Engaged Scholarship: A Guide for Organizational and Social Research
Oxford University Press, forthcoming 2007

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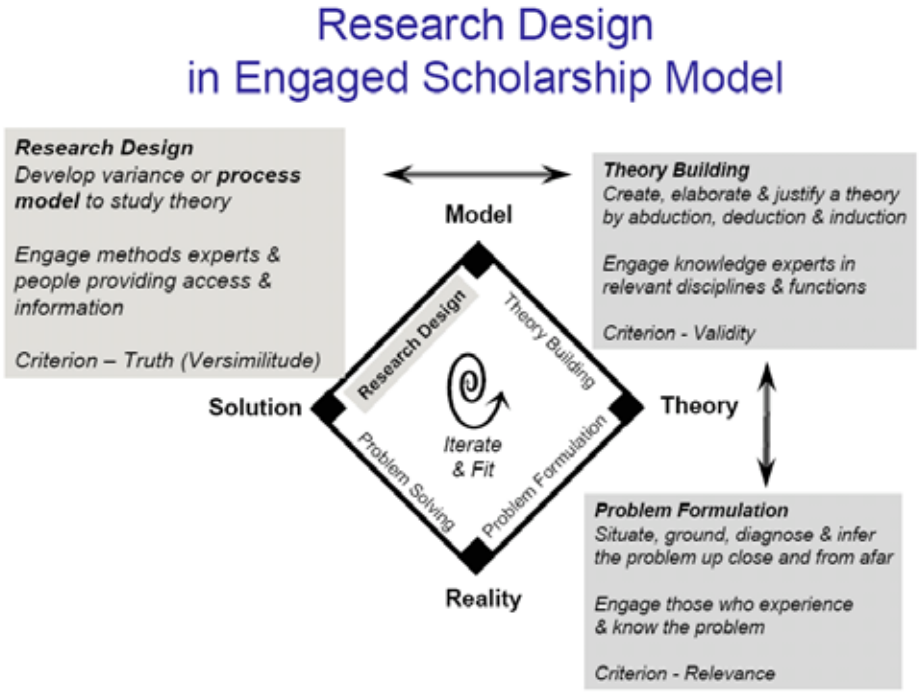

Chapter 7. Designing Process Studies

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There is a growing interest in understanding processes of change and development in individuals, groups, organizations, and other social entities. Process studies are undertaken to examine research questions dealing with how things change and develop over time. Chapter 5 reviewed the philosophical assumptions underlying process research and how they differ from variance models. This chapter discusses some of the operational issues and decisions involved in designing process models to either develop or test a process theory. These issues, outlined in Table 7.1, include: clarifying the meanings and theories of process, designing field studies to address process questions, observing and collecting data about process events over time, and analyzing these data into coherent and useful process theories.[1] By necessity these issues are discussed in sequential order. In practice they are highly interdependent and need to be treated in an iterative manner. Poole, Van de Ven, Dooley, and Holmes (2000) provide a more detailed book-length treatment of these issues.

<Table 7.1>

Following a discussion of the process research design issues listed in Table 7.1, this chapter presents an example of designing a study to evaluate an influential process model of organizational growth developed by Greiner (1972). The example also illustrates how valuable insights and learning can be gained by engaging in conversations with others when designing research--in this case between the process theorist (Prof. Larry E. Greiner) and modeler (me).

The chapter concludes on a motivational note addressing concerns often expressed by junior faculty and doctoral students about the amounts of time, resources, and contacts needed to conduct longitudinal process studies. Process questions of how things change and develop over time require longitudinal data that can be obtained either from historical archival files or from a real-time field study of a change process. Whether the data are obtained from archival sources or from field studies, I advise researchers not

[1] This discussion does not exhaust the issues that confront process researchers, but in my experience it covers most of the critical choices in designing field process studies of organizational innovation and change. Other good sources for designing longitudinal organizational studies include Galtung (1967), Huber and Van de Ven (1995), Kimberly and Miles (1980), and Miller and Friesen (1982).

to go it alone; instead, they should engage and collaborate with other scholars (typically senior colleagues) who are conducting process studies or have access to longitudinal process data.

Formulating the Research Plan

1. Clarify Meanings of Process

Process studies are centrally concerned with how change unfolds in the entities or things being studied. This chapter focuses on organizational change to exemplify methods for designing process studies. *Organizational change is defined as a difference in form, quality, or state over time in an organizational entity* (Van de Ven & Poole, 1995). The entity may be an individual's job, a work group, an organizational subunit, strategy, or product, the overall organization, or a community or population of organizations. Change can be empirically determined by longitudinal observations of the entity over two or more points in time on a set of dimensions, and then noticing a difference over time in these dimensions. If there is a noticeable difference we can say that the entity has changed. Much of the voluminous literature on organizational change focuses on the nature of this difference, and the processes that explain how it unfolds.

Two different definitions of 'process' are often used to explain change: (1) a category of concepts or variables that pertain to actions and activities, and (2) a narrative describing how things develop and change (Van de Ven, 1992). As discussed in Chapter 5, when the first definition is used, process is typically associated with a 'variance theory' methodology (Mohr, 1982), where an outcome-driven explanation examines the degrees to which a set of independent variables statistically explain variations in some outcome criteria (dependent variables). The second meaning of process takes an event-driven approach that is often associated with a 'process theory' explanation of the temporal order and sequence of change events based on a story or narrative (Abbott, 1988; Pentland, 1999; Poole et al., 2000; Tsoukas, 2005). These two definitions represent very different views of process, and the definition that researchers adopt influences the questions they ask, the research methods they employ, and the contributions they make. Hence, at the outset of a study, it is important to clarify the meanings of process.

a. *Process as a Category of Concepts*

Studies of process in the social sciences typically treat process as a category of concepts of individual and organizational actions, such as communication frequency, work flows, decision making techniques, as well as strategy formulation, implementation, and corporate venturing. In this usage, process refers to a category of concepts that can be distinguished from other categories of concepts, such as organizational environment, structure, and performance. Like these other categories, process concepts are operationalized as variables and measured as fixed entities (variables), the attributes of which can vary along numerical scales from low to high.

Studies that adopt this definition of process typically examine research questions dealing with the antecedents or consequences of change. As discussed in Chapters 5 and 6, these kinds of questions call for a variance research design of the causal factors (independent variables) that statistically explain variations in some outcome criteria (dependent variables).

Some researchers who are wedded to defining process as a category of concepts may argue that one can decompose an observed sequence of events into a series of input-process-output analyses by viewing each event as a change in a variable (e.g., as the difference between nonexistence at the beginning state and existence at the ending state of the entity) and then determining whether state transitions are explained by some other independent variables. From this perspective, events represent changes in process and output variables in an input-process-output model, and the essential influence can be captured by measuring these variables and estimating the likelihood of occurrence using stochastic methods like event history analysis (Tuma & Hannan, 1984). However, if the research question is how, not if, a change occurred, then an answer requires a narrative describing the sequence of events that unfolded while the change occurred. Once the sequence or pattern of events in a developmental process is found to exist, one can turn to questions about the causes or consequences of events within the process pattern.

Thus, to understand how processes of change unfold, researchers may need to alter their typical ways of modeling and methods of analysis. Rather than first generalize in terms of variables, researchers 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 social change and development.

b. Process as a Developmental Event Sequence

A second meaning of process is a sequence of events or activities that describe how things change over time. Whereas the first definition of process examines changes in variables over time, this definition of process takes a historical developmental perspective, and focuses on the sequences of incidents, activities, or stages that unfold over the duration of an entity being studied. Table 7.2 exemplifies this meaning of process by outlining a sample of well-known process models of decision making, strategic planning, and organization development.

<Table 7.2>

While the process models in Table 7.2 are concerned with the development of very different things, they are strikingly similar in two respects. First, with the exception of Cohen, March, and Olsen's (1972) garbage can model, research on all the other process models are based on cross-sectional observations or retrospective case histories in a variety of organizations. The stages or phases of activities in each model were inferred either from organizational historical self-reports or by categorizing cohorts of groups or organizations into the stages or phases. My understanding is that in no instance was any one organizational unit actually observed over time to go through all the stages or phases of any model shown in Table 7.2. Thus, there is a great need and opportunity for systematic longitudinal research to substantiate and elaborate these process models of development.

Second, in contrast with the first meaning of process as a category of variables, variables are not the centerpiece of the process models in Table 7.2. Instead, the central focus of developmental process models is on progressions (i.e., the nature, sequence and order) of activities or events that an organizational entity undergoes as it changes over

time. As the table exemplifies, a linear sequence of stages or phases of development is a common form of progression in these process models. For example, a rational process of decision making is typically viewed as a sequence of separable stages (e.g., need recognition, search, screen, and choice activities) ordered in time and with transition routines to make adjustments between stages (March & Simon, 1958). Many social processes reflect far more complex progressions than simple linear sequences of stages or phases.

There are many other forms of progression that are useful for thinking about and observing developmental processes. The child development psychologists, Flavell (1972), Riegel (1969), and van den Daele (1969; 1974),for example, propose a vocabulary of developmental progressions that goes beyond simple unitary stages. As Table 7.3 illustrates, the vocabulary includes *multiple, cumulative, conjunctive,* and *recurrent progressions* of *convergent, parallel,* and *divergent* streams of activities as a developmental process unfolds over time. This vocabulary is useful for appreciating alternative forms of developmental progressions, which in turn, is central to understanding the second meaning of process. It provides the analytical terms needed to make clear distinctions between the various process models in Table 7.2.

<Table 7.3>

1. A *Unitary Progression* is a simple linear sequence of the form U ---> V ---> W, where U, V, and W represent qualitatively different patterns, stages, or phases of activities or behaviors. This model assumes that each stage may consist of any number of subsets of activities, but that these subsets must occur in an ordered progression. If a developmental progression has no more than one subset of events over time, it is called a simple unitary progression, as illustrated in Table 7.2 by the two strategic planning models and Scott's (1971) stage model of corporate development.

2. *Multiple Progressions* assume that developmental processes follow more than a single path. Three common forms of multiple progressions among event sequences are the parallel, divergent, and convergent progressions illustrated in Table 7.3.

In multiple progressions a temporal sequence of events may reflect more than one pathway at a given time in the ordered progression. For example, in the strategic decision process study of Mintzberg, Raisinghani, and Theoret (1976) in Table 7.2, more than one feasible path (or routine) of decision diagnosis, search, or evaluation might be pursued in each respective stage of identification, development, and selection. These paths diverge from each other at the beginning of each stage, proceed in parallel progressions during each stage, and converge at the end to complete each stage. As this example suggests, any developmental progression that has more than one subset of parallel paths at a time is called a multiple progression. A description of how multiple progressions of events diverge, proceed in parallel, or converge over time provides a useful vocabulary for making process statements about specific stages or the overall developmental pattern of a developing entity over time.

