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Organizational Restructuring: Community Response to Natural Disaster

John G. Crooks
College of William & Mary - Arts & Sciences

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ORGANIZATIONAL RESTRUCTURING:
COMMUNITY RESPONSE TO NATURAL DISASTER

A Thesis

Presented to

The Faculty of the Department of Sociology
The College of William and Mary in Virginia

In Partial Fulfillment
of the Requirements of the Degree of
Masters of Arts

by

John G. Crooks

1988

APPROVAL SHEET


This thesis is submitted in partial fulfillment of
the requirements for the degree of

Master of Arts

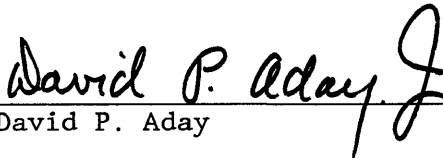


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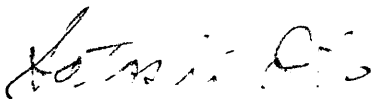
Approved, January 1988



Gary A. Kreps



David P. Aday



Satoshi Ito

DEDICATION

To Jane G. and Benjamin N. Crooks.

They sacrificed so much, yet asked for so little.

Thank you.

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ABSTRACT

Kreps' (1985) structural code and taxonomy of organizing is used to describe organizational changes during the emergency period of a flood. The methodology Linn (1986) used to capture organizational changes in response to a tornado is replicated and refined. Kreps' code allows for the qualitative description of what takes place and Linns' methodology allows for the quantification of the detailed descriptions and comparisons within and across organizations and disaster events. An important advancement is the methodology for describing each case of organizational change (see Appendix A). Other refinements include the following: (1) analysis of restructuring (1-4 element changes) temporally at each level (degree) of change; (2) construction of a pure Guttman scale to measure rhythmic tendencies; (3) use of a electric motor metaphor to analyze rhythm; (4) establishment of formal criteria to measure periodicity; and (5) development of a hierarchical approach to define forms, chains, sequences, and life history. Differences between the tornado and flood studies of organizational change relate to event characteristics (e.g., the flood had a forewarning period) and the type of enacting social units studied (many units responding to the flood had emergency experience and/or training). The findings suggest that disaster experience, training, and formal planning reduce symbolic milling during the emergency period of a disaster.

ORGANIZATIONAL RESTRUCTURING:
COMMUNITY RESPONSE TO NATURAL DISASTER

INTRODUCTION

Linn (1986) conducted a study of a natural disaster (tornado) which applied Kreps' conception and taxonomy of organizing (Kreps, 1983; 1985a; Bosworth and Kreps, 1986; Saunders and Kreps, 1987). His focus was not on the origins of organization, but rather on its changing or restructuring. Linn's major task was to capture the dynamics of restructuring at the empirical level by examining a mental health delivery system in the aftermath of the tornado. I have replicated and refined Linn's methodology in examining community responses to a flood which occurred in 1972. The significant differences between our studies are (1) the type of natural disaster studied and (2) the types of organizations analyzed. These differences allow for comparisons of different disaster events and enacting organizations. As with Linn, my data base was developed from archival materials housed at the Disaster Research Center (University of Delaware).

My thesis is formatted in the following manner. First, Kreps' conception and taxonomy of organizing are presented and discussed. Second, Linn's methodology and its application to the present study are outlined. Third, findings from the present study are presented and compared to Linn's findings. In doing all the above, conceptual innovations and/or refinements of Kreps' and Linn's approaches are proposed. The thesis concludes with a summary of major findings and conclusions, and a critique of Kreps' research program.

KREPS' CONCEPTION AND TAXONOMY OF ORGANIZING

In his studies of organizational responses to disasters Kreps proposes a structural code consisting of four elements. Each of the elements represents a unique dimension of structure, and each may be present individually or in any combination with one or more of the other elements (Bosworth and Kreps, 1986; Saunders and Kreps, 1987). Kreps (1985a:51) argues that the four elements are "individually necessary and collectively sufficient for organization to exist" (emphasis added). These core elements are DOMAINS (D), TASKS (T), RESOURCES (human and material) (R), and ACTIVITIES (A). As defined by Bosworth and Kreps (1986), domains (D) and tasks (T) are structural ends of organization, and resources (R) and activities (A) are its structural means. Each element is analytically distinct, and no ordering is assumed to be more frequent or important. Individually they are defined as follows.

Domains--(D)

"Domains (D) are collective representations of bounded units and their reasons for being" (Bosworth and Kreps, 1986:700). Drawing from Durkheim, Kreps refers to collective representations as generalized (external to given individuals) information which indicates what is taking place and facilitates time and energy use in the performance of organized activities. In short, domains are "socially produced ideas of shared membership and common activities" (Kreps, 1986a:8).

Domains point to the open system character of organizations. They are evidenced by communications between social units' members or others connected in some fashion at the boundaries of the organization. As such, domains can be legitimated internally and externally (Kreps,

1985a:53). However, in order to delineate boundaries domains are, by definition, externally legitimated (Farmer, 1986). This means that some entity or authority external to the social unit must acknowledge the social unit and what it does. This does not mean that each social unit has a unique domain. As Kreps (1986a:8) states: "the performance of many domains are up for grabs," with various social units having the same (yet independent) domain(s). For instance, police and military organizations could each be involved in search and rescue. It could also be that search and rescue efforts by these separate organizations result in a new (emergent) organization.

Tasks--(T)

"Tasks (T) are collective representations of a division of labor for the enactment of human activities" (Bosworth and Kreps, 1986:700). As such, they indicate how a domain is accomplished. Tasks are found in written or stated communications among participants. In contrast to domain, tasks point to organization as closed system (Kreps, 1985a:53). Tasks give internal focus and clarity and are legitimated by participants within the social unit. Task structures may be simple or complex, and, like domains, they can emerge as a result of the event or exist prior to it.

Resources (human and material)--(R)

"Resources (R) are individual capacities and collective technologies of human populations" (Bosworth and Kreps, 1986:700). They include people and their many attributes, as well as commodities and equipment. Resources vary in quality, quantity, and kind (Kreps, 1986a:10). It should be noted that "the presence of resources does not necessarily mean that the actions of individuals or social units are

conjoined in any meaningful sense of the term" (Kreps, 1986a:11). The resources may be available to a social unit, yet may not be utilized by members.

