Journal of Management
1984, Vol. 10, No. 1, 67-86

Design Strategy from the Population Perspective

Howard Aldrich
University of North Carolina at Chapel Hill
Bill McKelvey
University of California/Los Angeles
Dave Ulrich
University of Michigan

The population perspective on organizational change downplays the consequences of managerial action and focuses on populations rather than on single organizations as evolving units. The population perspective is useful in suggesting broad classes of design strategies. Using this perspective, we argue that models of organizational change must accurately represent the diversity of units studied, be based on tests of alternative explanations, and explicitly incorporate organizational dynamics. Moreover, designs must take account of five empirical generalizations about organizations: individuals' intentions are not a good guide to organizational outcomes, environments are difficult to describe with typologies of a few attributes, designs are a joint product of organizational forms and environmental characteristics, population effects are as important as individual intentions, and environmental trends are increasingly short-lived. We present a simple classification of four categories of macro environments and draw inferences about the kinds of design strategies appropriate in each. We conclude with a strategy of design strategies: questions and issues to consider before beginning detailed planning.

The phrase *organizational design* crept into the organization theory literature around the mid-1960s, roughly concurrent with the development of contingency theory by Lawrence and Lorsch (1967). Contingency theory took organizational environments into account much more than did earlier approaches and marked the beginning of an expanded awareness of the importance of external constraints in explaining or designing organizational structures and processes. Current approaches to organizational design, while thus recognizing events

Address all correspondence to Howard Aldrich, Department of Sociology, Hamilton Hall 070 A, University of North Carolina at Chapel Hill, Chapel Hill, NC 27514.

beyond organizational boundaries, place heavy emphasis on managerial choice and strategy formulation (Gouldner, 1959). In contrast, the population perspective, a more recent approach to conceptualizing external constraints, downplays the consequences of managerial action and focuses on populations rather than on single organizations as the evolving units (Aldrich, 1979; Hannan & Freeman, 1977; McKelvey & Aldrich, 1983).

In spite of the population perspective's cautious and rather skeptical view of the connection between managerial intentions and organizational outcomes, we believe it has something to offer people concerned with questions of organizational design. Just as the contingency view of organizational design proposes that managers identify the texture of environments and then make appropriate organizational responses, so too the population perspective suggests the conditions under which particular kinds of organizational forms are created and sustained. With its focus on the macrocontext for populations of similar organizations, rather than on single organizations, the population perspective is useful in suggesting broad classes of strategies designers might adopt. It also suggests that the degree of confidence designers may place in their recommendations varies, given the extent of information available about the environment confronting organizations.

We begin by reviewing the population perspective, emphasizing its usefulness in understanding organizational change. Based on the population perspective, we then offer some criticisms of previous organization research used by investigators to develop design implications. We argue that the existing literature is a weaker guide to design prescriptions than many have heretofore realized. Next, we present a simple classification of macroenvironments within which organizational populations are evolving. From the characteristics of each environmental category, we infer classes of design strategies that might help managers avoid some potentially serious design errors. Rather than provide specific design prescriptions, we suggest a design strategy framework which identifies questions and issues to consider before beginning more detailed organizational design efforts.

Population/Natural Selection Theory

We use the phrase population perspective to refer collectively to four related components of what is commonly termed population ecology or natural selection theory. *Taxonomy* focuses on activities devoted to developing a theory of organizational differences and a theory of classification. *Classification* procedures allow the identification and description of organizational populations and their relationship to other more or less similar populations. *Evolutionary* inquiry supports taxonomic and classificatory activities by providing an underlying theoretical framework explaining how different kinds of organizations arose, why they remain different, and which organizational attributes might be evolutionarily significant. *Population ecology* explains the relationship of organizational forms to their niches and environments, detailing the rise and fall of populations relative to specific environmental conditions and events.

The primary unit of analysis is a local population, which consists of similar kinds of organizations such as private schools, general hospitals, fast food restaurants, or automobile battery manufacturers. Warriner (1980, p. 11) defined local populations as "similarly constituted organizations, occupying the same ecological niche, and sharing the same modeling or replication materials through interconnections among the organizations in that population." An organizational species is likely composed of one or more local populations. McKelvey (1982, p. 192) defined organizational species as "polythetic groups of competence-sharing populations isolated from each other because their dominant competencies are not easily learned or transmitted." A new grouping concept is introduced into organization theory with this definition. A polythetic group is one in which (a) each member possesses many properties, p, of a set of properties, P; (b) each p in P is possessed by many members; and (c) no p in P is possessed by all members.

The concept of an organizational species is needed because organization scientists recognize that organizations are neither all alike nor all unique (McKelvey & Aldrich, 1983), but rather appear as a moderate number of populations composed of similar member forms. We are also now aware that no one definition of an organization or application of design principles is likely to apply to all organizational forms. Therefore we suggest empirically delineating different organizational forms into populations to provide classifications that help producers and users of organization research set each kind of form apart from others.

Organizational species are not nominal or arbitrary groupings. The population perspective identifies three processes that cause different kinds of organizational forms to become and remain differentiated. *Ecological processes* include competition for scarce resources and negative selection such that some members of a population fail and take with them ineffective attributes, leaving an increasingly homogeneous group of members having a narrower set of survival-enhancing attributes. *Generational processes* assure that technologies, competencies, and attributes enhancing survival will be retained by surviving members even when their employees change, and that diffusion across members within a population will take place. *Isolating processes* ensure that technologies, competencies, and attributes of the members of one population are not easily shared with the members of other populations; otherwise population differences would slowly disappear.

The three speciation processes are reflections of the four principles of natural selection theory:

1. *Principle of variation.* Any kind of change is a variation. Purposeful variations occur as intentional responses by people attempting to adapt organizations to perceived environmental conditions. Blind variations occur independently; they are not the result of intentional responses to environmental characteristics, but rather occur by accident or chance.

