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Hyperturbulence and the Emergence of Type V Environments[1]

Environmental turbulence is a condition that will intensify, not abate. Excessively turbulent conditions that threaten to overwhelm adaptive capacity pose serious, but largely unexplored, research and social policy questions. This paper explores the nature and consequences of hyperturbulence--the condition in which environmental demands finally exceed the collective adaptive capacities of members sharing an environment. The potential for hyperturbulence needs to be recognized and its consequences understood. This is because hyperturbulence can lead to what Emery (1977) calls a "vortical environment"--an environment shaped by forces totally beyond management.

This paper argues that before hyperturbulence becomes endemic and an environment totally unmanageable, members will engage in a partitioning process analogous to social triage (Rubenstein, 1983). Social triage is an effort by members to allocate and protect scarce resources and skills. Social triage involves what Gerlach and Palmer (1981) call the "manipulation of surpluses and scarcities." Partitioning may not be an optimal response at a total environment level, but at least it is a feasible response at a local level. Partitioning occurs because of the inherent limitations of other adaptive responses that members have had available for managing their relations prior to hyperturbulent conditions.

The Emery and Trist (1965) typology of four environmental "textures" is extended to include a fifth type: the partitioned environment. The partitioned environment arises as a result of social triage and partitioning, and contains highly bounded domains called social enclaves and

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social vortices. The Type V environment is not hypothetical; important elements of it already exist, and this paper offers examples to defend this argument. Several propositions are advanced to aid future research about overloaded systems (Metcalfe, 1978:37-55; Rose, 1980).

Because the conceptual framework offered in this paper goes well beyond Emery and Trist, clarification of the concept of turbulence is necessary. Past writings, including those by Emery and Trist, together and individually, have not recognized the highly differentiated impact that threatening environmental conditions have on members sharing an environment. The differentiated experiencing of turbulence by members has significant consequences for the environment as a whole.

Turbulence as a Relative Condition

The concept of turbulence currently is too ambiguous to be very useful. There are at least three reasons for the continuing ambiguity. First, "turbulence" is a metaphor and all metaphors are difficult to operationalize, though such difficulty does not negate their usefulness (Cowan, 1979; Meyer, 1984).

Second, core environmental constructs composed of a very limited number of empirically derived variables will never be consistently reliable. Turbulence, as a condition, is inherently unstable and diffused in its sources and effects. Its effects are not entirely quantifiable; turbulence generates significant qualitative changes that may well be impossible to assess rigorously (Jermier, 1982; Osborn, 1976). This is not to say that attempts at developing objective measures are not needed, only that the reliability and external validity of such measures will be unstable across industries and over time. Carefully designed and conceptually grounded empirical research still needs to be done.

Third, and most importantly, turbulence is not a threshold state passed through by all members of an environment in the same way or at the same

time. The factor making turbulence an unevenly experienced condition is the relative adaptive capacity of members. Although work by Emery (1977), Emery and Trist (1973) and Trist (1968, 1977) has helped to clarify the relationship between turbulence and capacity, a great deal of confusion remains.

Based on these and other references, the two driving forces that promote turbulence appear to be (a) an escalating scale and density of social interaction brought about by population growth and its demands (Tinbergen, 1976; Ward, 1962) and (b) increasing, but uneven, technological innovation that is diffused through all aspects of social activity (Ellul, 1964; Mumford, 1966; Toffler, 1970; Williams, 1982). These two forces result in more numerous and interdependent--but less stable and predictable--relations among the parts of an environment.

High levels of complexity and change are necessary but not sufficient conditions for understanding turbulence. An environment is not turbulent as long as a member has the requisite resources and skills to meet the demands the conditions impose. Only when such conditions become truly problematic--that is, when the level of "relevant uncertainty" (Emery and Trist, 1965) confronting a member makes its continuing adaptation uncertain--can the label "turbulent" be assigned to an environment. Woodward (1982), for example, believes that only ailing organizations having limited capacity experience turbulence. Other organizations within the same industry with sufficient capacity may see dynamic, complex conditions as simply opportunities for innovation and growth. IBM, for example, is better able, due to its size and resources, to weather a prolonged "shake-out" in the microcomputer industry than are smaller competitors. Such a shake-out, in fact, provides an opportunity for IBM, rather than a serious threat to its survival.

