
Institutional Rational Choice

An Assessment of the Institutional Analysis and Development Framework

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BACKGROUND

Paul Sabatier has asked me to do an assessment of institutional rational choice. Unfortunately, I think the field is now too broad for one person to do an assessment of all the work that might be covered by the term *institutional rational choice*. Instead of trying an assessment of such a broad array of literature, I will focus more specifically on the institutional analysis and development (IAD) framework that has evolved out of the work of many colleagues at the Workshop in Political Theory and Policy Analysis at Indiana University.

The publication of "The Three Worlds of Action: A Metatheoretical Synthesis of Institutional Approaches" (Kiser and Ostrom, 1982) represents the initial pub-

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lished attempt to develop a general framework to help integrate work undertaken by political scientists, economists, anthropologists, lawyers, social psychologists, and others interested in how institutions affect the incentives confronting individuals and their resultant behavior.¹ During the nearly fifteen years since this publication, the framework has been further developed and applied to the analysis of a diversity of empirical settings (E. Ostrom, 1986; E. Ostrom, Gardner, and Walker, 1994, ch. 2; Blomquist, 1992; Tang, 1992; Schlager, 1990; Oakerson, 1992). The elements involved in the framework are closely related to concepts that play an important role in related theories, such as those represented in the work of Douglass C. North, Oliver Williamson, and others in the "new institutional economics" tradition (see Eggertsson, 1990).

Two important aspects of the IAD framework were developed in the initial article. One aspect is the distinction among three tiers of decisionmaking and the relations among them: constitutional, collective choice, and operational decisions. The second is the elucidation of the fundamental elements that can be used for analysis of outcomes and their evaluation at any of the three tiers of decisionmaking. In this chapter, I will present an updated version of the framework in light of the additional work undertaken since 1982 and of theories and models consistent with this framework. I will conclude with a brief assessment of the utility of this tool for institutional analysis. Before I do this, however, I wish to indicate some of the difficulties that confront those interested in understanding incentives, institutions, and outcomes.

CHALLENGES

Various aspects of the IAD approach are clarified if one is aware of the difficulties to be overcome in undertaking any form of institutional analysis. Here is an initial list of what I consider the key difficulties involved in studying institutions:

1. The term *institution* refers to many different types of entities, including both organizations and the rules used to structure patterns of interaction within and across organizations.
2. Although the buildings in which organized entities are located are quite visible, institutions themselves are invisible.
3. To develop a coherent approach to studying diverse types of institutional arrangements, including markets, hierarchies, firms, families, voluntary associations, national governments, and international regimes, one needs multiple inputs from diverse disciplines.
4. Given the multiple languages used across disciplines, a coherent institutional framework is needed to allow for expression and comparison of diverse theories and models of theories applied to particular puzzles and problem settings.

5. Decisions made about rules at any one level are usually made within a structure of rules existing at a different level. Thus, institutional studies need to encompass multiple levels of analysis.
6. At any one level of analysis, combinations of rules, attributes of the world, and communities of individuals involved are combined in a configural rather than an additive manner.

Let us briefly discuss these issues before turning to the IAD approach.

Multiple Definitions of Institutions

It is hard to make much progress in the study of institutions if scholars define the term *institution* as meaning almost anything. A major confusion exists between scholars who use the term to refer to an organizational entity such as the U.S. Congress, a business firm, a political party, or a family and scholars who use the term to refer to the rules, norms, and strategies adopted by individuals operating within or across organizations. In this paper, I will use the term *institution* in the latter sense, to refer to the shared concepts used by humans in repetitive situations organized by rules, norms, and strategies (see Crawford and Ostrom, 1995). By *rules*, I mean shared prescriptions (must, must not, or may) that are mutually understood and predictably enforced in particular situations by agents responsible for monitoring conduct and for imposing sanctions. By *norms*, I mean shared prescriptions that tend to be enforced by the participants themselves through internally and externally imposed costs and inducements. By *strategies*, I mean the regularized plans that individuals make within the structure of incentives produced by rules, norms, and expectations of the likely behavior of others in a situation affected by relevant physical and material conditions.²

Invisibility of Institutions

One of the most difficult problems to overcome in the study of institutions is how to identify and measure them. Because institutions are fundamentally shared concepts, they exist in the minds of the participants and sometimes are shared as implicit knowledge rather than in an explicit and written form. One of the problems facing scholars and officials is learning how to recognize the presence of institutions on the ground. The primitive physical structures that embed property rights systems that farmers have constructed over time look flimsy to an engineer who considers real only structures built out of concrete and iron. These flimsy structures, however, are frequently used by individuals to allocate resource flows to participants according to rules that have been devised in tough constitutional and collective-choice bargaining situations over time.

In training researchers to identify and measure institutions, we stress the concept of rules-in-use rather than focusing on rules-in-form. Rules-in-use are re-

ferred to whenever someone new (such as a new employee or a child) is being socialized into an existing rule-ordered system of behavior. They are the dos and don'ts that one learns on the ground that may not exist in any written document. In some instances, they may actually be contrary to the dos and don'ts that are written in formal documents. Being armed with a set of questions concerning how X is done here and why Y is not done here is a very useful way of identifying rules-in-use, shared norms, and operational strategies.

Multiple Disciplines—Multiple Languages

Because regularized human behavior occurs within a wide diversity of rule-ordered situations that share structural features such as markets, hierarchies or firms, families, voluntary associations, national governments, and international regimes, there is no single discipline that addresses all questions important for the study of human institutions. Understanding the kinds of strategies and heuristics that humans adopt in diverse situations is enhanced by the study of anthropology, economics, game theory, history, law, philosophy, political science, psychology, public administration, and sociology. Scholars within these disciplines learn separate technical languages. Meaningful communication across the social sciences can be extremely difficult to achieve. When social scientists need to work with biologists and/or physical scientists, communication problems are even more difficult. One of the reasons for developing the IAD framework has been, therefore, to develop a common set of linguistic elements that can be used to analyze a wide diversity of problems.

Multiple Levels of Analysis

When individuals interact in repetitive settings, they may be in operational situations that directly affect the world, or they may be making decisions at other levels of analysis that eventually impinge on operational decisionmaking situations (Shepsle, 1989). Multiple sources of structure are located at diverse analytical levels as well as diverse geographic domains. Biologists took several centuries to learn how to separate the diverse kinds of relevant structures needed to analyze both communities and individual biological entities. Separating phenotypical structure from genotypical structure was part of the major Darwinian breakthrough that allowed biologists to achieve real momentum and cumulation during the past century. The nested structure of rules within rules, within still further rules, is a particularly difficult analytical problem to solve for those interested in the study of institutions. Studies conducted at a macro level (see Kaminski, 1992; V. Ostrom, 1997; Loveman, 1993; Sawyer, 1992) focus on constitutional structures. These, in turn, affect the type of collective-choice decisions as they eventually impinge on the day-to-day decisions of citizens and/or subjects. Studies conducted at a micro level (Firmin-Sellers, 1996; E. Ostrom, Gardner,

and Walker, 1994) focus more on operational-level decisions as they are in turn affected by collective-choice and constitutional-choice rules, some, but not all, of which are under the control of those making operational decisions. Finding ways to communicate across these levels is a key challenge for all institutional theorists.

Configural Relationships

Successful analysis can cumulate rapidly when scholars have been able to analyze a problem by separating it into component parts that are analyzed independently and then recombining these parts additively. Many puzzles of interest to social scientists can be torn apart and recombined. Frequently, however, the impact on incentives and behavior of one type of rule is not independent of the configuration of other rules. Thus, the impact of changing one of the current rules that is part of a state "welfare system" depends on which other rules are also in effect. Changing the minimum outside income that one can earn before losing benefits from one program, for example, cannot be analyzed independently of the effect of income on benefits derived from other programs.³ Similarly, analyzing the impact of changing the proportion of individuals who must agree prior to making an authoritative collective choice (e.g., 50 percent plus one) depends on the quorum rule in force. If a quorum rule specifying a low proportion of members is in effect, requiring two-thirds agreement may be a less stringent decision rule than a simple majority rule combined with a quorum rule requiring a high proportion of members. *Ceteris paribus* conditions are always essential for doing any theoretical work involving institutions. In the case of institutional analysis, one needs to know the value of other variables rather than simply asserting that they are held constant. This configural nature of rules makes institutional analysis a more difficult and complex enterprise than studies of phenomena that are strictly additive.

INSTITUTIONAL FRAMEWORKS, THEORIES, AND MODELS

Given the need for multiple disciplines, and hence multiple disciplinary languages, and given the multiple levels of analysis involved in studying configural relationships among rules, relevant aspects of the world, and cultural phenomena, the study of institutions does depend on theoretical work undertaken at three levels of specificity that are often confused with one another. These essential foundations are (1) frameworks, (2) theories, and (3) models. Analyses conducted at each level provide different degrees of specificity related to a particular problem.

