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Research methodology for New Public Management

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Abstract

This article outlines recommendations for improving research methodology in New Public Management (NPM). It begins by describing three characteristics related to NPM that make it such a research challenge: a change in perspective, a willingness to experiment, and the high-stakes consequences of NPM research and its results. Recommendations for improvements are grouped within the five stages of the research process: formulating the research question and specifying the units and levels of analysis; choosing the research design; sampling and gathering the data, coding and analyzing the data; and interpreting the results. Two ongoing large-scale programs of research (one on innovation and the other on the dynamics of social organization) illustrate how the recommendations can be put into practice. Taken as a whole, the recommendations call for a systems approach to NPM research that is supported by teams of interdisciplinary researchers who complement one another's knowledge and skills and collaborate on long-term, field-based studies.

Introduction

In the 1980s, under the rubric of "new public management" (Hood, 1991), New Zealand undertook a series of public sector reforms and became the focus of international attention. Looking to New Zealand as the test-bed of innovation, officials from all over the world came to ask: What were these public sector reforms? Were they working? Were they successful? Could other countries emulate the New Zealand model of change?

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Answers to these questions called for evaluation and assessment of New Zealand's change effort. But as Jonathan Boston (2000) points out, substantive research to address these questions faces serious hurdles. He groups the hurdles into four basic categories:

1) The difficulty of choosing appropriate evaluation criteria to determine what constitutes success.
2) The challenge of identifying and securing relevant evidence, especially making decisions on what to measure and how to measure it.
3) The question of how to interpret available evidence, especially appropriate counterfactual evidence, and to determine causation in a complex change process.
4) The problem of determining an overall assessment when the reforms encompass wide-ranging interventions into various parts of the public management system.

We believe that it is possible to conduct research on complex public management reforms such as those undertaken by New Zealand. We agree with Boston that although the challenges are formidable, they are not insurmountable (Boston, 2000, 23). Our goal in this paper is to outline what steps researchers could take, not only to overcome the hurdles, but to establish a more solid research foundation on which to base public policy.

To make our recommendations for improvements in research methodology, we organize the article into sections that parallel the five stages of the research process. Taken together, these five stages define research methodology as the "system of explicit rules and procedures upon which research is based and against which claims for knowledge are evaluated" (Nachmias & Nachmias, 1981, 15). The five stages of the research process are: (1) formulating the research question and specifying the units and levels of analysis; (2) choosing the research design; (3) sampling and gathering the data; (4) coding and analyzing the data; and (5) interpreting the results. Our purpose is to identify and recommend research methods that are especially relevant to NPM at its present stage of development. When coupled with an interdisciplinary systems approach, these methods will not only be helpful in examining public management reforms, but they also will produce a body of scientific knowledge and theory to inform NPM practice.

We enliven our examination of research methodology by summarizing two large-scale research programs in which the authors have been involved. The first is the Minnesota Innovations Research Program, of which the first author was a principal (Van de Ven et al., 1989; Roberts & King, 1996). The second is the nation-wide study of urban communes in which the second author was a principal participant (Bradley, 1987; Carlton-Ford, 1993; Zablocki, 1980). Although each program explored topics and content different from the thrust of New Public Management (NPM), both illustrate how our recommendations for improvements can be put into practice and applied to NPM research. At their core, the recommendations illustrate a systems approach to research that is supported by teams of interdisciplinary researchers who complement one another's knowledge and skills and collaborate on long-term programs of field-based studies.

In developing our argument, the intent is not to be comprehensive. Instead, we concentrate on particular aspects of the research process we believe merit attention given the current status of public management reforms. Accordingly, we begin by linking certain characteristics of NPM to the research process.

Characteristics of New Public Management

For nearly a decade now, the characteristics of NPM have been discussed in conferences and publications (Hood, 1991; Jones, Schedler & Wade, 1997; Thompson, 1997) without widespread agreement among scholars as to whether it constitutes a separate, distinctive field of public management (Barzelay, 1999; Kaboolian, 1998; Lynn, 1998; Mathiasen, 1999; Nagel, 1997). At risk of over simplification, we believe there are three characteristics of NPM that have relevance for research in NPM. These characteristics are a change in perspective, a willingness to experiment, and the high stakes consequences of NPM research and its results.[1] The point of what follows is to show how these characteristics motivate certain kinds of research questions and methodologies.

Change in perspective

NPM represents a significant departure from the classical theory of administration which underlies much in the traditional approaches to public management. Traditional approaches are based largely on Weber's (1947) ideal-type of bureaucratic authority which calls for certain basic categorical separations in administration: the separation of administration from policy, of administrative functions from each other, of public and private institutions from each other, of public sector theory and practice from private sector theory and practice, and so forth. These 'separations,' among others, have held sway as injunctions on both management practice and research; they have operated, essentially, as boundary conditions defining distinct, incompatible, or mutually exclusive categories of phenomena.

In NPM, however, the situation is more complex and more fluid. These aspects of management are not viewed as sets of fixed oppositions. Rather the 'separations' devolve into an almost seamless web of complementary combinations, connections, and interrelations among elements, subsystems, systems, and contexts. For example, public-private partnerships, regulated by law and by market forces, may involve organizational structures based on self-directed, coevolving networks of self-organizing, competing teams. As such, they can operate with some degree of decentralized decision-making and combine concerns for citizen equity, policy responsiveness, customer satisfaction, and service efficiency and effectiveness. This shift in management orientation requires a comparable shift in research methodology to accommodate the large-scale interdisciplinary, multilevel network and systems-oriented reforms of NPM, as we elaborate below.

Experimentation in practice

The corollary of this perspective change in practice is experimentation—a willingness in NPM to experiment with the forms and processes of public institutions. At its core, NMP is a large collection of ever-evolving natural experiments, in which the concepts and principles that inform the practice of NPM are under continuous 'empirical test' variously throughout the world in the realities and day-to-day lives of citizens. As one anonymous reviewer noted, if most NPM research seems to be pre-experimental in nature, it may be because the practice of NPM itself *is* the experiment.

This willingness to experiment may result from challenging previously-held theoretical assumptions (Lynn, 1997; Boston et al., 1996), but it may also emerge in responding creatively to local needs and conditions (Naschold & Daley, 1999; Osborne & Gaebler, 1992). To date, programmatic assessment has been conducted primarily at the *micro* level on relatively narrow areas of activity (e.g., contracting out, strategic management, financial management) or on at the policy level (e.g., health care, education). Few studies have attempted system-wide assessments, and those that have been undertaken have been described as "constrained in terms of their depth and rigour" (Boston, 2000, 11).

Given the scale and complexity of the units of analysis (often nation states), and the geopolitical contexts in which they function, this approach may seem reasonable since there are enormous obstacles to research (Boston, 2000). Moreover, even under optimal research conditions, it is unlikely that sufficient scientific measurement and control can be achieved to render a comprehensive understanding of the functionality and effectiveness of the reformed system as a *whole* (Nadeau & Kafatos, 1999, Chap. 10). Despite such difficulties, however, we believe an approach informed by interdisciplinary perspectives, and one that utilizes a longitudinal, comparative research methodology, will motivate development of well-grounded, robust theories to guide NPM practice as we illustrate below.

High-stakes consequences of research

In pure science, research is a slow, deliberative process in which research findings are scrutinized by skeptical colleagues and subjected to repeated empirical verification before accepted as valid. Here research is motivated by the search for abstract principles and generalizations that stand above daily human life. However, in applied science, like public and corporate management, it is the 'political' need for timely solutions to particular worldly problems that drives research. Most often the timescale between research and action is short, with insufficient time for outside peer review, let alone replication of research findings in other independent studies. But there are also many instances where large-scale public reform has had *no* empirical basis (e.g., Moynihan, 1970).[2]

The issues and problems that drive applied research have consequences for the lives of the research subjects and also for the lives of researchers (Gans, 1968). The research subjects' lives have been directly affected by the nature and consequences of the problem, and will likely be impacted by subsequent public policy and action. In such circumstances, they have a vested interest in how the problems are defined and studied, and also in action taken to mitigate or resolve them (Habermas, 1970). On the research side, short time frames, political pressures, inadequate funding, and so forth, all conspire to produce poor research, the results of which can negatively affect the professional reputations and lives of the researchers involved.

Such a research context is a conundrum of competing political interests for the applied researcher: the interests and biases of those funding the research; the self-interests and bias of respondents and respondent subgroups; the interests of stakeholders and other third parties; and the interests and bias of the researcher. Because these interests have bearing on the operational construction of the research problem, we describe certain imperatives that should be con-

sidered in the problem definition sampling, data collection, coding, and interpretation stages of research.

Stages of the research process

In starting with problem formulation, we give much more space, and hence weight, to this initial phase of research because of its central importance in defining and setting up all that follows. While the selection and implementation of an appropriate methodology is important, formulating the research to address fundamental, insightful questions about the research subject is *absolutely critical.*

Stage one: formulating the research problem

Some researchers documenting the world-wide movement from Public Administration to New Public Management view it as a "paradigm shift" (Jones & Thompson, 1997; Mathiasen, 1999). The assumptions, values, organizational designs, and operating systems of the two approaches are considered to be so different that the transition from one to the other is described as "transformational" and "radical" (Osborne & Gaebler, 1992; Nagel, 1997; Pallot, 1997).[3] However, one thing that does appear unchanged with the development of NPM is that research still tends to be a discipline-based endeavor with each speciality opting for indepth study of the elements of its own subsystem. For instance, economists examine economic markets and their incentives (Scott et al., 1990), financial management experts focus on accounting models, measures of performance, and different control mechanisms (Guthrie et al., 1997; Harr, 1990; Thompson, 1994), and organization specialists are concerned with design features such as jobs, structure, and the technology of work (Barzelay & Armajani, 1992).