2. *Principle of natural selection.* Some variations in organizations prove

more beneficial than others for acquiring resources in a competitive environment, giving an organization or its subunits survival advantages over competing organizations. Subunits or organizations driven by maladaptive variations in technology, managerial competence, or structural attributes are likely to draw fewer resources from their environments and therefore are more likely to fail. Over time a population of similar organizations is more apt to be characterized by the attributes of surviving organizations than by the attributes of those that failed.

3. *Principle of retention and diffusion.* What is preserved through retention is the technological and managerial competence that all members of a population use, collectively, to exploit the resources of their environment. The survival of a particular organization is irrelevant to the survival of the population as a whole; the population's survival depends on the total pool of technological and managerial competence, not on the variant of competence held by a particular organization. The competencies of a population are held by the employees of its member organizations. They are passed, with more or less variation, from old to new employees. They are diffused, with more or less variation, from one member to other members of a population. The natural selection principle works at this level as well: not all variations are passed to new employees (because of dislike, pique, mistake, stupidity, unwillingness to learn, etc.), and not all variations are diffused (because of selective hiring, resistance to change, the "not invented here" syndrome, proprietary secrecy, etc.).

4. *Principle of the struggle for existence.* A competitive struggle over resources occurs among organizations and populations. Sometimes resources are temporarily so abundant that no competition takes place. When the airline and banking industries in the United States were regulated, competition was almost absent. With deregulation, however, conditions have changed and competition is fierce. In new industries, such as personal computers, competition is initially moderate, since there are enough resources for all entrants. As the industry evolves, however, a shakeout occurs and competition increases. Sometimes the pace of competition and the time it takes for an organization or population to fail are so drawn out that to short-term observers, which most scientists are by virtue of their working lifespan, it appears that no struggle exists. But over decades, even firms as large and long-lived as the *Fortune 500* group face competition and fail (Aldrich, 1979, p. 199; Hannan & Freeman, 1977).

Population/natural selection theory explains how particular forms of organization come to exist in specific kinds of environments. A specific environment contains a resource pool uniquely suited to the adapted organizational form. A form well-adapted to a specific environment probably is not the fittest form conceivable. It is tolerably fit and probably more fit to its specific environment than previous failed forms. Such a well-adapted form is neither better nor worse, neither more nor less advanced, efficient, or humanistic, than previous or subsequent forms. It is only the best right now with respect to its specific

environment. For example, airlines under conditions of deregulation will probably become more efficient, more price competitive, less unionized, and less middle-sized. But they may also be less safe; offer fewer, more crowded flights; and be less humanistic. It is not for us to say whether the newly adapted forms are better or worse.

A discussion of the role of human intentionality or purposeful action in explaining the adaptation of organizational form to specific environments has begun elsewhere (Aldrich, 1979; McKelvey, 1982; McKelvey & Aldrich, 1983). We contend that explanations of why particular organizational forms exist do not require knowledge of the purposes and activities of individuals in organizations other than that they act and, in doing so, create variations. Population/natural selection theory is all that is needed. Nonetheless, purposeful human behavior in organizations (following from accurate perceptions of environments and including careful analyses, timely decision making, effective implementation, and a host of other sound managerial practices) may produce variations which steer organizations away from many mistaken paths. Human purposes and actions are thus necessary, but not sufficient, to explain changes in organizational forms.

Evaluating Research on Organizations and Design

We think many current approaches to organizational design rest on shaky empirical grounds since they presume knowledge that we do not have and ignore some widely accepted empirical generalizations. Evaluated against the standard criteria used to judge social science research, a great deal of organizational research falls woefully short. Using the population perspective and its emphasis on studying heterogeneous populations of organizations over time, we have identified three shortcomings that call into question the empirical basis of many organizational design prescriptions. After reviewing the three criteria, we offer five generalizations that are based on existing research but are interpreted within the framework of the population perspective.

First, organizational design research may be evaluated by the extent to which it accurately represents the diversity of the units studied. Large-scale, cross-industry comparative studies are carried out much less frequently than case studies, and not only because they are expensive and time-consuming. We believe that large-scale studies are infrequent primarily because researchers believe such studies are unnecessary. Hidden within case studies of single organizations or industries we often find the assumption that organizations are all alike or are nearly so (McKelvey & Aldrich, 1983). Were it otherwise, we would expect investigators and organizational designers to pay much more attention to the process by which cases are chosen. If, however, an investigator's model of organizations implies that organizations are all alike, or vary along a few well understood dimensions, then there is no need to go beyond a convenience sample. Even if a theoretical model took organizational diversity into account, incorporating diversity into a sampling plan is difficult. Without the benefit of a formal taxonomy of organizational forms, an investigator has little

basis upon which to draw a sample (McKelvey, 1982).

Second, cumulative research should be evaluated by whether it is based on a rigorous hypothesis-testing logic that rules out alternative explanations. The deductive nomological framework (Hempel, 1965) or hypothetico-deductive method, which is the reconstructed logic and supposed logic-in-use (Kaplan, 1964) currently used by researchers (MacKenzie & House, 1978; McKelvey, 1982), calls for a very tight logical linkage between the general design principle and the deduced hypothesis to be empirically tested. The argued hierarchical relationship between principle and hypothesis is usually so loose in organization research that, even if a positive test of the hypothesis is made, alternative explanations to the stated principle cannot be ruled out. The situation is so poor in organization studies that MacKenzie and House (1978) called for a totally different method, which they termed the *strong inference* approach.

Even if the logical linkage between theoretical principle and hypothesis were tight, the issues of measurement, of the functional form of relations, and of explanatory power need to be addressed. Most measures of organizational structure and process lack an intrinsically meaningful metric. Investigators tend to use indices based upon aggregations across self-report items having an arbitrary metric, such as five-point *agree-disagree* scales. Can a designer reasonably expect to alter one variable by operating on another when their relationship is posed in terms of obscure metrics? Related to the question of measurement is the assumption of a linear world. Step functions, curvilinear or power functions, and other possible relationships are too infrequently used. Finally, current design research would probably still be of limited usefulness because of the very low explanatory power of most models. Judged by the common criteria of variance explained, most research results would not justify a second look from organizational designers.