The development and use of a general *framework* help to identify the elements and relationships among these elements that one needs to consider for institutional analysis. Frameworks organize diagnostic and prescriptive inquiry. They provide the most general list of variables that should be used to analyze all types

of institutional arrangements. Frameworks provide a metatheoretical language that can be used to compare theories. They attempt to identify the *universal* elements that any theory relevant to the same kind of phenomena would need to include. Many differences in surface reality can result from the way these variables combine with or interact with one another. Thus, the elements contained in a framework help analysts generate the questions that need to be addressed when they first conduct an analysis.

The development and use of *theories* enable the analyst to specify which elements of the framework are particularly relevant to certain kinds of questions and to make general working assumptions about these elements. Thus, theories focus on a framework and make specific assumptions that are necessary for an analyst to diagnose a phenomenon, explain its processes, and predict outcomes. Several theories are usually compatible with any framework. Economic theory, game theory, transaction cost theory, social choice theory, covenantal theory, and theories of public goods and common-pool resources are all compatible with the IAD framework discussed in this chapter. In this chapter, I illustrate the framework primarily with reference to our work on the theory of common-pool resources.

The development and use of *models* make precise assumptions about a limited set of parameters and variables. Logic, mathematics, game theory, experimentation and simulation, and other means are used to explore systematically the consequences of these assumptions in a limited set of outcomes. Multiple models are compatible with most theories. A recent effort to understand the strategic structure of the games that irrigators play in differently organized irrigation systems, for example, developed four families of models just to begin to explore the likely consequences of different institutional and physical combinations relevant to understanding how successful farmer organizations arranged for monitoring and sanctioning activities (Weissing and Ostrom, 1991). This is one of the models we have developed for the precise analysis of a subpart of the theory of common-pool resources.

For policymakers and scholars interested in issues related to how different governance systems enable individuals to solve problems democratically, the IAD framework helps to organize diagnostic, analytical, and prescriptive capabilities. It also aids in the accumulation of knowledge from empirical studies and in the assessment of past efforts at reforms. Markets and hierarchies are frequently presented as fundamentally different “pure types” of organization. Not only are these types of institutional arrangements perceived to be different, but each is presumed to require its own explanatory theory. Scholars who attempt to explain behavior within markets use microeconomic theory, whereas scholars who attempt to explain behavior within hierarchies use political and sociological theory. Such a view precludes a more general explanatory framework and closely related theories that help analysts make cross-institutional comparisons and evaluations.

Without the capacity to undertake systematic, comparative institutional assessments, recommendations of reform may be based on naive ideas about which kinds of institutions are “good” or “bad” and not on an analysis of performance. One needs a common framework and family of theories in order to address questions of reforms and transitions. Particular models then help the analyst to deduce specific predictions about likely outcomes of highly simplified structures. Models are useful in policy analysis when they are well tailored to the particular problem at hand. Models can be used inappropriately when applied to the study of problematic situations that do not closely fit the assumptions of the model.

THE INSTITUTIONAL ANALYSIS AND DEVELOPMENT FRAMEWORK

As indicated earlier, an institutional framework should identify the major types of structural variables that are present to some extent in *all* institutional arrangements, but whose values differ from one type of institutional arrangement to another. The IAD framework is a multitier conceptual map (see Figure 3.1). One part of the framework is the identification of an action arena, the resulting patterns of interactions and outcomes, and evaluating these outcomes (see right half of Figure 3.1). The problem could be at an operational tier where actors interact in light of the incentives they face to generate outcomes directly in the world. Examples of operational problems include:

- The task of designing the incentives of a voluntary environmental action group so as to overcome to some extent the free-rider problem;
- The challenge of organizing local users of a forest to contribute resources to the protection of local watersheds to improve soil quality and water storage; and
- The question of how to invest in irrigation infrastructures so that capital investments enhance, rather than detract from, the organizational capabilities of local farmers.

The problem could also be at a policy (or collective-choice) tier where decision-makers repeatedly have to make policy decisions within the constraints of a set of collective-choice rules. The policy decisions then affect the structure of arenas where individuals are making operational decisions and thus impacting directly on a physical world. The problem could as well be at a constitutional tier where decisions are made about who is eligible to participate in policymaking and about the rules that will be used to undertake policymaking.

The first step in analyzing a problem is to identify a conceptual unit—called an *action arena*—that can be utilized to analyze, predict, and explain behavior within institutional arrangements. Action arenas include an *action situation* and

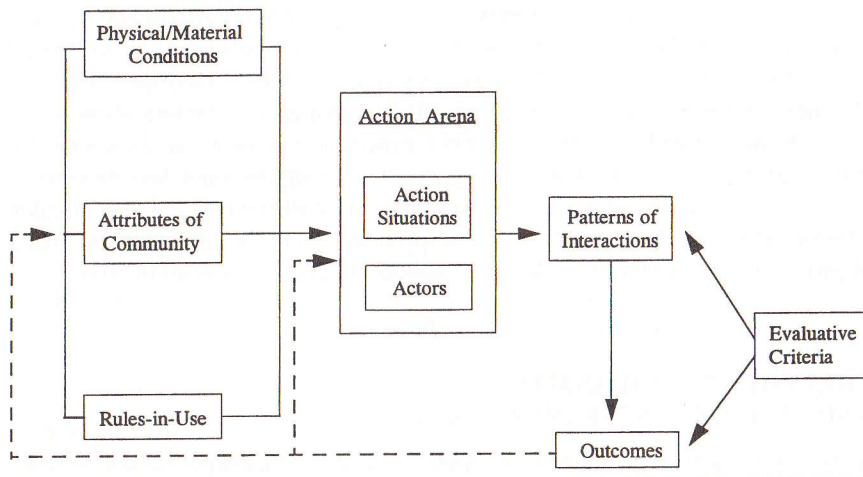


FIGURE 3.1 A Framework for Institutional Analysis

SOURCE: Adapted from Ostrom, Gardner, and Walker (1994, p. 37).

the *actors* in that situation. An action situation can be characterized by means of seven clusters of variables: (1) participants, (2) positions, (3) outcomes, (4) action-outcome linkages, (5) the control that participants exercise, (6) information, and (7) the costs and benefits assigned to outcomes. An actor (an individual or a corporate actor) includes assumptions about four clusters of variables:

1. The *resources* that an actor brings to a situation;
2. The *valuation* actors assign to states of the world and to actions;
3. The way actors acquire, process, retain, and use *knowledge contingencies and information*; and
4. The processes actors use for *selection* of particular courses of action.

The term *action arena* refers to the social space where individuals interact, exchange goods and services, solve problems, dominate one another, or fight (among the many things that individuals do in action arenas). A major proportion of theoretical work stops at this level and takes the variables specifying the situation and the motivational and cognitive structure of an actor as givens. Analysis proceeds toward the prediction of the likely behavior of individuals in such a structure.

An institutional analyst can take two additional steps after making an effort to understand the initial structure of an action arena. One step digs deeper and inquires into the factors that affect the structure of an action arena. From this vantage point, the action arena is viewed as a set of variables dependent upon other factors. These factors affecting the structure of an action arena include three clus-

ters of variables: (1) the rules used by participants to order their relationships, (2) the attributes of states of the world that are acted upon in these arenas, and (3) the structure of the more general community within which any particular arena is placed (see Kiser and Ostrom, 1982). The next section of this chapter explicitly examines how shared understandings of rules, states of the world, and nature of the community affect the values of the variables characterizing action arenas.

Then one can move outward from action arenas to consider methods for explaining complex structures that link sequential and simultaneous action arenas to one another (see the left side of Figure 3.1).

DIAGNOSIS AND EXPLANATION WITHIN THE FRAME OF AN ACTION ARENA

As mentioned earlier, the term *action arena* refers to a complex conceptual unit containing one set of variables called an *action situation* and a second set of variables called an *actor*. One needs both components—the situation and the actors in the situation—to diagnose, explain, and predict actions and results.

An Action Situation

The term *action situation* is used to refer to an analytic concept that enables an analyst to isolate the immediate structure affecting a process of interest to the analyst for the purpose of explaining regularities in human actions and results, and potentially to reform them. A common set of variables used to describe the structure of an action situation includes (1) the set of participants, (2) the specific positions to be filled by participants, (3) the set of allowable actions and their linkage to outcomes, (4) the potential outcomes that are linked to individual sequences of actions, (5) the level of control each participant has over choice, (6) the information available to participants about the structure of the action situation, and (7) the costs and benefits—which serve as incentives and deterrents—assigned to actions and outcomes. In addition, whether a situation will occur once, a known finite number of times, or indefinitely affects the strategies of individuals. When one is explaining actions and cumulated results within the framework of an action arena, these variables are the “givens” that one works with to describe the structure of the situation. These are the common elements used in game theory to construct formal game models.