There are advantages to taking a disciplined-based view of NPM, of course. Choice of units and levels of analysis, and thus variables, can follow established protocols of research in a particular field. In organization theory, for example, organization structure becomes a unit of analysis, organization the level of analysis, and measures of differentiation, formalization, degree of centralization, and so forth, the variables of interest (Hall, 1999). Empirical documentation of a shift from one type of structure to another, associated with an observed increase in the quality of services provided, would support hypotheses on the effectiveness of the new structural arrangements.

But sole reliance on disciplined-based research has disadvantages, too. Social systems are highly interconnected open systems in which system behavior is a combination of intentional human action and system processes of self-organization. Small changes in one element can produce a cascade of consequences, many unintended and unanticipated, that ultimately affect the structure and performance of the whole system (Merton, 1936; Tenner, 1996). Research on particular aspects of the system puts the emphasis on the parts, not on the whole. Thus, when discipline-based researchers investigate public management reform, they may at best become expert on how the subsystem they studied is affected. However, not only is it likely that such a specialist approach will miss how these affects are related to impacts

elsewhere in the system, but, even more importantly, it will certainly miss how the reform system is affected as a totality. Because NPM is concerned with changes and reforms that, either by design or consequence, affect the system as a whole, an *interdisciplinary system-based* approach is essential. As we describe below, this approach should be both contextualist and processual in character: it should draw on "phenomenon at vertical and horizontal levels of analysis and the interconnections between those levels through time" (Pettigrew, 1990, 269).

Levels and units of analysis

System-based research questions address the organization and dynamics of the reform system as a whole. In its simplest form, a system is a collectivity comprised of inputs, operating functions, outputs, and an environment. It is an emergent order of collective organization in which the *arrangement* of its elements (parts and relations) creates an operational logic that generates a qualitatively different functionality which cannot be produced merely from an aggregation of the elements alone (Piaget, 1970; Nadel, 1957).

At the sociological level—the level at which NPM operates—public institutions and organizations are highly complex, multilevel systems (Hall, 1999; Scott, 1981). Endogenously, each system is comprised of many levels and units of organization. These levels and units are variously linked by vertical interdependence between higher and lower layers of organization and by horizontal interdependence between adjacent units at the same organizational level. At the same time, each system is linked exogenously by a complicated web of interactions with its environment (Pettigrew, 1990). This recognition of multiple levels of organization in a system is *not* an argument for reductionism, however, as Hinde (1992, 1019) rightly points out. This is because each level "must be thought of not as an entity but rather in terms of *processes continually influenced by the dialectical relations between levels.*"[4]

Such system complexity makes problem conceptualization a daunting challenge. One approach to this problem has been to take a "holistic stance" and attempt to describe the organizational elements for study (e.g., organization structure, culture, strategy, environment, etc.) as a "configuration"—a clustering of relations among "conceptually distinct characteristics that commonly occur together" and cohere in stable, understandable ways (Meyer et al., 1993, 1175–1176). Another approach, network analysis (Knoke & Kuklinski, 1982), which we favor as a highly effective research tool, provides a rigorous methodology for empirical description of a given configuration of organizational elements (Bradley & Roberts, 1989a). In a moment we will show how network concepts also offer a powerful way of depicting the global organization of parts and relations in these systems.

Differences in the various characterizations of NPM suggest there is little agreement about what elements or units of analysis constitute NPM, and thus are appropriate or useful in research. System-level research on different programs of reform, whether among nations or among agencies within a single nation, requires some agreement on which units to compare and contrast.

In keeping with our system's perspective, a "new" unit of analysis—the social relation—could be added to future NPM studies. In virtually all research in public management the unit of analysis is an individual entity, whether a person (manager), a social unit (organizational division

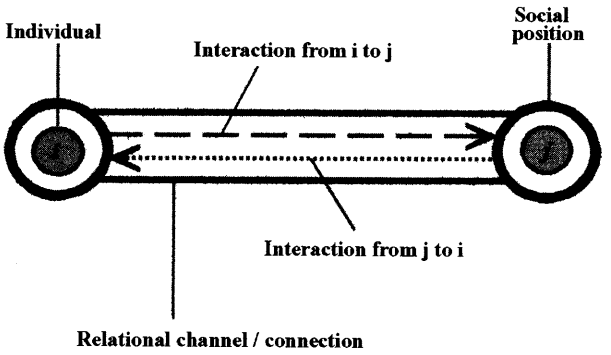


Fig. 1. Relation as Unit of Analysis. © Copyright by Raymond Bradley, 2000; reprinted with permission.

or group), or some other discrete object (new management technique). Typically, the characteristics of one set of individual entities (managers) are examined in relation to the characteristics of a second set of individual entities (new management techniques). However, what is missed in such research is the *pattern of social relations that interconnect social entities* in a system.

Network analysis is the research methodology, *par excellence,* that focuses on the organization of social relations (Mitchel, 1969). In contrast to all other social science methodologies, where the unit of analysis (and measurement unit) is centered on or derived from the individual, the unit of analysis in network research is relational—the social tie or bond between two actors *i* and *j* (see Fig. 1: the inner-circle in the two nodes represents the entities, the outer circle represents the social position each occupies, and the two solid lines between them represent the connection or channel through which each transmits signals—interactional content, dashed/dotted lines—to the other, as shown). The power of this approach, both in its conceptual and empirical application, is that it can be used to study relations either within or between systems at any level of analysis—from nation states, large organizations, small groups and communities, to couples—in which the units of analysis can range from individual entities; bounded subnets such as dyads, triads, and cliques; open networks such as diffusion or contagion webs; and bounded networks such as groups, organizations, and societies.

Shifting the unit of analysis from the node to the relation makes sense for a number of reasons. Reliance on market incentives, and the attendant intra- and interorganizational interactions they prompt, are prominent features of NPM. Transactions across formal lines of organizational authority are creating opportunities (and perils) through partnerships and networks among entities, which are less concerned with the boundaries that separate them and more concerned with the potential afforded by new relationships between them. For example, outsourcing a particular management function, say claims processing for a state unemployment bureau, creates a reliance on an "outside" contractor who is expected to perform services that were once handled internally by state agency personnel. The contract between the agency and the outside supplier continues to the extent that the relationship between the two entities is judged to be mutually advantageous. Neither the characteristics of the state agency nor the characteristics of the supplier are as important as how they forge and organize the bond between them.

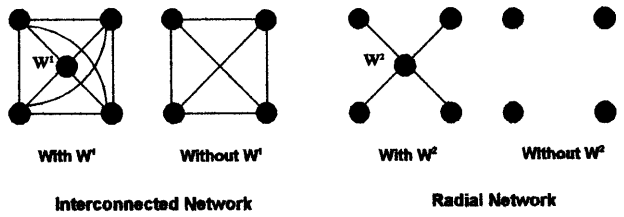


Fig. 2a. Network Structures.

Two simple examples illustrate the utility of network analysis for examining bonding patterns in this kind of situation. The first example shows how the loss of just a single node in two different networks can have profoundly different structural consequences for interactional flow. The "interconnected network," shown in Fig. 2a, is a more resilient system: despite the loss of node W^1 and its associated relations, interaction still flows among the four remaining nodes due to the redundancy of ties in the system. By contrast, loss of this node (W^2) and its relations in the "radial network" results in the complete collapse of the system: with no redundant connectivity at all, there are *no* relations left among the four remaining nodes. Clearly, a radial network would be a disastrous interorganizational structure for public agencies and organizations that must provide critical services during civil emergencies.

The second example (Fig. 2b) shows how "weak ties" (casual acquaintances) and "structural holes" (absence of connection) in social systems create strategic opportunities in competitive situations.[5] Independent, autonomous entities are rare in social networks. "Hence the strength of weak ties. Weak ties are essential to the flow of information that integrates otherwise disconnected social clusters into a broader society" (Burt, 1992, 26). In each of the three networks depicted in Fig. 2b, individuals are highly intraconnected so that each is likely to know what the others in their own network know. A source of information on new ideas and opportunities is available from outside, through the weak ties (dotted lines in Fig. 2b) that connect individuals from different networks. Thus, the node labeled "X" is

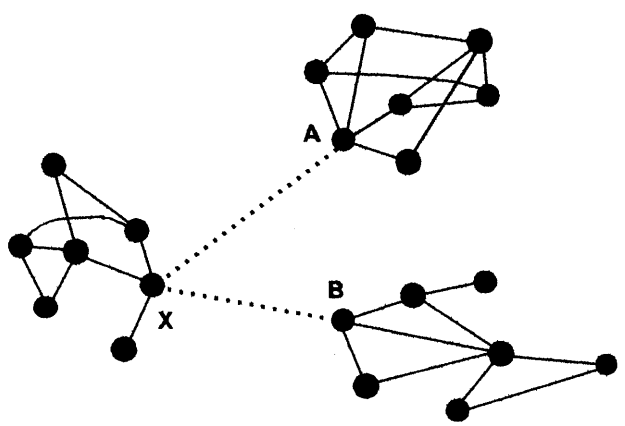


Fig. 2b. Structural Holes and Weak Ties. Redrawn from Burt, 1992, Fig. 1.6. © Copyright by Raymond Bradley, 2000; reprinted with permission.

in a strategic position of information control as an interactional bridge linking the three networks. Take our outsourcing example again. As the time for contract renewal draws near, the state manager hears from long-time acquaintances in two other companies (say, nodes *A* and *B* in Fig. 2b) that these companies have recently developed innovations in claims processing technology. The manager decides to include them in the Request For Proposal process and open the process to increased competition.

Changing the unit of analysis from an entity to the relation between entities is more consistent, we suggest, with the more relational character and emergent networks of NPM.