3. A *Cumulative Progression* (in unitary or multiple models) assumes that elements found in earlier events or stages are added and built upon in subsequent events or stages (as they are assumed to be in Lorange's (1980) and Scott's (1971) models in Table 7.2). Complete cumulation means that every event from each stage is carried from

its onset until the end of the developmental progression. Of course this seldom happens, since losses of memory, mistakes and detours, and terminated pathways all imply partially cumulative or substitution progressions (as illustrated in the bottom two tracks in Table 7.3). Such partial cumulation is reflected in Quinn's (1980) 'logical incremental' model of a long sequence of fourteen stages, which distinguishes it from a cumulative progression implied by a rational model of decision making.

A cumulative progression may take the form of addition, substitution, or modification (Flavell, 1972). In *addition*, a later-occurring event supplements an earlier-occurring event. The outcomes of two events E1 and E2 may coexist and are both equally available for E3. For example, in Scott's (1971) model of corporate development, a multiple products divisionalized structure is largely produced by the addition (with slight modification) of a stage 1 single product entrepreneurial structure with a stage 2 single product functional structure. With *substitution* the outcomes of a later event largely replace those of an earlier one. More precisely, E2 deletes or subtracts the effects of E1, and replaces them by adding those of E2. For example, in Greiner's (1972) model of organizational growth, crisis at the end of each stage leads the organization to shift (or substitute) its focus and transition into the next qualitatively new stage. In *modification* a later event represents 'a differentiation, generalization, or more stable version of the earlier one' (Flavell, 1972: 345). In this case the outcome of E1 is revised or modified in E2. For example, in the strategic planning model of Gluck, Kaufman, and Walleck (1980) in Table 7.2, the planning process and focus of each prior stage is modified and made more elaborate in the next stage.

4. *Conjunctive Progressions* (in unitary, multiple, or cumulative models) posit that the elements of subsets may be related. Conjunctive events are causally related events, meaning that events in one pathway may influence events in other pathways of a multiple progression. Of course what is related at one time may be viewed as unrelated at another. Therefore, strict causality among events is difficult to establish.

Conjunctive progressions may be probabilistic, inclusive, or mediated. *Probabilistic* relationships between events occur when the trajectories of multiple paths of activities happen to intersect. Such is the form of conjunction among streams of choices, problems, solutions, and participants' energy in the garbage can model of Cohen, March, and Olsen (1972). *Inclusion* occurs when the outcomes of earlier events become incorporated into the later one, as often observed with PERT charts. In this case E11 and E12 are logically integrated or converge to yield E2. For example, Lorange's strategic programming phase represents the logical inclusion of alternatives from stage 1 into a strategic program in stage 2. In a *mediation* relationship an earlier event or element 'represents some sort of developmental bridge or stepping stone (mediator) to the later one' (Flavell, 1972: 345). So E2 is required in order to move from E1 to E3, which may also pre-empt alternative paths. For example, in Greiner's model crisis events mediate and bridge transitions between evolutionary stages of organizational growth.

5. *Recurrent Progressions* (in unitary, multiple, cumulative, or conjunctive models) are repeating strings of events or activities over time. Although the previous progression models have been treated as nonrecurrent sequences, parts or all of them may repeat over time. For example, what distinguishes Mintzberg's model of strategic unstructured decision processes from the others in Table 7.2 is its attention to repeating

routines, or iterative progressions, within each phase of decision making. Abbott (1990) discusses a variety of techniques for the colligation and measurement of recurrent and nonrecurrent event sequence data.

These alternative models of progression in Table 7.3 do not occur independently. Whether implicit or explicit, every development process model makes a commitment to some form of temporal progression of unitary or multiple sequences of events that may be cumulative, conjunctive, and reoccur over time. This vocabulary of temporal relationships among events can help scholars articulate the meanings of their process models in more operational and discriminating ways than in the past. However, this analysis of process as a sequence of events cannot go far without considering the alternative theories of process that may explain specific developmental progressions.

2. Clarify Theories of Process

Whereas a definition of process indicates one's meaning of process in relation to other uses, a theory of process consists of an explanation of how and why a process unfolds over time. Such a theory is useful not only to ground the conceptual basis of a process study, but also to guide the design and conduct of an empirical study. Thus, the second basic decision for designing a process study is to clarify the theory of process underlying the substantive investigation.

I do not wish to imply that you have a clear process theory in mind before undertaking empirical research so that it can be tested. In my experience, I have never been sure what process theory might be useful to explain field observations. It is precisely because of this ambiguity in not knowing what to expect that a repertoire of alternative models is immensely helpful in making sense of reality. As Pasteur advised, 'Chance favors the prepared mind.'

Viewing process as a developmental progression, Scott Poole and I proposed four basic theories that serve as ideal types for explaining processes of development and change in organizations (Van de Ven & Poole, 1995). Figure 7.1 shows that each theory views the process of development as unfolding in a fundamentally different progression of change events, and to be governed by a different generative mechanism or motor.

<Figure 7.1>

- A *life cycle* (or regulated) model depicts the process of change in an entity as progressing through a necessary sequence of stages or phases. In terms of the vocabulary introduced before, the typical progression of a life cycle process of change is a unitary, cumulative, and conjunctive sequence of stages, because the content and historical sequence of these stages is prescribed and regulated by an institutional, natural, or logical program prefigured at the beginning of the cycle.
- A *teleological* (or planned change) model views development as a cycle of goal formulation, implementation, evaluation, and modification of actions or goals based on what was learned or intended by the entity. This sequence emerges through the purposeful enactment or social construction of an envisioned end state among individuals within the entity. Teleological models of development incorporate the systems theory assumption of equifinality; there are several equally effective ways to achieve a given goal. There is no assumption about historical necessity. Rather, these

models rely on agency as the explanatory principle: they posit a set of functions or goals desired by an organizational unit, which it has to acquire in order to 'realize' its aspirations. Development is movement toward attaining a purpose, goal, function, or desired end state.

- In *dialectical* models of development conflicts emerge between entities espousing an opposing thesis and antithesis that collide to produce a synthesis, which in time becomes the thesis for the next cycle of a dialectical progression. Confrontation and conflict between opposing agents generate this dialectical cycle. Stability and change in a dialectical process theory are explained by the relative balance of power between opposing forces. Stability is produced through partisan struggles and accommodations, which maintain the status quo between oppositions. Change occurs when these opposing values, forces, or events go out of balance. The relative strength, power, or legitimacy of an antithesis may emerge or mobilize to a sufficient degree of force to overthrow the current thesis or state of affairs and produce a synthesis, which then becomes the new thesis as the dialectical process recycles and continues.
- An *evolutionary* model explains change as a recurrent, cumulative, and probabilistic progression of variation, selection, and retention among entities in a designated population. This evolutionary cycle is generated by competition for scarce environmental resources between entities inhabiting a population. As in biological evolution, change proceeds in a continuous process of variation, selection, and retention. Variations, the creation of novel forms, are often viewed to emerge by blind or random chance; they just happen. Selection occurs principally through the competition among forms, and the environment selects those forms that optimize or are best suited to the resource base of an environmental niche. Retention involves the forces (including inertia and persistence) that perpetuate and maintain certain organizational forms. Retention serves to counteract the self-reinforcing loop between variations and selection.

Two dimensions are useful for distinguishing the four process models illustrated in Figure 7.1: (1) whether the unit of change involves one or more entities, and (2) whether the mode of change is prescribed or constructed. Life cycle and teleological theories operate on a *single entity*. In the case of a life cycle model, the development of any entity is governed by a code immanent within the entity or a set of institutional rules to which the entity adapts while changing. While the environment and other entities may shape how an entity adapts, they are strictly secondary to the immanent forces for development within the single entity. Teleological theories also focus on only a single entity's goals, social construction, or envisioned end state to explain development. A teleological theory can operate among many members of an organization or a set of organizations when there is sufficient consensus among the members to permit them to act as a single organizational entity. On the other hand, evolutionary and dialectical theories operate on *multiple entities*. Evolutionary forces are defined in terms of their impact on populations and have no meaning at the level of the individual entity. Dialectical theories require at least two entities to fill the roles of thesis and antithesis.

The generative mechanisms of the four process theories also differ in terms of a second dimension regarding whether the sequence of change events is prescribed *a priori* or whether the progression is constructed and emerges as the change process unfolds. A

prescribed mode of change channels the development of entities in a pre-specified direction, typically of maintaining and incrementally adapting their forms in a definite, calculable way. A *constructive* mode of change generates unprecedented, novel forms that, in retrospect, are often discontinuous and unpredictable departures from the past. A prescribed motor evokes a sequence of change events in accord with a pre-established program or action routine. A constructive motor, on the other hand, produces new action routines that may (or may not) create an original (re)formulation of the entity. Life cycle and evolutionary theories operate in a prescribed modality, while teleological and dialectical theories operate in the constructive modality.

Most researchers conduct their studies with one model or theory in mind. Working with a single model or perspective of change has the advantage of sharpening and focusing data collection and analysis. A single perspective or model is also easier to operationalize and fit the data. However in Chapter 4, I argued, in contrast, that having two or more models enables the researcher to make stronger inferences by positing a series of critical tests of assumptions that differentiate the models. Another advantage of comparing plausible alternative models is that null results on one model are less likely to leave the researcher in a cul-de-sac of knowing only what is not the case.

Most organizational change processes can be exceedingly complex, and far beyond the explanatory capabilities of any single process theory found in the literature. Typically several different models are needed to capture different aspects of the same process; they complement each other to better understand the process (Pettigrew, 1990). Moreover, when researchers and practitioners have only a single perspective or theory, they tend to twist and rationalize facts to fit their model (Mitroff & Emshoff, 1979). Consequently, I suggest it is generally better to develop and juxtapose alternative theories and then determine which theory better explains the data or how they can be combined.

The comparative method also facilitates keeping the research focused and manageable. It reduces complexity because it is very difficult to analyze a large array of field data without conceptual guidance. This approach emphasizes that testing a process theory should be based on the relative explanatory power of alternative theories that are available or that can be developed to explain the phenomena. It is also consistent with the principle that knowledge advances by successive approximations and comparisons of competing alternative theories (Lakatos, 1978).

3. Frame of Reference to View the Research Question

Once the meanings and theories of process are clear, then a researcher has the basic conceptual foundations for designing a process study undertaken to examine a specific research question about how change unfolds over time. A crucial step in launching any study is being reflexive about the researcher's role and perspective. As discussed in Chapter 2, a researcher can only observe and recount a partial view of the events that may unfold in a change process (Schein, 1987). The view that scientific observations can be impartial or detached has been severely discredited (Popper, 1972). Most social scientists now concede that no research is value free; a researcher should therefore disclose his or her values and perspective (Alvesson & Skoldberg, 2000; Van Maanen, 1995).

Every act of observing something represents countless choices not to observe other things and perspectives. Any topic or issue can be examined from the viewpoints of many different individuals or stakeholders. Some of these viewpoints are accessible to the researcher, others are not. It is difficult, if not impossible, for a researcher to assume an impartial and detached perspective or to obtain a balanced representation of all stakeholders involved in any complex organizational change process. It is better to be explicit about which stakeholder's interests and viewpoints are favored (and accessible) than to be silent or naïve about whose interests are served and ignored in any study.

