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THE ELEMENTS OF AN ACTION SITUATION

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VERY PRELIMINARY DRAFT
-COMMENTS APPRECIATED-

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THE ELEMENTS OF AN ACTION SITUATION

In my paper entitled "A Method of Institutional Analysis," which will appear as Chapter 23 in the book entitled Guidance, Control, and Performance Evaluation in the Public Sector, edited by Kaufmann, Majone, and V. Ostrom (forthcoming, 1984), I identified a conceptual unit -- called an "action arena" that could be utilized to analyze, predict, and explain behavior within a wide array of different institutional arrangements. An action arena contains both a model of an action situation and a model of the actors in that situation. A model of the action situation can be characterized using seven clusters of variables -- participants, positions, outcomes, action-outcome linkages, information, the level of control that participants exercise at choice nodes, and the costs and benefits assigned to outcomes and actions. A model of the "actor" includes assumptions about four clusters of variables: the resources that an actor brings to a situation; the valuation actors assign to states of the world and to actions; the way actors acquire, process, retain, and use information; and the processes actors use for selection of particular courses of action. Using the set of assumptions made about the situation and the actor, the analyst predicts the types of actions that will be selected by participants and how these are likely to cumulate into results.

This working paper will examine the elements (or working parts) of an action situation. Whenever a set of individuals are faced with a set of potential actions that jointly produces outcomes, these

individuals can be said to be "in an action situation." Typical action situations include: (1) buyers and sellers interacting in a market, (2) legislators arriving at policy decisions in a committee or legislature, (3) bureau chiefs and officials bargaining over the amount of the budget to be allocated to a bureau and the level of output to be produced, and (4) superiors and subordinates in a bureaucratic structure bargaining over the distribution of work assignments and rewards to be allocated. Many other scholars have identified a similar unit, but called it a different name. Rawls (1969) used the term "practice," Newell and Simon (1972) used the term "task environment," Commons (1957) used the term "transaction," Allport (1962) used the term "collective structure," Weick (1969) used the term "double interact," Popper (1967) used the term "logic of the situation," and Harre (1974) used the term "well-defined social episode" to refer to the same type of analytical concept.

The concept of an action situation is an analytical construct. It is a way of looking at the world used by a theorist to isolate a number of key variables thought to affect individual behavior. The world being analyzed is always much richer than can be represented in a model of an action situation. However, by skillfully picking the most relevant aspects of "real world" action situations, a theorist should be able to isolate the key factors affecting individual actions and the cumulative effect on outcomes. The concept of an action situation is no more analytical and less real than the concept of an organization or any of the other terms used by social scientists to place analytical bounds on complex patterns of human behavior.

The Working Parts of an Action Situation

A general description of a simple action situation involves the specification of the following septuple:

(4) DS = (N, P, O, A, C, I, R), where

N = a set of participants and their attributes,

P = a set of positions,

O = a set of outcomes that may be affected,

A = a set of allowable actions assigned to positions at decision points (action-outcome linkages),

C = the amount of control assigned to each position at each choice node,

I = information sets about the structure of the situation,
and

R = the payoffs assigning positive and negative values to choices and outcomes.

Participants, positions, outcomes, actions, control, information, and payoffs can be thought of as seven "working parts" of all action situations. These working parts are adequate to describe the structure of most simple action situations. These elements can be used to describe a game in extensive form (see Selten, 1982, and Shubik, 1982). But they are also the elements used by analysts to describe a wide variety of less formal representations of action situations.

The number of participants and positions may vary, but there must always be participants in positions for one to talk about an action situation. Similarly, there must be potential actions that actors are

authorized to take. These actions represent the resources made available to the participants by the structure of the situation. Information about the situation may vary, but all participants must share some information about the situation for an analyst to even state that the participants are in an action situation. The costs and benefits assigned actions and outcomes can be thought of as the incentives and deterrents in a situation. How these affect actions, and thus, results, depend also on the resources and valuation patterns of participants.

Just as these working parts are always present in any setting that could be called an action situation, a change in one of these working parts produces a different action situation. Thus, three persons trying to decide whether to go to the opera, a football game, or a movie is a different situation than two persons trying to decide between the same options. In a three-person situation, coalitions of one subgroup against another are possible while no coalitions are possible in a two-person situation. Changing the set of alternative actions or the information conditions also fundamentally alters the structure of a situation.