Adaptive capacity thus becomes a primary moderator of environmental demands on a member. Members use resources and skills to process information, make sense of their environment and act--whether reactively or proactively--to build, or at least to maintain, their viability

(Thompson, 1967; Weick, 1979). Escalating complexity and change require greater adaptive capacity as regions of relevant uncertainty grow for members. Because adaptive capacities vary from member to member, the intensity and composition of those regions will vary even though members populate seemingly similar transactional and contextual environments. The differential impact of environmental conditions on members is of critical importance. These ideas can be summarized as a proposition:

> *Proposition 1: Perceptions of turbulence as an environmental condition depend on the prevailing level of complexity and change relative to a member's adaptive capacity available for managing those conditions.*

When members are interdependent, differences in their adaptive capacities pose serious implications for adaptation. The more interdependence existing among members, the more serious these implications. Members need to manage their interdependencies selectively in order to minimize the dysfunctional consequences of differences in their adaptive capacities. This situation is expressed as a second proposition:

> *Proposition 2: The capacity of an individual, group, organization or interorganizational collectivity for managing environmental complexity and change is contingent not only upon its own capacity, but also upon the capacities of those sharing the environment with it.*

Of major concern to Emery and Trist is an environment in which complexity and change escalate to an extent that the continuing viability of most, if not all, members is threatened--that is, the environment has become a "turbulent field." To understand fully the implications of Propositions 1 and 2 a better understanding of what constitutes adaptive capacity is first

needed.

Adaptive Capacity and Its Limits

Adaptation is defined as "the ability of an individual or system to modify itself or its environment, when either has changed to the individual's or system's disadvantage, so as to regain at least some of its lost efficiency" (Ackoff and Emery, 1972:125). As used here, adaptive capacity refers to both the amount and the variety of resources and skills possessed by and available within a member's environment for maintaining its viability. Resources are assets such as physical space and access to and control over inputs such as raw materials, financial reserves, services and people. Skills refer to abilities and technologies for understanding and acting effectively on conditions confronting a member. For example, the ability to interpret complex, ambiguous situations and build adequate decision-making models of those situations is a valuable skill for individuals and organizations operating under turbulent conditions.

Resources and skills possessed by members are exchanged and shared on terms and through processes negotiated by those members. In a capitalist society, for example, goods and services are exchanged based on commonly accepted norms and mechanisms such as markets and prices. Collectively, these resources and skills constitute the capacity for spontaneous adaptation by members at a given time. When the amount and variety of resources and skills are neither sufficient nor available for members to manage prevailing conditions effectively, they must find more resources and develop new skills. The appropriateness of prevailing norms and values for allocating scarce capacity also becomes a critical issue (Bell, 1976).

The histories of many societies are characterized by recurring patterns of crisis and response through the development of new resources and skills (DeGreene, 1982; Hannan and Freeman, 1977; Milna and Teune, 1978; Toffler, 1981). Miles (1980) provides a cogent example of these patterns in

the troubled oil-shale industry during the 1970s. At the other end of this "natural selection" approach to adaptation are abundant examples of societies that failed in the search for and mobilization of requisite resources and skills.

An environment's collective capacity for supporting adaptation is difficult to assess. Lindblom's (1965) concept of carrying capacity, Heilbroner's (1974) concept of socioeconomic capabilities for response, Aldrich's (1979) concept of environmental munificence and McCann's (1980) concept of environmental support suggest several possible dimensions of such a capacity. Aldrich, McCann and Lindblom are concerned about the level of slack resources able to be allocated for innovation and adaptation. Without slack resources, active adaptation is constrained because fragile innovations cannot be buffered and nurtured.