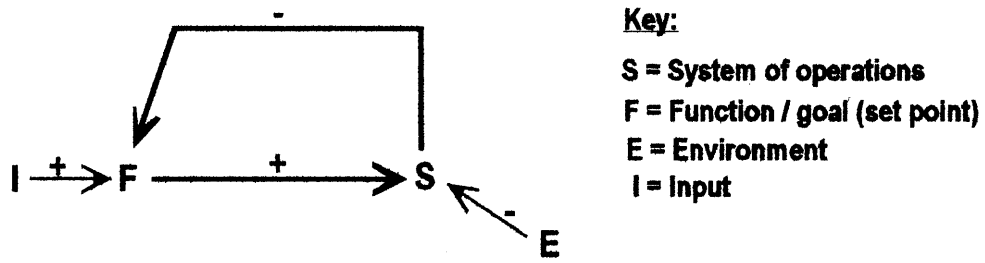
Processes

A social system is an entangled complex of past mandates, adaptations to present conditions, and potential action options in the future. As such, static characterizations of system organization are *not* sufficient to inform research on public management reform. What is needed, in addition, are the concepts and principles of system dynamics: ideas on how the system behaves over time.[6]

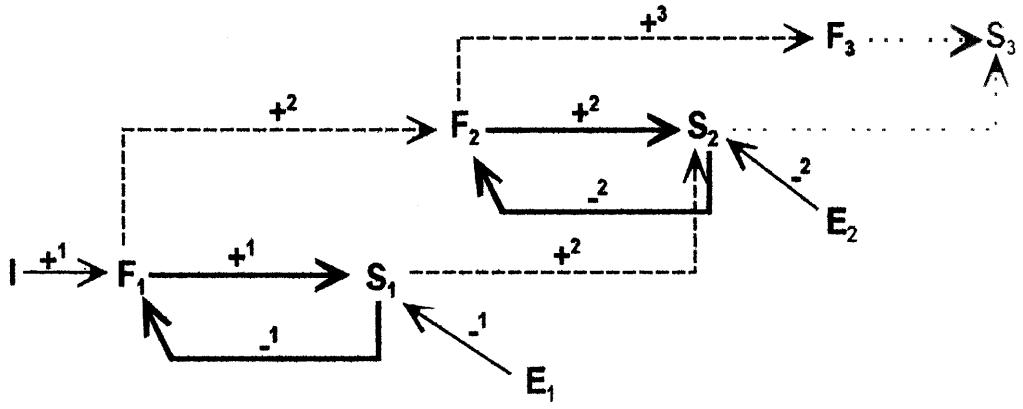
At an elementary level, research should investigate two aspects of system dynamics: those processes that operate to maintain the system as it is, and those processes that cause the system to change. In the language of information control theory, these processes are known as *feed-back* and *feed-forward* control, respectively. In simple terms (see Fig. 3a), a *feed-back* system is a self-regulating control process that involves four elements and relations: an input (*I*), that establishes a set-point for a function (*F*), that is to be maintained (positive arrow) by a system of operations (*S*), that is under constant tension (negative arrow) from its environment (*E*). The tension is transmitted back through the system (negative backward arrow), which causes the system to keep operating to maintain the function. An example is a thermostat which automatically controls the operation of a heating unit to maintain a stable room temperature as heat constantly dissipates into the surrounding environment. In sociological terms, the logic of feed-back control is the logic of functionalism (see Stinchcombe, 1968).

We can also use this example to illustrate the logic of *feed-forward* control—a control system that has more than a single point of stability or set-point (shown as F_1, F_2, and F_3 in Fig. 3b). In order to raise (change) the temperature of the room, we reset the target temperature on the thermostat's control dial from F_1 to F_2, thereby changing the set-point for the heating system. This will increase the operation of the heating unit until it has reached F_2, the higher room temperature. In other words, we *feed* the control *forward* to a new set-point—a new level of heat stability—that the heating system now uses to self-regulate the operation of the heating unit. This is exactly the same logic of control when we introduce a planned change or reform into a social system: *we are intentionally changing* the system's set-point and, therefore, the operations and actions involved to achieve the new state of stability for the system. The flow diagram (Fig. 3c) provides a substantive example in which both feed-back and feed-forward processes are shown in a model of purposeful organization from Bradley's work (2000a).

The beauty of these processes is that the logic of systems control is known to apply to systems at any level or scale of organization. This means that such models, and more complex variants such as the one shown in Fig. 3c, can be used as heuristic tools to model,



3a. Feed-back Control: System Maintenance



3b. Feed-forward Control: System Change

Fig. 3a and 3b. Elementary System Dynamics. © Copyright by Raymond Bradley, 2000; reprinted with permission.

in conceptual terms, the dynamics of the public management system under investigation. All public management systems involve a combination of both control processes—one for system maintenance and the other for system change. It is important in understanding the dynamics of a given system to describe how each operates as a distinct process and how, in addition, they are interlinked to regulate and direct the system as a whole.

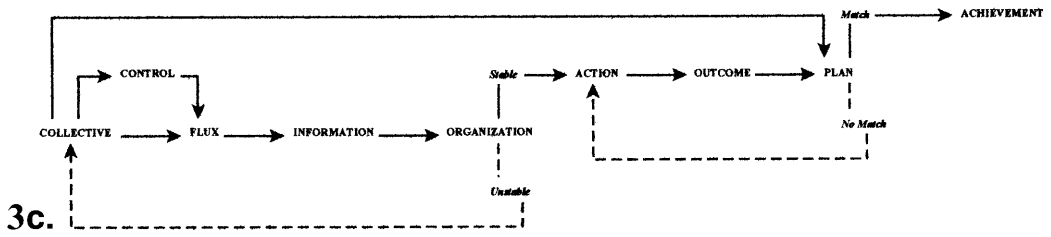


Fig. 3c. Feed-back and Feed-forward Processes: Logic of Communication for Endogenous Organization and Purposeful Action. © Copyright by Raymond Bradley, 1998; reprinted with permission.

Such description of a system's dynamics can help inform both public policy and research on public management. The implications of a reform can be conceptualized carefully, so that any policy proposal or research program considers key system maintenance elements in relation to the key elements of reform or change, enabling researchers to anticipate the degree to which the dynamics of the two, taken together, produce unanticipated, unintended dysfunction and instability in the reform system (Merton, 1936). It is also likely, of course, that such conceptual analysis may point to potential benefits, such as increased efficiency or effectiveness in system functionality, that otherwise would have gone unnoticed.

In short, problem formulation requires the development of a substantive model: a theoretical description of the system of public management to be studied, the nature of and means by which the reform plans are implemented, and their likely affects on the system. This description should be cast in terms of the levels and units of analysis, their interlinkages, and social processes that constitute the system; the likely changes both in these elements and processes, and in the system as a whole; and the expected changes in the relations between the system and its environment. Such description is minimally adequate. Without this conceptual 'road map' of the system, it is all but impossible to know what baseline measurements should be established and where additional research effort should be focused.

Stage two: selecting a research design

A research design is an operational plan describing the methods and procedures to be used for investigating relationships among the variables in the research problem. With the research problem in mind, it is developed in relation to three primary considerations: the nature and distribution of the phenomena to be investigated, the level of control required to operationally construct valid and reliable indices of these phenomena, and the duration of measurement (Kerlinger, 1973). The discussion that follows has been organized with these considerations in mind.

Research in NPM tends to rely heavily on nonexperimental research designs, most notably the *'one-shot' case study* (Campbell & Stanley, 1963). A one-shot case study involves field observation, typically of limited duration, of a single case (e.g., a group or an event), most often after some phenomenon has occurred that is expected to produce an observable effect on the subject of research (Nachmias & Nachmias, 1981, 107–109). In contrast to the more formal quasi-experimental and experimental designs (Campbell & Stanley, 1963; Cook & Campbell, 1979), there is minimal a priori specification of the research parameters and development of appropriate operational controls, as elaborated below.[7] As a consequence, there are severe limitations on scientific inference (Blalock, 1961; Campbell & Stanley, 1963). With no basis for comparative measurement, internal and external validity cannot be established directly (Cook & Campbell, 1979). And without formal longitudinal controls, this design has little value for causal inference: it cannot be used for testing or establishing causal relations (Lieberson, 1985). However, when the case is investigated as a system, and formal measurement procedures are used in a longitudinal design, multivariate techniques provide a rigorous means for constructing a nonempirically generalizeable understanding of causal relations in *that* system (to wit, Roethlisberger & Dicksons' (1939) classic study, *Management and the Worker*).

Thus, the one-shot case study is an excellent vehicle for theory construction, especially in areas where there is little existing work. When the case and research site are carefully chosen, the study can be used as exploratory research to facilitate the development of theory (Glaser & Strauss, 1967). This was the strategy Roberts pursued in her longitudinal, multimethod, one-shot case study of the role of policy entrepreneurship in educational innovation and reform in a large midwest state (Roberts & Bradley, 1988, 1991; Roberts & King, 1996). Researchers can use the extensive case data for hypotheses generation and then rely on more rigorously designed studies at a later point for hypothesis testing. Thus, one-shot case studies provide a rich empirical base for the development of theory so long as theory construction remains the researcher's goal. Unfortunately this potential remains unrealized because, all too often, researchers stop at description and leave the most important work of theory construction unaddressed. If NPM researchers continue to do one-shot case studies, then theory construction should be the goal, especially the formulation of hypotheses that pertain to system-level functioning.

There are two variations of the one-shot case study that are particularly useful, and could be utilized to great advantage at this point in the development of NPM: comparative case studies and longitudinal case studies. There are two design options: comparison of matched-groups and comparison of contrast-groups (Cook & Campbell, 1979). Matched-group comparison involves the examination of several groups, selected because they share certain characteristics in common, in order to distill differences in organization and function. Contrast-groups comparison is the opposite—examination of groups that are selected because of their differences on certain characteristics, in order to investigate commonalities in structure and behavior. Glaser and Strauss (1967) argue that the development of new theory is best facilitated when the differences among groups are maximized.