Third, research on organizational design should be judged by the extent to which such research explicitly incorporates organizational dynamics into the study design. Unfortunately, studies of organizational dynamics are scarce. Most studies leading to organizational design prescriptions are static and cross-sectional in design, such as those by Lawrence and Lorsch (1967), Khandwalla (1977), and other contingency theorists; those by the Aston group, Hickson, Pugh, and Pheysey (1969); and many later studies (see Daft, 1983, for further discussion). Dynamic analyses are more often found in case studies and historical analyses, which may account for their disproportionate appearance as examples in design-oriented textbooks. Obviously, such work frequently suffers from a lack of generalizability, as mentioned earlier. Controlled experiments, time-series analyses, event-history analyses, and other methodological techniques specifically developed to handle dynamic analyses are traditionally rare in the organization studies literature, although recent evidence suggests that the pattern is changing (Carroll, 1983).

Judged against the three criteria just discussed, organizational design statements presented in textbooks and journal articles rest on a shaky empirical base. In the absence of high-quality empirical findings, organizational design is often guided by fads and fashions. As Hayek (1978) noted, "An age of superstition is

a time when people imagine that they know more than they do'' (p. 31).

The population perspective is just beginning to have an effect on the way organization research is conducted, but previous research findings can be interpreted within its framework. Keeping the above three criteria in mind, we believe the following five empirical generalizations have enough support to serve as the basis for deriving some macrostructural design implications.

First, aggregate organizational behavior cannot always be explained by pointing to individual intentionality as the causal agent. By aggregate organizational behavior we mean the behavior of organizations as entities. Many models of organizational structure and design point to goals (official or unofficial), informal organizational processes, or individual intentionality as sources of organizational behavior (Georgiou, 1973). Managers and organization theorists assert that managers respond to environmental, social-system, or personal forces or needs and singly or in coalitions act to change organizations toward increased effectiveness in attaining organizational, social-system, or personal goals. Such rationalistic processes may occur, but research over the last decade also demonstrates the pervasive effect of retrospective logic (Weick, 1979) and internal positive attribution on observers' and participants' views of individuals' contributions to outcomes (Bem, 1967; Pfeffer, 1982; Staw, 1980).

The assumption that individual intentionality is the root cause of the behavior of organizational entities is based on a biased sample of all possible behaviors by people in organizations. Descriptions of successful organizational actions, such as those offered by Chandler (1977) or Peters and Waterman (1982), are invariably constructed after the fact by someone trying to make sense of some outcome. Investigators either reconstruct the event themselves, emphasizing the role of particular people in their account, or they ask participants to provide their own accounts of why things happened the way they did. Either method of explaining past events is open to the charge of selective use of evidence. Overlooked in such accounts are all the behaviors that led to no particular outcome, and thus went unnoticed and unrecorded. Participants are not usually conscious of all their tentative or unsuccessful attempts to reach some objective, and after the fact they tend to forget behaviors that went unrewarded. Similarly, outside observers approach cases with the idea of finding patterns in which human action played an important role, typically to highlight successes or attach blame. Given the usual surfeit of information surrounding organizational events, investigators can easily select those events that appear to show the efficacy of human intentionality even when it was not present.

Second, organizational environments are not adequately characterized by simple typologies of a few attributes. For the past several decades organization scientists have tried to reduce organizational environments to a small set of dimensions, which are typically cross-classified to produce a typology of environments (Jurkowich, 1974; Perrow, 1967; Pugh, Hickson, & Hinings, 1969; Thompson, 1967). Unfortunately such typologies have failed to actually inform empirical research about organizations (McKelvey, 1982). Our search through the literature failed to turn up any significant cumulative line of research

using a particular environmental typology, or even any research that showed how a particular typology made a contribution toward explaining representative instances of organizational change.

Why have typologies of environments had such a small effect on research designs and strategies? Part of the answer to this question may be found in the problems enumerated earlier with research designs, and part of the problem stems from an inattention to organizational history and evolution. Present typologies are meant to cover a wide variety of organizational environments and kinds of organizations. Environmental attributes most salient in an organization's adaptation and survival or effectiveness differ by kind of organization or industry and over time. For example, banks and airlines pay attention to different environmental attributes, and the attributes to which these organizations are most sensitive differ under conditions of regulation versus deregulation. Broadly generalized and highly abstracted typologies miss most of the important environmental attributes. Environmental dimensions such as stable/shifting and homogeneous/heterogeneous could be useful, however, if they were treated as generic categories which had to be further codified before being applied to analyses of particular organizational environments.

Third, organizational responses to environmentally imposed problems are not adequately characterized by typologies of a few design responses. A vast number of organizational attributes have been identified by scholars such as the Aston group, Hall, Haas, and Johnson; Warriner; and many others (summarized in McKelvey, 1982). A large proportion of these are sensitive to environmental forces: degree of centralization, formalization, standardization, divisionalization, task specialization, and so forth (Aldrich, 1979).

Linking organizational responses to specific environmental attributes requires a much more developed concept of organizational form than we now have available. Specifically, investigators need to learn more about organizations whose character is directly a response to environmental conditions and the environmental attributes causing such responses. Information available from a reading of existing research reports and articles indicates that environmentally tied attributes are quite diverse across different kinds of organizations or industry groups, far more diverse than is implied by the organizational design literature. A quick review of recent journal articles indicates the soundness of our generalization, even though few investigators report enough detail about their samples to allow a detailed comparison of organizational diversity across studies. Note how difficult it is for investigators to find precise precedents for the operationalization of variables they propose. Note how much difficulty they have in adapting the measurement procedures of other researchers to their work. Finally, note the level of abstraction at which investigators ultimately make a connection between their work and that of others. We think all of these difficulties stem from the great variety of organizational forms investigators find in the field and which existing design parameters fail to define adequately.