Members utilize available resources and skills in responding to environmental conditions. Emery and Trist (1965) attempted to classify the range of environmental conditions in terms of four environmental textures--the placid-random, placid-clustered, disturbed-reactive and turbulent field. Additionally, they linked each texture with an adaptive response tending to dominate or prevail within it--tactics, strategies, operations and multilateral agreements or collaboration, respectively (Trist, 1977).

These four textures can be placed along an evolutionary dimension. This dimension describes and characterizes four successive transformations of structure within an environment as a consequence of ever-escalating complexity and change (Terreberry, 1968). The structure of an environment is measured in terms of the pattern of interdependencies and predictability of relations among members and among the parts of those members' larger environment. As complexity and change escalate, the patterns and predictability of member relations undergo fundamental change and transformation. The duration of a specific environmental type and its characteristic structure depends on the ability of the corresponding response to manage the prevailing level of complexity and change.

The transformation of one environmental type to another appears to be inevitable. This is because of the inherent limitations of each adaptive response in managing the consequences of ever greater density of social interaction and technological innovation. Type I gives way to Types II, III and V. In other words, tactics, strategies and operations become in turn, inadequate and unable to manage the consequences of escalating complexity and change.

The levels of complexity and change prevailing in Type I and Type II textures pose relatively minor contingencies for members. But the contingencies posed in Types III and IV are significant, even unmanageable. For example, large technocratic bureaucracies have been the dominant organizational forms in Type III, disturbed-reactive, environments. Their strategies with respect to other organizations have emphasized autonomous, competitive, reactive and short-sighted behaviors--"operations," in Emery and Trist's terms. Such behavior is maladaptive in that it promotes, not dampens, high levels of complexity and change. Trist (1977:169) notes that this type of behavior has had "longer term more general effects...on wider systems," which these organizations have not considered. Aggregated over the whole society, these actions have led to massive unintended social and economic consequences (Harrington, 1976; Heilbroner, 1965; Lindblom and Cohen, 1979). Similarly, Metcalfe (1974:648) points out that unilateral action by an organization "may have widespread damaging effects if it triggers off uncontrolled positive feedback processes--i.e., if it creates [uncontrolled] turbulence...or deliberately managed 'mutiplier effects.'" The tendency to reinforce, not dampen, complexity and change seems more common than unusual, given the tendency of organizations to undermanage their interdependencies by using adaptive responses inappropriate for prevailing environmental conditions. This tendency leads to the Type IV turbulent field.

Collaboration has been proposed as an adaptive response in Type IV environments because it promotes recognition and active management of member interdependencies. Strategies such as interactive planning (Ackoff, 1981;

Michael, 1973), domain development (McCann, 1983; Trist, 1983) and interorganizational development (Schermerhorn, 1979) recognize the futility of competitive strategies prevailing in Type III environments. Competitive strategies assume zero-sum solutions: some members "win" and others "lose" in terms of adaptation and survival (Friedman, 1982; Walton and McKersie, 1965).

Instead, collaborative strategies attempt to harmonize member goals, emphasize shared values, build "appreciative skills" (Vickers, 1968) and create viable multiorganizational structures to regulate member relations. Collaboration, for example, promotes mutual understanding and provides a positive climate for managing interdependencies. Differing perspectives and values can be shared, information exchanged and trust established among members. Relevant uncertainty is reduced or at least effectively managed. Collaboration also can produce economies of scale, thereby reducing the level of resources needed by a single actor to manage turbulence (Galaskiewicz, 1979). Trist (1983, Vol. III) used to the example of the economic resurgence of Jamestown, New York to illustrate how pooled resources and action can produce significant benefits for individual members.