Comparative case studies have made their appearance in NPM, but the unit of analysis tends to be either a functional or a micro element of the system rather than the system as a whole. Hence we find cases of financial management changes in OECD nations (Guthrie, Olson & Humphrey, 1997), and performance auditing in OECD nations (Barzelay, 1997). There are even comparisons among international local governments (Naschold & Daley, 1999). But to our knowledge, empirical, system-level comparisons among nations undergoing this transition have yet to be done. Given the international scope of the New Public Management Network, cross-national comparisons seem like a good next step, especially since case studies that document the evolution of NPM at the national level are appearing (e.g., Boston et al., 1996).

Longitudinal case studies offer another variation for research design (Cook & Campbell, 1979). Rather than only examine *what* elements appear to characterize NPM, longitudinal designs enable us to examine *how* the nature and organization of elements actually change over time in the transition from Public Administration to Public Management. This difference in focus between "what" and "how" is the difference between cross-sectional and longitudinal designs (Campbell & Stanley, 1963). Because cross-sectional research involves measurement over a set of variables at *only* a single point in time, nothing can be inferred about processes and causal relationships (Blalock, 1961; Lieberson, 1985). The most that can be garnered from such research is empirically-based conceptual descriptions and typogolies—what Mohr (1982) calls "variance theories."

Longitudinal designs involve measurement of a set of variables across two or more moments in time, either periodically by panels, or continuously by constant measurement in real time (Cook & Campbell, 1979). Even for this type of design, though, the requirements for causal inference are difficult to meet: it requires direct evidence, when everything else is equal, of covariation, through time, between the variables involved (Lieberson, 1985).[8] Moreover, Mohr (1982) has argued that due to the lack of measurement between data points, panel designs cannot be used to study organizational processes. What is needed is an approach that is based on a "process theory," a substantive theory of how the—*processes by which*—the organization unfolds through time (Mohr, 1982). This is a 'story' or 'historical narrative' that guides ongoing observation to enumerate the temporal order of interactions and events, and the sequencing of organizational processes (Abbott, 1990). Thus a "process approach" seeks patterns and sequences of events over time in relation to some underlying generative mechanism(s), and documents the conditions under which and processes by which these mechanisms operate (Tsouskas, 1989).

In short, longitudinal designs are advantageous because they enable researchers to address questions about causal relations, processes and sequences about the transition from Public Administration to Public Management. Is there an incremental developmental path to this transition involving some elements before others, or do all elements change concurrently? Are the processes and consequences of this transition common or different across the various contexts in which these changes are occurring? What are the underlying generative mechanisms, and how do they cause these changes? And what is the likely future direction of this process? Only longitudinal comparative research permits the investigation of these types of process questions which, at this stage of the development of NPM, we believe are both more interesting and more important. From our perspective, therefore, we encourage a process approach and provide examples of research that addresses process questions below.

Stage three: sampling and collecting data

Sampling

Sampling involves selecting cases from the study population. Sampling is usually necessary because the number, characteristics, and behavior of a given phenomenon is so vast and complex that studying the whole population is not feasible. In such circumstances, sampling enables the researcher to generalize from a subset of cases to the whole population (Kerlinger, 1973; Namboodiri, 1978). There are two key issues. The first is clear definition of the phenomenon to be studied. The second is a clear conception of the study's scientific purpose. At a methodological level, these issues translate into the questions of sample representativeness and statistical adequacy, respectively (Blalock, 1960).

No matter how many cases are called for in the research design, the critical issue is choosing cases that are *representative* of the study population. This goes to the heart of scientific inference. For unless the characteristics and behavior of selected cases are shown to be typical of the study population, the validity of results, whether in terms of empirical description or statistical relationships, will be in doubt (Cook & Campbell, 1979; Lieberson, 1985). Without careful delineation of the research problem and full enumeration of the characteristics of the study phenomenon, researchers run the risk of sample bias—choosing

cases that are not typical of the population. When this occurs a false or distorted view of the phenomenon results (Namboodiri, 1978). This problem can be mitigated by developing a substantive model (a theoretical description) of the essential characteristics of the phenomenon, and then using this to guide selection of cases for study by application of a stratified, random sampling procedure (Blalock, 1960; Lieberson, 1985).

For exploratory studies, the research goal is description: that is, to document the nature and behavior of some new or previously uninvestigated phenomenon. Most often qualitative, field-based research techniques are used since these methods are highly flexible and can yield a fine-grained description of characteristics, relationships, and processes (Lincoln & Guba, 1985). Beyond selecting at least two cases for comparative purposes, the number of cases is less important than *which* cases are selected (Campbell & Stanley, 1963). Because the researcher is relying on qualitative inference, it is necessary that the particular cases selected capture what is common to and distinctive about *all* instances of the phenomenon in the whole population. Moreover, in order to adequately corroborate any descriptive findings, additional independent observations should be 'sampled' at different times and from various locales within the research site (Glaser & Strauss, 1967; Lincoln & Guba, 1985).

For most statistical studies, the goal is hypothesis testing—verifying the validity of predicted relationships among two or more variables. In this kind of research, both the *number* of cases and *how* they are sampled are critical issues (Namboodiri, 1978). This is because valid quantitative inference not only requires a representative sample from which to generalize, but it also requires sufficient cases in each variable's categories to meet statistical adequacy when analyzing relationships among variables (Blalock, 1960; Kerlinger, 1973). So that while sampling error and sampling bias are important considerations in determining sample size and composition, what is often overlooked are the cell-size requirements for statistical analysis. This is especially an issue for studies planning to use multivariate techniques (Tatsuoka, 1971; Fukunaga, 1990). Unless carefully built in to the sampling design, insufficient or the absence of cases in statistical cells can undermine, or even prevent altogether, the use of powerful statistical techniques and controls to test hypotheses, and thus place the study in jeopardy. This problem can be avoided by carefully planning for the most complex analyses anticipated (specifying what relationships are to be examined among which variables with the aid of a path analysis diagram), and then building the cell-size requirements directly into the sampling plan for the variables involved.

Data collection

It is generally recognized that there are three primary types of data collection in social science: observation, survey research, and unobtrusive or nonreactive techniques.

Observation is considered to be the archetypical method of scientific research. However, care must to taken to ensure that observations are systematic. Observations must be conducted with reference to three critical issues: what is observed, where and when to observe, and how much to infer when recording observations (Nachmias & Nachmias, 1981). Decisions on these issues depend on the research problem and the research design. For example, the most controlled observations—a laboratory study—test hypotheses experimentally, explicitly define the units of observation, place constraints from external influences on the setting, draw a time sample, and systematically record observations with as little observer

inference as possible. The least controlled observations—participant observation—define the research purpose broadly, permit the researcher to make *in situ, ad hoc* decisions about the focus and units of study, have little or no control over exogenous and endogenous sources of variation, require no formal sampling of events or behavior across socio-geographic space or in time, and allow observations to be recorded with large amounts of subjective inference (Nachmias & Nachmias, 1981).

Survey research is a powerful means of collecting data to test hypotheses on the relationship between respondent characteristics, perceptions, attitudes, and beliefs; it is less effective in measuring behavior because it relies on subjective 'self-reports' by respondents (Bradburn et al., 1979; Fowler, 1993; Labaw, 1980). Three variations of survey research are found, each with advantages and disadvantages well documented by the literature (Fowler, 1993; Sudman & Bradburn, 1982): the mail/e-mail self-administered questionnaire, the face-to-face interview, and the telephone interview. Because all three rely on prior development of formal instrumentation, there is limited flexibility, beyond open-ended and follow-up questions, to gather additional information that was not anticipated in the research design. On the other hand, the formal nature of the instrumentation and operational procedures is what gives survey research its strongest feature—controlled, systematic measurement of the variables in a study by means of standardized instrumentation administered to all research subjects (Fowler, 1993). When sampling and statistical requirements are met, powerful tools of statistical inference (such as those available in SPSS and SAS computer programs in a desktop PC format) then can be used for hypothesis testing.

Nonreactive techniques are data collection methods that gather evidence as it occurs naturally in a given research site (Webb et al., 1966), rather than in response to a stimulus introduced by a researcher in an experiment, or by one using interviews or questionnaires. There are three general types of nonreactive measures: physical traces, simple observation, and analysis of archival records (Webb et al., 1966). Physical traces document erosion (the selective wearing out of certain objects) and accretion (the deposit of materials). Passive observation occurs when the observer has no control or influence over the behavior in question, such as in observation of exterior body and physical signs, analysis of expressive movement, physical location analysis, and language analysis. Analysis of public and private archival records includes the examination of diverse sources such as actuarial records, governmental documents, mass media publications, and so forth. While the lack of a direct researcher affect on these kinds of data is an advantage, it must be balanced against the built-in biases and sources of measurement error that are nearly always involved (Webb et al., 1966). For example, different socio-historical contexts may affect the behavior that created the physical traces; different passive observers may focus (sample) on some kinds of behaviors and not others; and different keepers of the record of events in a public document may exercise varying discretion in deciding what gets recorded and what does not.

Based on our review of the studies in the *International Public Management Journal,* it appears that researchers rely more on reactive as opposed to nonreactive techniques. Of those studies that rely on reactive measures, surveys and interviews tend to be the most common forms of data collection. Observation, when utilized, tends not to be controlled: typically, there is no hypothesis testing, no explicit definition of the units of observation, no formalized sampling or systematic data collection, and few constraints on observer inference. Interviews

and observations that document ongoing activities also are rare. When utilized, interviews tend to be retrospective (e.g., *post hoc* interviewing participants in a change process), most likely reflecting the difficulties of capturing the ongoing processes of change that can span years.