Fourth, population effects are at least as significant in shaping organizational structures and processes as are the intentions of individual managers. Unfortunately, we only know about population effects in an indirect way because

they have not been the focus of much attention. In a field which often borrows heavily from microeconomics, organization scientists have paid surprisingly little attention to the effect of interindustry competition on the relative size of populations (roughly equivalent to industry groupings) or on the organizational form of their members. Population effects might easily have been discovered by paying more attention to the field of competitive strategy, where groupings by industry and subgroupings within industries are important determinants of industry differences. Reviews of the literature on organizational mortality (Aldrich & Fish, 1981; Carroll, 1983) have shown that negative selection culls a substantial proportion of organizations within diverse populations every year, at rates that could produce complete turnover in a population within a decade. Such a culling effect could be a major factor in reducing the variance of effective structure and process designs within a population. Homogeneity of design within a population could thus be due to selection effects rather than to the conscious imitative design intentionalities of managers.

Selection also takes place within subunits of organizations. As loosely coupled systems, organizations may be transformed through the selective survival or elimination of particular structures, processes, or subunits (Weick, 1976, 1979). Past observers have tended to attribute such changes to the deliberate manipulations of people within organizations, rather than to the effect of negative selection through external competitive pressures.

Conscious intentions of managers also produce population effects as they scan their competitors for clues about how similar organizations are faring (DiMaggio & Powell, 1983). The demonstrable positive effects of apparently successful organizations lead to the diffusion of similar structures and processes throughout a population, causing organizations to adopt new attributes even though the root environmental causes may be only dimly perceived or understood.

Fifth, trends in organizational environments are increasingly short lived. Increasingly complex and interdependent environments and interorganizational networks create less stable environments (Emery & Trist, 1965). One implication of rapidly changing environments is that long-range planning activities are increasingly misleading. Planners tend wishfully to reduce uncertain environments to risky or even known ones by attaching subjective prior probabilities to future events, or by setting up scenarios and planning for one of them to happen. Ignoring other possibilities, designers are seduced into designing for an environment that has only a slight chance of happening.

Even recent models of planning, which have adopted more sophisticated, broader based approaches (such as "What if?", multiple scenarios, contingency planning, and various feed-back and follow-up practices), offer a false sense of security. They still reduce a very complicated, interdependent, uncertain situation to a few alternative plans keyed to the assumed states of a few key parameters. Whether an organization prepares to meet one certain, known environment or prepares several totally different plans, assuming different known environments, the effect is still the same: managers are focusing on preparing for a predefined event. This does not lead to the kind of behavior or to the kind of organizational design suitable for aiding responses to unpredictable

events. Some aspects of planning are useful, of course, in that studying the organization, technology, personnel, environment, and competitors may help managers better understand in which category of design strategy (outlined in the following section) their organization is. Planning is also useful in the many organizational environments that are stable for some period of time.

A second implication of rapidly changing environments is that inertial effects become more pronounced as organizations have increasing difficulty keeping pace with changing trends. Organizations cannot readily track changing environmental selection processes when internal variation is limited. Most organizations remain under the control of their founding entrepreneur or coalition until the well-documented crisis of succession (Grusky, 1970). Adaptations required by changing environments clash with the founders' desires to maintain tight control over their organizations; and they respond by resisting decentralization, loose coupling, or other processes of maintaining requisite variety (Ashby, 1956). Various chapters in Kimberly and Miles (1980) suggested that the post-creation effects of institutionalization attenuate the innovativeness associated with the early entrepreneurial fervor, though research by Kanter (1983) and Peters and Waterman (1982) suggested that some organizations are able to institutionalize the entrepreneurial spirit over the long term.

As organizations age, pressures toward internal consistency as a basis for coordination and control increase. As Starbuck (1965, p. 481) noted, "older organizations have learned to ignore unimportant problems, and have accumulated mechanisms for attending to routine problems. They perceive stable problems and need stable structures." We are not arguing that all managers and organizations are simply the unconscious victims of their predispositions; many can and do learn, change, and act purposefully to transcend their personal and systemic limitations. However, major transformations within a population are much more likely the result of external constraint and coercion than of planned internal initiative, as illustrated by the recent breakup and reorganization of AT&T in response to government edict. The change from a production and service orientation to a marketing orientation was not willingly undertaken.

Social and cultural forces in organizations also limit preparations for uncertain future environments. Organizations tend to recruit people who mesh with existing norms, values, and perceptions. Organizations socialize old and new members toward uniformity, and homogeneous perceptions dim an organization's sensitivity to changing environmental trends. They reduce the consideration of alternatives to existing practices, making designers less likely to undertake transformations (Hannan & Freeman, 1977).

We have argued that the premises of current organizational design approaches are only partially supported by existing research. The five generalizations we have identified suggest the outlines of another approach to design that uses existing ideas about organizational design, but within a framework that recognizes the diversity and volatility of organizational populations. The population perspective, we believe, is fully compatible with these empirical generalizations and offers a set of assumptions consistent with organizational reality.

Categories of Macroenvironments and Design Implications

Many people object to applying natural selection theory to organizations because they have concluded that doing so implies that managers passively and powerlessly produce blind variations and wait for environmental selection to occur. Our view, spelled out in more depth in McKelvey (1982) and McKelvey and Aldrich (1983), is that there are a host of possible mistakes that proactive members could avoid as they help their organizations search for a survival path. Avoiding mistakes involves an understanding of organizational forms and the environments in which they are appropriate: the contributions of particular strategies to fitness in varying environments.

Because fitness is ultimately the joint product of interactions between organizations and environments, specific design prescriptions should not be made in the abstract. Accordingly, in this section we limit ourselves to describing classes of design strategies that will be effective in broad categories of environments. What we offer is a framework for examining design strategies, rather than detailed recommendations.