Unfortunately, collaborative strategies are severely constrained in several ways. Collaboration can be too expensive or too threatening in terms of the amount or variety of resources required to manage it. When needed resources are scarce, or high levels of uncertainty provoke hedging and competitive behavior, sufficient resources will not be made available to support collaboration (Hirschhorn, 1982; Selsky, 1978). Selsky (1978), for example, found severe limits to the level and amount of collaboration possible among a set of labor unions in the health and welfare area. Historical antagonisms, role conflicts and value conflicts posed obstacles. These obstacles were recognized yet maintained by union representatives despite threats to the survival of the unions' health and welfare funds.

Interventions to induce collaboration may be ineffective. Collaboration may be undertaken too late. Conditions may have escalated to a point at which resource sharing cannot, will not or should not occur (Bozeman

and Slusher, 1979). Other inefficiencies may be due to the weakness of the intervention or the inability to get broad stakeholder representation to prevent subversion of the collaborative initiative.

Another major limitation is the inability of members to manage the progressive integration of their values and goals. Interdependencies created through collaboration grow and the systems that are created keep getting larger. Such systems create resource and skill burdens that members could find overwhelming.

Finally, collaboration can be counterintuitive (Forrester, 1971). As Emery and Emery (1976) point out, turbulence enlarges the field of vision and domain of behavior of the individual and organization. This extension of the environment creates a fundamental dilemma. For the individual, "living in a [turbulent] environment requires continuous adaptation to the finer texture of this field but this requirement threatens to overload his perceptual system and [produce] negative adaptation" (Emery and Emery, 1976:38). From a cognitive standpoint, in other words, there is the danger of needing to accept and make sense of increasingly greater amounts of information and interdependencies before a correspondingly greater capacity to do so may be created. Simply to limit the input of information endangers adaptation because critical information can be missed. In sum, there is a need for effective, efficient collaborative strategies but these strategies are inherently limited. The proposition below summarizes the implications of this dilemma:

> *Proposition 3: Unless timely solutions to the limitations confronting the use of collaborative strategies are found turbulence can escalate beyond the range of adaptive capacity within an environment, resulting in another fundamental transformation of its structure.*

Emergence of Type V Environments

Because of limits to collaboration members will begin searching for alternative adaptive responses. In this transitionary period complexity and change have escalated to a point at which members' adaptive capacities are severely challenged and, for many, are overwhelmed. That is, turbulence has become endemic and cases of organizational failure and collapse have become increasingly frequent.

The Emery and Trist typology unfortunately does not suggest the type of environment emerging after the Type IV turbulent field. Is there a return to lower ordered types such as Type I or Type II, or does some fundamentally new type of environment emerge? Only when the core driving forces of complexity and change have lessened can such a reversion to lower ordered types be envisioned. The present authors believe that the Type V environment described below is radically different. The levels of complexity and change characterizing the Type V environments are grossly greater than in lower ordered types. It is feasible, however, that a total collapse of an environment can lead to the reemergence of Type I or Type II structures. Examples of such a reversion can be found--the collapse of the Roman civilization gave way to the Dark Ages, for example. In turn, the emergence of city states eventually led to increased social interaction and change. Accordingly, the primary focus of this paper is on: (1) maladaptive processes that lead to transformation and (2) the most immediate and probable successor type of environment after Type IV. The eventual outcome of unregulated hyperturbulence is left for further speculation, although the reversion to lower ordered types--a repetition of history--is a possible scenario.

As De Greene (1982) notes, escalating turbulence in a system can create a "succession of structural instabilities" which, beyond some point, give rise to radically new, unanticipated processes and conditions. Catastrophe theorists call this event a "bifurcation point" or a "point of singularity" (Prigogine, 1980; Thom, 1975). Although this point conceivably could be a sudden event such as a war or general economic collapse, it need not be. Proposition 4 summarizes an alternative possibility:

Proposition 4: When an environment becomes grossly overloaded, but before hyperturbulence becomes endemic, attempts to partition or segment the environment into domains radically varying in turbulence and adaptive capacities will first occur.