Most operational activities related to natural resources can be conceptualized as involving provision, production, appropriation, and assignment (see E. Ostrom, Gardner, and Walker, 1994; E. Ostrom, Schroeder, and Wynne, 1993). In an analysis of appropriation problems concerning overharvesting from a common-pool resource situation, for example, answers to the following questions are needed before analysis:

- *The set of participants:* Who and how many individuals withdraw resource units (e.g., fish, water, fodder) from this resource system?
- *The positions:* What positions exist (e.g., members of an irrigation association, water distributors-guards, and a chair)?
- *The set of allowable actions:* Which types of harvesting technologies are used? (E.g., are chain saws used to harvest timber? Are there open and closed seasons? Do fishers return fish smaller than some limit to the water?)
- *The potential outcomes:* What geographic region and what events in that region are affected by participants in these positions? What chain of events links actions to outcomes?
- *The level of control over choice:* Do appropriators take the above actions on their own initiative, or do they confer with others? (E.g., before entering the forest to cut fodder, does an appropriator obtain a permit?)
- *The information available:* How much information do appropriators have about the condition of the resource itself, about other appropriators' cost and benefit functions, and about how their actions cumulate into joint outcomes?
- *The costs and benefits of actions and outcomes:* How costly are various actions to each type of appropriator, and what kinds of benefits can be achieved as a result of various group outcomes?

The Actor: Theories and Models of the Individual

The *actor* in a situation can be thought of as a single individual or as a group functioning as a corporate actor. The term *action* refers to those human behaviors to which the acting individual attaches a subjective and instrumental meaning. All analysts of microbehavior use an implicit or explicit theory or model of the actors in situations in order to derive inferences about the likely behavior of each actor in a situation (and thus about the pattern of joint results that may be produced). The analyst must make assumptions about how and what participants value; what resources, information, and beliefs they have; what their information-processing capabilities are; and what internal mechanisms they use to decide upon strategies.

For many problems, it is useful to accept the classical political economy view that an individual's choice of strategy in any particular situation depends on how he or she perceives and weighs the benefits and costs of various strategies and their likely outcomes (Radnitzky, 1987). The most well-established formal model of the individual used in institutional analysis is *Homo economicus* as developed in neoclassical economics and game theory. To use *Homo economicus*, one assumes that actors have complete and well-ordered preferences and complete information, and that they maximize the net value of expected returns to

themselves. All of these assumptions are controversial and are being challenged on many fronts. Many institutional analysts tend to use a broader conception of individual actors. Many stress that perceived costs and benefits include the time and resources devoted to establishing and maintaining relationships (Williamson, 1979), as well as the value that individuals attach to establishing a reputation for being reliable and trustworthy (Breton and Wintrobe, 1982).

Alternatively, one could assume that the individuals who calculate benefits and costs are fallible learners who vary in terms of the number of other persons whose perceived benefits and costs are important to them and in terms of their personal commitment to keeping promises and honoring forms of reciprocity extended to them (E. Ostrom, 1990). Fallible learners can, and often do, make mistakes. Settings differ, however, in whether the institutional incentives involved encourage people to learn from these mistakes. Fallibility and the capacity to learn can thus be viewed as assumptions of a more general theory of the individual. One can then presume that the various institutional arrangements that individuals use in governing and managing common-pool resources (or other problematic situations) offer them different incentives and opportunities to learn. In some settings, the incentives lead them to repeat the mistakes of the past. In others, the rate of effective learning about how to make a resource sustainable over time is rapid. In all cases, the repertoire of institutional design principles known to individuals also affects their capacity to change their institutions in order to improve learning and other outcomes when faced with repeated failures.

When fallible, learning individuals interact in frequently repeated and simple situations, it is possible to model them as if they had complete information about the variables relevant to making choices in those situations. In highly competitive environments, we can make the further assumption that the individuals who survive the selective pressure of the environment act as if they are maximizers of a key variable associated with survival in that environment (e.g., profits or fitness) (Alchian, 1950; Dosi and Egidi, 1987). When individuals face a relatively simple decision situation where institutions generate accurate information about the variables relevant to a particular problem, that problem can be adequately represented as a straightforward, constrained maximization problem.

The most fully developed, explicit theories of individual choice compatible with the IAD framework—game theory and neoclassical economic theory—involve extreme assumptions such as unlimited computational capability and full maximization of net benefits. For some field settings, these theories generate empirically confirmed explanatory and diagnostic results. When analyzing commodity auction markets that are run repeatedly in a setting where property rights are well defined and enforced at a relatively low cost to buyers and sellers, theories of market behavior and outcome based on complete information and maximization of profits predict outcomes very well. Using these assumptions about individual choice turns out to be a very useful way of doing institutional analysis

when the problematic settings closely approximate this type of very constrained and competitive choice.

Many of the situations of interest in understanding common-pool resources, however, are uncertain and complex and lack the selective pressure and information-generating capabilities of a competitive market. Therefore, one can substitute the assumption of bounded rationality—that persons are intendedly rational but only limitedly so—for the assumptions of perfect information and utility maximization used in axiomatic choice theory (see Simon, 1947/1965, 1972; Williamson, 1985; E. Ostrom, Gardner, and Walker, 1994, ch. 9). Information search is costly, and the information-processing capabilities of human beings are limited. Individuals, therefore, often must make choices based on incomplete knowledge of all possible alternatives and their likely outcomes. With incomplete information and imperfect information-processing capabilities, all individuals may make mistakes in choosing strategies designed to realize a set of goals (V. Ostrom, 1986). Over time, however, they can acquire a greater understanding of their situation and adopt strategies that result in higher returns. Reciprocity may develop, rather than strictly narrow, short-term pursuit of self-interest (Hyden, 1990; Oakerson, 1993).

Individuals do not always have access to the same information known by others with whom they interact. For example, how much any one individual contributes to a joint undertaking is often difficult for others to judge. When joint outcomes depend on multiple actors contributing inputs that are costly and difficult to measure, incentives exist for individuals to behave opportunistically (Williamson, 1975). Opportunism—deceitful behavior intended to improve one's own welfare at the expense of others—may take many forms, from inconsequential, perhaps unconscious, shirking to a carefully calculated effort to defraud others with whom one is engaged in ongoing relationships. The opportunism of individuals who may say one thing and do something else further compounds the problem of uncertainty in a given situation. Moreover, the level of opportunistic behavior that may occur in any setting is affected by the norms and institutions used to govern relationships in that setting, as well as by attributes of the decision environment itself.

Predicting Outcomes Within an Action Arena

Depending upon the analytical structure of a situation and the particular assumptions about the actor used, the analyst makes strong or weak inferences about results. In tightly constrained, one-shot, action situations under conditions of complete information, where participants are motivated to select particular strategies or chains of actions that jointly lead to stable equilibria, an analyst can frequently make strong inferences and specific predictions about likely patterns of behavior and outcomes.

When there is no limit on the number of appropriators from a common-pool resource or on the amount of harvesting activities they undertake, for example, one can develop a mathematical model of an open-access, common-pool resource (see, for example, E. Ostrom et al., 1994). When the net benefits of harvesting to each entrant increase for the initial set of resource units sought and decrease thereafter, each appropriator acting independently tends to make individual decisions that jointly yield a deficient (but stable) equilibrium. A model of an open-access, common-pool resource generates a clear prediction of a race to use up the resource, leading to high social costs. Both field research and laboratory experimental research strongly support the predictions of overuse and potential destruction of open-access, common-pool resources where appropriators do not share access to collective-choice arenas in which to change the open-access structure they face (E. Ostrom et al., 1994).

Many arenas, however, do not generate such unambiguous results. Instead of making completely independent or autonomous decisions, individuals may be embedded in communities where initial norms of fairness and conservation may change the structure of the situation dramatically. Within these situations, participants may adopt a broader range of strategies. Further, they may change their strategies over time as they learn about the results of past actions. The institutional analyst examining these more open, less-constrained situations makes weaker inferences and predicts the patterns of outcomes that are more-or-less likely to result from a particular type of situation. In laboratory experiments, for example, giving subjects in a common-pool resource situation opportunities to communicate generally increases the joint outcomes they achieve (see E. Ostrom et al., 1994, and citations contained therein). In field settings, one can assume that helping individuals engage in face-to-face discussions will increase the probability of improved outcomes, but there are many historical factors that also affect this likelihood. Even weak inferences about likely results have an importance in specifying general tendencies. At times, it is possible to predict what will *not* occur. Predictions of impossibilities are very useful when one is contemplating reforms.