Following this recommendation, engaged scholars often aim to see organizational life from the perspective of a specific participant or stakeholder in the process. This often requires more than a detached view of the subject; indeed, researchers may actively participate in the lives of the people and situations that they are studying (Singleton, Straits, & Straits, 1993).

This requires a degree of access and engagement with key stakeholders that few researchers have been able to develop. Gaining access is problematic for many researchers because they seldom place themselves into the frame of reference of the stakeholders who sponsor the study or wish to use its results. Typically, managers are key stakeholders in field studies of change in their organizations. Without observing a change process from the manager's perspective, it becomes difficult for a researcher to understand the dynamics confronting managers who are directing the change effort, and thereby generate new knowledge that advances the theory and practice of managing change. If organizational participants do not understand the relevance of a study, there is also little to motivate them to provide access and information to an investigator. The issue here is *not* that researchers become consultants. As discussed further in Chapter 9, the issue is one of engaging key participants in a study in formulating important research questions that capture the attention and motivation of scholars and practitioners alike.

For example, in launching the Minnesota Innovation Research Program (MIRP) (Van de Ven, Angle, & Poole, 2000), we found that a useful way to begin formulating a longitudinal field study was to conduct periodic meetings with small groups of managers from various organizations engaged in comparable change efforts or new ventures. In these meetings we discussed the meanings and implications of the research question (e.g., How and why do innovations develop over time?) and explored ways of studying the question so that it might advance theory and practice from a manager's viewpoint. These meetings produced many useful ideas that guided our research, and many participants also agreed to provide access to conduct the research. Moreover, these meetings often identified individuals whom we negotiated with to become study advisors, facilitators, or co-investigators.

4. Mode of Inquiry

Reflecting on their styles of inquiry and clarity of the subject matter, researchers can adopt a continuum of strategies that are grounded in theory or data. While *deduction*, a theory-driven approach, is familiar to most readers, *abduction*, and its relationship to the more popular term, *induction*, may not be. As discussed in Chapter 4, induction refers to the inference we draw from direct observation of a phenomenon that results in assigning a probability of the likelihood of an occurrence in the future. Abduction refers

to a conjecture or hypothesis that we invent to explain anomalies or surprising patterns that we observe (Peirce, 1955). Such a conjecture or hypothesis should go beyond the information given in a specific case (Bruner, 1973). Since abduction more accurately describes the mode of reasoning entailed in grounded theorizing than induction, I use the term abduction instead of induction.

With a deductive approach, the basic steps in designing research might consist of adopting one or more process theories of change (e.g., Figure 7.1), developing an operational template for the theory, and then using it to determine how closely an observed process matches the theory. With abduction, the steps might include observing processes of stability and change over time in a few organizational entities, sorting data into meaningful categories, developing propositions explaining the observations, and corroborating them with a different sample or on the same sample at a different time.

There is a tight iterative cycle between deduction, abduction, and verification in grounded theory building studies. Strauss (1987) emphasized that all scientific theories require that they be conceived, then elaborated, then checked. 'Few working scientists would make the mistake of believing these stood in a simple sequential relationship. . . . Many people mistakenly refer to grounded theory as "inductive theory". . . All three aspects of inquiry (induction, deduction, and verification) are absolutely essential' (Strauss, 1987: 11-12). In the course of a longitudinal study, most researchers move back and forth between these modes of inquiry many times.

5. Observing Processes in Real Time or Relying on Retrospective Accounts

Because change is defined as an observed difference in an organizational entity over time, a process study necessarily entails collecting longitudinal data. These data can be obtained either by observing the sequence of change events as they occur in real time, or by relying on archival data to obtain a retrospective account of the change process. Most studies of organizational change are retrospective, conducted after outcomes are already known before data collection begins. Retrospective studies provide the advantage of knowing the 'big picture'--how things developed and the outcomes that ensued. This *post hoc* knowledge is helpful for interpreting events that unfolded, and for constructing a narrative of the process. When researchers conduct real-time observations of a change process as it unfolds, they do not have this advantage of afterthought and may miss occurrences or events that later can be viewed as critical. Until we have the compass of the entire process, we often have no way of knowing what information is important and what is not.

However, prior knowledge of the outcome of an organizational change may also bias a study. This is especially true if the final assessment valorizes the outcome as a success or failure, effective or ineffective. There is a tendency to filter out events that do not fit or that render the story less coherent, such as censoring minority views.

A promising approach is to initiate historical study before the ultimate outcomes of a change process become apparent. It is even better to observe the change process in real time as it unfolds in the field setting. This approach maximizes the probability of discovering short-lived factors and changes that exert important influence. As Pettigrew (1985) notes, 'the more we look at present-day events, the easier it is to identify change; the longer we stay with an emergent process and the further back we go to disentangle its

origins, the more likely we are to identify continuities.' At one point or another, most field studies of organizational change involve many forms of longitudinal data collection: archival, retrospective, and real time observations.

6. Sources of Change

In the study of human development, Schaie (1965) discussed three common sources of temporal change:

1. Age: The age or temporal duration of the individual at the time of measurement. This variable represents that part of development and change that is produced by unfolding biological or institutional processes.

2. Cohort: The set of characteristics of all individuals who were born at the same time and go through similar developmental processes, such as classes in school. This variable represents the common historical conditions that shape the development of a given cohort.

3. Transient: All the temporary or immediate and non-cumulative factors that influence outcomes or the dependent variables at the time of measurement.

Schaie suggests that it is important to design organizational change studies so they can disentangle these three sources of change--those that are due to age, to external factors in the history of the developing organism (cohort), or to immediate external factors (time of measurement). What appears to be a developmental change due to some immanent mechanism could well be due to a cohort effect or to a unique effect at the time of measurement. For example, a sudden shift in morale compared to previous levels may result from a general improvement in social mood at the time of measurement. Interpreting this as a function of solidification of a developing culture would be incorrect, though it would be easy to see why a researcher whose attention focused only on the organization under study might draw this conclusion. In the same vein, what appears to be a general developmental pattern might be due to cohort effects, unique events occurring only to the group of organizations that were founded in a given time and place. By this reasoning, for example, it would be risky to try to generalize principles of effective development of organizational startups in the relatively benign 1950s to organizations in the competitive 1990s because they belong to different cohorts. They operated and started under different resource constraints, had employees with different attitudes, and had a different external environment.

This is not to imply that it is impossible to develop generalizable findings concerning development and change. Rather, it is important to consider what source observed changes may originate from and to rule out alternative explanations for the ones we advance. It is also important to consider the limits of our conclusions. Taking into account age, cohort, and time of measurement as well as organization type and context will result in more effective research designs.

Barley's (1990) research design, shown in Figure 7.2, provides a good example of a systematic study of these different sources of change. In his field study of the adoption of a technology (CT scanners), Barley drew comparisons between two parallel hospitals with synchronic (one point in time) observations of different radiology technologies, and with diachronic (repeated over time) observations of CT scanning behavior by radiology

department staff. Reflecting on his design, Barley discusses how conclusions can become problematic when the research questions and comparative analysis are not matched correctly.

> For example, synchronic data may seem to suggest that similar outcomes are rooted in similar processes. However, similar outcomes may arise from different processes and different outcomes may arise from similar dynamics (Barley, 1990: 186). Only diachronic data can disentangle such possibilities. By itself, a parallel study of a class of events, objects, or activities may also lead to wrongful conclusions. Suppose, for instance, that one were to investigate the effects of new technologies by studying CT scanning in a number of hospitals. Even if one found that all CT scanners occasion similar phenomena, one could not be sure whether the findings would apply to all computationally based imaging devices or only to CT scanners. A synchronic analysis of several technologies conducted in tandem could resolve this issue. In other words, the synchronic, the diachronic, and the parallel represent three distinct axes of comparison that, when used in combination, allow researchers to examine explicitly the spatial and temporal boundaries of their claims. (Barley, 1990: 227)

<Figure 7.2>

7. Sample Diversity: Homogeneous or Heterogeneous Cases

There is no one best sampling scheme for process research. A homogeneous sample has the advantage of keeping to a minimum the multitude of alternative explanations for developmental processes. This is especially advantageous in the case of lengthy sequences of events, because they are particularly vulnerable to accidental or adventitious occurrences that shift the course of development. Comparing cases that are similar in as many respects as possible facilitates identifying whether change processes are due to such transient events or to more basic developmental models, but does not control for cohort effects. A homogeneous sample also facilitates the development and investigation of very precise, focused questions or hypotheses. Hence homogeneous sampling is useful when a well-specified theory of change or development is available. A broad, heterogeneous sample, however, may provide a better opportunity to detect whether sources of change are due to temporal development, cohort, or transient factors.

The comparative method is perhaps the most general and basic strategy for generating and evaluating valid scientific knowledge. This strategy involves the selection of comparison groups that differ in the scope of the population and conceptual categories of central interest to the research. Kaplan (1964: 52) pointed out that scientific knowledge is greatly enhanced when we divide the subject matter into concepts and cases that 'carve at the joints' over the widest possible ranges, types, conditions, and consequences. In this way researchers can develop and evaluate the limits of their propositions.

A broad sampling scheme also permits a researcher to make empirical links between different specialties or schools of thought that have emerged for different organizational settings in which the change process occurs. For example, because organizational structures for business creation are different in small company start-ups, internal corporate innovation projects, and interorganizational joint ventures, it is widely

believed that the process of entrepreneurship in these organizational settings must also be different. Our MIRP studies questioned this conventional belief, and proposed the plausible alternative that creating a new business entails fundamentally the same process regardless of organizational setting. We obtained some empirical evidence supporting this proposition (Van de Ven, Polley, Garud, & Venkataraman, 1999). The findings suggest that significant benefits and efficiencies can be gained by applying principles of business creation from new company start-ups to internal corporate venturing and inter-organizational joint ventures, and vice versa.

Given the tradeoffs between homogeneous and heterogeneous samples, Pettigrew (1990: 275-277) suggests four useful guidelines for selecting cases to study:

1. 'Go for extreme situations, critical incidents and social dramas.' By choosing unusual cases, cases that are critically important or highly visible cases, researchers select cases in which the process is 'transparently observable.' However, such cases may have nongeneralizable features precisely because they are unusual.

2. 'Go for polar types.' Choose cases that seem very different in terms of the processes under study. For example, compare successful and unsuccessful program startups. Or, choose cases that differ from patterns in earlier cases. By successive sampling of polar types, it will eventually be possible to cover the range of possible cases.

3. 'Go for high experience levels of the phenomena under study.' Choose cases that have a long track record of experience with a process. This strategy may not be feasible for some cases: new program startups, for example, may best be illuminated by inexperienced entrepreneurs, since they will make the mistakes and experience the learning that highlights key requirements for successful startups.