The population perspective forces us to pay attention to organizational environments, following the trend begun under the influence of systems and contingency theorists. Given the population perspective's more central positioning of organizational environments, the first step in improving organizational design theory involves developing a more sophisticated view of environments. The solution is not as simple as just proposing a more complicated, multidimensional typology of organizational environments. We have argued elsewhere (McKelvey & Aldrich, 1983) that broad definitions of form ignore most of the important differences among populations of organizations. Environments are also specific empirical realities that cannot be usefully defined by broad, abstract typologies, because organizations and niches follow a mutually causal process of adaptation (McKelvey, 1983; Pianka, 1978). Environments, like organizations, are best empirically discovered and described, not defined.

We believe that it is useful to classify environments of organizations into four categories and to identify classes of design strategies within each category. Readers may be tempted to connect the types of continua, such as levels of uncertainty, stages of evolution or development, and level of knowledge. Perhaps this is appropriate, because the environmental categories are ranked by how much is really known by organizational participants and how intractable they are as constraint sets. Such a ranking is misleading, however, because the design responses do not seem to have any rank order; they are nominal categories.

The four categories are:

1. *Uncertainty state*. Environments are characterized by gross uncertainty, and the evolutionary important developments have not yet occurred. Niches are just being explored, resource distributions are uncertain, and organizational birth and death rates are quite high. Uncertainty stems from an unknown future rather than from lack of knowledge about events that have already taken place. Design in this context is a tentative, groping activity guided primarily by the

principles of natural selection, particularly by the need for variation.

2. *Domain state*. General resource pools have been identified and organizations have emerged to take advantage of the new resources, but populations of directly competing organizations have not yet materialized. Or, if populations already exist, a change in the resource pool means that adaptive clues can not be identified by studying population tendencies. New domains are emerging (Thompson, 1967), and design is guided by broad theories of organizational function and process.

3. *Population state*. Environments in this category contain identifiable populations of organizations which observers can identify using classification methods. Design is guided by studying other organizations in the population of which the focal organization is a member.

4. *Attribute state*. Many specific characteristics of these environments are known, including aspects of societal culture, economic systems, technological developments, legal structure, and so forth. Other attributes, such as level of complexity, heterogeneity, interdependency, hostility, and change, may also be known. Design is guided by matching organizations to specific environmental constraints.

Different classes of organizational design responses are called for within each environmental state. So different are the responses that separate subdisciplines of organizational science have developed as scholars responded to aspects of each state. Organizational design, one such subdiscipline, has traditionally contributed the most to designing for the attribute state. In what follows we do not offer specific new design options targeted for each state. Rather, our contribution is to redefine or broaden the scope of what heretofore has been thought of as organizational design.

Uncertainty Design Strategy: Category 1 Environments

Given that Category 1 environments are characterized by gross uncertainty, little is known toward which to design. All variations or innovations are thus blind. We suggest that the best design strategy is to follow the principles of natural selection, as outlined in McKelvey and Aldrich (1983) and briefly presented earlier. Though there are four principles, we have labeled this the uncertainty strategy to emphasize the need for variations. We emphasize variations because most of the practices that good managers use to make an organization more effective, whether from instinct or training in management education programs, generally reduce variations through rational planning, controlling, organizing, communicating, motivating, and leading. In highly uncertain environments, we suggest that designers consider strategies to increase variations. Weick (1977) offered several ways to enhance variations, giving them suitable counter-controlling labels: garrulous, clumsy, superstitious, hypocritical, monstrous, octopoid, wandering, and grouchy. Several other procedures for creating variations were suggested by Peters and Waterman (1982); Abernathy, Clark, and Kantrow (1983) also discussed the high fre-

quency of experiments as producers search for workable design concepts in the early stage of an industry's evolution.

As important as variations are, the other principles of natural selection must also be considered. Whether variations are blind or purposeful, not all will prove beneficial. Managers may help their organizations toward environmentally induced survival paths by augmenting selection processes, thereby lessening the drain of unfavorable variations on resources. Internal selection processes abound in all organizations in the form of control systems, human resource systems, cost cutting methods, and the like; these must be watched carefully because they are typically associated with organizations in more stable and well understood environments. We suspect that internal selection processes compatible with the organic form of design (Burns & Stalker, 1961) are more appropriate.

Managers must continually monitor internal selection processes to determine what kinds of variations are selected. The outcomes of diverse internal variations will give clues about external selection processes, and as these clues materialize, internal selection processes may be altered so that they complement these external processes. Without creating and experimenting with variations, learning in an uncertain environment is impossible. Without recognizing selection processes, however, the cost of learning may be so expensive that it jeopardizes the survival of organizations.

The principle of retention and diffusion suggests that it is important to think about how competence (whether technological or managerial) is held by an organization over time, diffused from one generation to another, and, if necessary, diffused from one part of an organization to another. Whatever is learned in an organization from variation and selection processes is held by employees as their knowledge and skill. In Category 1 environments, characterized by high levels of uncertainty and change, it seems unlikely that learning could be codified as formal written policies, job descriptions, and programmed work procedures. Such formal developments could hardly keep up with the pace of change; and, since understanding in this environmental state is apt to be haphazard, rapid institutionalization could be dangerous because of premature formalization of possibly faulty knowledge, as illustrated by Kimberly (1981). In Category 1 environments, premature plans that formally retain variations may cause rigidity and an inability to retain flexibility. Design strategies should encourage the influx of new ideas through rewarding innovation, hiring new employees, and establishing a culture where entrepreneurship is favored (Kanter, 1983; Peters & Waterman, 1982).

In brief, in Category 1 environments, characterized by gross uncertainity, design strategies should emphasize variation. Designers should build into organizations processes, activities, and rewards for experimentation and innovation. Most variations are blind, as designers are only partially able to predict which variations will be favorably selected. Thus, few efforts should be made to codify and retain specific organizational processes, with efforts directed toward increased diversity instead.