The partitioning or segmenting of the environment represents a midrange condition between a Type IV turbulent field and Emery's vortical, and totally hyperturbulent, environment. Only when partitioning behavior proves ineffective will hyperturbulence become endemic.

Partitioning occurs when members attempt to allocate and protect limited adaptive capacity. Partitioning becomes a likely phenomenon because of the asymmetrical distribution of resources and skills among members. Adaptive capacity at the level of the organization various greatly; for example, abilities to assimilate large amounts of information about the environment can vary significantly from organization to organization. Organizations also vary considerably in their capacities for responding to threats quickly and fully.

Collective adaptive capacities within environments, such as a community or geographical area, also can vary considerably. Collective capacity can be maintained through the unique psychological, social and physical assets of members within such settings (Henderson, 1978). Ouchi's (1980) example of the clan illustrates how shared values and beliefs produced an enduring basis for collaboration and resource sharing during periods of prolonged threat and scarcity in Japan. Callenbach's (1975) vision of Ecotopia, a resource-rich geographic area composed primarily of the Pacific Northwest, provides an illustration of collective adaptive capacity built around natural resources not generally shared by the entire nation.

Importantly, the calls by members on available resources and skills within an environment will be uneven because of differences in capacities. The industrialized Northeast, for example, is experiencing a prolonged decline in fiscal and human resources because of the overwhelming

needs of its cities and loss of resources to other parts of the nation attributable to migration and national economic policies (Reich, 1983). Further prolonged deterioration of services, even the fiscal and social collapse of some cities and communities, remains possible as demands begin to exceed capacity. Organizations in this environment require resources and skills well beyond the perceived capacity of the environment to provide. More specifically, an entire community such as the South Bronx in New York, may be so limited in adaptive capacity that the provision of needed resources, such as city fire and police protection, may be withdrawn because requirements are simply too great. At larger levels of analysis, some Third World nations have moved or will be moving into a new classification, the "Fourth World." This is a result of serious climatic shifts, wars and the failure of the global economic system to provide sufficient resources and skills for development. These Fourth World nations become the "basket cases" for which available help will never be sufficient. They represent extreme cases of environments in which collective capacity is totally overwhelmed.

In such situations, social triage may well occur (Rubenstein, 1983). Available resources and skills will be collected and protected by those best able to utilize them. Those unable to do so, along with those demanding resources and skills beyond available capacity, will be deprived. For resource- and skill-rich members, defense of their existing domain becomes primary (Broskowski, O'Brien and Prevost, 1982). Resource- and skill-needy members, on the other hand, are left to adapt as best they can. Redefinition of their domains and reductions in their scale of operations become essential if even limited adaptation is to continue. Failure and collapse become significant prospects.

Social triage as a policy and as an allocation process clearly is undesirable for humanistic and ethical reasons. However, ethical standards can prevent social triage only as long as agreement can be maintained about the desirability of those standards and effective means exist for enforcing them. The use of markets and prices in a capitalist economy may well

reinforce social triage. This is because the ability to compete for additional resources and skills in a market is largely a function of existing capacity. Organizations, for example, are priced out of markets when the risk of providing resources to them is perceived to be excessive.

To illustrate this point, consider subsidies and loan guarantees provided to ailing industries and organizations such as Chrysler. Subsidies and guarantees are used to induce resource allocation to excessive risks and represent active management of environmental conditions to prevent hyperturbulence. Inducements will occur only when slack capacity exists in the larger environment and the consequences of not providing capacity pose unacceptable costs for those having significant interdependencies with risky members. If slack capacity did not exist, if worker and supplier interdependencies were limited or could be lessened, and if prevailing ethical standards were not supportive, would allocation still occur? Specifically, if Chrysler workers could not afford pay and benefit reductions, if other jobs with equal pay were available elsewhere and if strict market-and-prices ideology were adhered to, would loan concessions have been made? Conceivably not. These issues can be stated as a proposition:

