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# ACTIONS AND RULES

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Each of us was supposed to reflect on how we would approach the study of actions and rules.

I wish to approach this question by setting up a general framework that could be used to study actions and rules in complex systems at various levels of human action (international, national, face-to-face, etc.). In order to define human action, we must establish what is going to be acted upon. Let us first envision the naturally occurring world which can be represented by a series of state variables. Without human intervention physical transformations among these variables occur. These transformations are represented by the physical laws of Newton and Einstein, by chemical laws, and by biological laws. We presume that water moves to the lowest point, chemical transformations occur, etc., whether or not human actors do anything.

In order to keep this representation as simple as possible, I will put into this "physical" world all machines that operate in that world and consider them as having certain transformations that are operating at any particular moment in time. Think of a machine that is currently set at some position which, if no human intervenes, will continue doing whatever it is internally scheduled to do until it wears down or a human intervenes to change its control mechanism. I

do not want to think of a machine acting. I want to think of a machine as performing transformations that can be set either "on or off" as a result of human action.

Other variables, which are created by humans such as checking accounts, balance of payments, GNP, crime rate, unemployment rate, etc., will also be represented in this world as state variables. The values of these state variables affect the choices available to humans. These variables are in turn strongly affected by the actions of many individuals located in many different locations. The exact transformations between individual actions and resulting values on these state variables are only imperfectly understood (and, are to a large extent the subject of our general inquiry).

Now having constructed a world represented by state variables and their transformations, I now want to construct a second set of variables which can be thought of as control variables linked in a direct or indirect way to the state variables. Control variables can be thought about as a series of switches. Many of these control variables will have only two values (on and off), but many of them have an intricate array of settings. Similar to the control variables are symbol variables which individuals can use to communicate their intentions and requests to one another about control and state variables.

Now we can define an action. **An action is the selection by a human of a feasible setting** on one or more control or symbol variables **intended to produce some effect** on one or more state variables. An action has three components. The first is a conscious selection (or retention) of a setting on a control variable. The second is that

there is an intended result. The third is the restriction of control settings to those which are possible. The person may have an inaccurate view of these control settings, but actual actions are restricted to those which are feasible.[1]

Let us assume that persons act in response to three "stimuli":

1. a perceived change in a nonpreferred direction in the value of a state variable of concern to an individual;

2. a perceived action by another person which may affect a state variable of concern to an individual; and

3. a perceived difference between the value of a state variable that an individual would prefer and the individual's estimated value for that variable at a future time (a gap between the projected and preferred value of a state variable).

To understand this way of thinking about actions, let us construct a hypothetical machine. We shall call this machine a Lasswellizer after Harold Lasswell. The Lasswellizer helps us represent the information that an individual has about the values of state variables, the actions of others, and the control variables and symbol variables perceived to be available to the individual (potential actions). The "control panel" of the Lasswellizer has three sections (see attached diagram). In the center panel is a set of dials that represent values of state variables of interest to the

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[1] In other words, I include the actual choice set available to an individual and ask separately (when relevant) whether or not individuals in particular situations accurately perceive this choice set and attempt to take an action which is not feasible. If an individual misperceives and tries to select an impossible value, they will attempt to take a control variable to a value beyond the range available. If their subsequent perception of this event is correct, they will learn that their feasible set of actions does not include what they wanted to do. If their subsequent perception is inaccurate, they may retain the false image that they were able to set their control variable beyond the range of the actual settings.

individual. One side panel provides information about the actions that other individuals are taking (or are expected to take). The other side panel contains a series of control or signal variables to be used in attempting to affect the state variables.

The control panel and the wiring behind it is partially accessible and changeable by the individual using a Lasswellizer. New dials can be added and old dials deleted. It is possible for the individual to wire the machine so that relationships among values of state variables can be displayed on a new dial (e.g., the difference between the values of two state variables such as projected income and expenditures).