Domain Design Strategy: Category 2 Environments

A domain of operation emerges after a variation opens a promising new resource pool and survival path for organizations. The domain is part of the macroenvironment to which new organizations and eventually emergent populations must adapt. Specific attributes of competing organizations or of specific environmental constraints in the new domain are poorly understood. Or, the macroenvironment of a defined population in a Category 3 environment may be starting to change so quickly that studying a population's previous attributes is misleading and outdated. We think Category 2 environments are best understood in terms of broad theories of organization that explain organizational activities as responses to broadly painted selection processes. Environmental forces, according to natural selection theory, exist whether managers are aware of them or not. Managers must recognize these forces, understand how environments pressure their organizations, and respond through organizational design. Specific paths to success may not be identifiable, but general directions, such as "Head north," are possible.

Several theories of organization attend to the interaction between organizations and their environments. These include, but are not limited to, resource dependence (Pfeffer & Salancik, 1978); transaction efficiency (Ouchi, 1980; Williamson, 1975); niche theory (Hannan & Freeman, 1977); and institutionalization (Meyer & Rowan, 1977; Zucker, 1983). Although each theory has been developed for general application, without regard to environmental states, we think their usefulness is most readily apparent in Category 2 environments. We briefly discuss each of these theories as selection processes; a more complete discussion of the selection process aspects of these theories is available in Ulrich (1982).

Resource dependence. One of the earliest aspects of an organization's environment to crystallize is its relationship to other organizations in its immediate resource network or microniche. Resource dependence theory posits that organizational survival is enhanced if organizations minimize their dependence on other organizations in their network. By gaining power over supplier and customer relations organizations reduce, to some extent, uncertainty about their access to resources, thus enhancing their survival chances. Design strategies include mergers, joint ventures, long term contracts, co-optation, and interlocking boards of directors. The strategies are network-oriented ones, focusing on increasing the net size of the resource pool available to an organization.

Transaction efficiency. Organizations may be selected against because of high transactions costs. In some domains such costs may be an overriding concern, and hence a design strategy to lower transaction costs is appropriate. The theory holds that under many circumstances using a market to govern transactions is most efficient. In immature domains, however, due to few participants, ambiguous product or service specifications, opportunism, or complexity and uncertainty, markets may fail as the most efficient way to govern transaction costs. Bureaucratic control mechanisms may replace markets as design strategies. The clan form, a third design strategy advocated by transaction efficiency

theorists, replaces bureaucracies, which are unable to respond to dynamic environments. As transaction costs are better controlled, resources are used more efficiently; thus increased resources are made available, enchancing survival chances.

Specialism/generalism. In addition to resource and cost networks, organizations are sensitive to elements of complexity and change in their environments. The interaction of organizational and environmental characteristics may place organizations in a variety of different situations which may be relatively similar (a convex fitness set) or grossly different (a concave fitness set) as described by Hannan and Freeman (1977). An organization may encounter different situations infrequently (a coarse-grained environment) or frequently (a fine-grained environment). Design strategies call for organizations to specialize in a few product lines in unchanging environments or in changing ones that are fine-grained with a concave fitness set. In situations having convex fitness sets, whether fine- or coarse-grained, strategy calls for generalism (offering a variety of product or service lines).

Institutionalization. Even though the specific environments of organizations may be relatively undefined, their broader societal environment may be highly defined and reasonably well understood. The structure of the societal environment (the environment outside the domain or macroniche) consists of various organizational entities and their relationships, typically termed the institutional environment. To the extent that organizations are dependent on the institutional environment for resources and legitimacy, they are subject to institutional selection pressures (DiMaggio & Powell, 1983). Design strategy calls for building organizational features that match or complement elements of the institutional structure. This might mean that organizations adopt policies, areas of competence, and official goals that satisfy institutional pressures; though organizational design features might have little to do directly with the quality or quantity of organizations' resource-returning outputs or services.

Each of the foregoing theories of organization is sensitive to different aspects of organizational environments and contains different design messages. As organizations better understand their environments, or as environments shift from one type to another, we anticipate that the more specific design strategies from the Category 3 and Category 4 environments will replace the broad design messages characteristic of the Category 2 environment. It is possible that one pressure might replace another or that several will prevail where earlier only one was important.

Population Design Strategy: Category 3 Environments

As a population of similar organizations forms in a new domain, managers must worry not only about the domain or macroniche of the population, but also about an organization's position relative to other members of the population, that is, its microniche. Part of this concern takes the form of competitive strategy, as firms battle with each other for a better competitive position; and part takes the form of imitative strategy, with managers using other organizations within the

population as a source of design ideas.

Competitive strategy is a well-known and extensive field (Porter, 1980). As thoughtful as the competitive strategy field is, it typically has little to say about the actual design of organizations. One approach involves studying market share in relation to return on equity. The design implication for business units is to get rid of "dogs" with no market share and a low return on equity; milk "cash cows," using elsewhere funds earned by subunits having a large market share and a high return on equity; and invest funds in "stars," subunits with a potentially high market share and return on equity. Another strategy calls for building entry barriers. Among the most important barriers are economies of scale obtained by high capital investment and resultant low-cost operation. Organizational design implications typically suggest mechanistic organizational forms with sophisticated control systems, careful management of interdependencies, and uncertainty absorption.

Competitive strategy largely addresses a territorial problem. Organizations in the same population, tapping the same resource pool and using a similar form, try to occupy slightly different microniches in order to compete for the pool's resources without directly competing with each other (unless one organization thinks it can defeat another by direct competition). Even though an organization typically looks for strategic differentiation at the level of its microniche, it must have the same form as the rest of the population's members if it is to continue tapping the population's resource pool. For example, in the deregulated airline industry each firm looks for distinctive microniches (routes), but each also matches other firms in many areas such as pricing, contests, and services.

Even though an organization may know very little about its specific environment, learning from members of its population may guide design strategy. In simplified terms, think of a population as consisting of the following three kinds of members:

1. *Centroid members* are the exemplary or leading members of the population. Since they would be identified via a classificatory study and would appear as the centroid, we give them that label. Given current knowledge of the state of the environment, these organizations would have to be considered the best adapted.

2. *Lagging members* are members that are out-of-date. They are adapted to previous states of the population's environment. If trends continue and they fail to adapt, they could fail to survive.