> *Proposition 5: Social triage implies that the gap between those with and those without sufficient adaptive capacity will increase, not lessen, under turbulent conditions. The rate at which this gap grows will be a function of: (a) how quickly turbulence accelerates; (b) the amount of excess capacity within an environment; (c) the ability of members to minimize the dysfunctional consequences of their interdependencies with other members and (d) the type and enforceability of prevailing ethical standards.*

Social Enclaves and Vortices

Partitioning as a result of social triage gives rise to two very different types of coexisting, highly bounded domains within an environment: social enclaves and social vortices. Behavior by members that effectively protects adaptive capacity creates social enclaves. At the opposite extreme are populated domains of very low adaptive capacity relative to the surrounding environment. These domains are called social vortices. The Type V environment is unlike any other type postulated to date. Social enclaves are surrounded by higher levels of complexity and change; social vortices are surrounded by lower levels. Enclaves and vortices can coexist contiguously if partitioning proves effective. Boundaries between domains are actively managed and a "closed-system" logic prevails.

Creating Social Enclaves

A social enclave is a domain of less turbulent, more manageable social space that is created and protected by one or more members. Enclave members selectively manage their relations with each other while defending their shared domain from external demands. An enclave represents defensible space in which localized adaptation and development can continue to occur when selective decoupling is effective (Ignatius, 1982; Weick, 1979).

Ouchi's (1980) example of the clan illustrates an enclave formed by a group of individuals for mutual survival. Contemporary survivalist communities created out of fears of a general economic collapse are examples of social enclaves formed by individuals solely for mutual defense (Rivers, 1975). The monastery in the Dark Ages is an example of a social enclave that successfully preserved and cultivated learnings from earlier ages (Stavrianos, 1976). At still larger levels of analysis, Callenbach's (1975) Ecotopia is a hypothetical geographical area capable of decoupling and functioning independently from the rest of the United States. Nations, too, can act as social enclaves when the larger environment of which they are a part threatens them. South Africa, for example, selectively and forcibly manages its

boundaries with its neighbors.

The emergence of enclaves within an environment is not an unusual phenomenon. Enclaves form whenever a group of members attempt to create a shared, unique identity for defending scarce resources and skills from both real and perceived threats. Boundaries are created and enforced through rules and norms that define membership and through physical barriers such as geography. Three possible criteria for enclave membership are stated as a proposition:

> *Proposition 6: Three criteria for obtaining membership in a social enclave are: (a) the adequacy of a member's current adaptive capacity; (b) its ability to contribute excess capacity and build the capacity of others within the enclave and (c) the compatibility of the values and goals of prospective members.*

Although social enclaves are a natural phenomenon, it is the threat of hyperturbulence that accelerates their formation. Hyperturbulence means that many interdependencies among members have become dysfunctional and impossible to manage on a nondiscriminatory basis. It simply is more efficient and viable to decouple from those relations that tax capacity and build those relations that promise to maintain capacity.

When decoupling occurs throughout an environment, the field appears to be segmenting. Gerlach and Palmer (1981), for example, talk about an "involution of structures" when continued expansion of tribal societies falls. Involution is characterized by an increased emphasis on resource efficiency, boundary management with other tribes and the regulation of consumption to maximize group--not individual--survival. Resource diversification is controlled and cooperative structures emerge within the tribe that regulate member behaviors through strong rules, beliefs and customs. Hence the effectiveness of enclave formation depends on several factors:

Proposition 7: The rate and extent of enclave formation depends on: (a) the abilities of members to differentiate among their functional and dysfunctional relations; (b) the speed at which they can break off undesired relations by becoming self-sufficient or minimally dependent on others with needed capacity and (c) their ability to create and enforce boundaries.

Encapsulating Hyperturbulence

Domains in which hyperturbulence prevails are called social vortices. A social vortex contains members who collectively lack sufficient adaptive capacity relative to prevailing environmental conditions. These are the "have nots" in terms of requisite resources and skills.