Activities--(A)

"Activities (A) are the conjoined actions of individuals and social units" (Bosworth and Kreps, 1986:700). As such, they link the organization's raw materials (human and material resources) with collective representations (domains and tasks) of what is happening. However, "the fact that people enact activities, are themselves resources, and communicate (formally and informally) domains and tasks does not mean that structure reduces to action as opposed to order" (Kreps, 1985a:53). Activities may initiate the origins or come into play at any time in the organizing process.

Summary

The presence of all four elements indicates that organization exists. As defining characteristics of organization, each element is unique. Analytical primacy is not given to either ends (D,T) or means (A,R). All are grounded equally in the human actor, as reality and creator of social structure, and the social unit, as reality and constraining force (Linn, 1986:3).

SYSTEM STATES

Kreps develops a processual theory of organizing. In so doing, he presents three system states of an organization's existence (Dubin, 1978): origins, maintenance, and suspension. With some exceptions (Linn, 1986; Farmer, 1986), the primary focus of earlier work has been

on origins. In this system state, "organization is in a state of becoming" (Linn, 1986:3). The individual elements (D, T, R, A) emerge in stages until all four are present. For instance, in an R-D-T-A form of association the first stage has one element present (R), the second has two elements present (R-D), the third has three elements present (R-D-T), and the fourth has four elements present (R-D-T-A). It is only at this last stage, where all four elements are co-present in time and space, that organization exists.

Table 1 presents Kreps' taxonomy of 1-4 element forms of association. The forms are logically derived from all possible combinations of the four elements (64 total forms of association). The taxonomy includes 4 one-element forms; 12 two-element forms; 24 three-element forms; and 24 four-element forms. With 64 total forms of association, 24 of them capture organization (4 elements present). With respect to origins, the remaining 40 forms (1-3 elements present) represent organizing in process.

The system state of maintenance begins when all four elements are present. In the maintenance state the elements are "restructured" to meet new demands placed upon the organization. Restructuring "is the term used to reference instances of change in an organization's elemental values" (Farmer, 1986:6). As such, it is a sensitizing concept for describing what goes on once organization has come into being. For instance, several pharmacists offer and are used to assist a hospital that is in need of their skills (an increase in resources for the assisted hospital). This example illustrates a simple restructuring of the hospital (one element form, R). However, changes can occur in one, two, three, or all four of the elements. If one element

Table 1: Taxonomy of 64 Forms of Association

<u>One Element Forms</u>	<u>Two Element Forms</u>	<u>Three Element Forms</u>	<u>Four Element Forms</u>
D	D-T	D-T-R	D-T-R-A
T	D-R	D-T-A	D-T-A-R
R	D-A	D-R-A	D-R-A-T
<u>A</u>	T-R	D-R-T	D-R-T-A
	T-A	D-A-T	D-A-T-R
	T-D	D-A-R	D-A-R-T
	R-A	T-R-A	T-R-A-D
	R-D	T-R-D	T-R-D-A
	R-T	T-A-D	T-A-D-R
	A-D	T-A-R	T-A-R-D
	A-T	T-D-R	T-D-R-A
	<u>A-R</u>	T-D-A	T-D-A-R
		R-A-D	R-A-D-T
		R-A-T	R-A-T-D
		R-D-T	R-D-T-A
		R-D-A	R-D-A-T
		R-T-D	R-T-D-A
		R-T-A	R-T-A-D
		A-D-T	A-D-T-R
		A-D-R	A-D-R-T
		A-T-D	A-T-D-R
		A-T-R	A-T-R-D
		A-R-D	A-R-D-T
		<u>A-R-T</u>	<u>A-R-T-D</u>
4	12	24	24

Total Forms of Association = 64

restructures, it is considered a single element restructuring. When more than one element changes it is classified as a multiple element restructuring. As Linn (1986) and Farmer (1986) have illustrated, it is possible to identify sequences of restructurings over time for a single organization (e.g., A-T-R, A-T-R-D, T-R, T-R-A, R, D-T). Each restructuring in a sequence can be any one of the 64 forms of association found on Table 1. The parenthetical letters indicate which elements have changed and their ordering. Therefore a D-T-R-A form of restructuring indicates that all four elements changed and the temporal sequence was D first, T second, R third, and A fourth.

As with origins, the process of maintenance (restructuring) can be articulated as either ends- or means-initiated. With means-initiated restructurings the organization's resources (R) and activities (A) are changed while domains (D) and tasks (T) remain relatively fixed (Farmer, 1986)¹. This indicates that changes in social action (activities) or what to work with (resources) occur either before or without changes in the ends of organization. In either case, when a means-related element is changed initially any resulting form is considered means-initiated. In contrast, ends-initiated restructurings are changes in the division of labor (tasks) and/or collective representations of the organization's focus (domains), either before or without changes in the means of organization (Farmer, 1986).

Too much restructuring of either ends or means could be detrimental to an organization. If emphasis is on the ends of organization (D or T), there is the possibility of confusion or uncertainty about the organization's goals and operations. On the other hand, if changes in means (R or A) are stressed, an organization may become inflexible in a

changing environment (Farmer, 1986; Linn, 1986). It is possible that the balancing or interplay among changes of means and ends enhances the viability of organization (Kreps, 1986b). In the final system state, that of suspension, organization no longer exists. This occurs when one of the four elements is no longer present. For instance, an organization might lose all of its personnel (resources) or external legitimation for what it was doing (domain).

ENDS- AND MEANS-BASED CHANGES: ORIGINS VERSUS RESTRUCTURING

Kreps (1985a) derives a continuum to express the origins of organization with the polar extremes being D-T-R-A and A-R-T-D. As will be highlighted below, the continuum (Table 2) can also be used to illustrate ends- and means-based restructuring when an organization already exists. Domains (D) and tasks (T) are the elements representing ends and "symbolize structure from an order perspective" (Kreps, 1986b:2). A D-T-R-A form of origins is considered "order-driven because collective representations of what is to be done (D) and how (T) precede what takes place" (Kreps, 1986b:3). Thus "ends" (D-T) precede "means" (R-A) in time and space. Conversely, resources (R) and activities (A) are the elements representing means and "symbolize structure from an action perspective" (Kreps, 1986b:2). An A-R-T-D form of origins is "action-driven because things happen before there are collective representations of what is going on" (Kreps, 1986b:3). At this polar extreme "means" (R-A) precede "ends" (D-T) in time and space.