When doing analysis at an operational level of analysis, these working parts are the "givens" of the situation. Individuals cannot change the structure of an action situation in the short run. Within a particular situation, an individual can only attempt to choose in light of the opportunities and constraints of that situation. But, these working parts can be affected by changing rules. Thus, one of the ways individuals can and do affect the action situations in which they repetitively find themselves is to change the rule configurations affecting these action situations.

Participants

Participants (N) in an action situation are decision-making entities capable of selecting actions from a set of alternatives made available in the situation. One of the key attributes about this element of an action situation is the number of participants. A minimal action situation contains only one participant.

Interdependent action situations require two participants where the actions of each affects the outcomes for both. Adding a third player changes the structure of the situation greatly. The dividing line between major types of games is between 2-person and N -person games where N is defined as any number greater than 2. The specific number of participants is frequently overtly specified in a formal theory and in such real world situations as legislatures, juries, and many sports. However, some descriptions of a decision situation specify the number of participants in a looser fashion such as small and large groups, face-to-face relationships versus impersonal relationships, etc.

In many action situations the decision-making entity is an individual person. Scholars who are methodological individualists assume that only individuals, and not groups, act. The outcomes selected in one action situation may, however, be decisions about actions to be taken in another more encompassing action situation. Thus, a group of individuals may be considered as one participant (a team) in a particular action situation when these individuals participate in another action situation. The outcomes of the second situation are strategies in the first situation. A market, for example, frequently involves many buyers and sellers that are firms.

Firms are composed of many individuals. Each firm is treated as a single participant in a market action situation even though any firm is itself a composite of many different internal action situations.

Whether an analyst treats separate individuals each as a participant or as members of a team depends upon the concerns and questions of the analyst. The game of bridge, for example, may be represented as having either two or four participants. If the analyst is interested in examining communication behavior during bidding, bridge is best represented as involving four participants. However, for purposes of examining the moves leading to a final score, the game may best be represented as involving two team participants.

It may even be useful for some types of analysis to posit internal agents within the single individual who makes decisions at particular nodes in a decision tree and nowhere else. Reinhard Selten has developed an analytical technique for solving games in extensive form in which each player may be represented as several "agents" who are the decision makers at particular information sets. The term "agent" is also used in principal-agent relationships to denote that one individual -- the agent -- is expected to act in a situation so as to take the interests of a second individual -- the principal -- into account. The principal exists outside of the immediate situation, but the interests of the principal are important in understanding the objective function of the agent.

To predict how participants (whether they be individuals or teams of individuals) will act in a situation requires the analyst to build a model of the actor for use in analysis. At a minimum, the analyst must make assumptions about:

1. participants' capacities to obtain and process information,
2. participants' valuations of potential outcomes and alternative actions,
3. participants' calculation process for selecting among actions, and
4. participants' resources brought to the situation.

When participants are individual actors and the analyst assumes they can know everything relevant about the situation, can assign cardinal utility to summarize their valuations of outcomes and actions, can maximize expected utility, and possess all relevant resources to undertake any required or desired action, the analyst is using a neoclassical model of the actor. While these assumptions are most frequently encountered in formal institutional analysis, they are not the only assumptions that can and are made about the internal processes of participants. Many theorists building upon the work of Herbert Simon assume participants with incomplete information, a simple valuation structure (for example, outcomes evaluated as satisfactory or unsatisfactory), are willing to select the first action that appears to lead to an outcome rated as satisfactory.

Variations in these assumptions are the working parts of a model of the actor which I will examine in greater depth in a separate paper. These assumptions are extremely important in enabling an analyst to generate predictions about the likely patterns of consequences in an action arena -- combining the attributes of action situations with the attributes of the actor. The nature of the participants is the working part in the action situation into which the model of the actor gets "plugged into" the action situation to

make an action arena. Without specifying how participants reach their decisions about actions, no analyst can make any predictions about likely patterns of actions and results.

Analysts frequently blur the distinction about the way they are modeling the action situation and the way they are modeling the actors in the situation. In the process of constructing a representation of the situation, assumptions about the actors and about the situation are mixed together. For example, whenever utility values for outcomes are displayed as the entries in a game matrix, particular assumptions about valuation processes are implicitly (or explicitly) being made. For many modeling purposes, equating outcomes with the valuation assigned by neoclassical economic participants to outcomes, is a useful and very efficient way of setting up a model of the action arena (both situation and actor combined) for analysis. The analyst wishes to examine the consequences of combining the model of the action situation with a particular model of the actor. The analyst who constructs such a representation is not interested in addressing the question of how changes in the model of the actor (or, in that of the action situation) might affect the predicted results. When a combined model is used, there is no particular advantage for a theorist to be quite precise in specifying which of a series of assumptions relate to the model of the situation and which relate to the model of the actor.