3. *Experimental members* are members behaving in ways unlike those of the centroid members, but which appear successful in garnering resources. They would claim to be responding to changes in the environment. Several might claim this, with each doing different things and claiming the future is in its favor. Since the future is unknown, we simply term them experimental. A new organizational form, better adapted to the environment, will emerge from this set, but no one can predict which adaptation will succeed.

Sophisticated classificatory analysis of an organizational population, as described by McKelvey (1982), will identify centroid members of a population. Since these are the exemplary members of the population, they become models

for design purposes. Whether managers of centroid organizations realize it or not, the centroid form is often the acceptable adaptive response to the macroniche of the population; and thus, studying the centroid form is a surrogate for studying the environment. Copying the design of centroid members may allow an organization to become a viable member of the population. Attaining the centroid form must be considered a first or basic step toward adequate design and the springboard from which to work on a strong competitive or microniche stategy. As the personal computer market stabilizes, for example, manufacturers increasingly imitate and design components compatible with the IBM PC. Companies like Osborne, Texas Instruments, and others that did not engage in strategies to imitate IBM have already been selected against.

The imitative design strategy is viable in stable and slowly changing environments. In a stable situation, a population will contain large proportions of members with an optimal design because ample time has elapsed to shake out the maladapted forms. In changing environments, as long as the change is not of major proportions, the centroid form will also be the optimal identifiable design strategy. The centroid form does not remain static in a changing environment. Rather, it is constantly updated by the diffusion of competence and technology from the more effective organizations and the decline of maladapted forms. But a sudden change in the environment would outpace the adaptive ability of the centroid organizations since all members of the centroid would be under severe adaptive pressure; therefore the centroid form would no longer serve as the basis of an imitative design strategy. Whether this happens often enough to undermine a copying strategy as a valid form of organizational design is an empirical question.

Attribute Design Strategy: Category 4 Environments

As stable environments mature, their current and future attributes become well known; uncertainty has been worn away by experience. Also, stable environments are more constraining because they consist of more specific attributes that organizations must adopt because their competitors have adopted them, and failure to do so puts organizations at a disadvantage.

The traditional organization design approaches that call for managers to fit their organization to various attributes of the environment fall within this part of our typology. Since the mid-1960s, contingency theory is the label typically given this perspective. In its broadest form, contingency theory suggests managers decide on whether their organization's environment is certain or uncertain. The contingency theorist's response to uncertainty fits into our uncertainty design category (Category 1 environments), calling for a dynamic, informal design strategy. The theory does not offer much beyond this broad response to uncertainty. Since the attributes of an uncertain environment are unknown, this approach has little more to say.

Contingency theory has been most instructive in helping managers respond to known attributes of their environment. Its main contribution has been a focus on dimensions, of which both ends are known, such as benign/hostile or

homogeneous/heterogeneous, or on the known part of dimensions such as stability/change or certainty/uncertainty.

Conclusion

We have offered the population perspective as an orientation that may help designers think about some of the macroenvironmental issues involved in designing organizational structures.

The population perspective, we believe, is empirically compatible with five generalizations: it downplays the role of individual intentionality, it takes account of the complexity of organizational environments, it recognizes that designs cannot be developed without knowledge of organizations in their environments, it emphasizes population level effects on organizational change, and it treats environmental trends as typically short-lived. Taking account of these generalizations, we offered an approach to design that emphasized the macrocontext for design strategies.

Our strategy for developing design strategies does not assume managers can somehow outwit a dimly perceived environment. The prescriptions stay within the bounds of natural selection theory and the enhanced environmental determinism it posits. The four-part classification of environments was offered only for heuristic purposes, and we hope future work will take into account the vast outpouring of research from the population perspective that is becoming available.

References

Abernathy, W.J., Clark, K.B., & Kantrow, A.M. (1983). *Industrial renaissance*. New York: Basic Books.

Aldrich, H. (1979). *Organizations and environments*. Englewood Cliffs, NJ: Prentice-Hall.

Aldrich, H., & Fish, D. (1981, December). *Origins of new organizational forms: Birth, deaths, and transformations*. Paper presented at the Social Science Research Council Conference on Organizational Indications of Social Change, Washington, D.C.

Ashby, W.R. (1956). *An introduction to cybernetics*. London: Chapman & Hall.

Bem, D.J. (1967). Self-perception: The dependent variable of human performance. *Organizational Behavior and Human Performance, 2*, 105-121.

Burns, T., & Stalker, G.M. (1961). *The management of innovation*. London: Tavistock.

Carroll, G.R. (1983). A stochastic model of organizational mortality: Review and reanalysis. *Social Science Research, 12*, 303-329.

Chandler, A. (1977). *The visible hand*. Cambridge, MA: Belknap.

Daft, R.L. (1983). *Organization theory and design*. St. Paul: West.

DiMaggio, P.J., & Powell, W.W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review, 48*, 147-160.

Emery, R.E., & Trist, E.L. (1965). The causal texture of organizational environments. *Human Relations, 18*, 21-32.

Georgiou, P. (1973). The goal paradigm and notes toward a counter paradigm. *Administrative Science Quarterly, 18*, 291-310.

Gouldner, A.W. (1959). Organizational analysis. In R.K. Merton, L. Brown, & L.S. Cottrell, Jr. (Eds.), *Sociology today* (pp. 400-428). New York: Basic Books.

Grusky, O. (1970). The effects of succession: A comparative study of military and business organization. In O. Grusky & G.A. Miller (Eds.), *The sociology of organization* (pp. 439-454). New York: Free Press.

Hannan, M.T., & Freeman, J. (1977). The population ecology of organizations. *American Journal of Sociology, 82,* 929-964.

Hayek, F.A. (1978). *The three sources of human values.* Hobhouse Lecture. London School of Economics, London.

Hempel, C.G. (Ed.). (1965). *Aspects of scientific explanation.* New York: Free Press.