Table 2 presents numerous forms at origins that are not dominated by either ends (D-T) or means (R-A)². Of the 24 organizational

Table 2: Origins Metric

<u>Organizational Forms</u>	<u>Logical Metric</u>	<u>Number of Forms</u>
D-T-R-A	+3	(1)
D-T-A-R D-R-T-A T-D-R-A	+2	(3)
D-R-A-T D-A-T-R T-R-D-A T-D-A-R R-D-T-A	+1	(5)
D-A-R-T T-R-A-D T-A-D-R R-D-A-T R-T-D-A A-D-T-R	0	(6)
T-A-R-D R-A-D-T R-T-A-D A-D-R-T A-T-D-R	-1	(5)
R-A-T-D A-T-R-D A-R-D-T	-2	(3)
A-R-T-D	-3	<u>(1)</u>
	Total	(24)

forms (all four elements present), the "22 forms between D-T-R-A and A-R-T-D, and the remaining 40 non-organizational forms subsumed by them, suggest varying degrees of continuity and discontinuity between the ends and means of collective life" (Kreps, 1985a:57).

Empirical Illustrations

Below are three illustrations of element relationships at the origins of organization. These also signify each of the four stages of origins. All the examples are drawn from Kreps' work with DRC archival materials.

Example 1: Four Element Form A-R-D-T

Flood waters rise over a period of several days in the impacted community and are monitored. Flooding eventually covers much of an urban area and virtually the entire downtown of its major city. There are few deaths or injuries but extensive property damage. Major flood conditions prevail for over a week. The police department initially is involved in traffic control during the emergency period, but that action terminates with the complete inundation of central city streets. Several citizens with boats docked in the downtown area conjointly begin evacuating people from buildings. Their preliminary actions are independent of anything being done by the police department. In fact, police officials note that, at this point, they are looking for something to do. There has been no planning for what follows. Having a few boats of their own, the police coordinate their evacuation actions with those of private citizens (A). The need to evacuate the entire downtown area quickly becomes apparent. A large number of boats from other private owners, the Bureau of Land Management, the fire department, and the military are provided. The latter public bureaucracies also offer personnel to drive some of the boats, and some citizen volunteers respond to the same need. By now, the majority of police personnel have become involved because they are available, in close proximity, and know where to take evacuees (R). The following morning, local government leaders declare the downtown evacuation as the responsibility of the police department (D). This is questioned briefly but then legitimated by state and military officials. The police then quickly develop a rather complex task structure--one that involves location, notification, dispatching, and refueling of boats, assignment of police personnel to all boats, and coordination of water and ground transportation to move evacuees

to shelters (T). About 5000 people are evacuated during the next 3-4 days. The operation is maintained by the police department until the demand is met.

Example 2: Four Element Form D-T-R-A

Evacuation of a potential flood plain is enacted by a fire department prior to impact. A river runs through a large metropolitan area. A state police unit wires the city fire department with information that the river is at flood level, that flood waters are causing considerable damage upstream, and that flood conditions are expected to reach the city within several hours. A fire department communications operator contacts the fire chief who then puts the fire department on standby alert. The fire department is schooled in evacuation procedures through pre-disaster preparedness activities. After being notified by the operator, the fire chief goes to the site of the initial city police command post and informs police personnel of his intention to evacuate low lying manufacturing and residential areas of the city. Following this discussion there is agreement that the fire department will handle the evacuation of selected low lying areas (D). Upon receiving additional information from the local police and water departments, the chief decides to divide the fire department's equipment and personnel into two sections, one on each side of the river, to ensure an adequate distribution of resources for both evacuation and fire protection. Working through the normal chain of command, he orders fire personnel to mobilize and relocate people and possessions below 1000 feet from the bank on each side of the river (T). Fire department personnel and equipment are then deployed according to the chief's dictates (R). While the threatened population already has been warned of flooding via the mass media, fire department personnel move door to door in order to evacuate all residents in the selected lowland areas. There is sufficient time prior to flooding to both evacuate those threatened and recheck the areas covered (A). Several threatened individuals choose to remain anyway, arguing that they must protect or secure their property. Some of those who remain are stranded. The evacuation of those stranded by high water is then accomplished by using fire department boats. As conditions become more severe, larger boats are requested by the fire department and several are volunteered. The evacuation is terminated shortly after impact when all those stranded have been successfully evacuated. In the face of considerable property damage, there are no deaths or serious injuries resulting from the flood.

Example 3: Four Element Form D-R-A-T

A temporary morgue is set up after a tornado. The county coroner is not a doctor but a local funeral director. He has no

coroner's office, no staff, and no morgue. Normally, he simply signs autopsies after they are completed by hospital pathologists. After the tornado, spokesmen for the only local hospital say their staff cannot handle those killed by the event. A discussion by the coroner and two pathologists at the hospital leads to a decision to set up a temporary morgue. The coroner requests use of the local YMCA for the morgue. The YMCA director accedes to the request (D). The coroner, the two pathologists, a licensed embalmer, and a marine recruiter go to the YMCA. The YMCA provides several rooms and a couple of staff (R). Concurrently, ambulances start bringing bodies to the morgue; people come to the morgue concerned about the missing; bodies start to be identified (no autopsies are done and none is intended): and ministers who stop by or come with concerned residents start attending to the needs of the bereaved (A). The need for "organization" is expressed by the key participants. The identified and unidentified dead are physically separated, with the two pathologists attending to them. The licensed embalmer and marine recruiter take on paper work tasks. The coroner maintains liaison with the hospital, funeral homes, and next of kin. Two ministers are asked to remain and attend to the needs of the bereaved at another location in the building (T). The morgue closes about 24-30 hours after it opens.

Each example illustrates a four-element form of association. They all represent organization, yet vary as to whether means, ends or neither dominate the process. The first example expresses means domination, the second ends domination, and the third neither means nor ends domination.

Using disaster events as catalysts, Kreps earlier treated all of the above (and several hundred other) cases as emergent organizations. His reasoning was that when disasters occur many existing units do not act at all and others undertake activities which are unrelated to pre-disaster routines. However, there is an alternative way to interpret the first and second examples. In these cases, the units already exist prior to the disaster. Only example 3 indicates a circumstance where there was no pre-disaster unit. What has been captured, therefore, in the first and second examples is the realignment

of the four pre-existing elements as each was restructured to accommodate the unusual demands of the emergency. As such, the first two examples illustrate restructuring of existing organization during the maintenance state. The first evidences means-initiated restructuring and the second ends-initiated restructuring. Only the third example depicts the origin of organization in the pure sense of the term.