4. 'Go for a more informed choice of sites and increase the probabilities of negotiating access.' Cases must often be selected on the basis of who will cooperate, rather than on grounds of optimal sampling. This, of course, introduces a sampling bias that must be considered in drawing conclusions from the study.

8. Sample Size: Number of Events and/or Cases

The major sample size consideration in variance research studies is the number of cases selected for data collection, as discussed in Chapter 6. The larger the number of cases that are sampled from a population of interest, the more generalizable are the results (provided that the cases are drawn in a representative fashion). Furthermore, in experimental designs, researchers are advised to select the number of cases needed to obtain enough power of statistical tests to equate statistical significance with practical significance in hypotheses testing (Walster & Cleary, 1970). Pragmatically, the number of cases selected also depends on the availability of sites and the costs involved in collecting data on each case.

In longitudinal process studies, the central sample size consideration is the *number of temporal intervals or events* obtained on a change process in each case. The number of temporal intervals or events observed depends on what constitutes the 'natural' flow of experience in the organizational change cases being studied. Organizational change processes vary in *temporal duration* and *granularity*. In terms of

temporal duration, some organizational change processes, such as group decision making, may occur in committee meetings lasting no more than a few hours. Other change processes, such as the development of technological and administrative innovations, may span several years.

Granularity refers to the preciseness or discreteness of events that are recorded throughout the temporal duration of a case being studied. The granularity of events varies greatly, ranging from events of such large scope that only 5 to 20 might be observed over the period of study to events of such small scope that several thousand occur. Event granularity typically increases with the micro-analytic detail of the change process being investigated.

Events that require a great amount of time and effort to observe and code are likely to be observed in shorter sequences than those less costly to observe. Because there are inherent tradeoffs between the temporal duration and granularity of events that can be sampled, most studies of fine-grained events tend to focus on change processes of relatively short temporal duration, while studies of lengthy change processes tend to adopt coarse-grained events.

9. Process Research Designs

There are important implications of the number of cases and events observed in a study for process research design and data analysis. Poole et al. (2000) discuss these implications with reference to their typology of alternative process research designs shown in Table 7.4.

<Table 7.4>

Studies consisting of *few cases, few events* reflect the typical sampling design of comparative case studies. Sometimes there may be few events, not due to paucity of data, but because only a few occur. For example, in a comparative study of strategic decision-making where the sequence of search, screen, and choice behaviors are being investigated, there may be relatively few instances of each type of behavior in the case. Alternatively there may be only a couple of instances of the key events (e.g., conflicts) in otherwise lengthy cases. Provided there are enough cases for systematic comparison and induction across the instances, Yin's (2003) comparative case study designs can be utilized.

Studies with *many cases, few events* provide many comparative options for the researcher. *Summary measures* for each case can be derived by collapsing the data along the time dimension (e.g., counting the number of conflicts that occur during innovation regardless of when they occurred), or through the use of surrogate measures of temporal order (e.g., did the conflict occur during the first or second halves of the innovation process?). Such measures can then be treated as variables in traditional statistical methods. However, with such pooling of the data, one can lose the temporal order of events that figure prominently in most process research studies.

One method to preserve information about temporal order that clusters cases with similar sequences is *optimal matching*. Poole et al. (2000) discuss that once clusters have been derived, they can serve as the basis for variables that can then be entered into traditional statistical analyses. Alternatively, Tuma and Hannan (1984) discuss how *event*

history or *survival analysis* can be used to determine when critical events occur, provided the length of time until they occur is recorded. Supplementary analysis can in some cases divulge causal factors underlying event occurrences (Willett & Singer, 1991).

A different set of options are open for studies with *few cases, many events*. Comparative analysis of *qualitative case studies* using Yin's designs are one option. Events can be parsed into *phases* representing coherent periods of activities subsuming two or more events in sequence. These phases can then be used as bounded units to provide temporal divisions in case studies, as Holmes (1997) did in his studies of hostage-taking situations and Van de Ven and Polley (1992) did in their study of a biomedical innovation. Various types of *time series* analyses can also be used when many events are available for each case. These generally involve transforming the event series into some continuous form. In addition, Poole et al. (2000) discuss the application of *Markov analysis*, which preserves the categorical qualities of the event series and enables us to track temporal dependencies among events.

For studies with *many cases, many events* a number of powerful statistical techniques are available. As with the many cases, few events situation, simple *descriptive summaries* of the frequency with which coded events occur provide useful displays for examining stages or phases in the developmental progression. However, with such pooling of the data, one can lose the temporal order of events that figure prominently in most process research studies. *Optimal matching* can be used to derive measures of similarity among the event sequences for the cases and these measures can then be analyzed in at least two ways. First, they can be used as input to cluster analysis and multi-dimensional scaling techniques that can identify clusters of similar sequences; the resulting clusters can then be used to define variables for causal or correlational analysis, as in Poole and Holmes (1995). Second, these distances can be used to test for causal factors that create the differences between pairs of sequences. Poole et al. (2000) also discuss how *trend analysis* or *multiple time series methods* can be used to identify patterns of change across many cases, provided the events can be used to define continuous variables. *Markov analysis* of multiple cases can provide maps of temporal dependencies among events. Causal factors leading to such dependencies can then be analyzed using *Markovian regression* techniques or other simpler designs.

Measuring and Analyzing Process Data

At the heart of any longitudinal study is measuring and analyzing process data. This section reviews techniques for gathering, tabulating, and analyzing process data. In a typical longitudinal field study, the gathering of data might entail the following procedures:

- survey questionnaires completed by all participants every six months;
- interviews with key managers and participants every six months;
- direct observations of regularly scheduled meetings;
- a diary recording informal discussions with participants; and
- documents and reports from news media and organizational archives.

Whatever data collection methods are used to observe change processes in the field or from archival records, over time data mount astronomically and overload the information processing capacity of even the most insightful mind. Drawing careful inferences requires methods that go beyond subjective 'eyeballing' of raw data to identify patterns. But it is difficult to reconstruct field methods, because they are rarely reported in detail in published field studies. One cannot ordinarily follow how the researchers arrived at their conclusions from hundreds of pages of field observations, even though the reports may be sprinkled with vivid--yet idiosyncratic--quotes from organizational participants. As in variance research, methods for measuring and analyzing process data require explicit and careful attention. Chapter 6 discussed well-established psychometric procedures for survey instrument construction and evaluation. The remainder of this chapter deals with analogous, but less well-established procedures for measuring and evaluating process data. These procedures and decisions are outlined on the bottom of Table 7.1.

1. Process Concepts

Whether a researcher sets out to develop or test a process theory, the collection of longitudinal data requires a set of categories or concepts. These concepts provide selective focus for observing a change process; one cannot study everything, and different categories can produce very different findings. When a particular process model(s) is proposed or known beforehand, category development proceeds deductively by operationalizing theoretical constructs into empirical indicators of those constructs. When a grounded theory building approach is taken, these initial categories are best viewed as 'sensitizing constructs' for conducting exploratory research. The categories become clear as they are grounded in field observations. Eventually, these grounded concepts can be codified in a final category system.

A grounded theory-building strategy provides a useful first step in developing some basic concepts and ideas from raw data. To its originators, Glaser and Strauss (1967) and Strauss and Corbin (1990), grounded theory building consists of the following structured steps. Begin with small units of data (incidents) and gradually construct a system of categories or concepts that describe the phenomena being observed. The categories may have several subcategories and dimensions that are gradually elaborated and refined as specific incidents are examined, coded, and compared. As the categories are developed, additional data are examined to verify the properties of the emerging category system. The analysis concludes with the identification of a small number of core categories that serve to integrate the theoretical concepts that are firmly rooted or 'grounded' in the data.

In our Minnesota Innovation Research Program (MIRP), for example, we began with five 'sensitizing categories' to study innovation development: ideas, people, transactions, context, and outcomes (Van de Ven et al., 2000). As is typical in longitudinal studies, our assumptions and definitions of these concepts over time changed substantially and became progressively clear with field observations. Table 7.5 compares our starting assumptions of these concepts drawn from the literature at the time, with how we came to view them as a result of two years of field studies. The latter disclosed a different reality from the rather orderly and naïve conceptions of the former. As this

example illustrates, the development of research constructs involves an iterative process of conceptualization, observation, and reformulation.

<Table 7.5>

2. Incidents and Events

It is useful to distinguish between *incidents* and *events* in a process theory (Abbott, 1984), which are analogous to the distinction between *variables* and *constructs*, respectively, in a variance theory (discussed in Chapter 6). Incidents are operational empirical observations, while events are abstract concepts of bracketed or coded sets of incidents. The stream of incidents, a directly observable first-order set of activities, is translated into a sequence of events, a more abstract second-order construction. This implies that some incidents may be embedded in different conceptual domains and utilized as constituents of different events.

Events may differ in temporal and spatial scope, and as a result, incidents may indicate more than one, overlapping event. For example, a meeting with 'firm Q' can indicate the event 'meeting with a partner,' but it may also indicate a longer event, 'negotiation with firm Q regarding partnership.' Events may be embedded within other, different types of events of larger scope. Both levels may be important for understanding the change process, because interwoven narratives clarify it better than either narrative could on its own. Abbott (1992) gives an example from his studies of the rise of professions in society, 'I once set out to explain why there are no psychiatrists in American mental hospitals. The exodus, which dates from 1900-1930, reflects not only the rational individual mobility decisions that are specifiable annually, but also outpatient community developments that are specifiable only decadely, and changes in knowledge and social control taking place over even longer periods.'

Another complication is the possibility that the incident-event relationship may change over time (Abbott, 1984). The significance of events may change as the process unfolds. The same change is possible in incident-event relations. For example, the first time a potential partner is encountered may signal an expansion of an organizational program, whereas the sixth encounter with a potential partner may signal desperation for ideas or resources. Thus, while events are constructs indicated by incidents, the indication relationship is more complicated for qualitative data than it is for quantitative scores. The assumption of uniformity across respondents and responses in psychometrics and scale theory may not hold for data used to define events. What quantitative analysis would classify as an error may be quite important nuances for qualitative data.

3. Defining an Incident: A Qualitative Datum

In survey research, a *quantitative datum* is commonly regarded to be: (1) a numerical response to a question scaled along a distribution, (2) about an object (the unit of analysis), (3) at the time of measurement; which is, (4) entered as a variable (along with other variables on the object) into a record (or case) of a quantitative data file; and (5) is subsequently recoded and classified as an indicator of a theoretical construct.

In comparison, we define a *qualitative datum* as: (1) a bracketed string of words capturing the basic elements of information; (2) about a discrete incident or occurrence (the unit of analysis); (3) that happened on a specific date; which is, (4) entered as a

unique record (or case) in a qualitative data file; and (5) is subsequently coded and classified as an indicator of a theoretical event.

The basic element of information in a qualitative datum is a bracketed string of words about a discrete incident. Raw words, sentences, or stories about incidents that are collected from the field or from archives cannot be entered into a qualitative data file until they are bracketed into a datum(s). Obviously, explicit decision rules that reflect the substantive purposes of the research are needed to bracket raw words.