In field settings, it is hard to tell where one action arena starts and another stops. Life continues in what appears to be a seamless web as individuals move from home to market to work (action situations typically characterized by reciprocity, by exchange, or by team problem solving or command). Further, within arenas, choices of actions *within* a set of rules as contrasted to choices *among* future rules are frequently made without a recognition that the level of action has shifted. So, when a "boss" says to an "employee," "How about changing the way we do X?" and the two discuss options and jointly agree upon a better way, they have shifted from taking actions *within* previously established rules to making decisions *about* the rules structuring future actions. In other words, in IAD language, they have shifted to a collective-choice arena.

Evaluating Outcomes

In addition to predicting outcomes, the institutional analyst may evaluate the outcomes that are being achieved as well as the likely set of outcomes that could be achieved under alternative institutional arrangements. Evaluative criteria are applied to both the outcomes and the processes of achieving outcomes. Although there are many potential evaluative criteria, let us briefly focus on (1) economic efficiency, (2) equity through fiscal equivalence, (3) redistributive equity, (4) accountability, (5) conformance to general morality, and (6) adaptability.

Economic Efficiency. Economic efficiency is determined by the magnitude of the change in the flow of net benefits associated with an allocation or reallocation of resources. The concept of efficiency plays a central role in studies estimating the benefits and costs or rates of return to investments, which are often used to determine the economic feasibility or desirability of public policies. When considering alternative institutional arrangements, therefore, it is crucial to consider how revisions in the rules affecting participants will alter behavior and hence the allocation of resources.

Fiscal Equivalence. There are two principal means of assessing equity: (1) on the basis of the equality between individuals' contributions to an effort and the benefits they derive and (2) on the basis of differential abilities to pay. The concept of equity that underlies an exchange economy holds that those who benefit from a service should bear the burden of financing that service. Perceptions of fiscal equivalence or a lack thereof can affect the willingness of individuals to contribute toward the development and maintenance of resource systems.

Redistributive Equity. Policies that redistribute resources to poorer individuals are of considerable importance. Thus, although efficiency would dictate that scarce resources be used where they produce the greatest net benefit, equity goals may temper this objective, and the result is the provision of facilities that benefit particularly needy groups. Likewise, redistributive objectives may conflict with the goal of achieving fiscal equivalence.

Accountability. In a democratic polity, officials should be accountable to citizens concerning the development and use of public facilities and natural resources. Concern for accountability need not conflict greatly with efficiency and equity goals. Indeed, achieving efficiency requires that information about the preferences of citizens be available to decisionmakers, as does achieving accountability. Institutional arrangements that effectively aggregate this information assist in realizing efficiency at the same time that they serve to increase accountability and to promote the achievement of redistributive objectives.

Conformance to General Morality. In addition to accountability, one may wish to evaluate the level of general morality fostered by a particular set of institutional arrangements. Are those who are able to cheat and go undetected able to obtain very high payoffs? Are those who keep promises more likely to be rewarded and advanced in their careers? How do those who repeatedly interact within a set of institutional arrangements learn to relate to one another over the long term?

Adaptability. Finally, unless institutional arrangements are able to respond to ever-changing environments, the sustainability of resources and investments is likely to suffer. Rural areas of developing countries are often faced with natural disasters and highly localized special circumstances. If an institutional arrangement is too inflexible to cope with these unique conditions, it is unlikely to prosper. For example, if an irrigation system is centrally controlled and allocates only a specific amount of resources to annual and periodic maintenance, it may not be able to meet the special needs associated with a major flood that destroys a section of the canal system.

Trade-offs are often necessary in using performance criteria as a basis for selecting from alternative institutional arrangements. It is particularly difficult to choose between the goals of efficiency and redistributive equity. The trade-off issue arises most explicitly in considerations of alternative methods of funding public projects. Economically efficient pricing of the use of an existing resource or facility should reflect only the incremental maintenance costs and any external or social costs associated with its use. This is the well-known, efficiency-pricing principle that requires that prices equal the marginal costs of usage. The principle is especially problematic in the case of goods with nonsubtractability attributes. In such instances, the marginal cost of another user's utilizing the good is zero; hence, the efficient price is also zero. Zero user prices, however, require that all sources of resource mobilization be tax-based and thereby induce other kinds of perverse incentives and potential inefficiencies. Evaluating how institutional arrangements compare across overall criteria is quite a challenge. Analytical examination of the likely trade-offs between intermediate costs is valuable in attempts to understand comparative institutional performance (see E. Ostrom, Schroeder, and Wynne, 1993, ch. 5).

EXPLANATION: VIEWING ACTION ARENAS AS DEPENDENT VARIABLES

Underlying the way analysts conceptualize action arenas are implicit assumptions about the *rules* individuals use to order their relationships, about attributes of *states of the world and their transformations*, and about the *attributes of the com-*

munity within which the arena occurs. Some analysts are not interested in the role of these underlying variables and focus only on a particular arena whose structure is given. On the other hand, institutional analysts may be more interested in one factor affecting the structure of arenas than they are interested in others. Sociologists tend to be more interested in how shared value systems affect the ways humans organize their relationships with one another. Environmentalists tend to focus on various ways that physical and biological systems interact and create opportunities or constraints on the situation human beings face. Political scientists tend to focus more on how specific combinations of rules affect incentives. Rules, states of the world, and the nature of the community all jointly affect the types of actions that individuals can take, the benefits and costs of these actions and resulting outcomes, and the likely outcomes achieved.

The Concept of Rules

Rules are shared understandings among those involved that refer to enforced prescriptions about what actions (or states of the world) are *required*, *prohibited*, or *permitted*.⁴ All rules are the result of implicit or explicit efforts to achieve order and predictability among humans by creating classes of persons (positions) that are then required, permitted, or forbidden to take classes of actions in relation to required, permitted, or forbidden states of the world (Crawford and Ostrom, 1995; V. Ostrom, 1991).

With governance, one needs to ask where the rules that individuals use in action situations originate. In an open and democratic governance system, there are many sources of the rules that individuals use in everyday life. It is not considered illegal or improper for individuals to organize themselves and craft their own rules, if the activities they engage in are legal. In addition to the legislation and regulations of a formal central government, there are apt to be laws passed by regional, local, and special governments. Within private firms and voluntary associations, individuals are authorized to adopt many different rules about who is a member of the firm or association, how profits (benefits) are to be shared, and how decisions will be made. Each family constitutes its own rule-making body.

When individuals genuinely participate in the crafting of multiple layers of rules, some of that crafting will occur using pen and paper. Much of it, however, will occur as problem-solving individuals interact trying to figure out how to do a better job in the future than they have done in the past. Colleagues in a work team are crafting their own rules when they might say to one another, "How about if you do A in the future, and I will do B, and before we ever make a decision about C again, we both discuss it and make a joint decision?" In a democratic society, problem-solving individuals do this all the time. They also participate in less fluid decisionmaking arrangements, including elections to select legislators.

Thus, when we do a deeper institutional analysis, we attempt first to understand the working rules that individuals use in making decisions. Working rules

are the set of rules to which participants would make reference if asked to explain and justify their actions to fellow participants. Although following a rule may become a "social habit," it is possible to make participants consciously aware of the rules they use to order their relationships. Individuals can consciously decide to adopt a different rule and change their behavior to conform to such a decision. Over time, behavior in conformance with a new rule may itself become habitual (see Shimanoff, 1980; Toulmin, 1974; Harré, 1974). The capacity of humans to use complex cognitive systems to order their own behavior at a relatively subconscious level makes it difficult for empirical researchers to ascertain what the working rules for an ongoing action arena may be.

Once we understand the working rules, then, we attempt to understand where those rules come from. In a system governed by a "rule of law," the general legal framework in use will have its source in actions taken in constitutional, legislative, and administrative settings augmented by decisions taken by individuals in many different particular settings. In other words, the rules-in-form are consistent with the rules-in-use (Sproule-Jones, 1993). In a system that is not governed by a "rule of law," there may be central laws and considerable effort made to enforce them, but individuals attempt to evade rather than obey the law.

Rule-following or conforming actions are not as predictable as biological or physical behavior explained by scientific laws. All rules are formulated in human language. Therefore, rules share the problems of lack of clarity, misunderstanding, and change that typify any language-based phenomenon (V. Ostrom, 1980, 1997). Words are always more simple than the phenomenon to which they refer.