I conclude that (1) only emergent social units unambiguously capture origins, (2) changes of pre-existing social units more appropriately reflect restructuring, and (3) these pre-existing units need to have their pre-impact elements identified (not necessarily ordered) so that restructurings and suspension can be more clearly documented.

APPLICATION OF LINN'S METHODOLOGY

Consistent with Linn's study, I focus on various forms of association that are implicated as restructurings of existing organizations (maintenance state). To capture these restructurings, I have (1) documented changes in domains (D), tasks (T), resources (R), and/or activities (A), and (2) described their patternings as alternative forms of association (1-4 elements present). My unit of analysis is "the instance of restructuring: one that is spatially and temporally bounded" (Linn, 1987:7). This means that within a particular time period the four elements co-exist and are changing. The disruption of a disaster highlights these restructuring processes. The unique demands serve as dramatic catalysts for change in any one or all of the

elements of an organization.

Kreps' structural code has therefore provided the foundation for describing how existing social units restructured. Special attention has been given to the measurement of (1) means and ends relationships, (2) temporal dimensions, and (3) other characteristics of the social units that might offer further insights about the processes of restructuring. I use data derived from interviews and documents obtained from the Disaster Research Center at the University of Delaware. A total of 103 interviews with organizational participants were obtained during the flood and in the following 18 months. The interviewees were direct participants in either established or emergent social units. As with all the disaster studies following Kreps' lead, the archival materials were collected initially for purposes other than what they are used for here. Therefore, some of the probing questions which would have been helpful for this study were not asked.

The "methodology used is both qualitative and quantitative" (Linn, 1986:16). Restructuring is initially captured and measured through qualitative descriptions of what occurred. The pattern of the elements in each restructuring is then expressed quantitatively. The strategy I employ is similar to that used by Linn with one exception. Lack of specific information in the data precludes analysis of spatial variables in the present study. Discussed below is one example drawn from my data file to illustrate the type of descriptive information I generated from the interviews. Appendix A provides a summary of all restructurings documented for 21 social units.

Enacting Unit: Local Government Agency

The following example depicts the documented restructurings enacted by a local government agency (Unit 15 in the Tables). The restructurings are presented chronologically. Note that one, two, three, and four element forms are described.

Sequence of Restructurings: A, T-D-A-R, T-R, A, T-A, T-A-R, A, R-A, T-A, A-T, T-R-A-D

The enacting unit was the local affiliate of a state agency. The impacted area was included in its assigned territory (the surrounding county). Physically located in the impacted area, the unit maintained a staff of 10 employees and volunteers. The unit's pre-disaster domain included emergency preparedness, training, and hazard monitoring. Initiation of disaster related activities for the enacting unit began 37 hours prior to the event (event in this study is the breach of a dyke). Its total time of involvement in disaster related activities was 7 days and 17 hours.

The catalyst for the first restructuring was the unit's notification of an official flood warning. The warning was received about 38 hours prior to the event. The elapsed time from catalyst to change in the unit's routine activities was about one hour. The restructuring is depicted as an A form in the taxonomy. The metric score for this single element restructuring is -4, in this case indicating a change of means only. The warning message prompted the top official of the unit to cancel a previously scheduled commitment and call an unscheduled staff meeting. At that meeting the staff considered steps which might have to be taken and potential units to be notified should the magnitude of the emergency increase significantly. The staff also computed the potential impact of the predicted 25 foot crest of water on the surrounding area (A). But because of the lack of urgency perceived by unit members at this time, no emergency domain or tasks for the unit were identified.

The catalyst for the second restructuring was an updated prediction of a 30 foot flood crest. This message was received 15 hours prior to the dyke failure. The restructuring which followed is a T-D-A-R form in the taxonomy. The metric score for this form is +4, indicating a strain towards ends-based restructuring. The elapsed time from the catalyst to the first element change was about 1 hour, from first to second element change about 15 minutes, from second to third element change

about 1 hour, and from third to fourth element change about 15 minutes. Total time of restructuring for this restructuring was about 2 hours and 30 minutes. The documented pattern of element changes is as follows: Within an hour after receiving the 30 foot crest prediction, the top official of the agency determined that two hospitals in the projected flood area would have to be partially evacuated and that his people would take the necessary steps to ensure compliance. The resulting expansion of the unit's task structure was undertaken. This included notifying the two hospitals to partially evacuate and notifying three other hospitals to prepare for possible evacuees (T). In considering this change of normal activities, the staff assumed that the unit's pre-disaster domain would legitimize its authoritative role in the forthcoming precautionary evacuation. One hospital recognized the unit's authority (evidenced by compliance) and the second did not (evidenced by noncompliance on two separate occasions). The enacting unit therefore changed its domain as the emergency crystallized (T-D), but not without some difficulty. Once accomplished, staff members coordinated the precautionary partial evacuation of the two hospitals (T-D-A). Both hospitals were contacted by phone and informed of the precautionary decision to partially evacuate. They instructed hospital personnel as to what types of patients should be discharged (e.g., walking patients). The other three hospitals were contacted by phone and told to discharge patients (free up space) in case the above two hospitals had to be evacuated totally. Instructions given to these hospitals included the following: (1) discharge with or without the attending physician's approval all walking patients; (2) call families of those patients discharged; (3) do not sound the internal general alarm; (4) discharge pre-operative elective surgical cases; and, (5) discharge post-operative and all diagnostic patients. In the course of contacting the hospitals, the agency also notified two local mass media representatives. Each was asked to contact several other media outlets. Subsequently, representatives from several media units were stationed at the agency's command center. This allowed for emergency public information from the agency on a timely basis (e.g., evacuation of hospitals is in progress and families should wait for the hospital to contact them prior to picking up patients). In effect, the presence of these media representatives provided the agency with expanded resources for emergency communication (T-D-A-R).