Hickson, D.J., Pugh, D.S., & Pheysey, D.C. (1969). Operations technology and organizational structure: An empirical reappraisal. *Administrative Science Quarterly, 14,* 370-397.

Jurkovich, R. (1974). A core typology of organizational environments. *Administrative Science Quarterly, 19,* 380-394.

Kanter, R.M. (1983). *The change masters.* New York: Simon and Schuster.

Kaplan, A. (1964). *The conduct of inquiry.* San Francisco: Chandler.

Khandwalla, P.N. (1977). *The design of organizations.* New York: Harcourt Brace Jovanovich.

Kimberly, J.R. (1980). Initiation, innovation, and institutionalization in the creation process. In J.R. Kimberly & R.H. Miles (Eds.), *The organizational life cycle* (pp. 18-43). San Francisco: Jossey-Bass.

Kimberly, J.R., & Miles, R.H. (Eds.). (1980). *The organizational life cycle.* San Francisco: Jossey-Bass.

Lawrence, P.R., & Lorsch, J.W. (1967). Differentiation and integration in complex organizations. *Administrative Science Quarterly, 12,* 1-47.

Mackenzie, K.D., & House, R. (1978). Paradigm development in the social sciences: A proposed research strategy. *Academy of Management Review, 3,* 7-23.

McKelvey, B. (1982). *Organizational systematics: Taxonomy, evolution, classification.* Los Angeles: University of California Press.

McKelvey, B., & Aldrich, H. (1983). Populations, natural selection, and applied organizational science. *Administrative Science Quarterly, 28,* 101-128.

Meyer, J.W., & Rowan, B. (1977). Institutionalized organizations: Formal structure as myth and ceremony. *American Journal of Sociology, 83,* 340-363.

Ouchi, W.G. (1980). Markets, bureaucracies, and clans. *Administrative Science Quarterly, 25,* 129-141.

Perrow, C. (1967). A framework for the comparative analysis of organizations. *American Sociological Review, 32,* 194-208.

Peters, T.J., & Waterman, R.H., Jr. (1982). *In search of excellence.* New York: Harper & Row.

Pfeffer, J. (1982). *Organizations and organization theory.* Boston: Pitman.

Pfeffer, J., & Salancik, G.R. (1978). *The external control of organizations.* New York: Harper & Row.

Pianka, E.R. (1978). *Evolutionary ecology* (2nd ed.). New York: Harper & Row.

Porter, M. (1980). *Competitive strategy.* New York: Free Press.

Pugh, D.S., Hickson, D.J., & Hinings, C.R. (1969). An empirical taxonomy of structures of work organizations. *Administrative Science Quarterly, 14,* 115-126.

Starbuck, W.H. (1965). Organizational growth and development. In J.G. March (Ed.), *Handbook of organizations* (pp. 451-534). Chicago: Rand McNally.

Staw, B.M. (1980). Rationality and justification in organizational life. In B.M. Staw & L.L. Cummings (Eds.), *Research in organizational behavior* (Vol. 2, pp. 45-80). Greenwich, CT: JAI Press.

Thompson, J.D. (1967). *Organizations in action.* New York: McGraw-Hill.

Ulrich, D. (1982). *United States and Japanese electronics industries: Description, taxonomy, selection.* Unpublished doctoral dissertation. University of California, Los Angeles.

Ulrich, D., & McKelvey, B. (1983). *Population perspective: Taxonomy and selection in environments and niches.* Unpublished manuscript, University of Michigan, Ann Arbor.

Warriner, C.K. (1980). *Organization types: Notes on the organizational species concept.* Unpublished manuscript, University of Kansas, Lawrence.

Weick, K.E. (1976). Educational organizations as loosely coupled systems. *Administrative Science Quarterly, 21,* 1-19.

Weick, K.E. (1977). Re-punctuating the problem. In P.S. Goodman & J.M. Pennings (Eds.), *New perspectives on organizational effectiveness* (pp. 193-225). San Francisco: Jossey-Bass.

Weick, K.E. (1979). *The social psychology of organizing* (2nd ed.). Reading, MA: Addison-Wesley.

Williamson, O.E. (1975). *Markets and hierarchies: Analysis and antitrust implications*. New York: Free Press.

Zucker, L.G. (1983). Organizations as institutions. In S. Bacharach (Ed.), *Research in the sociology of organizations* (Vol. 2, pp. 1-47). Greenwich, CT: JAI Press.

Received November 9, 1983 ■

Final draft received January 23, 1984 ■

Howard Aldrich is Professor of Sociology
at the University of North Carolina at Chapel Hill.

Bill McKelvey is Professor of Management
at the University of California/Los Angeles.

Dave Ulrich is Assistant Professor of Management
at the University of Michigan.

Erratum

The Fall/Winter 1983 issue of the *Journal of Management,* Volume 9, No. 2, contains an error in the article by Bronston T. Mayes and Daniel C. Ganster titled "A Multitrait-Multimethod Matrix Analysis of the PRF and MNQ Need Scales." While this error does not affect the interpretation of the data or the conclusions reached, it should be noted that in the Analysis section on pages 117 and 118 the term "same-trait/different-method" should read "different-trait/different-method" in reference to the MTMM matrix triangles. Thus, on page 117 in the paragraph headed *Reliability and Validity* the fourth sentence should read:

> The key features of the matrix for validity assessment are the different-trait/same-method triangles (set off with solid lines), the different-trait/different-method triangles (set off with dashed lines), and the validity diagonal (the diagonal values located between the different-trait/different-method triangles).

On page 118 item number 2 should read:

2. The first evidence of *discriminant* validity is obtained by comparing the validity coefficients with other coefficients in the different-trait/different-method triangles. The validity coefficient should be larger than any of the other coefficients located in the same row or column.

On page 118 item number 4 should read:

4. The final test for *discriminant* validity is to show that the pattern of trait correlations is the same in every triangle within the matrix. This test involves both the different-trait/same-method triangles and the different-trait/different-method triangles.