I will argue in later papers that an over-reliance in institutional analysis has been placed on a single model of the actor. Thus, I wish to make a clear distinction between the model of the situation and the model of the actor "plugged into" that situation.

Positions

The second element of an action situation is the set of positions (P) or "anonymous slots" in which participants (N) are placed. Examples of positions include players, voters, judges, buyers, sellers, legislators, police officers, etc. Positions and participants are separate elements in a situation. In some situations, the number of positions may be considerably less than the number of participants. In many committee situations, for example, there are two positions -- chair and member -- while there may be five or more participants. Any one participant may simultaneously occupy more than a single position. All participants will occupy whatever is the most inclusive position in a situation -- member, legal person, employee, etc. In a private firm, additional positions such as foreman, division manager, or president will be occupied simultaneously by some participants while they continue to occupy the most inclusive position -- that of employee.

Positions, without the other working parts of an action situation, are rather empty elements. However, in combination with the other working parts, positions define the capabilities and limitations on the set of actions that a participant may take. In some situations, any participant in any position may be authorized to take any of the allowable actions in that situation. However, in most "organized" situations, the capability to take particular actions is assigned to a specific position and not to all positions. The nature of a position assigned to a participant in an action situation defines the "standing" of the individual in that situation. The standing of a position is the set of authorized actions and limits

on actions that the holder of the position can take in the situation. Buyers and sellers have standing in a market. This means that individuals who hold the position of buyers and sellers in a market are authorized to exchange property that they own. Buyers and sellers do not have standing in a legislature. Only those individuals who have been assigned the position of a legislator through an election mechanism have standing in a legislature. Only those eligible voters who have registered have standing in most general elections.

Potential Outcomes

Potential outcomes (0) are a set of state variables that can be affected by the choices of participants in positions in an action situation. State variables that may be affected in an action situation include: (1) attributes of individuals, (2) attributes of property owned by individuals or group of individuals, and/or (3) attributes of events that jointly affect many individuals simultaneously, such as the passage of legislation or the level of air pollution in a community. State variables can be physical attributes, such as weight or volume, or intangible attributes, such as the goodwill or debt of a business.

The status quo is a potential outcome in some action situations. The status quo occurs if no change is registered on any relevant state variable. The status quo is always included in the set of potential outcomes in a legislative action situation, but not included among the outcomes of a football game or an election when there are fixed terms of office. Outcomes may be conceptualized as discreet values on one or more state variables or continuous values along one or more

dimensions. The potential outcomes of elections or legislative situations are usually discrete variables. The outcomes of a market are normally considered as continuous.

Outcomes are frequently conceptualized as varying across a single dimension. In parliamentary systems, the outcomes of an election are sometimes conceptualized as a set of promises by teams of players (parties) to take particular combinations of policy stands on a one-dimensional policy space. Representing outcomes as a single dimension is obviously a major simplification of electoral outcomes even in a Parliamentary system. However, Downs (1957: 116) argued that one could conceptualize such a continuum to reflect an answer to the question of the extent of government intervention in an economy. Downs represents the left end of the scale as full government control (zero percent of the economy left in the private sector) and the right end of the scale as minimal government control (100 percent of the economy left in private hands) ("excluding those minimal state operations that even the most Hayekian economists favor") (*Ibid.*) The outcomes of a bargaining situation between a bureau chief and elected officials is also represented as a one-dimensional variable including different levels of output-budget combinations.

The set of potential outcomes may also be conceptualized as bounded sets on two or more dimensions. An appropriations bill, for example, affects the level of funding allocated to many different public programs. Parliamentary elections can be viewed as the selection of a set of policy positions from a multidimensional policy space. The outcomes of a market include both the amount of a particular good sold, the price of the good, and the amounts of consumer and producer surplus (if any).

The outcome of one action situation may include the possibility or necessity of proceeding to another action situation. Thus, the outcome of a committee hearing in the U.S. Congress may be the successful reporting out of proposed legislation. But combined with this success is the necessity to take action in several differently structured situations before any proposed legislation is passed into law. If one action situation is not reached until after particular outcomes are reached in other action situations, it is a contingent action situation (Coleman, 1973: 64). Most organizations are composed of a complex series of differently structured action situations linked by a set of procedural rules.