In other words, we are assuming that this control panel is not totally fixed at birth. Some portions can be changed over time as the individual learns more and more about the relevant world about him. New dials can be added reflecting new state variables to be monitored.[2]

If I were a strict utilitarian, I would simplify this center panel by placing on it one master dial intricately hooked to all other dials so that it performed the integrative function of assigning utiles to all values on all relevant variables and presenting this information on a signal dial. If I were also a rational expectation theorist, I would presume that an individual contemplating a future action could ask the Lasswellizer to perform a projection and tell her how various possible control settings will affect the readings on the

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[2] When an individual accepts a new position, for example, responsibilities may involve monitoring a whole new bank of dials not previously monitored. Upon leaving that position, those dials may be completely, or partially removed from the control panel.

Master Dial. The individual would ask the Lasswellizer to compare all possible combinations of control variable settings in terms of expected utility and to print a "read out" of the most preferred configuration of settings of the control variables. My Lasswellizer does not include either a Master Dial nor the capability to do complete analysis of all configurations of settings on control dials. One might imagine a Lasswellizer with such capabilities.

Using W. Ross Ashby as an inspiration, let us assume that some of these dials are considered by the individual to be more important than others and are placed where they can be monitored more regularly than others. Ashby calls these "essential variables" and presumes that any regulator (decision maker) tries to keep these variables within some upper or lower limits. On the diagram the essential variables are represented as a group of very large dials prominently displayed. I presume that the individual can decide which state variables will be given this status. The choice of "essential variables" may enhance or retard the person's capability to control state variables or even to survive. These essential variables may include things like one's own temperature, oxygen levels in the blood, and other vital signs of the individual actor. Other essential variables may include such socially constructed state variables such as the balance in a checkbook or even the level of personal respect one is receiving from one's colleagues.

Let us briefly turn to the two side panels. On the right are readout panels that provide information about the actions (or expected actions) of other individuals. These might be represented as dials which mirror the settings of the control or symbol variables of other participants. Or, they may be represented as CRT's with short

paragraphs stating what other actors are doing. Some monitors may provide information about aggregated actions of others. Dials and readouts can be added or subtracted to this panel.

On the left are the control and signalling variables thought to be available to the individual. Let us turn first to the control variables. These are variables thought by the individual to directly affect state variables through some transformation in the world. The transformation may require multiple inputs from several individuals (e.g., two keys must be turned to open a safety deposit box). Thus, the state variable may not be affected unless several individuals set the right combination of control variables. Since the individual can build aspects of his or her own Lasswellizer, the individual may put a control variable onto the panel which does not affect the state variable in the way that the individual expects it to. The labeling of the control variable is up to the individual. But, I require that the results following the selection of a control variable be the "real" results. If pushing the control variable does not really affect a state variable, the readout on the state variable does not change. (We could also posit random or biased error in the dials' representing state variables. For this initial version of the Lasswellizer, let us assume that these dials are accurate.)

The signalling dials are not directly hooked to the state variables but are the means available to one individual of communicating with others. Think of the river boat captain who wants to pass under a draw bridge controlled by a tender. The captain signals his intent to pass under the bridge, by a defined set of blasts of the boat's horn. If the communication is successful, the

tender raises the bridge. The signal variables may indirectly affect state variables (such as the position of a bridge) but only as a result of their being comprehended and acted upon by other individuals. In complex social systems, individuals use these signal variables a lot!

We can now turn to a definition of rules. **A rule is a prescription agreed to by some set of individuals for what actions (or signals) are required, forbidden, or permitted in defined situations.** A situation is defined by some configuration of the dials and read-out panels on a Lasswellizer. Rules state what individuals have agreed should, should not, or may be done when either some particular configuration of dial readings is present on the Lasswellizer. Rules may place a limit on the values of a control variable or state variable that are acceptable or even rule out certain control variables for use in particular situations.

An example may help us here. Let us think of an operator assigned the responsibility to control the valves at a hydroelectric dam. In his center panel would be a series of dials providing information about the volume of water going through the generators, the amount of electricity being generated, the amount of water flowing in at upstream locations, the amount of water located in some downstream storage sight, etc. The operator might have a complex set of rules that he is expected to follow. Some of them would refer to values of state variables that should not be exceeded. An example might be that it is forbidden for the level of the storage area behind the dam to exceed a certain height. Such a rule does not tell him which action he must take. The rule says that a certain state

variable should not exceed a particular value. (This is a scope rule in the system I have elsewhere elucidated.)