In our MIRP studies, the decision rule used to bracket words into a qualitative datum was the definition of an incident that occurred in the development of an innovation (Van de Ven et al., 2000). An incident occurred whenever changes were observed to occur in any one of our five core concepts: innovation ideas, people, transactions, context, and outcomes. When an incident was identified, the bracketed string of words required to describe it included: date of occurrence, the actor(s) or object(s) involved, the action or behavior that occurred, the consequence (if any) of the action, and the source of the information. As with any set of decision rules, discussions among researchers were necessary to define innovation incidents in an operationally consistent manner.

Decision rules may vary in the level of specificity and the temporal duration of incidents they construct. Some rules specify fine-grained definitions of incidents that interpret each action as a separate incident; others adopt coarse-grained definitions that require longer episodes for incidents. The proper granularity of incidents depends on the rates of development of various kinds of processes, and the differing research questions associated with these rates.

For example, Knudson and Ruttan (2000) found that hybrid wheat development was governed by biological laws that require several decades to move from basic research through technology development to market introduction. They observed that hybrid wheat's innovation process had been following this 'biological time clock' for forty years since the late 1950's. In studies of biomedical innovations, Garud and Van de Ven (2000) observed that the rate of development was governed by an 'institutional regulation time clock,' in which the design, testing, and commercial release of devices entailed extensive review and approval steps by the U.S. Food and Drug Administration, sometimes lasting five years. However, rates of development of other processes, such as group decision-making (Poole & Roth, 1989) or the development of novel administrative programs (Bryson & Roering, 2000; Roberts & King, 1996) are more rapid and appear to be limited only by entrepreneurial time and attention. As these variations suggest, the temporal scope of organizational change should correspond with the granularity of incidents being observed in the field study. Zaheer, Albert, and Zaheer (1999) provide a stimulating discussion of these and other considerations in developing temporal metrics.

4. Reliability and Validity of Incident Construction

It is important to establish the reliability of classifying raw data into incidents. An equally important, though often neglected, issue is the validity of this bracketing procedure (Folger, Hewes, & Poole, 1984; Poole, Folger, & Hewes, 1987). Researchers often assume that the meaning of incidents is clear, and that establishing reliability is equivalent to showing the meaning of codings is clear. However, attaining reliability among coders simply indicates that the meaning of incidents is clear to the particular

group of researchers who designed the coding system, not necessarily to participants or key stakeholders. It is necessary to test empirically whether researchers' classifications coincide with practitioners' perceptions of events. If the evidence indicates inconsistency, then no claims about the meaning of events to the participants are valid. Researchers can still sustain claims about the meaning of the incident from their theoretical position, but no claims about the 'social reality' of the event are appropriate.

Two basic procedures can enhance the reliability and validity of incident coding. First, coding of incidents from raw data sources can be performed by two or more researchers. Consensus among coders increases the consistency of interpretations of the decision rules used to identify incidents. Second, incident codings can be reviewed by key organizational informants. It is useful to ask informants if any incidents are missing or incorrectly described. Based on this feedback, revisions in the incident listings can be made if they conform to the decision rules for defining each incident. Typically, these two steps result in a more complete listing of incidents about the change process being studied.

5. Qualitative Strategies for Identifying Events from Incidents

The next step is to identify theoretically meaningful events from the incident data. Since the temporal sequence of events is a central organizing device for process data, this next step typically consists of identifying the order and sequence of events from observed incident data. Several approaches are available for tacking back and forth between incident data and event sequence categories.

Abductive approaches go first to the data--the incidents--and sift through the various instances, deriving categories from the ground up, using the constant comparative method for identifying concepts from data (Dougherty, 2002). Langley (1999) discusses two additional strategies for making sense of process data:

Visual Mapping. As the saying goes, 'a picture is worth a thousand words.' A diagram of how incidents unfolded by event categories or actors over time is a useful method for organizing incident data. Visual graphical representations permit the compact presentation of large quantities of information, and are particularly useful for analyzing process data because they allow the simultaneous display of a large number of dimensions, and they show precedence, parallel processes, and the passage of time. Miles and Huberman (1994) provide many different formats with examples of how these graphical displays might be constructed. Meyer (1991) provides a creative application of visually mapping major changes unfolding at different levels of a health care system.

Temporal Bracketing. Various categories of events identified through visual mapping can be arrayed over time by phases, stages, or distinct periods of activities. In their study of technology adoption in small manufacturing firms, for example, Langley and Truax (1994) decomposed decision, activity, and context events into three periods: rivalry between projects and management turnover (1987), financial and technical difficulties and union strike (1988), and major project investment stimulated by customers (1989). They observed continuity in the activities within each period and discontinuities between the periods. Importantly, these periods are not 'phases' in the sense of a predictable sequential process but simply a way of structuring the description of events (Langley, 1999).

Deductive approaches make use of theory to specify the expected order and sequence of event categories.

Template Matching. In this strategy, operational templates of one or more process theories, such as those illustrated in Figure 7.1 and Table 7.2, are used to determine how closely an observed event sequence matches each theory. Allison (1971) used this strategy to examine how well decisions made during the Cuban Missile Crisis reflected three theoretical templates: a rational actor model, an organizational process model, and a political model. He concluded that the second and third models more accurately explained the observed decision process than the first model.

Pentland (1999: 719) poses an important challenge to template matching by asking (with reference to Figure 7.1): 'How can we tell which motor (or theory) is running?' Many specific theories of organizational change are combinations of two or more of basic 'motors' (e.g., life cycle plus teleology). The problem is that these deep structures [process theories] are never directly observed. All we have in empirical research is the 'surface structure' captured in our observations. This is the problem of construct validation; given some data, what is the underlying construct? A number of steps can be taken to enhance the reliability and validity of coding incidents into indicators of event constructs or events into higher-order constructs. Operational definitions and coding conventions can be drafted for the coded constructs, and periodic meetings can be conducted with researchers and other colleagues to evaluate the construct validity of these definitions.

I found that a useful way to conduct such meetings is to begin with an overall presentation of the conceptual model being studied, then give specific definitions of each construct in the model and the measurement indicators to be used (Van de Ven & Ferry, 1980). Participants can then be asked to 'suggest better indicators for measuring this construct as defined previously.' Often using a Nominal Group Technique format (see Delbecq, Van de Ven, & Gustafson, 1975), reviewers are provided a brief period to think and respond to the questions in writing. Then a general discussion ensues to obtain group opinions. The qualitative written comments from these review sessions are especially helpful to clarify the different interpretations of constructs and event indicators by participants in the review sessions.

Synthetic Strategy. Another deductive approach to analyzing process data is to transform sequence data into summary statistics such as: the total number of events in various categories in the entire sequence or in segments of it; or the total number of phases in the process. This 'synthetic strategy,' as Langley terms it, can then be used to test developmental models with variance analysis. While this transformation is commonly used (e.g., Eisenhardt, 1989), caution must be taken to preserve the temporal sequence in observed change processes. Too often the categories that researchers use collapse the data over time, and thereby remove the temporal information that is central to any process story.

Poole et al. (2000) point out that in practice, these strategies are frequently combined in a *retroductive* approach. He used this approach to derive his group decision coding system (Poole & Roth, 1989). A literature search is undertaken to derive a scheme for categorizing and coding events, and categories are adjusted in view of what is

workable and informative after trying them out on the data. This permits the theoretically driven scheme to emerge and adapt in response to the exigencies of the data. Bales and Strodtbeck (1951) used this approach in developing his Interaction Process Analysis.

6. Quantitative Strategies for Coding Event Sequence Data

The foregoing qualitative approaches to ordering and making sense of event process data are useful for identifying and displaying general patterns in event sequence data. However, they only take us so far. Longitudinal field data on organizational change incidents typically far exceed our limited capacity to analyze qualitative data. Further information reduction strategies are often needed to analyze process patterns in the data.

A limitation of many quantitative coding systems is that they reduce rich qualitative data to a single dimension of meaning. One way to organize multidimensional data to analyze change processes is to array them on multiple tracks corresponding to conceptually meaningful categories. The procedure of coding incidents along several event tracks was used in Poole's (1983) studies of decision development in small groups, which coded acts with a three-track coding system that took into account the impact of each incident (a group member's statement) on group work process and group relationships, and also indexed incidents on several topics it referred to. By coding each incident on several conceptually relevant dimensions simultaneously, Poole was able to derive a richer description of group processes than previous studies had achieved.

Abbott (1990) describes methods for analyzing sequence, order, and causal relationships in coded event data. They involve different forms of transforming a chronological listing of coded incidents into dichotomous indicators of event constructs. Such transformations of qualitative codes into quantitative dichotomous variables permits applying various statistical methods to examine time-dependent patterns of relations among the event constructs. *Sequence analysis*, a family of methods concerned with the problem of determining the temporal order among events, is particularly useful for such analyses (Abbott, 1984). Analogous to analysis of variance that determines differences or correlations between spatial orders (variables), sequence analysis examines similarities and differences between temporal orders (discrete events).

Poole et al. (2000) review a variety of statistical methods that can be used to identify substantively interpretable time-dependent patterns (or lack thereof) and relationships in event sequence data. These techniques include:

1. Stochastic modeling techniques (e.g., Markov and logit analysis) to examine probabilistic relationships between the occurrence of events.
2. Granger causality and vector autoregression to identify possible causal relationships between dichotomously coded events.
3. Phasic analysis of temporal patterns in event sequence data.
4. Linear time-series regression analysis on incidents aggregated into fixed temporal intervals to examine causal relationships among coded event time series.
5. A variety of diagnostic procedures for examining non-linear dynamic patterns in event time series.

Other statistical methods can also be used to examine the temporal duration and sequence among coded events. For example, 'renewal theory' can be used to examine whether the duration between two consecutive events in a change process are distributed according to some known probabilistic distribution, such as the exponential or more general Weibull distribution. In addition, Tuma and Hannan (1984) show how 'hazard rates' can be computed to determine the likelihood of occurrence of certain coded events based on a set of predictor variables.

7. From Event Sequence to Story Narrative

A basic scientific goal in conducting longitudinal studies of organizational change is to develop a *process theory of change*. A process theory needs to go beyond a surface description to penetrate the logic behind observed temporal progressions. This explanation should identify the generative mechanisms that cause observed events to happen in the real world, and the particular circumstances or contingencies when these causal mechanisms operate (Harre & Madden, 1975; Tsoukas, 1989).

Thus, as we move from surface observations toward a process theory, we move from description to explanation. Explanation requires a *story*, and stories can be understood as process theories (Pentland, 1999). In narrative theory the story is an abstract conceptual model; it identifies the generative mechanisms at work. At a minimum this story must describe a progression or sequence of events. In narrative theory, however, the 'story' includes a great deal more than just event sequence. In particular, a process theory should include the following features in the story (Pentland, 1999: 712-713):

1. *Sequence in time*. Narrative should include a clear beginning, middle, and end . . . Chronology is a central organizing device. The events or actions referred to in a narrative are understood to happen in a sequence.