The catalyst for the third restructuring was an impromptu meeting by some staff members about 13 hours prior to the event. The restructuring which followed is depicted as a T-R form in the taxonomy. The metric score for this form is +1, suggesting some balancing of ends- and means-based changes. Time from catalyst to first element change was about 15 minutes, and from first to second element change about 2 hours. Total time of restructuring was about 2 hours and 15 minutes. Staff members involved in a discussion of the new crest prediction decided to

identify and mobilize local groups and organizations for potential assistance. Before doing so, they determined that criteria should be established and used in the selection of units to be contacted. Such factors as availability/response time, experience/expertise, number of personnel and type of equipment were to be evaluated (T). Four units (identified in the first restructuring described above) were identified and contacted, and all of them assigned personnel and commitment to the agency's command (T-R). One large organization, for example, committed over six subunits, one of which had over 250 personnel and much needed equipment (30 radio transmitters, boats, jeeps, and 2 1/2 ton trucks) to function under the Agency's command (T-R).

The catalyst for the fourth restructuring was the noncompliance of one of the two hospitals previously notified to partially evacuate. This occurred about 12 hours prior to the event. The resulting restructuring is an A form in the taxonomy. The metric score for this form is -4, indicating a change of means. Time from catalyst to change of activities (A) was about 2 hours. The hospital's refusal to partially evacuate prompted the top official of the agency to assert its authority during the emergency. A special message was sent to the noncompliant hospital. While the earlier message to evacuate was a request, the present one was an official directive (A).

The catalyst for the fifth restructuring was an increase of the crest prediction to a minimum of 34 feet. This was announced about 7 hours prior to the event. The resulting restructuring is depicted as a T-A form in the taxonomy. The metric score for this form is +1, suggesting some balancing of ends- and means-based restructuring. Elapsed time from catalyst to first element was about 15 minutes and from first to second element about 1 hour. Total time of restructuring for this form was about 1 hour and 15 minutes. Once the updated prediction was known, a decision was made to totally evacuate two hospitals (those previously instructed to partially evacuate). Staff members were to contact the two hospitals and deliver this new/modified directive. The other three hospitals were also to be informed of this new development and instructed to prepare for an onslaught of evacuees. Finally, various transportation services (bus and ambulance) were to be notified and instructed that their priority was patient evacuation from the two hospitals (T). The agency then began coordinating the total evacuation in accordance with the above decisions (T-A). The five hospitals were notified and given instructions about what to do. In addition, bus and ambulance services were instructed to assist the hospitals with transporting patients (which they did).

The catalyst for the sixth restructuring was the continuing noncompliance of one hospital in the face of a directive to evacuate partially. This noncompliance was known about 6 hours

before the dyke failure. The subsequent restructuring is a T-A-R form in the taxonomy. The metric score for this form is -1, suggesting some balancing of ends- and means-based changes. Elapsed time from catalyst to first element change was about 15 minutes, from first to second element change about 1 hour, and from second to third element change about 1 hour. Total time of restructuring for this form was about 2 hours and 15 minutes. The agency's concern was to make sure that all hospitals complied with the current directive to evacuate totally. Given the previous noncompliance of one hospital, the agency's top official decided to take particular steps to ensure that this not continue. First, two authority figures in the community were to be selected and briefed on the situation/problem. Second, these two authority figures were to hand deliver the new directive (total evacuation) personally to the hospital (T). Two independent authority figures from the area were then contacted and a meeting was held at the agency's command center. At this meeting the unit's two top officials informed the two authority figures about the necessity of compliance by the hospital (T-A). Two factors were most persuasive: (1) the new crest prediction and (2) the estimated time when the dyke would breach. The discussion also included alternative ways to get the hospital to comply. It was decided that the two authority figures would deliver the directives as official representatives of the agency (T-A-R). They did so and compliance followed.

The catalyst for the seventh restructuring was a large amount of water seeping into the agency's operations center. This occurred about 1 hour prior to the dyke failure. The resulting restructuring is an A form in the taxonomy. The metric score for this form is -4, indicating a change of means. Elapsed time from catalyst to the change of activities was about 1 hour. With a considerable amount of water seeping into the facility, members moved equipment and themselves to higher floors. For a time (albeit momentarily) this disrupted the activities (e.g., monitoring) previously being undertaken by unit members (A). There was no thought of relocating at this time because all equipment was still operational.

The catalyst for the eighth restructuring was the loss of electrical power. The loss of power occurred about 30 minutes prior to the dyke failure. The restructuring is depicted as an R-A form in the taxonomy. The metric score for this form is -7, indicating a total change of means. Elapsed time from catalyst to the first element change was about 35 minutes and from the first to the second element change about 20 minutes. Total time of restructuring for this restructuring was about 1 hour and 25 minutes. Shortly after the loss of electrical power an alternative facility was sought, located, and committed for the agency's new command center (R). Once the facility was committed unit members proceeded to move equipment to this facility, re-establish communications, and inform other units of its relocation (R-A).

The catalyst for the ninth restructuring was the decrease of water in the impacted areas. This occurred about 2 days and 20 hours after the dyke failure. The resulting restructuring is depicted as a T-A form in the taxonomy. The metric score for this form is +1, suggesting some balancing of ends- and means-based changes. Elapsed time from catalyst to the first element change was 6 hours and from first to second element change about 2 hours. Total time of restructuring for this form is therefore estimated to be 8 hours. With the water decreasing in the impacted area, staff members determined that it was time to begin planning, coordinating, and monitoring clean up efforts. Initially, social units were to be selected and assigned specific duties and areas. Once clean up efforts were underway, the agency was to monitor these assignments for progress. In addition, when notified of a need for equipment (by some external unit), staff members were to locate this equipment and notify the requesting unit of its whereabouts (T). The agency began implementing these tasks by notifying selected social units (5 were documented) of their areas of responsibility (e.g., body removal, downtown area). The staff members also advised other units on what types of equipment would be needed (bulldozer, four-wheel drive vehicle, etc.). In the case of body removal, a location to put the corpses washed out of the cemetery was found and the relevant unit was notified (T-A).

The catalyst for the tenth restructuring was the slow progress of the clean up being undertaken by various social units. This was noted by agency members about 3 days and 21 hours after the event. The resulting restructuring is depicted as an A-T form in the taxonomy. The metric score for this form is -1, suggesting some balancing of ends- and means-based changes. Elapsed time from catalyst to the first element change was 10 hours and from first to second element change 30 minutes. Total time of restructuring for this form was about 10 hours and 30 minutes. Believing that the clean up progress was inadequate, the unit held a meeting of top officials from the agency and the units assigned clean up duties (A). Reasons for the slow progress were discussed. The reasons given were security problems, lack of a curfew, and the need for authorization passes. Corrective measures were established in the form of new policies and procedures which included who to inform if problems were encountered and who to get the proper clearances from in gaining access to restricted areas (T-A). Once established, the agency's staff contacted all units affected by the new procedures and informed them of modifications in the clean up process.