The stability of rule-ordered actions depends upon the shared meaning assigned to words used to formulate a set of rules. If no shared meaning exists when a rule is formulated, confusion will exist about what actions are required, permitted, or forbidden. Regularities in actions cannot result if those who must repeatedly interpret the meaning of a rule within action situations arrive at multiple interpretations. Because "rules are not self-formulating, self-determining, or self-enforcing" (V. Ostrom, 1980, p. 342), it is human agents who formulate them, apply them in particular situations, and attempt to enforce performance consistent with them. Even if shared meaning exists at the time of the acceptance of a rule, transformations in technology, in shared norms, and in circumstances more generally change the events to which rules apply: "Applying language to changing configurations of development increases the ambiguities and threatens the shared criteria of choice with an erosion of their appropriate meaning" (V. Ostrom, 1980, p. 342).

What rules are important for institutional analysis? A myriad of specific rules are used in structuring complex action arenas. Scholars have been trapped into endless cataloging of rules not related to a method of classification most useful for theoretical explanations. But classification is a necessary step in developing a science. Anyone attempting to define a useful typology of rules must be concerned that the classification is more than a method for imposing superficial or-

der onto an extremely large set of seemingly disparate rules. The way we have tackled this problem using the IAD framework is to classify rules according to their impact on the elements of an action situation.

Rule Configurations

A first step toward identifying the working rules can be made, then, by overtly examining how working rules affect each of the variables of an action situation. A set of working rules that affect these variables should constitute the minimal but necessary set of rules needed to offer an explanation of actions and results based on the working rules used by participants to order their relationships within an action arena. Because states of the world and their transformations and the nature of a community also affect the structure of an action situation, working rules alone never provide both a necessary and a sufficient explanation of the structure of an action situation and results.

If this view of the task is adopted, seven types of working rules can be said to affect the structure of an action situation. These are *entry and exit rules*, *position rules*, *scope rules*, *authority rules*, *aggregation rules*, *information rules*, and *payoff rules*. The cumulative effect of these seven types of rules affects the seven elements of an action situation.

Entry and exit rules affect the number of *participants*, their attributes and resources, whether they can enter freely, and the conditions they face for leaving. Position rules establish *positions* in the situation. Authority rules assign sets of *actions* that participants in positions at particular nodes must, may, or may not take. Scope rules delimit the *potential outcomes* that can be affected and, working backward, the actions linked to specific outcomes. Authority rules, combined with the scientific laws about the relevant states of the world being acted upon, determine the shape of the decision tree, that is, the *action-outcome linkages*. Aggregation rules affect the level of *control* that a participant in a position exercises in the selection of an action at a node. Information rules affect the *knowledge-contingent information sets* of participants. Payoff rules affect the *benefits and costs* that will be assigned to particular combinations of actions and outcomes, and they establish the incentives and deterrents for action. The set of working rules is a *configuration* in the sense that the effect of a change in one rule may depend upon the other rules-in-use.

Let us return to the example of conducting an analysis of common-pool resources discussed earlier. Now we will focus on a series of questions that are intended to help the analyst get at the rules-in-use that help structure an action situation. Thus, to understand these rules, one would begin to ask questions such as:

- *Entry and exit rules*: Are the appropriators from this resource limited to local residents; to one group defined by ethnicity, race, caste, gender, or family structure; to those who win a lottery; to those who have obtained a permit; to those who own required assets (such as a fishing

berth or land); or in some other way limited to a class of individuals that is bounded? Is a new participant allowed to join a group by some kind of entry fee or initiation? Must an appropriator give up rights to harvest upon migrating to another location?

- *Position rules*: How does someone move from being just a "member" of a group of appropriators to someone who has a specialized task, such as a water distributor-guard?
- *Scope rules*: What understandings do these appropriators and others have about the authorized or forbidden geographic or functional domains? Do any maps exist showing who can appropriate from which region? Are there understandings about resource units that are "off-limits" (e.g., the historical rules in some sections of Africa that particular acacia trees could not be cut down even on land owned privately or communally)?
- *Authority rules*: What understandings do appropriators have about mandatory, authorized, or forbidden harvesting technologies? For fishers, must net size be of a particular grossness? Must forest users use some cutting tools and not others? What choices do various types of monitors have related to the actions they can take?
- *Aggregation rules*: What understandings exist concerning the rules affecting the choice of harvesting activities? Do certain actions require prior permission from, or agreement of, others?
- *Information rules*: What information must be held secret, and what information must be made public?
- *Payoff rules*: How large are the sanctions that can be imposed for breaking any of the rules identified above? How is conformance to rules monitored? Who is responsible for sanctioning nonconformers? How reliably are sanctions imposed? Are any positive rewards offered to appropriators for any actions they can take? (e.g., is someone who is an elected official relieved of labor duties?)

The problem for the field researcher is that many rules-in-use are not written down. Nor can the field researcher simply be a survey worker asking a random sample of respondents about their rules. Many of the rules-in-use are not even conceptualized by participants as rules. In settings where the rules-in-use have evolved over long periods of time and are understood implicitly by participants, obtaining information about rules-in-use requires spending time at a site and learning how to ask nonthreatening, context-specific questions about rule configurations.⁵

Attributes of States of the World: Physical and Material Conditions

Although a rule configuration affects all of the elements of an action situation, some of the variables of an action situation are also affected by attributes of the

physical and material world. What actions are physically possible, what outcomes can be produced, how actions are linked to outcomes, and what is contained in the actors' information sets are affected by the world being acted upon in a situation. The same set of rules may yield entirely different types of action situations depending upon the types of events in the world being acted upon by participants.

The attributes of states of the world and their transformation are explicitly examined when the analyst self-consciously asks a series of questions about how the world being acted upon in a situation affects the outcome, action sets, action-outcome linkages, and information sets in that situation. The relative importance of the rule configuration and states of the world in structuring an action situation varies dramatically across different types of settings. The rule configuration almost totally constitutes some games, like chess, where physical attributes are relatively unimportant. The relative importance of working rules to attributes of the world also varies dramatically within action situations considered part of the public sector. Rules define and constrain voting behavior inside a legislature more than attributes of the world. Voting can be accomplished by raising hands, by paper ballots, by calling for the ayes and nays, by marching before an official counter, or by installing computer terminals for each legislator, on which votes are registered. However, in regard to organizing communication within a legislature, attributes of the world strongly affect the available options. The principle that only one person can be heard and understood at a time in any one forum strongly affects the capacity of legislators to communicate effectively with one another (see V. Ostrom, 1987).

Let us consider several attributes that are frequently used to distinguish goods and services that are more effectively provided by diverse institutional arrangements. Goods that are generally considered "public goods" yield nonsubtractive benefits that can be enjoyed jointly and simultaneously by many people who are hard to exclude from obtaining these benefits. Common-pool resources yield benefits where beneficiaries are hard to exclude but each person's use of a resource system subtracts units of that resource from a finite total available for harvesting.

Excludability and the Free-Rider Problem. When it is difficult or costly to exclude beneficiaries from a good once it is produced, it is frequently assumed that such a good must be provided publicly, rather than privately. When the benefits of a good are available to a group, whether or not members of the group contribute to the provision of the good, that good is characterized by problems with excludability. Where exclusion is costly, those wishing to provide a good or service face a potential free-rider or collective-action problem (Olson, 1965). Individuals who gain from the maintenance of an irrigation system, for example, may not wish to contribute labor or taxes to maintenance activities, hoping that others will bear the burden. This is not to say that all individuals will free-ride whenever they can. A strong incentive exists to be a free-rider in all situations where

potential beneficiaries cannot easily be excluded for failing to contribute to the provision of a good or service.

When it is costly to exclude individuals from enjoying benefits from a common-pool resource or an infrastructure facility, private, profit-seeking entrepreneurs, who must recoup their investments through quid pro quo exchanges, have few incentives to provide such services on their own initiative. Excludability problems can thus lead to the problem of free riding, which in turn leads to underinvestment in capital and its maintenance.

Public sector provision of common-pool resources or infrastructure facilities raises additional problems in determining preferences and organizing finances. When exclusion is of low cost to the supplier, preferences are revealed as a result of many quid pro quo transactions. Producers learn about preferences through the consumers' willingness to pay for various goods offered for sale. Where exclusion is difficult, designing mechanisms that honestly reflect beneficiaries' preferences and their willingness to pay is complex, regardless of whether the providing unit is organized in the public or the private sphere. In very small groups, those affected are usually able to discuss their preferences and constraints face to face and to reach a rough consensus. In larger groups, decisions about infrastructure are apt to be made through mechanisms such as voting or the delegation of authority to public officials. The extensive literature on voting systems demonstrates how difficult it is to translate individual preferences into collective choices that adequately reflect individual views (Arrow, 1951; Shepsle, 1979; Buchanan and Tullock, 1962).