No matter how the analyst chooses to represent outcomes -- discreet or continuous, single or multidimensional, intermediate or final -- the state variables considered to be outcomes are what the participants in an action situation are thought of as affecting. A frequent assumption is made that the participants wish to affect the outcomes. However, analysts can include "unintended outcomes" within the set of potential outcomes included in a model. Schelling's analysis of Micromotives and Macrobehavior (1978) examines a large variety of action situations in which the actors did not intend to produce particular outcomes and, in some cases, might not clearly be aware of the connection between their own actions and the joint outcomes produced.

The "opportunity" involved in an action situation may be defined as the range of the outcomes involved in the situation. If only a single state variable is affected, the level of opportunity is the difference between the highest and lowest achievable values in the

situation. The level of opportunity in an exchange is the difference between the lowest price offered by a potential buyer and the highest price offered by a potential seller (Commons, 1957: 67). In situations affecting multiple outcomes, the concept of opportunity becomes more difficult to measure but involves a cumulative score of the range of all the outcome variables involved.

Actions and Their Linkage to Outcomes

In order to achieve outcomes, participants assigned to a position in an action situation must choose from a set of authorized actions (A) at a particular stage in a decision process. An action can be thought of as a selection of a setting or value on a control variable that a participant hopes will affect a state variable or outcome. In game theory, the set of actions available to a participant at a particular sequence in a game -- a decision point -- is called a move. The specific action selected by a participant from the set of authorized actions is called a choice (Luce and Raiffa, 1957: 39). The types of variables included within the concept of a set of authorized actions are vast. Examples of typical action sets available to participants holding positions in many different types of action situations are arrayed in Table 1.

Table 1

Examples of Action Sets Assigned to
Positions in Action Situations

<u>Position to Which Action Set is Assigned:</u>	<u>Authorized Actions Included in Action Set</u>
A voter in a general election	Vote for candidate i or abstain.
A seller in a market	Sell up to X quantity of good Y at the going price, do not sell any of good Y at the going price.
An employee in a corporation	Agree to join a labor union or not agree to join a labor union.
A member of a legislature	Submit an amendment to add provisions to a bill, submit an amendment to delete provisions from a bill, submit no amendments.
A chairperson of a committee	Order the votes on an original bill (B), an amendment (A), and the status quo (Q) in any of the three following ways: (1) A vs. B and then the winner vs. Q, (2) A vs. Q and then the winner vs. B, or (3) B vs. Q and then the winner vs. A.

Which specific actions are included in an authorized action set depends, of course, on the rules structuring an action situation. Authority and procedure rules directly affect whether certain actions are within a participant's set. Thus, in a state with legislation authorizing a "closed shop," an employee of a corporation that has signed a collective bargaining agreement with a labor union may not have a choice as to whether or not to join a labor union. If the person wishes to be an employee of that corporation, joining the labor union is a requirement. In modeling action situations involving employees and unions in such a state, the action sets for employees would not include joining or not joining a union, but would include attending or not attending meetings and other voluntary actions. Similarly, the action set for a chairperson of a committee or

legislature may or may not include the "power" to order an agenda as illustrated in Table 1. If a committee or legislature uses a set procedure for voting order, such as that prescribed in Roberts Rules and Orders, the order of voting on bills, amendments, and the status quo is set in the procedure and is not a prerogative of the chair (see Shepsle & Weingast, 1981).

In most action situations that are formally analyzed, it is presumed that the way actions are linked to outcomes is knowable. In such situations, one could represent the chain of actions and results as a decision tree or as a matrix. If the full tree or matrix is presumed to be knowable, analysts refer to three levels of certainty: certainty, risk, and uncertainty.

In a certain world, every action is linked directly with one and only one outcome. One can conceptualize this in matrix as the existence of one state of nature that determines the outcomes for every action (or series of actions) that an individual has available. Such a matrix is represented in Figure 1. The competitive market is a situation often viewed as certain. Since neither sellers nor buyers in a perfectly competitive market has any control over price, the price at which alternative quantities of a product can be bought and sold is determined, and thus certain, in the short run. Offers to buy or sell at the market price lead to one and only one outcome. The analytical world of certainty is vast and encompasses much of the formal theory in economics and management science (Luce and Raiffa, 1957: 15). Efforts to find maxima and mina of functions, feasible regions, production possibility frontiers, etc., are all modes of analysis appropriate for action situations characterized by certainty. In both risky and uncertain situations at least some actions are linked with more than one outcome.