The catalyst for the eleventh and final restructuring was criticism by local political leaders of how the crisis was being handled by the agency. The criticism occurred about 4 days and 12 hours after the event. The resulting restructuring is

depicted as a T-R-A-D form in the taxonomy. The metric score for this form is 0, indicating a balancing of ends- and means-based changes. Elapsed time from the catalyst to the first element change was about 12 hours, from first to second element change about 3 hours, from second to third element change about 18 hours, and from third to fourth element change about 48 hours. Total time of restructuring for this form was about 3 days and 9 hours. Following the criticism directed at the unit's top officials, the staff members decided it was time to relinquish their emergency command and control domain. There was some uncertainty, however, about how this was to be accomplished. The unit's two top officials decided not to relinquish their command until they had contacted the state council (authority for the totality of local units) for their advice and consent (T). This was to be done for one specific reason: to avoid criticism of the agency and state council by local individuals, groups, and organizations. In effect, the agency staff felt that the unit could not withdraw from its local power position without the umbrella of the more inclusive state agency of which it was a part. The top official of the agency went to the state council, explained the situation, documented progress in recovery activities, and requested support for relinquishing its role in the emergency. Receiving the state council's support for the maneuver (T-R), agency members began implementing the turnover of command. Political officials were notified and briefings started to ensure a smooth transition of command (T-R-A). With the command and control relinquished to local political officials, the agency took on its pre-disaster domain, playing only a consultant role to local political authorities (D).

Variable Measurement

The measurements discussed in this section are represented in the codebook developed initially by Linn (see Appendix B). The asterisks in the codebook signify refinements of Linn's measures or entirely new variables. The coding techniques have been replicated as precisely as possible. Only those variables directly relevant to the replication and summarized in this thesis are discussed in this section. Particular attention is given to temporal properties of restructuring. It should also be noted that this study deals with a broader range of organizations than that examined by Linn. While he studied social service agencies primarily, organizations analyzed in the present

research include hospitals, military units, financial institutions, state and federal bureaucracies, local and state law enforcement agencies, and one mass media outlet.

Catalysts and Events

Linn's event and catalyst for each initial restructuring was a tornado. All of the social action studied took place following impact. In contrast, the event studied here was a flood having slow onset and a period of forewarning. The breaching of a dyke is used to distinguish between pre- and post-impact time periods. The above example and Appendix A illustrates pre-impact responses and a variety of initial catalysts. Similar to Linn's (1986) and Farmer's (1986) respective works, there were several subsequent types of catalysts documented. These included the dyke breaching, previous restructurings (including element related contingencies), conflict (internal and external), forewarning, cooperation, and impending or waning flood stages. Farmer (1986) and Linn (1986) indicate that each restructuring in a sequence must have a separate catalyst. Following this approach, unique catalysts are noted for each restructuring documented in a sequence (see Appendix A). The progression therefore is initial catalyst to first form of restructuring (start and finish), second catalyst to second form of restructuring (start and finish), and so forth. Because of this "no overlapping forms criterion" held in the flood study, Linn's original sample (N=57) was limited to nonoverlapping forms (N=33). This ensures that comparable data were used in comparing the studies.

Means- and Ends-Based Restructuring³

Linn (1986) developed a new metric (Table 3a) to measure means- and ends-based restructuring. This metric refined Kreps' earlier origins

Table 3a: Basic Restructuring Metric

DR	RD		
DA	RT		
TR	AD		
TA	AT		
DTRA	DRAT		
DTAR	DART		
DRTA	TRAD		
DATR	TARD		
TRDA	RADT		
D	T	R	A
DTR	TRD	DRA	RDA
DTA	TAD	DAR	RTA
DRT	RDT	TRA	ADR
DAT	RTD	TAR	ATR
TDR	ADT	RAD	ARD
DT			RA
<u>TD</u>	<u>ATD</u>	<u>RAT</u>	<u>ART</u>
Scores +2	+1	0	-1
			-2

metric (see Table 2) of the 24 organizational forms (all 4 elements present) by incorporating the remaining 40 forms of association (1-3 elements present). With Linn's metric, each of the 64 forms of association represents possible instances of restructuring. To repeat, changes of domains (D) and/or tasks (T) are restructurings of ends; changes of activities (A) and/or resources (R) are restructurings of means.

Linn (1986) established his metric scores as follows: For each element in a restructuring there is an assignment of a plus (+) if it is an end (D or T) or a minus (-) if it is a mean (R or A). Scoring all 64 forms of association in this manner results in a distribution ranging from a +2 (++, D-T or T-D, ends predominate) to -2 (--, A-R or R-A, means predominate) with a mid-point of 0 [e.g., +- (D-A), +++- (D-T-R-A), balance or tension] (Linn, 1986:18). For example, a D-A-R form of restructuring will have a total score of -1 [D=1, A=-1, R=-1; $1+(-1)+(-1)=-1$]. According to Linn this -1 score indicates that means slightly dominate in this restructuring. This scoring technique means that all four-element restructurings are scored zero; those with three elements are scored either +1 or -1; those with two either +2, -2, or 0; and those with one +1 or -1. "The result is a normal distribution of the 64 forms in Kreps' taxonomy" (Linn, 1986:18).

The above metric was then revised by Linn to be more sensitive to the relative ordering of ends and means in the various instances of restructuring (Table 3b). This was done by weighting each of the elements: "the plus or minus sign for the first appearing element in any instance of restructuring is weighted by four times...the second appearing end (+) or mean (-) is weighted by three times...the third

appearing element by two times...and the fourth appearing element is not weighted at all" (Linn, 1986:18-19). This results in a distribution of +7 to -7 with the midpoint at 0. For example the D-T-R-A form would have D or +4, T or +3, R or -2, and A or -1. The aggregate score for this form becomes a +4 on the revised metric $[(+4) + (+3) + (-2) + (-1) = +4]$. The forms that receive a +7 (D-T or T-D) depict pure ends-based restructuring and the forms scored -7 (A-R or R-A) depict pure means-based restructuring. Linn's derived metric (+7 to -7) has been replicated in this study.