Another attribute of some goods with excludability problems is that once they are provided, consumers may have no choice whatsoever as to whether they will consume. An example is the public spraying of insects. If an individual does not want this public service to be provided, there are even stronger incentives not to comply with a general tax levy. Thus, compliance with a broad financing instrument may, in turn, depend upon the legitimacy of the public-choice mechanism used to make provision decisions.

Subtractability of the Flow. Jointly used infrastructure facilities can generate a flow of services that is entirely subtractable upon consumption by one user; in other instances, consumption by one does not subtract from the flow of services available to others. The withdrawal of a quantity of water from an irrigation canal by one farmer means that there is that much less water for anyone else to use. Most agricultural uses of water are fully subtractive, whereas many other uses of water—such as for power generation or navigation—are not. Most of the water that passes through a turbine to generate power, for instance, can be used again downstream. When the use of a flow of services by one individual subtracts from what is available to others, and when the flow is scarce relative to demand, users will be tempted to try to obtain as much as they can of the flow for fear that it will not be available later.

Effective rules are required if scarce, fully subtractive service flows are to be allocated productively. Charging prices for subtractive services obviously constitutes one such allocation mechanism. Sometimes, however, it is not feasible to price services. In these instances, some individuals will be able to grab considerably more of the subtractive services than others, thereby leading to noneconomic uses of the flow and high levels of conflict among users.

Allocation rules also affect the incentives of users to maintain a system. Farmers located at the tail end of an irrigation system that lacks effective allocation rules have little motivation to contribute to the maintenance of that system because they only occasionally receive their share of water. Similarly, farmers located at the head end of such a system are not motivated to provide maintenance services voluntarily because they will receive disproportionate shares of the water whether or not the system is well maintained (E. Ostrom, 1996b).

Consequently, for common-pool resources whose flows are highly subtractive, institutional arrangements related to the allocation of the flow of services are intimately tied to the sustainability of the resource. It is highly unlikely that one can achieve sustainability without careful attention to the efficiency, fairness, and enforceability of the rules specifying who can appropriate how much of the service flow, at what times and places, and under what conditions. Furthermore, unless responsibilities are linked in a reasonable fashion to benefits obtained, the beneficiaries themselves will resist efforts to insist that they take responsibilities.

Additional Attributes. In addition to these general attributes of physical and material conditions that affect the incentives of participants, resource systems are also characterized by a diversity of other attributes that affect how rules combine with physical and material conditions to generate positive or negative incentives. Whether resource units are *mobile* or *stationary* and whether *storage* is available somewhere in a system affect the problems that individuals governing and managing common-pool resources face (Schlager, Blomquist, and Tang, 1994). The problems of regulating a lobster fishery, for example, are much simpler than those of regulating a salmon fishery. Similarly, allocating water predictably and efficiently is easier to achieve when there is some storage in the system than when it is a run-of-the-river system.

If a natural resource system is renewable, such as many groundwater basins, the relevant time horizon for sustaining use is very long, and achieving appropriate rules may mean the difference between creating a sustainable conjunctive-use system and destroying a groundwater basin. Devising an effective set of rules for regulating the use of an oil pool, on the other hand, involves determining an optimal path for mining a resource. The cost of withdrawing the last units of oil will be much higher if producers have not coordinated their withdrawal patterns, but the lack of a future may produce insufficient incentives to achieve adequate regulation early in the development phase.

The size of a resource system can also have a major impact on the incentives facing participants. The length and slope of a main canal of an irrigation system affect not only the cost of its maintenance but also the strategic bargaining that exists between headenders and tailenders on an irrigation system (Lam, 1994; E. Ostrom, 1996b). Increasing the number of participants is associated with increased transaction costs. How steeply the costs rise depends, to a large extent, on the rules-in-use and the heterogeneity of the users.

The productivity, predictability, and patchiness of a resource affect the likelihood that private-property arrangements will be successful and enhance the likelihood that common-property arrangements will be necessary (Netting, 1982). Similarly, the resilience of a multispecies ecosystem affects the sensitivity of the system both to the rules used to govern the particular system and to changes in economic or environmental conditions elsewhere (Holling, 1994). These additional attributes are slowly being integrated into a body of coherent theory about the impact of physical and material conditions on the structure of the situations that individuals face and their resulting incentives and behavior. Analysts diagnosing resource problems need to be sensitive to the very large difference among resource settings and the need to tailor rules to diverse combinations of attributes rather than trying to achieve some assumed uniformity across all resources in a particular sector within a country.

Attributes of the Community

A third set of variables that affect the structure of an action arena relates to the community. The attributes of a community that are important in affecting the structure of an action arena include the norms of behavior generally accepted in the community, the level of common understanding that potential participants share about the structure of particular types of action arenas, the extent of homogeneity in the preferences of those living in a community, and the distribution of resources among those affected. The term *culture* is frequently applied to this bundle of variables.

For example, when all appropriators from a common-pool resource share a common set of values and interact with one another in a multiplex set of arrangements, the probabilities of their developing adequate rules and norms to govern resources are much greater (Taylor, 1987). The importance of building a reputation for keeping one's word is important in such a community, and the cost of developing monitoring and sanctioning mechanisms is relatively low. If the appropriators from a resource come from many different communities and are distrustful of one another, the task of devising and sustaining effective rules is substantially more difficult.

Whether individuals use a written vernacular language to express their ideas, develop a common understanding, share learning, and explain the foundation of their social order is also a crucial variable of relevance to institutional analysis (V.

Ostrom, 1997). Without a written vernacular language, individuals face considerably more difficulties in accumulating their own learning in a usable form to transmit from one generation to the next.

LINKING ACTION ARENAS

In addition to analysis that digs deeper into the factors affecting individual action arenas, an important development in institutional analysis is the examination of linked arenas. Whereas the concept of a "single" arena may include large numbers of participants and complex chains of action, most of social reality is composed of multiple arenas linked sequentially or simultaneously. The chapters in this volume that address policy subsystems examine multiple linked action arenas at all three levels of analysis (see Chapter 6 by Sabatier and Jenkins-Smith).

When individuals wish to intervene to change the structure of incentives and deterrents faced by participants in socially constructed realities to guide (or control) participants toward a different pattern of results, they do so by attempting to change the rules participants use to order their interactions within particular types of action arenas. Some interesting and important institutional arrangements for coordinating complex chains of actions among large numbers of actors involve multiple organizations competing with one another according to a set of rules. Markets are the most frequently studied institutional arrangements that achieve coordination by relying primarily on rule-governed competitive relationships among organizations. Rule-governed competition among two or more political parties is considered by many analysts an important requisite for a democratic polity. Less studied, but potentially as important a means for achieving responsiveness and efficiency in producing public goods and services, are arrangements that allow rule-ordered competition among two or more potential *producers* of public goods and services.

MULTIPLE LEVELS OF ANALYSIS

Besides multiple and nested action arenas at any one level of analysis, nesting of arenas also occurs across several levels of analysis. All rules are nested in another set of rules that define how the first set of rules can be changed. The nesting of rules within rules at several levels is similar to the nesting of computer languages at several levels. What can be done at a higher level will depend on the capabilities and limits of the rules (or the software) at that level and at a deeper level. Whenever one addresses questions about *institutional change*, as contrasted to action within institutional constraints, it is necessary to recognize the following:

1. Changes in the rules used to order action at one level occur within a currently "fixed" set of rules at a deeper level.

2. Changes in deeper-level rules usually are more difficult and more costly to accomplish; thus, there is an increased stability in the mutual expectations of individuals interacting according to a set of rules.

It is useful to distinguish three levels of rules that cumulatively affect the actions taken and outcomes obtained in any setting (Kiser and Ostrom, 1982). *Operational rules* directly affect day-to-day decisions made by the participants in any setting. *Collective-choice rules* affect operational activities and results through their effects in determining who is eligible and the specific rules to be used in changing operational rules. *Constitutional-choice rules* affect operational activities and their effects in determining who is eligible and the rules to be used in crafting the set of collective-choice rules that in turn affect the set of operational rules. There is even a "metaconstitutional" level underlying all the others that is not frequently analyzed. One can think of the linkages among these rules and the related level of analysis as shown in Figure 3.2.

At each level of analysis, there may be one or more arenas in which the types of decisions made at that level will occur. In the collective-choice, constitutional, and metaconstitutional situations, activities involve prescribing, invoking, monitoring, applying, and enforcing rules (Lasswell and Kaplan, 1950; Oakerson, 1994). The concept of an *arena*, as described earlier, does not imply a formal setting but can include such formal settings as legislatures and courts. Policymaking (or governance) regarding the rules that will be used to regulate operational-level choices is usually carried out in one or more collective-choice arenas, as shown in Figure 3.3.