In a social enclave, the boundary between it and more turbulent areas of the environment is maintained by members within the enclave. Conversely, vortices are created when members within the larger environment attempt to isolate and contain those members experiencing hyperturbulence within a manageable, nonthreatening space. If successful, hypterturbulence thus becomes a localized state. The motivation for such behavior exists because demands for needed resources and skills within a vortex may be so great that the viability of members in the larger environment is itself risked if demands are met. The objective for members of the larger environment, out of necessity, is to decouple from interdependencies with members within a social vortex.

Social vortices are analogous to problem situations for which no perceived realistic solutions exist in the short run. Within a social vortex, attempts at collaboration either will be highly fragile, episodic and prone to setbacks or will be impossible because of the limits to integrative strategies (discussed earlier). Small local successes in adaptation may be achieved but, on the whole, the trend is one of continuing decline and greatly suboptimal functioning by vortex members. Food cooperativess, building renovation

projects and alternative energy experiments can be found in the South Bronx, but such efforts are fragile at best.

Contemporary examples of social vortices unfortunately exist. The example of the South Bronx illustrates a clear partitioning and active maintenance of boundaries between parts of a large urban setting. Northern Ireland and Lebanon also illustrate the deeply enmeshed, pathological qualities of social vortices. In both cases, active efforts are made to contain the conflicts within definable space. Entry and exit into those areas, for example, are intensively monitored and regulated. The formation of social vortices depends on several factors:

> *Proposition 8: The rate and extent of social vortex formation is dependent on: (a) the availability of adaptive capacity relative to demands on that capacity within a domain and (b) the ability of larger members in the environment to decouple from and enforce boundaries around domains of low capacity. If demands on capacity are excessive and boundaries cannot be enforced, a vortex will grow as adaptive capacity is dissipated.*

Partitioning as a Dynamic Process

The partitioned environment is dynamic, not static. Domains--whether enclaves or vortices--shift in size, location and membership over time. Their rates of change can vary significantly. Some enclaves may form more readily than others; still others may collapse. Some social vortices may intensify and expand; others may shrink when turbulence moderates. Using the industrialized Northeast again as an example, suburbs outside a deteriorating urban core may grow and prosper. Meanwhile, other suburbs may be drawn into the dynamics of the urban core as city boundaries change or crime spreads outward. Many of the worst parts of an urban core may become unpopulated and unserviced.

Summary and Implications

The partitioned environment is one scenario for environments that have begun to overwhelm their members' adaptive abilities. In this scenario, segmenting and bounding will occur as more and more members confront unmanageable levels of complexity and change. Attempts to preserve and protect adaptive capacity at a domain level result in social enclaves. Attempts to encapsulate hyperturbulent domains create social vortices.

Collaboration may occur but will not be successful at a total environment level to the extent needed to bring those conditions within the range of existing adaptive capacity. Collaborative strategies are constrained for several significant, perhaps determining, reasons. Nor is the continued use of strategies prevailing in Type I, II or III environments appropriate; indeed, these not only are inadequate but are maladaptive and tend to promote turbulence, not lessen it.

Whether environmental conditions can be managed before hyperturbulence results and partitioning becomes likely is not clear. The positive short-term benefits of partitioning are apparent. From the perspective of members of a social vortex, the dysfunctional consequences of partitioning are equally obvious. Long-term benefits and costs to an environment are less certain. On the one hand, the monasteries of the Dark Ages preserved invaluable skills and knowledge from the Roman era for many generations. On the other hand, isolating and buffering the larger society from profoundly disruptive and demanding problem settings, such as the South Bronx, may violate contemporary notions of human morality and rights. Nonetheless, as resources become scarcer and turbulence becomes more widely experienced, the partitioning of environments or of entire societies becomes a more likely scenario.

