

ON CONCEPTUAL CHALLENGES: REPLY TO HAYES AND HOUMANFAR

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Hayes and Houmanfar (2004) pinpointed several of the conceptual challenges we faced in writing *Complexity and Selection* and provided us with an opportunity to enter a dialogue on some of those challenges. They began by accurately and succinctly stating our purpose in delineating the classes that participate in functional relations at the organizational level of analysis. If we can accurately describe the processes that account for organizational change, then we can use them to guide interventions designed to enhance organizational fitness. We also believe that if we can use the model to intervene successfully in organizations where instances of the classes are fairly discernible, such as a factory, analysis and intervention in cultural phenomena of even greater complexity becomes feasible.

In discussing the three types of organizational complexity we described, Hayes and Houmanfar (2004) noted that environmental complexity addresses the complexity of the world outside the organization -- more specifically, those parts of the world that function with respect to an organization's continuing activities. We identified some of the external variables that affect some organizations. Hayes and Houmanfar (2004) suggested that those variables pertain to all organizations, whereas different empirical events affect different operants in an operant analysis (for example, light onset reinforces flipping the switch whereas water flowing reinforces turning the faucet handle).

We think matters are not so clear cut. In behavioral selection, certain types of events (e.g., praise) have the same function with respect to many operants. Our examples of external environments affecting organizations were selected from many possibilities to illustrate some of the features of organizational environments in modern society. If we were dealing with natural selection, we might name climate, predators, and vegetation as examples of environmental variables that often play a role in survival. Similarly, we might mention food, drink and attention as variables that often have an environmental function. For organizations, laws (for example) are often part of the external environment, but different laws are relevant to different organizations. Laws pertaining to air pollution may be critical for a manufacturer but not for a software developer. Similarly, food would rarely be acceptable as specification of a reinforcing consequence, although we get by with "praise" or "attention" in application.

Hayes and Houmanfar (2004) suggested that we refine our taxonomy of environmental events affecting organizational survival. We agree that would be useful for practical purposes, which are among our interests in writing the article under discussion. For analytical purposes, we are lacking ways to classify the environmental events *functionally*. Whereas behavioral selection processes are refined as reinforcement, punishment and extinction, cultural selection processes have not been so refined. If the concepts of behavioral selection processes can be further used to understand cultural selection, classification of environmental variables in functional terms will be necessary.

In response to our section on organizational complexity, Hayes and Houmanfar (2004) pointed out that component and hierarchical complexity are topographical descriptors. Although the descriptors may apply to many organizations, they are not “criteria for the grouping of organizations into functional classes” (p. 107). We agree. However, the instances of the classes entering functional relations in metacontingencies are not organizations but interlocking behavioral contingencies that repeatedly produce an outcome. The descriptors, *component and hierarchical complexity*, help us discern the relations among the classes (recurrences) of interlocking behavioral contingencies that reliably produce products needed elsewhere in an organization for the final product to be available to the selecting environment.

This brings us to Hayes and Houmanfar’s comments on selection. Selectionist terminology is notoriously difficult. Even in evolutionary biology, where the concept arose and has been worked over for more than 150 years, writers use the word in different ways. It has been said that Darwin’s great achievement was to posit a mechanism that explained the evolution of species (Mayr, 1982). That mechanism is natural selection. Change over time in characteristics of organisms of a lineage is the *effect* of contingencies of natural selection. Reduced to its most simplistic formulation, the elements of the mechanism are as follows:

- a) Organisms of a lineage interact differentially with their environment.
- b) The differential interactions cause differential preservation of some characteristics in the lineage.
- c) The change over time in characteristics of a lineage of organisms is called evolution by natural selection.

Statement *a* specifies differential relations (contingencies) between features of organisms and features of the environment. Statement *b* specifies the relation between *a* and its result; that result is differential preservation in the species (lineage) of some features over others. Statement *c* describes the relation between *a* and *b*.

In the biological literature, the term *selection* is used for both *a* and *b*, engendering charges of circularity. In behavior analysis, statement *a* is analogous to a reinforcement *procedure*; statement *b* is analogous to a reinforcement *process* (i.e., the change in behavior that results from response-consequence contingencies); and statement *c* describes the relation between the procedure and the process and is called learning.

Like *selection*, the term *reinforcement* is used for both a procedure and a process and engenders charges of circularity. It is surely confusing to say that reinforcement (procedure of establishing a contingency) brings about a result (increased frequency) and also that the relation between the reinforcement procedure and the result is called reinforcement (process). That confusion is endemic in the behavior analysis literature, as a similar confusion seems endemic in the literature of evolutionary biology.

Hayes and Houmanfar (2004) were concerned with our statement, “Together with behavioral contingencies, metacontingencies account for cultural selection and the evolution of organizations” (Glenn & Malott, 2004, p. 100) because it appeared circular. It implied to them that we were saying cultural selection (metacontingencies) causes cultural selection and evolution. But in light of the explication above, the statement can

be interpreted as follows: behavioral and cultural selection procedures (statement *a*) result in differential replication of some interlocking behavioral contingencies over others. The procedure and its result constitute a cultural selection process (statement *b*).

We do not agree with Hayes and Houmanfar (2004), that “the contingencies express the relation between [selection] processes and their outcomes” (p. 108). Instead, we believe a more accurate statement is “selection processes express the relation between contingencies and their outcomes.” At the risk of trying the reader’s patience, selection as a *procedure* specifies the contingent relations between occurrences and their environments. A selection *process* specifies the relation between a procedure and its resulting changes over time in lineages of occurrences. Table 2 summarizes our perspective.

Hayes and Houmanfar (2004) elegantly stated the role of units of analysis in science and wondered whether the units of analysis in our selectionist view of organizations meet the class (lineage) requirement of *recurrences*. They are concerned that organizations are the units of analysis and organizations do not recur. We see organizations more like ecosystems. They are loci where multiple lineages of interlocking behavioral contingencies undergo selection by demand for their products. The units of interest are the recurring interlocking behavioral contingencies.

TABLE 2. TYPES OF CONTINGENCIES.

Type of Contingencies	Elements in Contingencies (Selection Procedures)		Results of Contingencies	Selection Process
Contingencies of natural selection	Organisms of a lineage	Environmental features	Changes in relative frequency of features of gene/organism lineage	Natural selection
Contingencies of behavioral selection (reinforcement, extinction, punishment)	Behavioral occurrences of an operant lineage	Consequences	Changes in relative frequency of features of operant lineage	Operant selection
Contingencies of cultural selection in organizations (metacontingencies)	Repetitions of interlocking behavioral contingencies of a cultural lineage	Demand for organizational product	Changes in the frequency of features of interlocking behavioral contingencies	Cultural selection

In conclusion, we appreciate the opportunity to clarify some points of confusion in the initial paper and thank Hayes and Houmanfar (2004) for the intellectual stimulation their comments provided.

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