Temporal Properties and Refined Measurements

Drawing from Wallace (1983), Linn devised five variables to highlight the temporal dynamics of restructuring. These were termed order, timing, total time of restructuring, rhythm, and periodicity. The first three capture temporal distinctions for every instance of restructuring. Rhythm and periodicity are added to measure patterns in multiple restructurings (i.e., several forms in a sequence). Each variable is detailed below.

As Linn (1986:19) states: "the temporal order of each case involves judgments (through descriptions of what happened) of which elements of organization were restructured (dichotomous choices of presence or absence) and in what order (what changed first and so on if additional elements came into play)." Determining the number and order of the elements implicated in a restructuring is "inevitably based on judgments about their observability" (Kreps, 1986b:17).

Timing is defined as "the elapsed time from an identified catalyst to change in the first appearing element, and to change in any subsequent element restructured (first to second, second to third, third

to fourth)" (Linn, 1986:11-12). Linn (1986:19) used the tornado as time 0 with timing of restructuring measured in days and hours relative to impact. I used the dyke breaching as time 0. Similar to Linn, time lags were recorded in days and hours. However, floods' greater forewarning increases the possibility for responses prior to impact. Therefore a distinction was made in this study between pre- and post-event restructurings. Measuring timing in this manner allows for the assessment of responses for which there is some forewarning.

The timing for the one element forms of restructuring is represented by the lag between the catalysts and the onset of the restructuring. With additional elements restructured (second, third, and fourth) the elapsed time between each additional element was also documented. This allows for temporal distinctions to be made between each element restructured. By summing the times, a derived total time of restructuring is achieved. This represents the lag between the initial catalyst and the "end-state of the restructuring" (Linn, 1986:20). The "end-state" is the placement of the last element of each restructuring.

Rhythm is "regularity in the order of the elements" (Linn, 1986:12). This variable comes into play when there are multiple restructurings (more than one restructuring in a sequence). Originally Linn (1986:20) determined the presence or absence of temporal rhythm by comparing the assigned scores from the derived metric across two or more restructurings. As suggested by Linn and Kreps (1988), I measured rhythm by four criteria: (1) similar direction of metric scores (+ or -), (2) identical scores, (3) identical forms, and (4) evidence of a rhythmic cycle. Each of these criteria is defined and discussed below.

The first three criteria form a pure Guttman scale. At the highest order of difficulty, identical forms is achieved when at least 60 percent of the restructurings in a sequence are the same type of form. For example, the sequence A, A, A, A-R would exhibit rhythm by this criterion (75% are A forms). The middle criterion is identical scores. It is achieved when at least 60 percent of the restructurings in a sequence have the same assigned metric scores. For example, a sequence of A-T-D, R-T-D, T-A, and A-D would evidence rhythm with scores of +1, +1, +1, and -1. The lowest criterion is identical direction. It is achieved when at least 60 percent of the restructurings in a sequence have negative (-1 thru -7), positive (+1 thru +7), or balanced (0) metric scores. For example, a sequence of T-A-R, A-T-R-D, A-R-T, and T-A-D would evidence rhythm because three of four forms have negative scores. From top to bottom, then, to have identical forms is to have identical scores and similar directions. To have identical scores is to have similar direction but not necessarily identical forms. Identical direction of scores dictates neither identical scores nor forms.

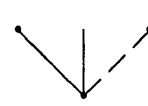
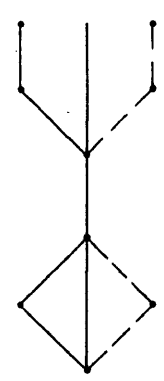
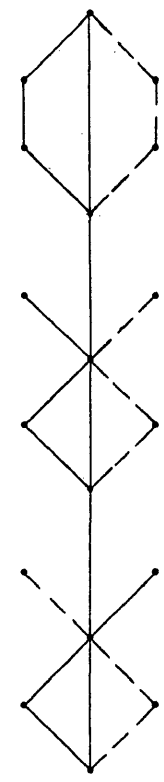
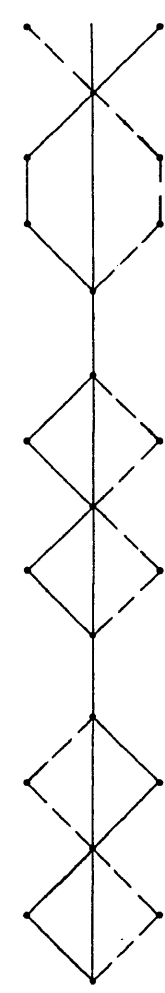
The fourth criterion used to measure rhythm is evidence of a rhythmic cycle. An analogy to electric motors illustrates how restructurings, like electromotive force (EMF), display variable yet restrictive patterns of form. Nuclei are positively charged and electrons are negatively charged. Under particular conditions a balance between these charges exists. Electromotive force (EMF) is created when this balance is disturbed. In a two pole motor, a conductor turns between the poles. As a conductor turns, EMF is generated in one direction as it passes one pole and in the opposite direction as it passes through the other. At one point for each pole, a maximum and

minimum amount of EMF is generated. "The EMF in rising from zero to a maximum and returning to zero again is said to make an alternation. When the EMF has made two alternations it is said to have completed a cycle or period. The number of cycles in a second is called the frequency of the circuit" (Bishop, 1943:7). The graphical depiction of a single cycle for an electric motor (\sim) presents the alternations as inverse of each other.

The EMF analogy can be applied to Kreps' taxonomy by assigning all ends-related changes a plus (positive charge) and means-related changes a minus (negative charge). As noted on Table 4, the maximum parameters are + and - with a baseline of zero (at rest). With a disturbance (catalyst), restructuring of ends or means produces a positive or negative charge (+ or -). If the next element restructured is opposite of the first then the organization returns to a balanced state (returns to 0). If not, then the positive or negative charge continues. Thus, alternations occur only with the alternating of ends and means relative to a baseline of 0.