USES OF THE IAD FRAMEWORK

The IAD framework is thus a general language about how rules, physical and material conditions, and attributes of community affect the structure of action arenas, the incentives that individuals face, and the resulting outcomes. It has been used extensively in teaching (see, for example, E. Ostrom, V. Ostrom, and McGinnis, 1996), as well as in the metalanguage for analyzing diverse theories. In the early 1970s, when the IAD framework was first being developed, we were trying to understand how the diverse paradigms in political science affected the way we conceptualized both public administration and metropolitan organization (see V. Ostrom and E. Ostrom, 1971; E. Ostrom, 1972). Then, for a decade and a half, we used the nascent framework as a foundation for the conduct of an extensive number of empirical studies of police service delivery in metropolitan areas. Since the late 1980s, the IAD framework has been used as the language to develop a theory of common-pool resources and to link formal models of appropriation and monitoring with empirical work conducted in an experimental laboratory and in field settings (see, for example, E. Ostrom et al., 1994).

In crafting empirical studies using the IAD framework, a key question has always been the appropriate units and levels of analysis for any particular type of

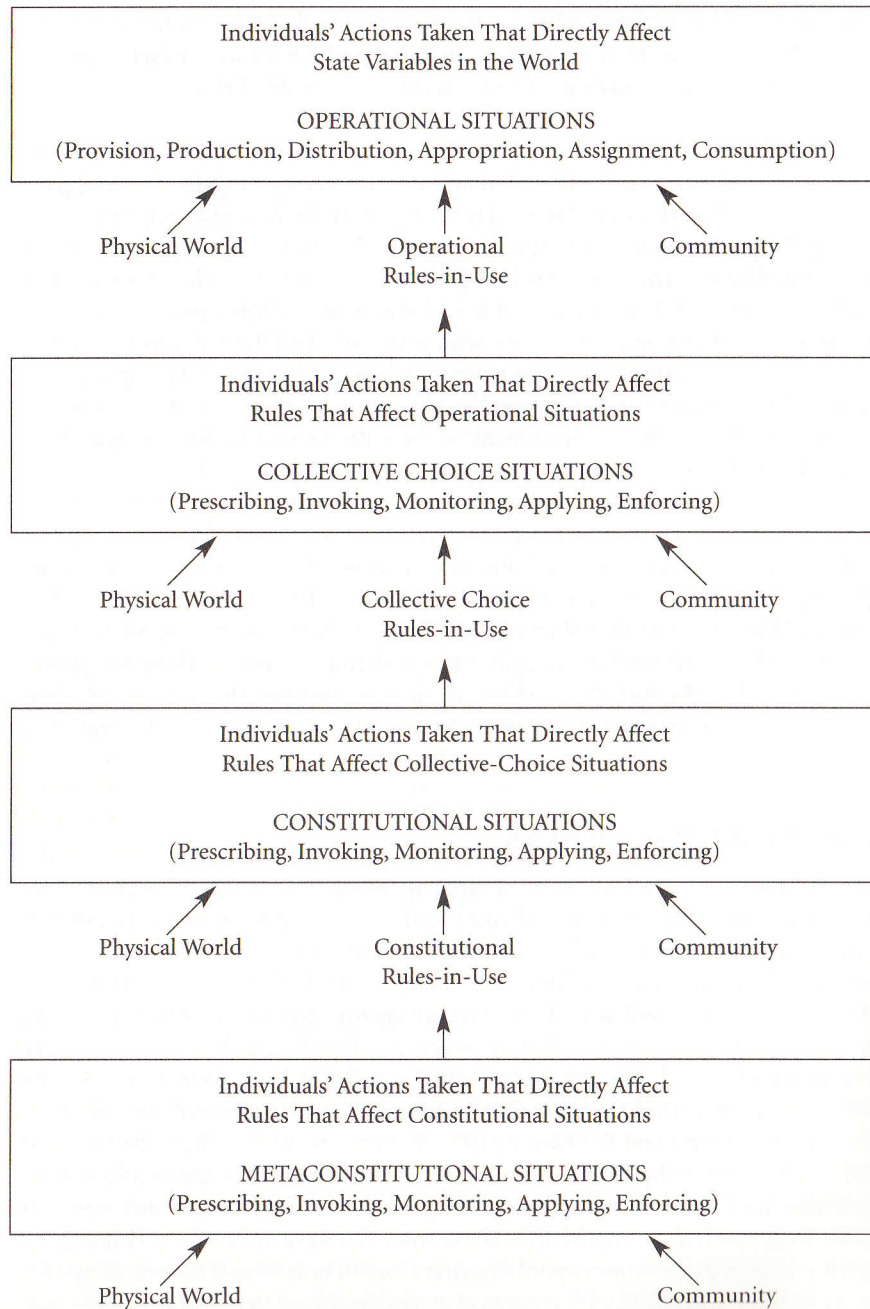


FIGURE 3.2 Levels of Analysis and Outcomes

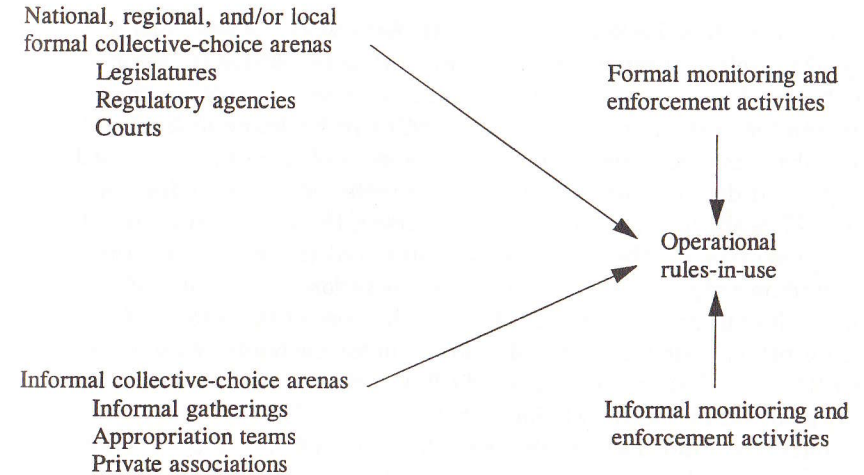


FIGURE 3.3 Relationships of Formal and Informal Collective-Choice Arenas

SOURCE: Ostrom (1990, p. 53).

question (see Gregg, 1974). For example, when we studied police services, the police department was only one of the units of analysis included in our work. Instead of assuming that the entire department was the appropriate unit, we tried to understand who the actors involved were in diverse service situations, such as immediate response services, homicide investigation, laboratory analysis, training, and communication services. We found different sets of actors involved in each of the service situations. In some, citizens as well as police officers as street-level bureaucrats were key participants. In others, we found participants from many different urban service agencies. We had to examine interorganizational arrangements to understand patterns of interaction and results. Using this perspective, we found highly structured patterns of relationships where others had found only chaos. The highest levels of police performance existed, for example, in those metropolitan areas where small-scale, immediate-response units worked along with large-scale investigatory, laboratory, and communication units (Parks, 1985). Ongoing research by Roger B. Parks in the Indianapolis area is providing strong evidence that many of the patterns we observed in the 1970s and 1980s were still in evidence in the 1990s. Efforts to understand who was involved in producing public safety led us to formulate a theory of coproduction of urban public services (Parks et al., 1982; Percy, 1984; Kiser, 1984; Lam, 1996; Whitaker, 1980). The theory of coproduction has now been applied to a wider set of phenomena (E. Ostrom, 1996b). In light of the extensive empirical research, colleagues were able to achieve a far better understanding of the patterns of metropolitan organization and local government more generally (Advisory Commission on Intergovernmental Relations—ACIR, 1987, 1988; V. Ostrom, Bish, and E. Ostrom, 1988; Oakerson and Parks, 1988; Parks and Oakerson, 1989; Stein, 1990).

The second broad area in which the IAD framework has played an important organizing role has been the study of common-pool resources. In the early 1980s, the National Academy of Sciences organized a research panel on the study of common property. Ronald Oakerson (1992) wrote a framework paper for the panel that was used in the organization of a series of case studies of how diverse people had devised institutional arrangements related to common-pool resources (see also Thomson, Feeny, and Oakerson, 1992; E. Ostrom, 1992). Oakerson's presentation of the framework has influenced an untold number of studies of common-property regimes in many diverse sectors in all regions of the world. The intellectual productivity stimulated by the work of the NAS panel has led to the formation of an International Association for the Study of Common Property (IASCP). More than five hundred scholars attended the 1996 meeting of the association held in Berkeley in June 1996.