To avoid some of the pitfalls common to these techniques, we recommend the use of real-time rather than retrospective interviews whenever possible, since memory lapses and the success or failure of an intervention have been shown to bias findings (Labaw, 1980; Payne, 1951). Reliance on a single data collection techniques, especially reactive techniques, should be avoided since they can introduce errors. Standard references to data collection all underscore this basic point. Data collection using multimethods are preferable (Bradburn et al., 1979; Fowler, 1993; Nachmias & Nachmias, 1981). We know, for example, that if researchers use either observational or survey techniques, then they are sensed by a social system. If they are sensed by a system, then they are part of it (Barley, 1990). Being part of a system, they affect it. When they affect it they cannot observe it in its natural state and end up reporting the state and/or processes of a disturbed system (Van de Ven & Huber, 1990). Consequently, we recommend a triangulated multimethod data collection effort to provide important crosschecks on the validity and reliability of the data (Campbell & Fiske, 1959). Each technique provides different strengths: interviews can offer depth and nuances; documents can distill certain ontological "facts"; and direct observation can help researchers distinguish between what people say and what they actually do.

Stage four: coding and analyzing the data

If researchers follow our recommendations in the first three research stages—to wit, a systems approach, employing a comparative, longitudinal design that calls for multimethod data collection techniques—then they will rapidly generate an overwhelming amount of rich raw data. The danger here, in Pettigrew's (1990, 281) apt words, is "death by data asphyxiation." The data processing requirements of large, complex data sets quickly exceed the capabilities of even the most experienced researchers. Organizing and evaluating these data becomes a very challenging task; in fact, new strategies and techniques for coding and analyzing such complex data often have to be devised for new research projects (e.g., Bradley, 1987; Van de Ven et al., 1987; Van de Ven & Poole, 1990). Although we uncovered no studies in NPM that can serve as exemplars in this regard, we offer two strategies that might be helpful to researchers at this stage in NPM's evolution.

The first, event coding and sequence analysis, is ideal for longitudinal case studies that investigate certain types of change process, especially those that rely on real-time observations and permit the transformation of qualitative data into quantitative measurements. Network analysis, the second strategy, is particularly useful, both in enumerating the structure of intraorganizational and interorganizational relations, and in documenting how these patterns of relations change over time. Since each will be discussed in greater detail below, we highlight only the basic steps in these strategies.

Incident coding and sequence analysis

This strategy has evolved from a longitudinal study, conducted by Van de Ven and his associates, investigating innovation processes in large systems in a midwest state (Van de

Ven et al., 1989). The following steps were developed to code and analyze the data (Van de Ven & Poole, 1990, 333):

1. Classification of an observed recurrence or change on any one of five core concepts (innovative idea, people, transactions, context, and outcomes) as "incidents" by nominal descriptors in a qualitative incident data file.
2. Binary coding of each "incident" in terms of the presence or absence of certain theoretically important "event" constructs and added to the qualitative incident data file.
3. Transformation of the qualitative codes into quantitative dichotomous variables or a bit-map "event sequence" data file.
4. Analysis of temporal relationships between variables in the event sequence data file using time-series analysis, and supplementing the interpretation of statistical results with content analysis of the relevant sequence of incidents in the qualitative data file.
5. Identification of developmental patterns or phases in organizational change or innovation by analysis of coherent patterns of activity among temporal events in the incident data file.

Coding and database construction in network analysis

Derived from the pioneering work of Moreno (1934), Festinger, Schachter, and Back (1950), Mitchel (1969) and others, network analysis has evolved into a powerful research tool for investigating social and organizational structure (Knoke & Kuklinski, 1982). What distinguishes network analysis from *all* other methods in social science, where an individual entity is usually the measurement unit, is its focus on the social tie or bond that connects two or more entities. Because the measurement unit is relational—that is, the social tie between two entities, *i* and *j*—certain "measurement imperatives" are recommended in order to minimize ideological contamination, structural bias and measurement error, and to avoid spurious images of network structure (see Bradley & Roberts, 1989a). The following procedures are central:

1. Enumeration of the ordering (nominal vs. ordered) and existential status (present vs. absent) of the relation between all pairs of entities in the network or group. Valid structural inference requires complete network enumeration and the reduction of coding errors well below those tolerated by conventional quantitative techniques.
2. Construction of a dyad file which in each record contains data on the relation between a given *pair* of individuals. For each dyad two records are required: one for the data on *i*'s relation to *j*, and a second record containing *j*'s relation to *i*. In a network of ten individuals, for example, the data file will contain 90 different dyadic records, or $N(N-1)$ relations.
3. Conversion of the raw relational data into an adjacency matrix (one for each relational content measured) by recoding the data into binary code. For nominal relations, one (1) denotes the presence of a relation; zero (0) its absence or otherwise. For ordered relations, one (1) indicates that relation involves greater influence or flow from *i* to *j*, than from *j* to *i* (or vice versa); zero (0) indicates the tie is absent or otherwise.
4. Structural analysis of the sociomatrix by using one or more network analysis computer programs (e.g., Holland & Leinhardt, 1976; White et al., 1976; Burt, 1990). These

programs analyze the organization of relations in the sociomatrix and provide structural measure of various patterns or arrangements of relations, either for relations centered on a given entity, or for relations in subnets or in the social unit as a whole.

Irrespective of the specific coding and data analysis strategy selected, a structural methodology is recommended for analysis of quantitative data. This is recommended because measures of individual organizational elements take their sociological meaning from the *whole* system, and have little meaning alone. Rather than relying on discrete depictions from bivariate analysis, inquiry is more appropriately based on multivariate techniques that analyze the *structure* of relations among the organizational elements in the system (Miller & Friesen, 1984).

3.5. Stage five: interpreting the results

The final stage of the research process, interpretation of the results, completes the theory testing or theory building efforts. Theory testing begins with a research question and the generation of hypotheses in stage one, and ends with interpreting data and weighing the level of support for the hypotheses in stage five. Theory building begins with a general research question in stage one, and ends in stage five with the development of theory and hypotheses for testing in more controlled studies in the future. Either way, because of the different and often competing interests among those involved in applied research (viz., researchers, policy makers, research subjects, etc.), and the high stakes consequences of using results to inform reform, we recommend that researchers take the additional precautionary step of assessing the 'truth content' of their findings and interpretations with the major stakeholders.

As noted above, theory-testing research generally stays within the confines of a researcher's speciality or discipline. However, interesting possibilities for interdisciplinary collaboration have emerged as researchers have begun to test theories developed with concepts of system organization drawn from the natural sciences. Of note are the recent efforts to apply chaos and complexity theory (Abraham & Gilgen, 1995; Cheng & Van de Ven, 1996) and the principles of energy conservation and holographic organization (Bradley, 1987, 1998, 2000a; Bradley & Pribram, 1997, 1998, 2000; Pribram & Bradley, 1998) to examine social science data.[9] In a moment, as we review two research programs that illustrate our recommendations above, we will elaborate on how such work may have relevance to researchers in NPM.

Recommendations in Action: Two Programs of Research

Our recommendations for NPM research methodologies are summarized in Table 1. We illustrate how these recommendations have been put into practice by describing two research programs: the Minnesota Innovation Research Program, led by Andrew Van de Ven at the University of Minnesota (Van de Ven et al., 1989), in which Roberts participated as a principal investigator (Roberts & King, 1996); and Columbia University's nation-wide Urban Communes Study, led by Benjamin Zablocki (1980) in which Raymond Bradley was a principal participant (Bradley, 1987). Each program is an example of our basic recommendations and serves as a model for those who wish to apply these techniques to NPM research.

Table 1
Recommendations for New Public Management research methodologies

Stage One: Research Questions/Problems:

1. Research questions should address New Public Management as a *total system*. During a period of transformation and radical change, research on the whole system (including its endogenous organization and its relations with the environment) is likely to be much more improtant than a study of its constituent parts.
2. Research questions should probe *how* something is occurring rather than solely focus on *what* is happening in order to capture the dynamics of change.
3. The *units of analysis* should be more clearly specified. Greater consensus on what constitutes New Public Management would enable some comparison across studies.
4. Defining *a relationship* between two parties as a *unit of analysis* also enables researchers to investigate how patterns of interactions evolve and change.

Stage Two: Research Design:

1. One-shot case studies should move beyond description to *theory development.*
2. *Longitudinal designs* would enable researchers to study the dynamics of change from the Public Administration Configuration to the New Public Management Configuration. Theory development and testing can then be broadened to include both *variance theories* and *process theories.*
3. *Comparative case study designs* would enable researchers to maximize the differences among cases to bring out the widest possible coverage of all aspects necessary for the elaboration of theory.

Stage Three: Data Collection:

1. *Multitrait-multimethod data collection techniques* need to be utilized.
2. Greater reliance on *non-reactive techniques* is advised.
3. *Real-time data* is preferable to retrospective data.
4. Greater *control over observations* needs to be exercised to minimize observer inferences.

Stage Four: Coding and Analysis:

1. *New operational techniques* need to be developed to process complex (comparative, longitudinal) data sets.
2. *Event coding and sequence analysis* are recommended for longitudinal, comparative case studies of change.
3. *Relational coding and newtork analysis* are recommended for studying how social relations are organized and change over time.

Stage Five: Interpreting the Results:

1. Interpretation of results depends on whether the researcher is *building or testing* social science theories.
2. Interpretations that include concepts and theories form the *natural sciences* (e.g., chaos/complexity theory and holonomic theory) may offer new ways of understanding and managing the energy transfer/regulatory processes and interdependencies that exist between human social systems and the biosphere as a whole.

