities and limitations of each approach.

Finally, papers by Monge and Abbott provide two useful and complementary primers of the analytical concepts and techniques available to examine dynamic

theories about changes in variables and process theories about sequences of events or stages. In addition to the contributions already summarized in this introduction, Monge importantly points out that one reason why organization science has made little progress in developing dynamic process theories is because its tool kit has largely been limited to verbal or linguistic analysis and correlational research at a single point in time. He focuses on the time-dependent processes of how individual variables may change over time, and then explores dynamic relationships between process related variables across time: their history, the time lag, rate of change, magnitude of change, and the permanence of change. He also discusses the important issue of feedback in process theories, and concludes with a typology of alternative methods for analyzing process data.

Abbott provides a useful primer for introducing organization scientists to the basic logic and methods entailed in studying processes of organizational change. He alerts us to an important deficiency in most analyses of organizational change and change processes, namely that the history of how an initial state came to be is oftentimes critical when using this state to predict a change in a later state. This fact is not accounted for in the Markovian thinking that underlies most of the analytic techniques currently used by organization scientists in their studies of change processes. To diminish this obstacle to developing process theories, Abbott articulates the need to think in terms of processes (sequences of events) and provides guidance in the conceptualization, measurement, and analyses of sequences.

Conclusion

The initial ideas that lead to the papers in this special *Organization Science* issue were presented and discussed at a conference sponsored by the National Science Foundation held May 1988 in Austin, Texas. During this conference, it became clear that a number of philosophy of science debates underlie the research problems and methods introduced above. These debates appeared to turn on the different meanings of the terms "process," "change," and "causality," and were manifest in disagreements about the merits and demerits of: (1) variables and quantitative data versus events and qualitative stories, (2) deductive versus inductive theory building, (3) biases in retrospective data versus the obtrusiveness of real-time participant observations, (4) generalizations to cases versus theories, (5) causal modeling versus historical narratives, and (6) theory-bound versus theory-free methods.

Some of these debates can be dissolved when it is recognized that different methods are appropriate for addressing different aspects of our two introductory questions about the inputs and outcomes of change versus the process of change. Moreover, answers to the two questions depend upon one another. Pragmatically, this suggests that if we are to gain an understanding of the inputs, processes, and outcomes of organizational change, we will be better off expanding our tool kits of concepts and methods instead of pursuing a "law of the hammer," which vainly assumes that all questions can be addressed equally well with one tool, usually the one we personally know best. These and other important philosophical issues will, no doubt, arise in connection with the papers in this special issue.

Following the conference, all papers were drafted and then evaluated using the standard *Organization Science* anonymous review process. However, to the extent possible, we exercised our editorial degree of freedom by encouraging authors not to focus on philosophical issues and debates. Instead, we encouraged the authors to describe and critically evaluate their research practice and methods, with emphasis on advancing pragmatically workable techniques and approaches. We believe these applications can guide future research and take us a step ahead in understanding the

inputs, processes, and outcomes of variety of important changes that organizations are undergoing at an increasing rate.

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