Colleagues at Indiana University have developed a theory of common-pool resources and a series of theoretical models of appropriation from a common-pool resource and have tested these in experimental laboratory settings (see E. Ostrom et al., 1994; E. Ostrom, Walker, and Gardner, 1992; Walker and Gardner, 1992; Hackett, Schlager, and Walker, 1994). Weissing and Ostrom (1991, 1993) developed a series of models focusing on how actions taken by appropriators were monitored. Predictions from these models have been tested in an experimental lab by Moir (1995). When laboratory subjects are not allowed to communicate, their behavior closely approximates the behavior that is predicted by finitely repeated, noncooperative game theory. When subjects are allowed to communicate or to use sanctioning mechanisms, the behavior observed in the lab is not consistent with these theoretical models but is similar to what we have observed in field settings. We have consequently developed a theory of how boundedly rational individuals use heuristics such as "measured responses" to stabilize agreements achieved in settings where there are no external enforcers to impose rules on participants (E. Ostrom et al., 1994).

The IAD framework has now been used to develop three major databases related to the study of common-pool resources and diverse property regimes. The first "Common Pool Resource (CPR) Database" drew on the cases produced for the NAS panel and on the extremely large number of individual case studies that we discovered had been written by historians, sociologists, engineers, political scientists, anthropologists, and students of environmental science (Martin, 1989/1992; Hess, 1996). We used the IAD framework overtly to create a structured database for appropriation and collective-choice arenas. Schlager (1990, 1994) and Tang (1991, 1992) studied approximately fifty inshore fisheries and irrigation systems, respectively, and were able to isolate key rules that were positively associated with higher performance levels. In *Governing the Commons* (1990), I was able to draw on the framework and on an analysis of the extensive case studies we were all reading at that time to elucidate some aspects of a theory of common-pool resources. In particular, I examined the key design principles

that characterized robust, self-organized institutions for achieving sustainable resource use of very long periods of time as well as for developing an initial theory of institutional change.

The second database focused entirely on irrigation systems and has been used to code more than 175 irrigation systems in Nepal (Benjamin et al., 1994). That database has enabled us to test many propositions growing out of both our own theoretical efforts and those of development scholars more generally (see Adhikari, Pandit, and Schweik, 1997; Lam, 1994; E. Ostrom, Lam, and Lee, 1994; E. Ostrom and Gardner, 1993; E. Ostrom, 1994, 1996a). We have been able to challenge many of the empirical assumptions used by development scholars who have presumed that farmers are unable to self-organize and engage in costly collective action without the imposition of rules from external authorities (see also Thomson, 1992). We have found that farmer-managed irrigation systems in Nepal are able to outperform agency-managed systems in regard to agricultural productivity when we have controlled for factors such as size of group, length of canal, and type of terrain (Lam, 1994).

The third database is an integral part of the International Forestry Resources and Institutions (IFRI) research program, which is a major ongoing research program of the Workshop on Political Theory and Policy Analysis and of the recently established Center for the Study of Institutions, Population, and Environmental Change (CIPEC). This research program is designed to address knowledge and information gaps about how institutions affect the incentives of forest users that result in substantial levels of deforestation in some locations, whereas forest conditions are improving in other locations. Six collaborative research centers have now been established in Bolivia, Ecuador, India, Mali, Nepal, and Uganda, and several more will be established during 1997 (E. Ostrom and Wertime, 1994; Jerrells and Ostrom, 1995). In Uganda, Banana and Gomba-Ssembajjwe (1996) showed in their initial studies that the only forests where deforestation is not extensive are those where local institutional arrangements are viewed by local residents as legitimate and are monitored extensively. In their study of a *comuna* in Ecuador, Becker and Gibson (1996) documented the importance of distance from a forest as it affects the costs that villagers would have to pay to actively monitor and enforce rules even when they have full authority to make and enforce their own rules. In India, Agrawal (1996) provided an empirical challenge to the presumption of many scholars that collective action becomes progressively more difficult as the size of the group increases from a very small face-to-face group. He showed that moderate-sized villages are better able to generate the labor needed to protect local forests than are very small villages. Schweik (1996) examined the geographic distribution of *Shorea robusta*, a highly valued species. He found that neither the population density of the villages adjacent to the three forests he studied in Nepal nor predictions by optimal foraging theory adequately predicted the spatial distribution of the species. The most robust explanation for the distribution of this species relates to the institutional rules that al-

low higher-caste villagers to access their "own" forests as well as forests located near the villages where lower-caste villagers live, but not vice versa.

In addition to the aforementioned research programs, the IAD framework has also influenced a variety of other studies, including those developing models of social-choice situations and then subjecting them to empirical tests in experimental laboratories (Herzberg, 1986; Wilson and Herzberg, 1987; Herzberg and Wilson, 1988; Herzberg and Ostrom, 1991); other empirical questions include the study of rural infrastructure in developing countries (E. Ostrom, Schroeder, and Wynne, 1993); privatization processes (S. Walker, 1994a, 1994b); development processes more generally (V. Ostrom, Feeny, and Picht, 1993; Wunsch and Olowu, 1995); constitutional dynamics in the American federal system (Jillson and Wilson, 1994; V. Ostrom, 1987, 1991) as well as in the Canadian federal system (Sproule-Jones, 1993); linking local and global commons (McGinnis and Ostrom, 1996; Keohane and Ostrom, 1995); and an analysis of how rules, norms, and equilibrium strategies are related (Crawford and Ostrom, 1995).

The IAD framework has thus influenced the analysis of a wide diversity of questions, including how institutions are organized for the provision and production of urban policing and education, primary health care, fertilizer, coffee, roads, irrigation, fisheries, forest resources, and common-pool resources more generally. Empirical work has been carried on in Bangladesh, Bolivia, Brazil, Cameroon, China, Ecuador, Ghana, Guatemala, Hong Kong, India, Indonesia, Ivory Coast, Liberia, Madagascar, Mali, Nepal, Nigeria, Norway, Poland, Taiwan, Uganda, and the United States.

ASSESSING THE VALUE OF A FRAMEWORK

It is hard to know exactly how to provide an assessment of a framework. The criteria for evaluating theories are relatively well known and accepted. Theories are evaluated for their capacity to generate predictions supported by empirical evidence and to provide coherent explanations for observed regularities. The criteria for evaluating frameworks or paradigms are not well established. The differences between frameworks, theories, and models are not even generally recognized. It is also difficult for someone who has been intimately involved in the evolution of a framework to make an unbiased assessment of its value. So, instead of providing an assessment as such, I will provide some of the key questions that would need to be addressed in such an assessment. These include questions related to three broad types of usefulness:

Usefulness for Theoretical Analysis

1. Does the framework provide a coherent language for identifying universal elements of theories attempting to explain an important range of phenomena?

2. Does the framework help scholars to identify the similarities and differences of diverse theories as well as to analyze the relative strengths and weaknesses of theories in explaining particular types of phenomenon?
3. Does the framework stimulate new theoretical developments?

Usefulness for Empirical Research

4. Does the framework help organize empirical research in those areas where well-specified theories are not yet formulated?
5. Does empirical research drawing on the framework lead to new discoveries and better explanations of important phenomena?
6. Can the framework be applied to multiple levels of analysis in empirical research?

Usefulness for Relating to Other Disciplines and Frameworks

7. Does the framework encourage integration across other disciplines?
8. Is the framework consistent with other frameworks initially developed to focus on a particular level of analysis?
9. Does the framework perform better than others in a similar range of applications?

I would answer these questions positively, but the real assessment will be made by other scholars over the next several decades.

NOTES

1. Elements of the framework have been used in teaching both graduate and undergraduate courses at Indiana University since the mid-1970s (see historical file of materials on the IAD framework, Workshop Library).

2. In formal game-theoretical analysis, such strategies would be those identified as equilibrium strategies. Shared strategies may, however, take the form of heuristics adopted by most individuals in a society when they find themselves in particular situations.

3. I am more appreciative of these configural relationships because of a very insightful colloquium presentation made by Professor Lloyd Orr, Department of Economics, Indiana University, to the Workshop in Political Theory and Policy Analysis on November 1995.

4. This section draws heavily on E. Ostrom, Gardner, and Walker (1994, pp. 38–41).

5. The International Forestry Resources and Institutions (IFRI) research program has faced this problem in developing research protocols that enable a network of research scholars to gather the "same" information from a sample of forestry sites located in multiple countries of the world. The recording forms can be structured and filled in by the research teams in the evening after in-depth group and individual discussions, but there cannot be a standard way of asking the questions. Anthropologists have looked upon the

individuals with whom they talk as "informants," and this is the stance that one has to take in any effort to elucidate any information about rules-in-use (see E. Ostrom and Wertime, 1994).

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