Figure 1

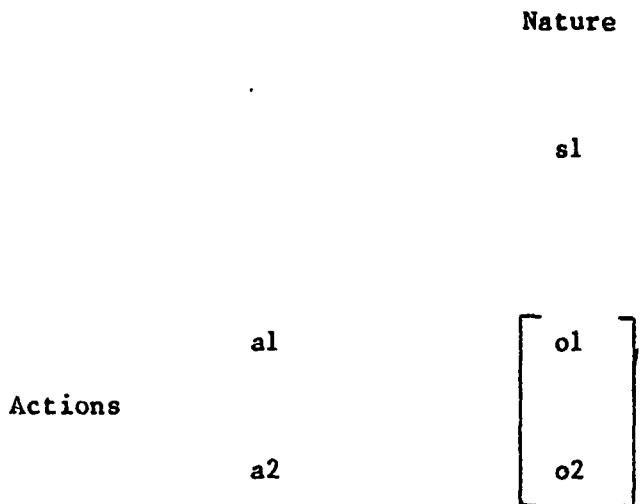
An Action Situation Characterized by Certainty

Figure 2

A Situation Characterized by Risk or Uncertainty

Nature

		s1	s2	s3
	a1	o11	o12	o13
Actions	a2	o21	o22	o23
	a3	o31	o32	o33

In a situation characterized by risk, the probabilistic relationships between each action and set of outcomes can be known (Knight, 1921). A classic situation of this type is the urn filled with a known number of red and black balls where the individual must decide upon actions that can lead to one or another outcome depending upon the color of the next ball drawn from the urn. A roulette wheel

is an instrument of risk. Insurance firms face a world characterized by risk when they calculate premiums to be charged for different types of insurance policies (Rothschild and Stiglitz, 1976). Once data about the distribution of past events is available, probabilities can be assigned to different distributions of future events. When the probability that particular actions will lead to particular outcomes is known, a probability matrix can be represented that indicates the probability of each outcome occurring given particular combinations of states of affairs and actions as shown in Figure 3.

Figure 3

Probability Matrix Associated with a Risky Situation

		s1	s2	s3
	a1	p11	p12	p13
Actions	a2	p21	p22	p23
	a3	p31	p32	p33

Uncertainty characterizes a situation in which the probabilities of specific actions leading to outcomes are unknown and unknowable. The set of actions and the set of outcomes are still assumed to be finite and knowable. The linkages between actions and outcomes are also presumed knowable. The matrix representation (normal form) for the action situation is as shown in Figure 2, but no probability matrix can be constructed.

In an uncertain situation, others act contingently or strategically. The potential decision of the individual is taken into account in the decision making of the "other." Each individual must

decide in the presence of at least one "strategic other" whose decision to act will be contingent upon expectations about the individual's action (Coleman, 1973: 42). An essential indeterminacy of social interactions remains in the context of many decision situations, and it is this indeterminacy that is called uncertainty (Knight, 1921). When institutional arrangements leave open wide avenues for choice, and each individual's outcome is dependent upon the action taken by others, uncertainty will characterize the resulting decision situation. Most N-person games are characterized by uncertainty as are decision situations existing in the political, as contrasted to the economic, realm.

The distinction presented here among certainty, risk, and uncertainty focuses entirely on the structure of the decision situation and not on the level of information that an individual has about the decision situation. Modern decision theorists frequently blur this distinction. This blurring leads to considerable confusion when they treat the uncertainty in the situation and lack of information by an individual as similar phenomena. The separation of situational and cognitive aspects of uncertainty draws heavily on the earlier work of Knight (1921) and the recent paper by Buchanan and diPierro (1978) who stress the need to distinguish between the structure of the situation and the cognition of the individual. Simon (1955) and Williamson (1975) also distinguish between situational complexity and uncertainty on the one hand and cognitive limitations on the other.

Control

The extent of control over outcomes that an individual in an action situation may have can vary from absolute to almost none. An individual has total control over a state variable in a situation if for each value x_i potentially affected within that situation there is an action a_i , such that the conditional probability of x_i given a_i equals one. An individual has total control over an event if for each combination of state variable values $x_{i,j}$ there is an a_j , such that the conditional probability of $x_{i,j}$ given a_j equals one (Coleman, 1973: 61). An individual has partial control over a state variable if the conditional probability of a change in the value x_i of the state variable given an action a_i available to the individual is greater than zero. Partial control can, thus, vary from an extremely small chance of affecting an outcome to a high probability of affecting the outcome.