2. *Focal actor or actors*. Narratives are always about someone or something . . . There is a protagonist and, frequently, an antagonist as well. The characters may not be developed or even identified by name, but, along with sequence, they provide a thread that ties the events in a narrative together.

3. *Identifiable narrative voice*. A narrative is something that someone tells, so there should always be an identifiable voice doing the narrating. That voice reflects a specific point of view of the key participant or stakeholder chosen in decision 3 (above).

4. '*Canonical' or evaluative frame of reference*. Narratives carry meaning and cultural value because they encode, implicitly or explicitly, standards against which actions of the characters can be judged. . . . But even without any explicit moral, narratives embody a sense of what is right and wrong, appropriate or inappropriate, and so on.

5. *Other indicators of content or context.* Narrative texts typically contain more than just the bare events. In particular, they contain a variety of textual devices that are used to indicate time, place, attributes of the characters, attributes of the context, and so on. These indicators do not advance the plot, but they provide information that may be essential to the interpretation of the events (e.g., knowing that the scene is a wedding changes the significance of the utterance 'I do').

These five steps in theory building are easier said than done. Developing a process theory that embodies these features requires considerable ingenuity and creativity in applying the repertoire of methods described in this chapter. Bruner (1986; 1991) and Polkinghorne (1988) provide extensive and useful perspectives for developing a narrative understanding of social behavior. But as the development of any skill requires, developing narrative theory requires repeated use and practice of these methods.

Example of Process Research Design With Comments from Larry E. Greiner

This section provides an example of some of the steps and decisions in designing process research. It also illustrates a pattern of interaction among scholars engaged in designing a study to evaluate a particular process model. The example was initially reported in Van de Ven (1992), and is largely reproduced here. It focuses on Greiner's (1972) well-known model of organizational growth outlined on the bottom of Table 7.2.

I sent a draft of this assessment to Prof. Larry E. Greiner at the University of Southern California. He responded with a very useful set of comments that not only clarify, amplify, and correct my initial interpretations of his model, but also exemplify how the meanings, vocabulary, and methods for process research covered in Chapter 7 can facilitate more penetrating and constructive dialogue among scholars whose primary motivations are to learn and better understand how organizations change. In order to show this constructive dialogue, I did not change my initial assessment of the model in the text from that which Prof. Greiner reviewed. With his permission, I include his comments in footnotes to pertinent statements made in the text.

Greiner's model clearly uses the second meaning of process as a developmental sequence of events, and proposes that organizational growth progresses through five stages of evolution and revolution: (1) creativity and leadership, (2) direction and autonomy, (3) delegation and control, (4) coordination and red tape, and (5) collaboration and revitalization.[2]

To evaluate the status of Greiner's applied theory, it is useful to recognize that he implicitly borrows conceptual elements from three of the ideal types of process theories. In so doing, Greiner's model contains a number of conceptual anomalies, which in turn suggest a number of promising areas for further theory building. In the main, the model is rooted in a life cycle theory of change, in which 'historical forces [organization age, size, growth rate, and stages of evolution and revolution] shape the future growth of organizations' (Greiner, 1972: 166). The quest for growth represents an underdeveloped

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[2] Greiner: You might give my article a little context in terms of time and place--since it was written in 1972, one of the first such models, and it was published in HBR [*Harvard Business Review*], which did not want a theoretical discussion. So I was unable at the time to explain the piece theoretically in 'academic' style or to describe the empirical aspects in somewhat more 'messier' form than the HBR artists and editors would allow. . . . (I might add too that I think the model was the precursor if not the first 'punctuated equilibrium' model--at least Tushman has said this to me.)

teleological element in the model. Greiner states his position that 'the future of an organization may be less determined by outside forces than it is by the organization's history. . . . [B]ehavior is determined primarily by previous events and experiences, not by what lies ahead' (p. 166). Beyond this introductory statement, the 'pull' of an envisioned end state of growth is largely ignored by Greiner, as are considerations of alternative paths to achieve the desired end of growth; instead only one particular sequence of developmental stages is discussed. The term 'evolution' is used loosely to describe prolonged periods of growth where no major upheaval (or 'revolution') occurs in organizational practices. Thus, Greiner does not borrow conceptual elements from the ideal type evolutionary theory (as we have described it). He does, however, entertain dialectical theory by observing that 'as a company progresses through developmental phases, each evolutionary period creates its own revolution' (p. 166). However, with the exception of asserting the life cycle view that crises are immanent to each evolutionary stage, Greiner does not explain how these divergent forces emerge out of unitary progressions within each stage, and how these antagonistic forces converge and collide to mediate a synthesis in the next stage, as a dialectical theory would require.[3] As this

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[3] Greiner: This [sentence] hurts a bit because I tried very consciously to use dialectical explanation (without calling it that to HBR readers) throughout the evolving stages and crises. I think you will see this logic if you go through each stage's description, such as at the end of the Phase 2 description where I write, 'although the new directive techniques channel energy more efficiently into growth (thesis), they eventually become inappropriate for controlling a larger, more diverse and complex organization. Lower level employees find themselves restricted by a cumbersome and centralized hierarchy. . . . thus a crisis develops from demands for greater autonomy by lower level managers (antithesis).' The synthesis link I then make (but perhaps not as explicitly as I should) when I introduce 'Delegation' in stage 3 as lower levels receive more autonomy--though this autonomy is different from the kind they were asking for--and this in turn--becomes the new thesis. You or others might not agree with how I use dialectics or that I don't explain them clearly enough, but I can say that I was very conscious of it at the time, and I do think it is more evident in my more concrete explanations than you note. In fact, I have had past correspondence with some dialectical sociologists about the model's use of dialectics, which was quite uncommon at the time in management literature. I also think it is the dialectics that added the power struggle reality and made the article so successful in managerial reaction.

[But in agreement with you] I would say my model is a reasonably explicit (for an applied business magazine) attempt to combine unitary life cycle with dialectical theories--but not teleological. For me, life cycle explains the 'form' of the unitary stages, while the dialectics explain the underlying dynamics of movement. For example, I put the 'crises' in the model because I could not find data showing the stages as naturally and automatically evolving one after the other. Thus, it is not a model where a future life or end state is assured--(there are even divergent paths which are not really discussed in the article, such a failing to solve a crisis or dying if the crisis continues). My reason for saying it is not teleological is that there is no envisioned end state that pulls the process--

overly brief critique suggests, a fruitful way to evaluate and extend applied models of process is to anchor the analysis in more basic and general theories of process.

To empirically examine Greiner's model (as formulated in 1972) from a developmental process perspective, one would ask the following kind of question, 'Does organizational growth commonly progress through the sequence of stages that Greiner proposes?' A key conceptual move for addressing this research question is to view Greiner's stages as categories of events, and not to assume that these categories of events occur in any particular sequence of progression over time. Thus, instead of viewing organizational growth as a unitary progression of a linear sequence of stages based on a life cycle theory of change, one is open to more empirical possibilities if the process of organizational growth is viewed in terms of a variety of other models of event progressions and theories of change process.

One way to do this is to adopt a research design as illustrated in Figure 7.3. In comparison with Greiner's initial formulation of the model in Table 7.3, this research design redefines the five stages of organizational evolution and the four revolutionary crises identified within the stages into nine conceptual tracks or categories of events,[4] and shifts time from a vertical to horizontal axis. In so doing, one can not only gain a richer appreciation of how events pertaining to organizational evolution and revolution unfold over time, but also how the multiple tracks of event categories are related and thereby facilitate and constrain the overall process of organizational growth.

<Figure 7.3>

Guided by this research design, one could undertake longitudinal study of a number of organizations from birth to maturity. One would gather data on the chronological sequence of activities or events that occurred in the development of each organization. The observed activities could then be coded along the nine event tracks or categories outlined in Figure 7.3. For example, the creativity track would not only include the occurrence of the initial business idea on which the organization was founded, it would also record all events that occurred to further invent, develop, and adapt the business idea (or strategy) of the organization. So also, the delegation track would include all events related to the decentralization of responsibilities, the establishment of profit centers and bonuses, top management restraints to managing by exception, and similar indicators of delegation activities described by Greiner (1972: 170-171). Clearly,

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for me it is the current dynamics within the organization that are driving it forward--convergence around the thesis of each stage and then running into resistance (antithesis) and requiring reorientation for the conflict to be resolved. The model in fact has no ending and concludes with a question mark.

[4] Van de Ven: A careful examination of the conceptual overlap between the nine substantive event categories in Greiner's model would prune the set to a smaller and more manageable number of tracks. However, we will not undertake this needed theory building task in this example.

events pertaining to each substantive event track listed in Figure 7.3 can occur repeatedly during the life of an organization, and often in no necessary temporal order. Recording events along these different substantive categories or tracks (rather than a single track as has been done in the past) greatly liberates one from the erroneous and confining assumption that the life cycle of an organization proceeds in a simple unitary sequence of stages.

Event sequence analysis could begin after the field observations have concluded and events were coded along the conceptual tracks. This analysis would consist of identifying the order and sequence of events for each organization, and then comparing the observed sequence with the proposed sequence of events in Greiner's model. A strong test of Greiner's model would require that all[5] events pertaining to creativity and leadership occur first, direction and autonomy second, delegation and control third, coordination and red tape fourth, and collaboration and revitalization last.

I doubt if empirical evidence from such a study will substantiate Greiner's model of organizational growth because no empirical support has been found for a unitary sequence of stages in other studies of innovation development (see Van de Ven et al., 2000). However, this conclusion is premature because (as stated before) very few longitudinal studies have examined the development of strategic change processes in general, and to my knowledge, no studies have specifically examined organizational growth as a developmental sequence of events along the lines suggested here.[6]

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[5] Greiner: My only concern here is with your use of the word 'all'--at least I would not argue for 'all,' though I would argue that the 'bulk' of events or the 'median' should occur during these time periods. While the HBR article draws a graphic line at the beginning and end of each stage in its pictorial portrayal to the reader, I have always said that there is bound to be 'slop over' between stages--for example, 'autonomy' concerns don't suddenly die away with initial attempts at 'delegation.'

[6] Greiner: My sample was small, mostly secondary data, and limited largely to industrial/consumer goods companies. So there is a need for a larger more systematic study--and it's interesting that none has been conducted over all these years on my model or any others for that matter. Such a study might go beyond determining if in fact there is the linear order of stages and crises to find out: Are there different growth stages for different industries? Do companies that fail to grow pursue a different order of stages, or do they fail to resolve certain crises?

Future studies don't necessarily have to measure every aspect of every hypothesized stage to begin to check out the model. For example, each stage contains a clear statement about formal organization structure, which is usually public information. So just a pass at this issue would tell us a lot. Other data for other aspects may be harder to come by because they are 'internal' to the companies.

Finally, it is noteworthy that a high level of mutual respect and trust is necessary for engaged scholars to have constructive critical dialogue as this example indicates. Greiner aptly concluded our dialogue with the following comments.