Minnesota Innovations Research Program

Since 1983, researchers at the University of Minnesota have been involved in the Minnesota Innovations Research Program (MIRP) for the purpose of developing a process theory of innovation (Van de Ven et al., 1989). Innovation was defined as "the process of developing and implementing a new idea" (Van de Ven et al., 1989, 12). Beyond serving as a model of our research recommendations, the MIRP has relevance for NPM in at least two ways. First, because NPM is an *innovation* in public management, the theory and findings of the MIRP may offer a way of understanding the processes of innovation by which NPM emerged as distinct area of management practice, and may also suggest the direction and stages of future development. Second, not only is NPM an innovation in itself, but its *raison d'etre* is the wholehearted systematic effort by its practitioners to cause innovations in government. As one of the projects within the MIRP demonstrated, a small group of 'policy

entrepreneurs,' operating behind the scenes, played a key role in bringing about radical innovation in education policy in a large midwestern state (Roberts & King, 1996). Thus we have an empirically-based, hands-on view of how innovation may be triggered and actualized in certain areas of government (see also, Roberts & Bradley, 1988, 1991).

4.1.1. Research questions

The MIRP began with three big research questions on innovation: How do innovations actually develop over time from concept to implemented reality? What innovation processes lead to successful and unsuccessful outcomes? And to what extent can knowledge about managing innovations and change processes be generalized from one situation to another? Four levels of analysis were involved—individual, group, organizational, and interorganizational. Five basic concepts or units of analysis provided the common framework: *people* initiated and developed *ideas* by engaging in *transactions* (relationships) with others to achieve *outcomes* within changing institutional and organizational *contexts.*

Research design

The research design called for longitudinal, comparative case studies so that researchers could carefully observe a wide variety of innovations as they developed in natural field settings in real time.[10] A total of fifteen faculty and nineteen doctoral students from eight different academic departments and five schools at the University of Minnesota made up the fourteen interdisciplinary research teams that studied various innovation processes. Because of the limited research and theory on the innovation process, the teams took a bottom-up "grounded theory" approach (Glaser & Strauss, 1967) seeking to develop a process theory of innovation from data systematically obtained in the longitudinal, comparative studies.

Sampling and data collection

Given the broad definition of the population of innovations to be studied, researchers used convenience samples and negotiated entry into fourteen technological, product, process, and administrative innovations in public, private, and not-for-profit sectors in the U.S. and abroad. Three overlapping stages structured data collection. First, exploratory studies enabled researchers to gain entry into the field and become familiar with each innovation idea. Second, case histories and baseline data were obtained on each innovation idea. The case histories mapped events leading up to the initiation of the longitudinal studies and the baseline information provided a description of the institutional settings in which the innovative ideas were developing. This information drew on published reports, documents, interviews, and questionnaires. Third, researchers developed data collection instruments as soon as they were clear on what specific aspects of each innovative idea were to be studied over time. Instruments consisted of on-site observation guides, interviews, questionnaires, and compilations of relevant documents.[11]

Depending on the study, panel intervals for regular questionnaire administration ranged from six to nine months. The repetitive surveys and interviews provided comparative observations of the research concepts tracked over time, and indicated temporal differences on these concepts. However, both panel and real-time observations were necessary to fully document the dynamics of the innovation development process. Difference scores between

panels of observations identified *what* changes occurred; real-time observations described *how* these changes occurred.

Data coding and analysis

Extensive techniques were developed to codify procedures for handling longitudinal panels of quantitative data, including constructing computer data files and analyzing longitudinal data (Tuma & Hannan, 1984; Van de Ven & Chu, 1989). Because less had been written on translating qualitative data into quantitative variables for the analysis of change, the MIRP devised the following procedures (see Van de Ven & Poole, 1990 for the details).

Operational procedures

Within the MIRP framework, an "incident" was operationally defined as a "bracketed string of words" that described the properties (date, actor(s), object(s), behavior, consequences, and so forth) of a recurrence or change in any one of the five core concepts (units): innovation idea, people, transactions, context, and outcomes. These nominal descriptors about each discrete incident were then entered into a qualitative incident data file. To ensure reliability, at least two researchers independently applied explicit coding rules to classify the raw observations into "incidents" in the data file. The researchers' classifications, in turn, were reviewed by field practitioners in an effort to achieve a level of validity in both the perception and recording of the incidents measured. The resultant data file of incidents did not represent the full population of occurrences in the development of an innovation, but was, instead, a *sample* of incidents occurring during the research time frame.

A list of incidents was a qualitative indicator of what happened in the development of an innovation, but one additional step was needed. Researchers had to code the incidents into theoretically-meaningful *event constructs.* MIRP researchers used the core concepts and developed multiple variables on which to code them into event constructs. For example, when incidents provided evidence of results, they were coded as representing either a "positive" event construct (good news or successful accomplishment), "negative" event construct (bad news or instances of failure or mistakes), or "mixed" event construct (neutral or ambiguous news indicating elements of both success and failure). The coding of incidents into event constructs was performed independently by two or more researchers, which enabled inter-rater reliability to be computed.

The next step involved the transformation of 'incidents' and 'event constructs' into a "bit map"—a matrix in which rows represented the incidents listed in chronological order, and columns represented the variables measuring all of the event constructs. Each event construct of an incident was coded into a dichotomous variable of 1 (change occurred) or 0 (no change occurred). This transformation of qualitative data into quantitative data permitted the application of various statistical techniques to examine time-dependent patterns of relation among the event constructs.

Data analysis

The stage was then set for examining temporal relationships and patterns among the variables in the development of innovation. The family of methods concerned with the problem of determining the temporal order among events is called sequence analysis

(Abbott, 1990). It examines similarities and differences between discrete events. The bit map files could be analyzed with a variety of statistical methods to identify time-dependent patterns among the dimensions coded as 1's and 0's. The MIRP studies utilized χ^2 test and log-linear models to examine probabilistic relationships between categorical independent and dependent variables, Granger causality and vector autoregression to identify possible causal relationships between bit-map variables, and time series regression analysis on incidents aggregated into fixed temporal intervals to test specific process models. All of these methods attempted to detect bivariate relationships between coded event variables.

To investigate multivariate relationships, phase analysis was used. This technique was used to both develop and test models (hypotheses) about developmental patterns or stages in the temporal sequence of data. It required the researcher to conceptually define discrete phases of innovation activity and create a phase map. The next step was to analyze sequences and properties of the phases and to identify any meaningful patterns. MIRP researchers focused on two kinds of patterns—the types of sequences and the structural properties of sequences. An advantage of phase analysis was that it could evaluate more than one process model. For example, the MIRP researchers used this technique to compare two models of the innovation process—random versus chaotic (Van de Ven & Poole, 1990).

Interpretation of results

The MIRP researchers developed a "meta-theory" of innovation processes based on their finding that a single theory could not encompass the complexity and diversity observed in the innovation process. The meta-theory classified innovation processes in terms of levels of analysis (local or global) and type of theory (historical, functional, or emergent process motors). It specified the conditions under which each type of theory was likely to apply. And it proposed three "switching rules" that might determine when to switch between models in order to account for innovation processes over time (Poole & Van de Ven, 1989).

Interpretation of results did not stop with social science constructs, however. When the results eliminated the plausible explanation that the onset of innovation could be modeled as an orderly periodic process of trial-and-error learning (Garud & Van de Ven, 1992; Van de Ven & Polley, 1992), the next step was to search for alternative explanations: that the innovation process was either random or chaotic. In examining the various patterns in time series data, the MIRP researchers were able to distinguish a chaotic pattern during the initial period of innovation development and an orderly periodic pattern during the ending of the development period (Cheng & Van de Ven, 1996). This approach could be used to explore the extent to which there are distinct stages or development patterns in NPM as it evolves in a system over time.

Nation-wide study of charisma and collaboration in communes

In the mid-1970s at Columbia University, a team of researchers, under the direction of Benjamin Zablocki, conducted a nation-wide longitudinal study of the characteristics, organization, and durability of sixty urban communes (Bradley, 1987; Carlton-Ford, 1993; Zablocki, 1980). As part of his participation in this project, Bradley (1987) used network analysis techniques[12] to identify two patterns of social relations involved in the arousal and

regulation of affective energy in charismatic communes. One pattern is a dense network of positive affect ("loving") that connects all members, and the second is a highly interlocking hierarchy of social control ("power") that also links everyone in the group. Bradley found that the relationship between these two systems—affective arousal and social control—is strongly associated with group stability (survival) in the charismatic communes. However, because of the difficulty in regulating the enormous amounts of affective energy aroused when charisma is present, Bradley's findings suggest that charismatically-inspired innovation is *not* an advisable strategy for NPM practitioners working to facilitate public management reform (Roberts & Bradley, 1991).

Bradley also found evidence that this relationship between affective arousal, social control, and group stability held in the noncharismatic communes (Bradley, 1987, Chap. 7), and in other kinds of face-to-face groups (Bradley, 1987, 216–219, 255, 258–259; Roberts & Bradley, 1991). These findings suggested that an endogenous order of relations involved in the arousal and regulation of affective energy appears to be operative in *all* groups and organizations (Bradley & Roberts, 1989b). Building on this insight, Bradley worked with neuropsychologist Karl Pribram to develop a general understanding of how the interaction between affective arousal and social control generates collaborative organization in all social collectives (Bradley, 2001, 2002; Bradley & Pribram, 1998; Pribram & Bradley, 1998). Because of its relevance to NPM, we will focus on this research in what follows.

Research question

Following up on Bradley's earlier findings, Bradley and Pribram (1998) sought to define, in more precise terms, the nature of the interaction between the two orders: whether certain combinations of positive affective attachment and social control increase the likelihood of collective stability and give rise, in turn, to distinct patterns of collective function (routine organization and structural transformation) while other combinations increase the risk of collective dysfunction and instability.[13] At a theoretical level, they began with the premise that collective social organization, whether a dyadic relationship, a group, or an organization, first and foremost, is a relationship of *collaboration* (or cooperation)—of individuals *working together* in relation to a common function, purpose, or goal. To collaborate entails work, and work requires a supply of *energy*. They assumed that, as biological organisms, the individuals in the collective are the source of this energy, and that they expend this energy as they interact in working toward a common outcome. The collective operates on this field of relations to *activate* individuals to action by *arousing* affective attachments among members; arousal of affective bonds *excites* emotions thereby mobilizing the individual's biological propensity for action and, thus, the *potential* for expending energy. In addition to the availability of a pool of potential energy, collaboration also requires that each individual's expenditure of this energy be socially regulated, coordinated, and directed toward the common outcome, and *not* be dissipated in other useless activity.