One way of viewing power combines the concept of control with the concept of opportunity discussed above regarding outcomes. The power of an individual in a situation is the value of the opportunity (the range in the outcomes afforded by the situation) times the extent of control. Thus, an individual can have a small degree of power even though the individual has absolute control if the amount of opportunity in a situation is small, or conversely, when the amount of opportunity is large, but the individual has only a relatively small degree of control. Action situations may involve differential distributions of control and opportunity to different individuals in the situation. Consequently, individuals may differ in the amount of power they have in the situations. Concepts of opportunity, control,

and power are thus defined as situation dependent. A single individual may have dramatically differing levels of control, opportunity, and power in the different action situation in which they participate.

Information About the Action Situation

Participants in an action situation may have either complete or incomplete information. Almost all formal representations of action situations assume that participants have complete information by which is meant that each participant knows the number of other participants, the positions, the outcomes, the actions available, how actions are linked to outcomes, the information available to other players, and the payoffs of the game. In other words, complete information is an assumption that each participant knows the full structure of an action situation as defined here.

When participants are assumed to have complete information, a further distinction is made in formal theory between perfect and imperfect information. When a participant has perfect information, they not only know all of their own past actions, they know the actions of all other players before they make any move. In other words, they know the exact decision node at which they are making a choice. Under imperfect, but complete information, the individual is assumed to know the structure of the situation, but may not know all the moves that other participants have taken prior to a particular move. The participants know all the possible nodes at which he or she could be, but is unable to distinguish the exact node for the current move.

When action situations are being analyzed in a less formal manner, analysts are more apt to assume that participants have incomplete information about the full set of actions available to them, the full set of outcomes, and about how actions are linked to outcomes. This assumption is frequently linked to fundamental assumptions made about the limitations of human cognitive abilities in a model of the individual. However, the usefulness of an assumption of complete or incomplete information also relates to the complexity of the action situation being modeled and the language structure used, the channels of communication, and the type of communication normally assumed to be present in the action situation.

Payoffs

Payoffs are cumulative values assigned to outcomes including the benefits and costs of actions taken along a path to an outcome. It is frequently assumed that acts are costly and outcomes are beneficial. Actions may, however, have associated benefits and outcomes may be "bads" instead of "goods." Thus, the final payoff assigned to an outcome for a participant in a position is the net value of the path taken to an outcome given the choices made by the participants and those of others. The payoff to a seller in a market is the profit resulting from the sale of a quantity of goods minus the cost of buying or producing those goods. The valuation attached to a payoff is the utility values of individual persons associated with the components of the objective value. A frequent assumption made for analytical simplicity is that the utility of an individual for a net payoff is linearly related to the "objective" outcomes obtained.

Payoffs may come to be assigned to an individual from multiple sources -- internal, peers, supervisors, or even participants or officials in a broader external context to the specific situation. The internal assignment is the personal satisfaction or costs associated with both outcomes and actions (and, perhaps even with strategies -- is it not possible that an individual gains a different satisfaction or cost from an action undertaken as part of a cooperative strategy than from the same action undertaken as part of a conspiracy? Selten calls these "secondary utilities.") Peers give positive and negative rewards to participants to the extent that they act in conformity with the norms of behavior shared by a group of peers. In structured situations, supervisors (or, parents in a family) assign positive or negative payoffs -- both those involved as part of an official relationship such as salaries, raises, ratings, etc., and those involved in more personal friendship ties. In a complex set of related situations, payoffs may not be finally fixed until a series of iterations are completed in several related situations. Profits, for example, are not set simply by the competition among sellers in a market, but also may be the external rules and regulations that affect both taxes and inducements.

* * *

Using these elements of an action situation, an analyst can construct a wide variety of simple to complex situations for analysis. Given the assumptions made about the actors, the analyst can then generate predictions about the likely behavior of participants and the

joint outcome patterns to be derived. Most analysis has been conducted at this level. These elements are considered as the givens of a situation and the analyst examines how they combine to affect results. I have earlier explored (see Kiser and E. Ostrom, 1982; E. Ostrom, Chs. 23 and 25) how these elements are themselves affected by rules, attributes of goods, and attributes of the community of participants interacting within situations. I will continue to explore those questions in forthcoming papers.

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