Such a scenario, it has been argued, more likely is due to the current limited conceptual appreciation of turbulence. To study turbulence in

terms of objective, quantifiable measures of environmental dimensions is to ignore the qualitative nature of turbulence and the role of member adaptive capacity in moderating its consequences.

A great deal more theory-building and empirical research are clearly needed in this area. Several specific research issues can be identified. First, additional research is needed to understand how technology and density of interaction promote change and complexity. Clarification of Emery and Trist's (1965, Vol.III) concept of relevant uncertainty also is needed. The word "relevant" implies that uncertainty per se is not problematic, only certain types of uncertainty, and these types can vary from member to member.

Second, turbulence as an environmental condition is contingent on the adaptive capacities of those experiencing it. Complexity and change create a turbulent condition when requisite resources and skills are strained. The linkage between environmental conditions and adaptive capacity as a moderating variable needs to be explored more thoroughly.

Third, because individuals, groups, organizations and interorganizational collectives are so integrally linked, research studies need to explore more actively how these different members help and hinder each other in managing turbulence. Research using multiple units of analysis, though complex, is greatly needed. By implication, efforts to build capacity must occur at multiple levels of analysis. Building sophisticated new planning and decision-making systems at an organizational level may help a corporation deal with greater complexity and change. But it may prove ineffective unless the individuals using those systems are faring well in their attempts at managing their own dynamic and complex personal environments.

Fourth, it remains unclear whether transformations of environments from one "texture" to another is an abrupt or gradual process. Nor is it clear whether an environment uniformly or differentially undergoes transformation. The nature of these transformations is a critical issue

because the ability to adapt to a gradual shift is more likely than to an abrupt shift. Similarly, differentially experienced transformations of an environment may allow more concentrated, concerted adaptive responses. Historical examples of all forms of transformation probably can be found. A clearer understanding of the advantages and limitations of each form is needed.

Fifth, and very important, solutions to the limitations of collaboration must be found. How, for example, can the costs and perceived threats to autonomy be minimized in collaborative efforts such as nuclear disarmament or the resolution of conflict in Northern Ireland? What alternative strategies can be effectively utilized without aggravating those situations? Creating and legitimizing alternative strategies built around more appropriate, humane values are tasks demanding attention.

Sixth, assuming that hyperturbulence emerges and partitioning through social triage occurs, the operational and practical implications for members need to be defined. How prevailing norms and values will be enforced, for example, is a critical issue. To what extent should the poor and disadvantaged in a society be protected? If "free market" capitalism prevails and protection becomes a function of political and economic power, such groups will not fare well. On the other hand, the limitations of centralized regulation and intervention by government in macro-social processes also have been proven. Can an equitable negotiated order ever be created under overload conditions? Such questions need conscious consideration to prevent de facto, unmanaged solutions.

In terms of business strategies for preventing hyperturbulence, enclave and defender strategies (Miles and Snow, 1978) would become dominant. Distinctive competencies and competitive advantages would become defined in terms of the collective adaptive capacity of those sharing an enclave. Synergies among potential enclave members would be actively sought and built. Explaining mergers and divestitures in terms of attempts to cope with environmental turbulence may be possible, for example. Given the recent

interest in creating an industrial policy (Reich, 1983) and the trends toward protectionism, it appears that many industries are actively seeking new resource allocation criteria to supplant those of free market capitalism. Other interpretations of hyperturbulence's implications for business firms are needed.

Finally, how long and how effectively partitioning occurs likely depends on many variables as yet undescribed. One of the most promising areas for further research is the empirical study of how individuals and organizations actually adapt under conditions of extreme turbulence. How do people caught up in war, for example, go about their daily routines? What psychological and social mechanisms fail and what others emerge? How do systems facing severe overloads of demands relative to capacity deal with their condition? These questions also await attention. Catastrophe and crisis management theorists could contribute in answering these questions. It is essential that a broad-based, multidisciplinary research strategy be implemented soon. This paper is offered as a first step in that direction.

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