Research design

The original study, the Urban Communes Project, was designed as a multimethod, longitudinal, panel study of sixty urban communes sampled from six Standard Metropolitan Statistical Areas: Atlanta, Boston, Houston, Los Angeles, Minneapolis-Saint Paul, and New

York (Zablocki, 1980). The design called for two full waves of data collection, twelve months apart, at the individual, relational, and group levels of analysis, with annual observation on commune survival status for an additional three years. A partial third wave of data was also collected. Bradley excluded three communes from his research because membership was not completely voluntary, which reduced the number of groups in his database to 57 (Bradley, 1987).

Data collection

Primary data collection took place over the summers of 1974, 1975, and 1976 and employed a combination of formal instruments and informal data gathering techniques. Intensive field-worker contact was maintained with each commune for three to four months each summer, providing extensive observational and interview material on the structure and activities of each group. In addition, a number of formal instruments (interviews and questionnaires) were administered to all permanent members 15 years and older to gather systematic information on social background, communal involvement, self concept, and attitudes.

A sociometric questionnaire (see Bradley, 1987, Appendix B), the major source of the relational data Bradley has analyzed, was developed to map all possible dyadic relations in each commune across a number of different relational contents. Thus, each member was asked to answer a set of questions about his or her pair-wise relationship with each of the other adult residents. The questionnaire contained a sheet of standardized questions that the respondent completed for every other individual in the commune (i.e., $N - 1$ sheets per respondent; they did not complete one for themselves). This generated an exhaustive mapping of the $N(N - 1)$ dyadic relations in a group. The instrument was administered under strict fieldworker supervision to ensure that there was no collusion among members in answering the questions.

Data coding and analysis

This is where the major differences between network analysis and standard nonrelational methods become most apparent. To set up the sociometric data for structural analysis, a dyad file must be created, as described above. In follow-up analysis of the commune data, Bradley and Pribram broadened the measure of positive affect to include "loving," or "exciting," or "improving" relations. As in Bradley's original study, they used triadic analysis (Holland & Leinhardt, 1976) to systematically analyze the structural organization of the two networks of relations in each commune.[14] Discriminant function analysis, a multivariate statistical technique for analyzing linear combinations of variables, was then used to investigate the relationship between positive affect and power, and group survival, and a number of other measures of group organization and member characteristics (Bradley & Pribram, 1997, 1998).

Interpretation of results

The postulated relationship between affective arousal, social control, and group stability was verified by analysis of the commune data. An important finding of general significance is that *none* of the other nine sociological variables investigated (measuring aspects of

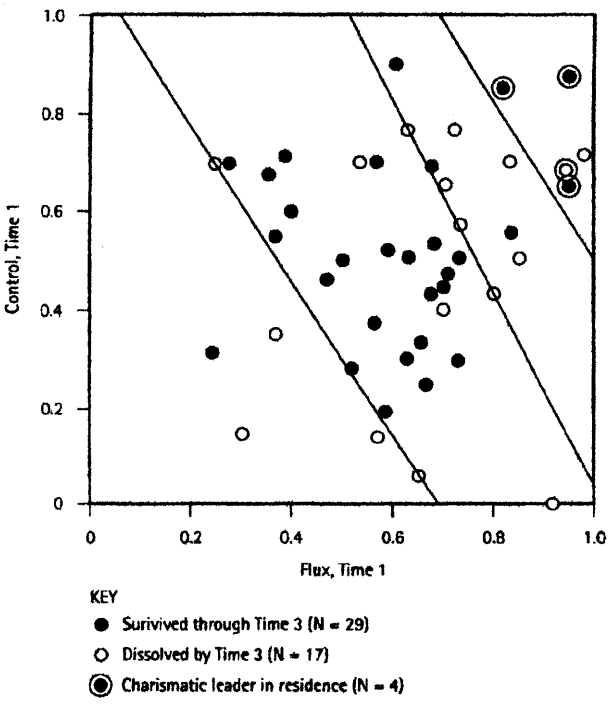


Fig. 4. Scatterplot of Communes on Flux (Affective Attachment) and Control (Power) at Time-1, by Stability (Survival Status) 24 Months Later. Communes intent on radical social change (charismatic leader in residence) are denoted by a circled dot. © Copyright by Raymond Bradley, 1996; reprinted with permission.

normative and structural organization) met the statistical criteria for inclusion in the multivariate stepwise procedure.

A scatterplot summarizes the major findings (see Fig. 4). The measure of social control, "power," is plotted on the vertical ordinate, and the measure of affective arousal, "flux," is plotted on the horizontal ordinate. Unstable (nonsurviving) groups are shown as hollow "dots."

The results show that most communes are scattered along the axis of the main diagonal of the field formed by positive affect and power. They form a triangular pattern that narrows, progressively, as higher values of positive affect and power are observed, and a pattern that alternates between four bands of unstable and stable groups. These four groupings of communes (separated by the three diagonal lines in Fig. 4), in terms of their patterns of positive affective attachment, power, and stability, are statistically significant (Bradley & Pribram, 1998, 46–50).[15]

The communes tend to cluster in the midregion where the values of affective arousal and control are more or less in balance. It can be seen that location in this space is associated with a high probability of survival in the future. These "balanced couplings" of relations of affective arousal and control predict the survival status of communes *24 months in the future.* However, location in the peripheral areas, denoted by extreme combinations of positive affect and power, is more likely to be unstable.[16] Taken altogether, Bradley and Pribram's

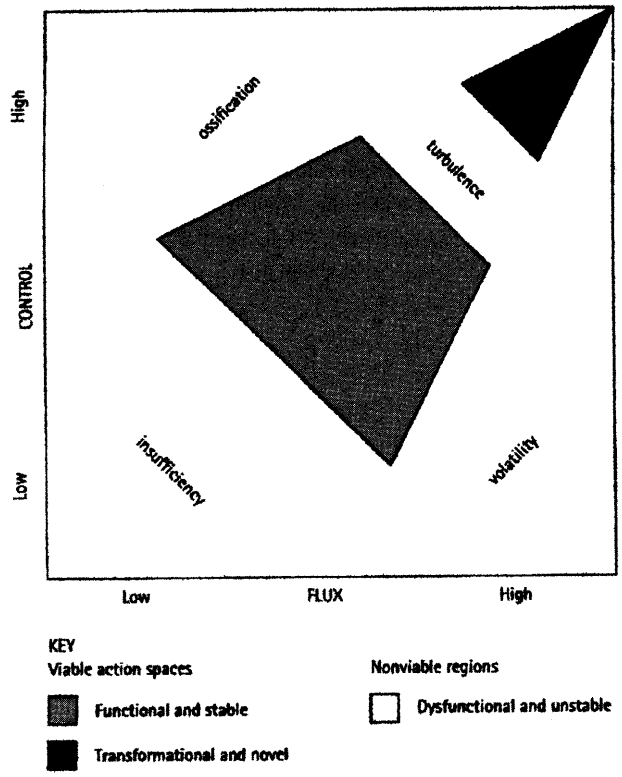


Fig. 5. Model of Relationship Between Flux (Affective Arousal) and Social Control, and Action States of Collective Organization. © Copyright by Raymond Bradley, 1996; reprinted with permission.

findings suggest that beneath the surface of normative and purposeful organization, the interaction between affective arousal and control appears to operate as a self-organizing, endogenous system that regulates, in a fundamental way, collective organizational function (see Bradley, 2002).

To explain these results Bradley and Pribram developed a theory of the endogenous processes involved in collaborative organization.[17] Although there is only space for a thumbnail sketch, their account of how different combinations of affective arousal and control produce various states of functional and dysfunctional organization has relevance for NPM. According to their model (see Fig. 5), functional (and thus stable) organization requires a certain minimum of affective energy, and it also requires that a minimum of direction be given to the use of this energy: that *all* members are *interconnected* by at least one bond of affective attachment (*flux* in Fig. 5) *and* at least one relation of social control. If these minimum values are not met, collective dysfunction results and nonviable or unstable states of organization are generated—the regions labeled "insufficiency," "ossification," and "volatility" in Fig. 5.

Beyond these minimum values, the range of values defining stable organization (the area of "functional or stable" organization in Fig. 5) narrows progressively from many different loosely coupled combinations of low values of affective arousal and control, to a close

coupling between high values of affective arousal and control. At the top end of this area, there is a discontinuity—a phase transition—in the values associated with stable organization (labeled "turbulence" in Fig. 5). Beyond this chaotic gap, there is a pattern of extremely high values of affective arousal and control that create the potential for structural transformation. Here, where energy expenditure is maximized, collective stability is problematic and requires a tight one-to-one coupling between affective arousal and control.

Bradley and Pribram's work and the network analysis approach they use have direct application to research in NPM. For example, as managers of public bureaus move to out-source functions that previously were executed within government agencies, network analysis offers a means of measuring and analyzing relations with external sources to inform policy and action. Starting with Burt's (1992) "structural holes" analysis, researchers can use this network analysis technique to map the existing structure of interorganizational relations and identify both strategic opportunities (structural holes) for forging new ties to prospective suppliers, and also identify relations where an alliance between suppliers and/or competitors may signal a potential structural vulnerability in terms of services and costs. Then Bradley and Pribrams' (1998) account of collaborative organization can be used to guide the affective dynamics of developing new out-sourcing arrangements. By providing the means and understanding to monitor these relations, their approach helps ensure that affective arousal and social control are coupled and maintained at levels to sustain a stable order of cooperative action.