> Probably some of this you were unaware of because I could not explicitly discuss it in the article. I don't think my suggestions change your basic points and hopefully they add a little more clarification. . . . Messing with another person's piece of art is always a little tricky. But I hope you know my intentions are good, as I know yours are too.
>
> I suppose you now may be wondering why I never did all of this--and I don't know, though I did get back to it with the professional service firm research this past year. . . . I think if I had read your piece, I might have had some guidance. It's interesting how undeveloped this area of research is. (Greiner, personal communication)

Concluding Comments

Research design invariably requires the exercise of what Aristotle termed 'practical wisdom.' There is no definitive best design for a given project, and any design requires giving up some data in order to focus on others. I outlined a number of methods for moving from data on observed incidents to a process model that does not betray the richness, dynamism, or complexity of a process theory or story. I also presented an example of designing a process model to empirically examine Greiner's (1972) model of the stages of organizational growth. This example and my interchange with Larry Greiner (representing views of the process theorist and modeler) shows that many strategies are possible in designing a process study. Each strategy reduces some aspect of complexity by focusing on some anchor point for guiding the analysis.

Langley discusses the strengths and weaknesses of alternative methods based on Thorngate's (1976) and Weick's (1979) tradeoffs between the *accuracy*, *generality*, and *simplicity* of any theory.

> Some strategies tend to stick closely to the original data, whereas others permit greater abstraction. Close data fitting reflects what Weick (1979) calls 'accuracy.' However, accuracy may act against generality--another desirable quality related to the potential range of situations to which the theory may be applicable. Finally, simplicity concerns the number of elements and/or relationships in a theory. It affects the theory's aesthetic qualities. Simple theories with good explanatory power may actually be preferred to complex ones that explain a little more; as Daft (1983) suggests, good research is more like a poem than a novel. (Langley, 1999: 694-695)

Fortunately, the methods discussed in this chapter are not mutually exclusive. They complement each other. Each method can provide useful information for deciding how and what other methods to use in the next step in the analysis. In this sense, the

methods serve as building blocks for developing process theories. My experience has been to use all the strategies for analyzing various aspects and questions in the course of designing and analyzing field data on processes of organizational change. In practice my objective is to combine the information that quantitative and qualitative approaches provide for understanding organizational change processes. By themselves quantitative data provide a skeletal configuration of structural regularities, often devoid of life, flesh, and soul. Qualitative data, by themselves, are like an amoeba, rich with life but absent apparent structure. Only by combining quantitative and qualitative data in a balanced way do we come to understand the richness of life in its varied regularities.

Finally, process questions of how things change and develop over time necessarily require longitudinal data. Junior faculty and doctoral students often express concerns about the amount of time, resources, and contacts needed to conduct longitudinal process studies. These concerns are genuine, but often reflect the mindset of a researcher attempting to go it alone in conducting a study. In keeping with the central theme of engaged scholarship, I advise researchers to seek out and collaborate with other scholars (typically senior colleagues) who have been engaged in studying a process question for some time, who have established trusting relationships with other scholars and practitioners, and who often welcome co-investigators to join and share in the collective achievement of conducting a longitudinal process study.

As discussed in this chapter (issue 5 on observation method in Table 7.1), longitudinal data can be obtained either by conducting a real-time field study of a change process as it unfolds or by obtaining historical archival data that are publicly available or that might be accessible by joining other researchers who collected such data. Collecting primary data involves more work and time than obtaining secondary data because the former requires building relationships with people in field sites, negotiating access, and collecting and tabulating longitudinal data as a change process unfolds. It often takes several years of repeated meetings with practitioners and stakeholders to develop trustworthy ties and to formulate research questions that both academics and practitioners judge worthy of longitudinal research. In addition, collecting longitudinal real-time data is a labor-intensive commitment for an extended period of time. Instead of trying to go it alone, I recommend that researchers (particularly those launching their careers) collaborate with and learn from experienced researchers engaged in an on-going longitudinal process study.

These data collection tasks are already completed when examining secondary data. However, gaining access to archival data, and figuring out how the data were collected, how they might be interpreted, and how they might be coded to examine process questions of interest represent challenging tasks. These tasks require careful study and communications with experts who created and maintain the secondary data files. Fortunately, as Greiner notes, researchers don't necessarily need to measure every aspect of a process model or question being investigated. A preliminary pass at analyzing archival information (often publicly available) may tell us a lot about the process being studied.

In short, whether the longitudinal process data are obtained from primary or secondary sources, I advise researchers not to go it alone; instead, engage and collaborate

with other scholars (typically senior colleagues) who are conducting process studies or have access to longitudinal process data.

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Table 7.1 Key Issues, Decisions, & Suggestions for Process Research in Field Studies

Issues	Decisions	Suggestions
Formulating the Process Research Plan		
1. Meaning of process	A category of concepts or a developmental sequence?	Process research is geared to studying how questions
2. Theories of process	Examine one or more models?	Apply and compare plausible alternative models.
3. Reflexivity	Whose viewpoint is featured?	Observe change process from a Specific participant's viewpoint
4. Mode of inquiry	Deductive, inductive or retroductive?	Iterate between deduction and retroduction
5. Observational method	Real-time or historical observations?	Observe before outcomes are known
6. Source of change	Age, cohort or transient sources?	Develop parallel, synchronic and diachronic research design
7. Sample diversity	Homogeneous or heterogeneous?	Compare the broadest range possible
8. Sample size	Number of events and cases?	Focus on number of temporal intervals and granularity of events
9. Process research designs	What data analysis methods to use?	Match data analysis methods to number of cases and events.
Measuring & Analyzing Process Data		
1. Process concepts	What concepts or issues will you look at?	Begin with sensitizing concepts and revise with field observations
2. Incidents & events	What activities or incidents are indicators of what events?	Incidents are observations; events are unobserved constructs
3. Specifying an incident	What is the qualitative datum?	Develop decision rules to bracket or code observations
4. Measuring an incident	What is a valid incident?	Ask informants to interpret and verify incidents
5. Identifying events	What strategies are available to tabulate and organize field data?	Apply a mix of qualitative and quantitative data analysis methods
6. Developing process theory	How to move from surface observations to a process theory?	Identify five characteristics of narrative theory

Table 1. Sample of developmental process models in strategic management literature

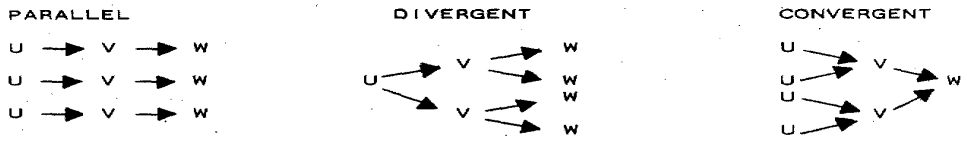
Authors and Summaries	Beginning ← Activity phases or stages → End					
Strategic decision models						
Mintzberg *et al.* (1976) —Field study of 25 strategic, unstructured decision processes	1. Identification phase —Decision recognition routine —Diagnosis routine	2. Developmental phase —Search routine —Design routine	3. Selection phase —Screen routine —Evaluation–Choice routine —Authorization routine			
Cohen, March and Olsen (1972) —Garbage can model of decision making	Decisions are probabilistic intersections of relatively independent streams within organizations of: —choices → —problems → —solutions → —energy of participants →					
Quinn (1980) —Case studies of nine major corporations	Fourteen process stages beginning with need sensing and leading to commitment and control systems. Flow is generally in sequence but may not be orderly or discrete. Some of the process stages are the following:					
	1. Sense need	2. Develop awareness & understanding	3. Develop partial solutions	4. Increase support	5. Build consensus	6. Formal commitment
Strategic planning models						
Gluck, Kaufman and Walleck (1980) —Study of formal planning systems in 120 companies	1. Basic financial planning —meet budget	2. Forecast-based planning —predict the future	3. Externally-oriented planning —think strategically	4. Strategic Management —create the future		
Lorange (1980) —Normative model of corporate strategic planning	1. Objectives setting —identify relevant strategic alternatives	2. Strategic programming —develop programs for achieving chosen objectives	3. Budgeting —establish detailed action program for near-term	4. Monitoring —measure progress toward achieving strategies	5. Rewards —establish incentives to motivate goal achievement	
Organization development models						
Scott (1971) —*Stages of corporate development*	1. Single product, channel & entrepreneurial structure	2. Single product, channel & functional structure	3. Multiple products, channels & divisionalized structure			
Greiner (1972) —Stages of organizational growth through evolution and revolution	1. Growth through creativity —Leadership crisis	2. Growth through direction —Autonomy crisis	3. Growth through delegation —Control crisis	4. Growth through coordination —Red tape crisis	5. Growth through collaboration —Crisis of ?	

Table 7.2. Source: A. Van de Ven (1992). Suggestions for studying strategy process: A research note. *Strategic Management Journal*, 13, 171.

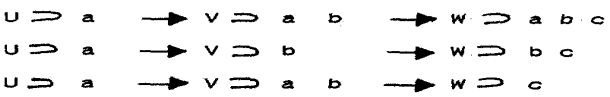
Table 7.3 A Vocabulary for Examining Developmental Progressions

Alternative Progressions of Events

- **simple unitary progression**
  - A sequence of the form U → V → W
- **multiple progressions**
  - Development can follow several paths
  - Forms: parallel, divergent, and convergent



- **cumulative progressions**
  - More than one stage may belong to a unit at a time.
  - Forms: by addition, substitution, or modification



- **conjunctive progressions**
  - Events in one path are related or influence events in another path of a multiple progression
  - Relations may be probabilistic, inclusive, or mediated
- **Recurrent progressions**
  - Repeating strings of events over time

Adapted from
L. van den Daele, "Qualitative Models in Developmental Analysis," Developmental Psychology, 1969.

Table 7.4. Typology of Process Research Designs from Poole et al. (2000)

	FEW EVENTS	MANY EVENTS
Few Cases	Summary Case Studies	Summary Case Studies Phasic Case Studies Time Series Analysis Markov Analysis
Many Cases	Multivariate Analysis	Multivariate Analysis of Summary Data
	Phasic Analysis with Optimal Matching	Phasic Analysis with Optimal Matching
	Event History Analysis	Markov Analysis Time Series Analysis

Table 7.5 Evolution of Innovation Concepts During MIRP

	Starting definitions from literature:	But we see this in field studies:
Ideas	One invention to be operationalized	Reinvention, proliferation, reimplentation, discarding and termination of many ideas
People	An entrepreneur with a fixed set of full time people over time	Many entrepreneurs, distracted, fluidly engaging and disengaging in a variety of roles over time
Transactions	Fixed network of people/firms working out the details of an innovative idea	Expanding and contracting network of partisan stakeholders converging and diverging on innovation ideas
Context	Environment provides opportunities and constraints on innovation process	Innovation process constrained and created by multiple enacted environments
Outcomes	Final result orientation: a stable order comes into being	Final results may be indeterminate; multiple in-process assessments and spinoffs; Integration of new order with the old
Process	Simple cumulative sequence of stages and phases of development	From simple to multiple progressions of divergent, parallel, and convergent paths; some are related and cumulative, others not

Source: Van de Ven et al., 1999.