Another type of rule would focus on required actions in a particular situation. An example might be that when three of the generators are on, you must have three of the large valves fully open. That rule is a conditional statement saying that when particular variables are at certain values in the world, then certain control variables must be at a particular position.

In this example of regulating a dam, we have represented what is called a game against nature. Rules are even more important in regard to the broad class of situations in which other actors who also take actions affecting state variables. Rules can state what should be done in response to signals or control settings by other individuals. Our bridge tender operates under such a set of rules. The rules used by a bridge tender can be stated something like the following: When an approaching ship signals intention to go under the bridge, you must do the following actions:

1. put up a warning signal for approaching bridge traffic;
2. when the bridge is clear of traffic put down a barrier so no traffic can go on the bridge;
3. raise the bridge;
4. when the ship has passed, lower the bridge; and
5. take down the warning signal for bridge traffic.

This rule states that in response to a signal by someone else, a series of actions are required.

Rules may evolve over a long time period when individuals repeatedly interact and come to a mutual understanding about what each

should do in particular situations. Rules may also be subject to conscious design. Rules are what enable individuals to accomplish complex tasks in complex environments. They can be viewed as the basis for coordinated actions in such complex systems.

Once a community of individuals begins to develop commonly accepted and followed rules, such individuals are able to go on to construct even more complex patterns of interaction. Such a community is able to construct new state variables that could not exist until rules are developed and followed. A checking account, for example, cannot exist until a very complex set of rules has been established concerning units of account and units of value in regard to currency and rules for what banks and individuals can and cannot do with money deposited in a bank. Many of the signals that we use in this world are only meaningful because of the rules that we have adopted that give them meaning. Raising one's hand can be thought of as an action. In a voting situation, that action is interpreted as voting for or against a proposition. It is a symbolic action rather than a physical action in the context of a voting situation.

It is important that we distinguish between the use of symbol dials and action dials. As I want to use the term, a physical action immediately occurs in the world. It is a direct attempt to affect some set of state variables in some preferred direction. On the other hand, a symbolic action does not directly affect the world.

Symbolic actions must be translated through the agency of other actors who take those symbolic actions into account in selecting their actions in the world. Let us return to our boat captain. The boat captain cannot simply toot his whistle and make the bridge rise.

There is no physical transformation that links the bridge rising to the physical act of tooting the horn. It is because the tender heard the symbol, interpreted it as a request to have the bridge raised, and obeyed the set of rules affecting this situation.

Similarly, when people use symbols, such as votes, to adopt a policy regarding future actions of themselves and others, that policy does not affect state variables until individuals accept that policy as an operational set of rules to be used when contemplating future actions. Thus rules have to be thought of as cognitive entities that must be understood by individuals to affect their choice of future actions. Rules are not hard wired into the Lasswellizer. That is why I have represented them separately as a "Rule Book" that must be understood and interpreted by the individual when making choices about which control and signal variables should be manipulated in response to information contained in the center and right-hand panels of the Lasswellizer.

Rules, as I have defined them, cover a wide variety of different types of instructions that people might follow in their everyday life. In this abstract way of defining rules, they include personal rules such as a diet or the set of ethical rules that an individual uses. Rules also include those prescriptions accepted by multiple individuals such as the family, clan, organization, neighborhood, or an informal friendship group. At a broader range, the term includes self-consciously selected rules of a political jurisdiction at any level including international regimes.

As political scientists, we are not usually interested in "personal rules" unless we are analyzing the strategic choices of a

famous leader. We are usually interested in rules which are used to govern relationships among communities of individuals ranging in size from small neighborhoods to major regions of the world. But, I think it is important initially to ground the idea of actions and rules in a very simple representation such as the Lasswellizer so that we can see how complex systems work as the result of sets of rules being built upon sets of rules.

It is through such socially structured rules that individuals build up a wide variety of new variables such as credit, goodwill, balance of payments, etc., that are only possible as a result of complex series of rule-ordered behavior.