Conclusion

We have summarized our recommendations for research in NPM in Table 1. Taken as a whole, these recommendations portray an approach to NPM research in which interdisciplinary teams of researchers collaborate on large-scale, long-term programs of field-based research, utilizing multimethods and a systems approach. Unlikely to have the requisite experience, knowledge, and skills, the individual researcher will welcome other specialists who complement his/her abilities and perspective. Heavy reliance on field-based studies requires large resources, and this offers research opportunities for talented graduate students. In gaining valuable first-hand training and research experience, graduate students serve as research assistants and colleagues, and participate in all stages of the research process under the direction of knowledgeable faculty—the principal investigators. The research team members work together in a collective process that requires a high level of collaboration and trust. While some NPM scholars may have had a direct hands-on experience at graduate school with such large-scale, interdisciplinary, team-based, field research, others may have had only a limited exposure. It will be important to make this kind of first-hand research experience more widely available in management programs at graduate school, especially at the doctoral level.

However, a team-based graduate research program will demand careful attention to issues of leadership, management and ethics (Bradley, 1982; Pettigrew, 1990). Designing a project for academic and practitioner relevance, and sustaining a project's vision through the months and years of challenging work, especially given individuals' needs

to complete dissertations, be promoted and receive tenure, are not trivial undertakings. Integrating and coordinating the efforts of large-scale research projects in a community of scholars could also benefit from the principles of NPM as it develops as a science. Needs for social and political skills are high along with a healthy level of respect for individual differences. A broad analytical structure is necessary to link the comparative studies, but there also needs to be plenty of intellectual space left to accommodate personal interests and needs. Generating funding for large-scale projects introduces another layer of complexity, as do pragmatic considerations about the sequencing of outputs and work and the requirements of funding bodies. Ethical issues also are paramount in this type of research: ethical issues concerning practitioners, grant-awarding bodies, publication rights, and data ownership (Bradley, 1982).

We recognize our recommendations are not without costs, but we believe the benefits and the returns are well worth the effort. Having spent a good portion of our academic careers in collaborative research programs such as those outlined above, we endorse the efforts and encourage others to consider them as NPM enters the next phase of its development.

Looking somewhat further ahead, we conclude with a brief sketch of where NPM may be headed as it is called to respond to a critical problem that is increasingly challenging all efforts to reform public management and governance institutions through out the world: the growing environmental crisis. In their provocative book, *The Non-Local Universe,* Nadeau and Kafatos (1999, Chap. 10), offer a view of a new kind of global public management research that is now urgently required to deal with the clash between the world's ever-growing economy and the finite resources of the Earth's biosphere. They point out that because it represents the "complex interaction of *all* human activities in the seamlessly interactive system of life," the *real* global economy is poorly represented in the economic models that inform current economic policy (207). Based on the "dangerously outmoded" assumption of the "benevolent forces" of the free market, these economic models grossly underestimate the *actual* cost of doing business, because they omit measures of energy usage that directly impact the overall state of the Earth's biosphere (206–207).

To deal with this problem, Nadeau and Kafatos argue that new economic models are required, and that their development "must be an intensely *interdisciplinary* activity," involving collaboration between the physical *and* the social sciences (206; our italics). They propose an *entropy tax* based on known scientific equations that measure and predict entropy increase in the biosphere resulting from human activity. Indexed against average national income or gross national product, the entropy tax would be levied on all major economic systems, and would represent the *real* cost of economic activity. The tax would be an incentive for implementation of energy-efficient, nonpolluting technologies, and the revenues could spur development of new, low-entropy technologies to be implemented first in developing economies. Solving this problem, like so many others in NPM, will require an approach to research like that we have described in this article, in which human social systems, or parts, are understood as open systems in mutual interaction within the larger system of the biosphere as a whole.

Notes

1. We would like to thank an anonymous reviewer who distilled these from our discussion in an earlier version of this paper.
2. As Moynihan (1970: 170–171) concludes from his analysis of government policy and action in the so-called "War on Poverty": "This is the essential fact: *The government did not know what it was doing.* It had a theory. Or, rather, a set of theories. Nothing more. . . . A *big* bet was being made. No responsible persons had any business acting as if it were a sure thing" (italics in original).
3. See Lynn (1997) for a contrary view.
4. Hinde's phrase, quoted in Bateson (1991, 14); our emphasis.
5. A "weak tie" is a casual acquaintanceship involving infrequent contact (Granovetter, 1973); a "structural hole" is the absence of relations between or among potentially connected nodes or networks (Burt, 1992).
6. This discussion of system dynamics focuses solely on the logic of system regulation, which is based on information control theory—cybernetics. The discussion does *not* address the more complex question of the *energy transfer* processes that actually drive system behavior: the translation of energy into a stable self-organizing system in defiance of the Second Law of Thermodynamics. This has been explained, in part, by "chaos theory" (Nicolis & Prigogine, 1977; Prigogine & Stengers, 1984) and its more recent variant, "complexity theory" (Kauffman, 1995; Nicolis & Prigogine, 1989; Prigogine, 1997). Applied most successfully to explain the emergence of self-organizing, nonlinear behavior in 'far-from-thermodynamic equilibrium' systems (e.g., Strogatz, 1994), the application of these theories to social science phenomena has been almost exclusively metaphorical (e.g., Arrow et al., 2000; Morgan, 1986; Thietart & Forgues, 1995). An exception is Bradley and Pribram (2000).
7. Typically, there is no enumeration of the research population, and hence, no control over the representativeness of the case sampled for study; no control over the influence of external forces on the research site, and limited control, if any, on the affect of endogenous factors; little use of formal instrumentation—no control over levels and units of measurement, and no control over the measurement and manipulation of key variables; and little control over the duration of observation, the length of which often is arbitrary.
8. Evidence of a causal relationship, between two variables, X and Y, is established only after all other sources of covariation have been ruled out, and then "*only*" when the change over time in X is shown to be directly associated with the change over time in Y (Leiberson, 1985, 180; see pp. 174–217).
9. While theories from the natural sciences may seem far removed from NPM and its domain of interest, recent work in physics and biology has shown that chaos theory offers a powerful way of understanding the emergence of stable forms of system organization that are far from thermodynamic (physical) equilibrium (Kauffman, 1995; Nicolis & Prigogine, 1977). As social systems are an order of relatively stable organization beyond both physical equilibrium and biological stability (Prigogine & Stengers, 1984), it is likely that the principles of chaos and complexity theory may not

only offer insight into the *energy transfer* processes involved in the emergence and dynamics of human social organization, but also provide some understanding of the *limits* of planned or intentional collective action—that is, management. Also, Pribram's (1971, 1991) pioneering work in neuropsychology has shown that the information processing involved in perception and memory in the brain appears to be best understood as a holographic process. In drawing on these concepts, Bradley (1987, 2000; Bradley & Pribram, 1998) has shown that communication in social groups appears to be organized as a holographic-like process in which information about the order of the group, as a whole, is distributed to all parts (relations and individuals).

10. The innovations studied include: the development of hybrid wheat, advanced integrated circuits, cochlear implants and therapeutic apheresis biomedical devices, public- and private-sector ventures to conduct experiments on the space shuttle, multi-institutional hospital systems, startup of a computer hardware and software company, defense contracting of a naval weapon system, the introduction of nuclear-power safety standards, strategic planning systems in local municipal governments, educational reforms at the state and local school levels, human resource management innovations, and organizational mergers and acquisitions.
11. These instruments are available in a "Methods Manual for Minnesota Innovation Research Program" (Van de Ven et al., 1987).
12. For the details see Bradley, 1987, Appendixes A–C; or, Bradley and Roberts, 1989a.
13. A "social collective" is defined as a durable arrangement of *two or more* individuals distinguished by shared membership (creating a social boundary) and collaboration in relation to a common function, purpose, or goal (Bradley & Pribram, 1998, 30).
14. Triadic analysis (Holland & Leinhardt, 1976) subdivides the relational structure into triads, and then, through a census of all possible triads, measures the distribution of 64 different triadic configurations which are then classified into 16 isomorphic structural types (see Bradley, 1987 or Bradley & Roberts, 1989b for further elaboration).
15. The three lines shown marking the boundaries of the regions in Fig. 4 were established by dividing the full sample of 46 communes into stable and unstable sets such that the probability of survival for the former was maximized while being minimized for the latter (see Bradley & Pribram, 1998). Discriminant analysis, comparing the four groupings of communes separated by the lines, provided a strong statistical confirmation of these results, as 45 (98%) of the 46 communes analyzed were correctly classified by two canonical discriminant functions constructed from the measures of positive affect and control. A split-sample reliability analysis confirmed the generalizability of these results.
16. In a recent analysis, Bradley has also found the way in which relations charged with negative affect are involved (McCraty & Bradley, 2000). When taken altogether, his findings suggest *that while effective social regulation of positive affective energy is the key to stable organization in newly created groups, dissipating the negative affective energy that is generated by the buildup of emotional tensions, interpersonal conflicts, and rigid regimes of social control, is key for stability in established collectives.*

17. Drawing on the concepts of *energy* and *information* from the natural sciences, Bradley and Pribram (1998) explain the endogenous processes by which a stable order of collaborative organization is generated. Very briefly, their theory describes how two orders of social relations, *affective arousal* (the distribution of energy) and *social control* (spatial and temporal constraints on member behavior) activate the potential energy of a collective's members—their capacity for physical and social behavior—and directs the expenditure of this energy towards collective ends. The interaction between the two orders gathers and communicates information about internal organization throughout the collective. The interaction *in-forms* (gives shape to) the members' expenditure of energy and results in stable, effective collective organization. Different combinations of affective arousal and social control produce different states of functional and dysfunctional organization. These same *socioaffective* dynamics are observed in social interactions early in life (Schore, 1994), and appear to hold across the life span both in intimate relationships (Sternberg, 1986) and in collective organization (see Bradley, 2001, 2002).

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