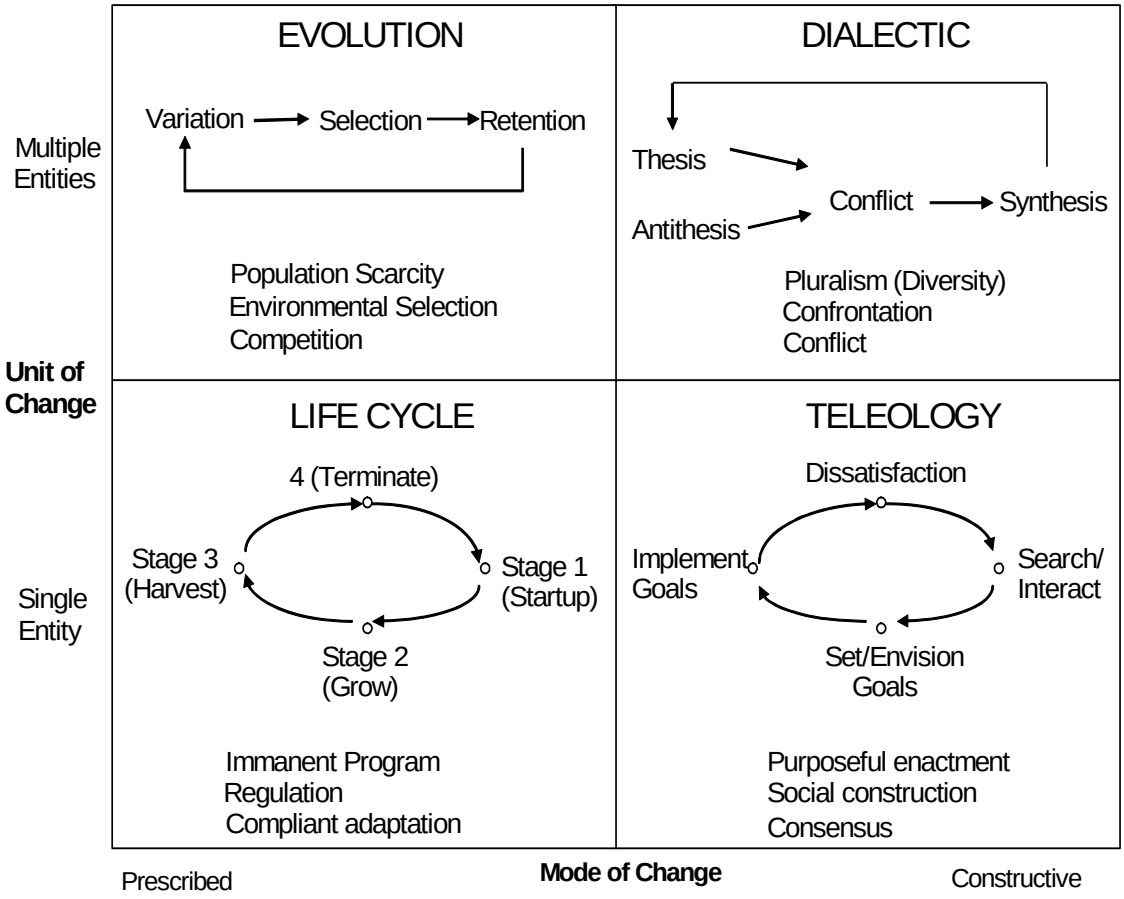
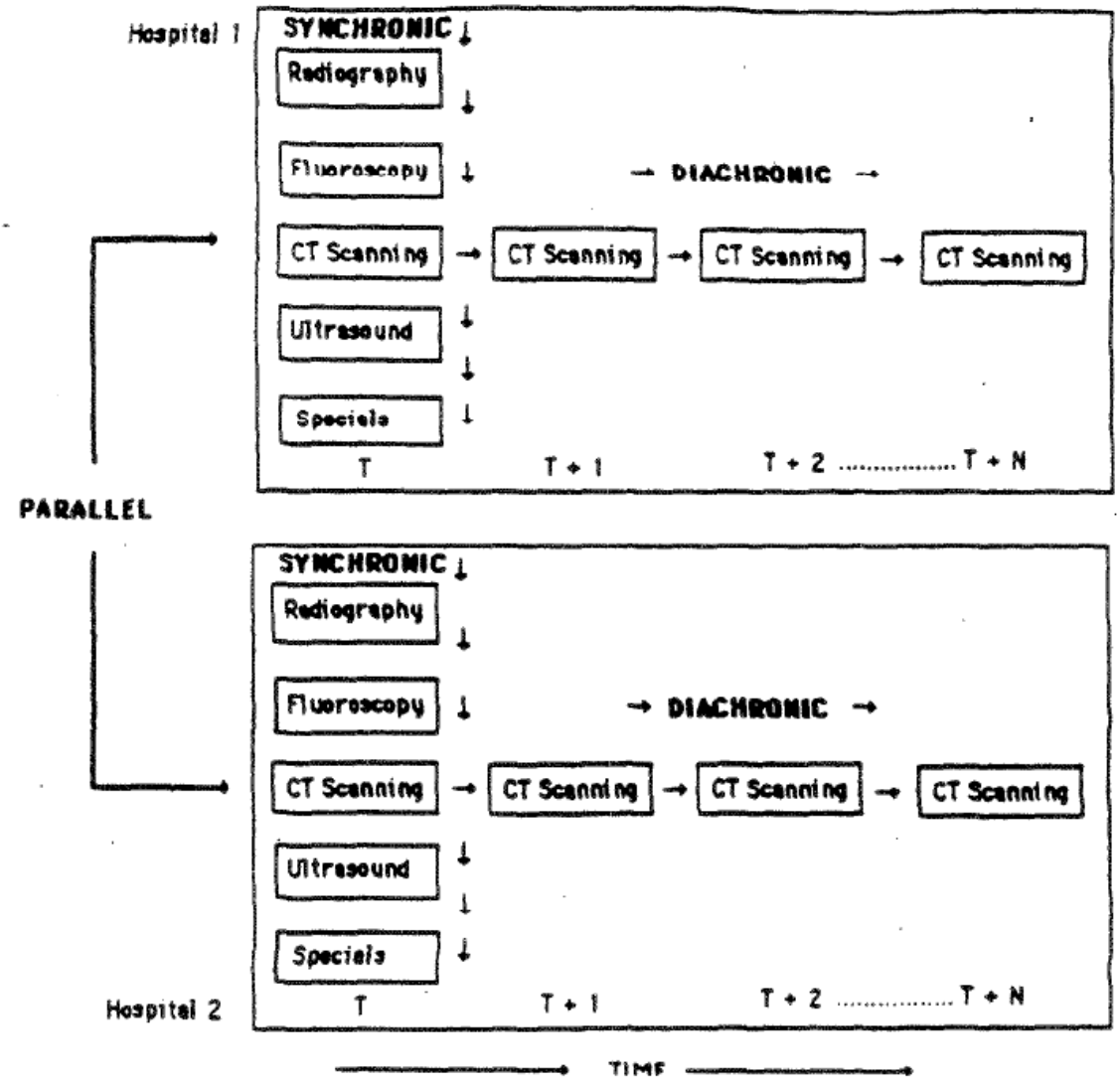


Figure 7-1. Process Theories of Organizational Development and Change

Note: Arrows on lines represent likely sequences among events, not causation between events.

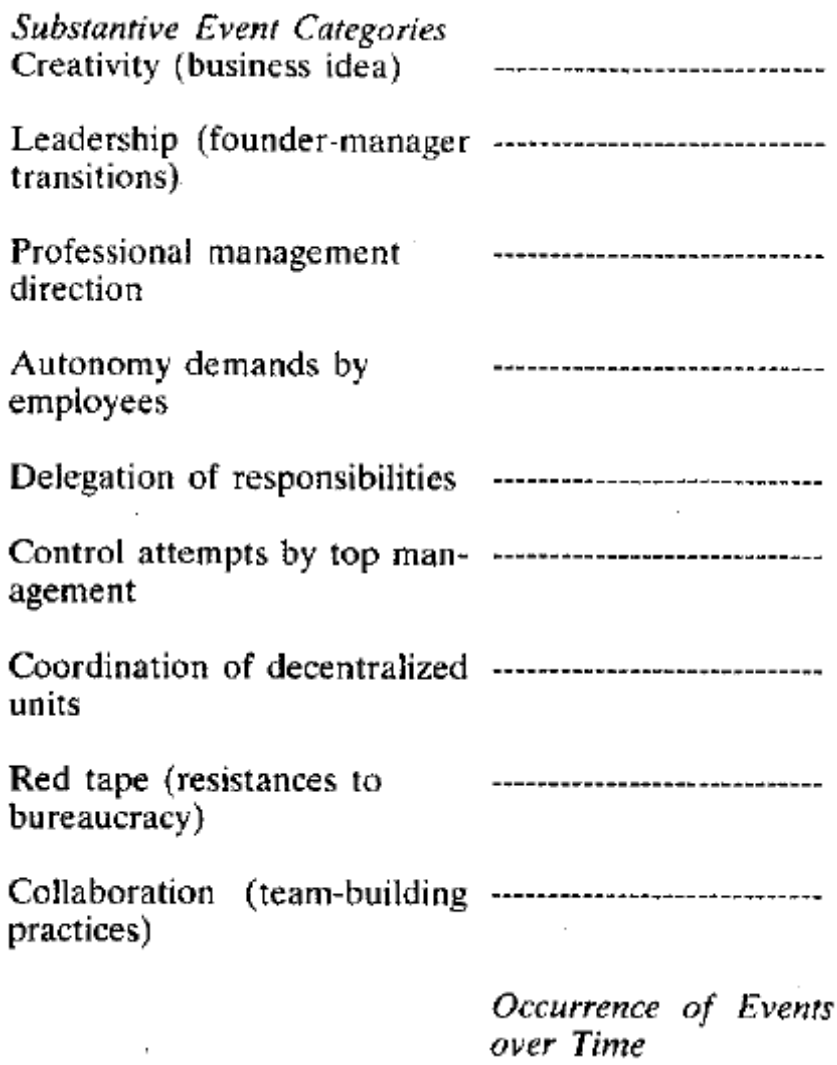
Source: A.H. Van de Ven and M.S. Poole, "Explaining Development and Change in Organizations," Academy of Management Review, 20, 3, p. 520

Figure 7.2 Barley's (1990) Parallel, Synchronic, and Diachronic Research Design



Source: Barley, S. R. 1990. Images of imagining: Notes on doing longitudinal research, *Organization Science*, 1(3), 226.

Figure 7.3 Research Design for Studying Greiner's Model of Organizational Growth



Source: Van de Ven, A. H. 1992. Suggestions for studying strategy process: A research note. Strategic Management Journal, 13, p. 185.