Recall that the second alternation for an electric motor is the inverse of the first. A complete cycle can therefore only be determined with four element forms in Kreps' taxonomy. For this to occur the third element change must be similar to the second (ends-means-means or means-ends-ends). The fourth element change completes the second alternation (and thereby a cycle) because there are zero degrees of freedom. For example, a given four-element restructuring such as D-A-R-T, having a derived metric score of 0, evidences 2 inverse alternations and a complete cycle. As noted on Table 4, three possibilities exist for four element forms of restructuring: $1 \frac{1}{2}$

Table 4: Alternations and Cycles by Degrees
(1, 2, 3, and 4 Element Changes) of Restructuring*

		E M	
	+		
One-Element Restructuring Possibilities	-		
	+		EM or EE ME or MM
Two-Element Restructuring Possibilities	-		
	+		EMM or EME or EEM MEE or MEM or MME
Three-Element Restructuring Possibilities	-		
	+		EMME or EMEM or EEMM MEEM or MEME or MEEE
Four-Element Restructuring Possibilities	-		

*Solid lines indicate ends-initiated forms.
Broken lines indicate means-initiated forms.

alternation and two 2 alternation types. The 1 1/2 alternation is represented by ends-ends-means-means (or vice versa). The two 2 alternation types are represented by ends-means-means-ends (or vice versa) and ends-means-ends-means (or vice versa). As described above, the first type has two opposing alternations (+, 0 and -, 0). The second type has two similar alternations (+, 0 and +, 0). Consistent with the EMF analogy, a balanced cycle is evidenced by opposing alternations and an unbalanced cycle is evidenced by similar alternations. Note that the two- and three-element forms of restructuring have two variations in alternations: Three-element forms have a maximum of 1 1/2 alternations (3/4 cycle) or minimum of 1 alternation (1/2 cycle); and two-element forms have a maximum of 1 alternation (1/2 cycle) or a minimum of 1/2 alternation (1/4 cycle). One-element forms necessarily have a 1/2 alternation.

Two measures were used in the measurement of cycles. First, the number of cycles (balanced or unbalanced) was calculated for pre- and post-event time periods as well as for the overall response of each unit. Second, the ratio of the number of cycles to the total number of forms in the sequence of restructurings was determined. The determination of rhythmic cycles across multiple restructurings requires relatively long life histories (many restructurings). Accordingly, only the two longest sequences documented from the present study are used for illustrative purposes. To further illustrate the methodology, Farmer's (1986) earlier life histories of two civil rights organizations (CORE and SNCC) are also analyzed.

Periodicity is the "regularity in the timing of elements" (Linn, 1986:12). Linn (1986) measured periodicity by comparing the time lags

between catalysts and appearance of element changes (see Table 5). "The more consistent the time-lags, the greater the periodicity" (Linn and Kreps, 1988:in press). However, he does not provide a specific criterion for determining consistency of time lags from catalyst to first element changes, first to second, second to third, and third to fourth element changes. In the present study periodicity was determined by comparing all possible pairs of lag times at each possible stage (1, 2, 3, and 4 element changes) of restructurings across a sequence.

Two criteria (one each for pre- and post-event restructurings) were established by which to judge whether or not pairs at each stage exhibited periodicity. The approach follows Linn's (1986:17) logic: "...the shorter the duration of the study, the more restrictive the criterion of periodicity should be." In other words, the shorter the time period in which to respond, the more restrictive the criterion of periodicity should be. The pre-event criterion was .03 days or the ratio of 1 to 38 hours. The denominator represents the total elapsed time from initial warning to the dyke breaching. A logically equivalent criterion for post-event time lags was achieved by the equation:

$$\frac{38 \text{ (hours)}}{720 \text{ (hours)}} \quad \frac{.03 \text{ (days)}}{x \text{ (days)}}$$

The 720 hours is the total amount of time elapsed from the dyke breaching to the occurrence of the last post-event catalyst (the effective end of the emergency period). This strategy eliminates restructurings that were not in the emergency period of the disaster. The resulting criterion for the post-event time lags is .57 days.

Table 5: Linn's Forms of Restructuring and Timing of Elements (Time Expressed in Days)

<u>Unit Type</u>	<u>Form</u>	<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>
1) Community Mental Health Group:	R	42.50				42.50
2) Local Church:	R	4.50				4.50
3) Drug Encounter Group:	DRTA	.62	.08	.87	.04	1.61
4) Children's Service Group:	R	6.50				6.50
5) Family Mental Health Unit:	RA	4.50	22.00			26.50
6) Religious Social Services Group:	AR	21.50	37.00			58.50
7) Children's Headstart Program:	R	.67				.67
8) Private Psychiatric Services:	AT	.17	4.00			4.17
9) Public Schools:	R	4.50				4.50
10) Youth Programs:	R	4.50				4.50
11) Child Guidance Center:	R	7.00				7.00

Table 5: Linn's Forms of Restructuring and Timing of Elements (Continued)

<u>Unit Type</u>	<u>Form</u>	<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>
12) County Mental Health Association:	DTRA RA	4.50 .50	1.00 1.50	3.30	2.00	8.80 2.00
13) County Hospital:	R R	.33 .50				.33 .50
14) County Mental Health Group:	DTRA DTRA	1.42 .12	.04 .04	.04 .04	2.50 6.00	4.00 6.20
15) Local Inter-Church Group:	R R	2.50 .50				2.50 .50
16) Mental Health Foundation:	R DTRA	.50 1.00	14.00	.08	16.92	.50 32.00
17) Metropolitan Hospital:	R DRAT RA	.50 1.50 2.50	2.42 13.00	.04	.04	.50 4.00 15.50
18) Multiple County Mental Health:	A	.58				.58

Table 5: Linn's Forms of Restructuring and Timing of Elements (Continued)

Unit Type	Form	Lag 1st Element	Lag 2nd Element	Lag 3rd Element	Lag 4th Element	Total Time of Restructuring
20) Counseling Intervention Unit:	ATR	.04	.17	.33		.54
	ATRD	.29	.16	.33	1.00	1.78
	TR	.50	1.00			1.50
	TRA	.50	.04	.04		.58
	R	.50				.50
	RA	1.00	.04			1.04
22) Multiple Faith Church Group:	DTRA	1.00	14.00	.08	16.92	32.00
	DTRA	1.21	3.00	.17	.04	4.42

Distribution Measures:

	Lag 1st Element	Lag 2nd Element	Lag 3rd Element	Lag 4th Element	Total Time of Restructuring
Total Number	33	18	11	9	33
Number Documented (N)	33	18	11	9	33
Mean	3.61	6.31	.49	5.05	8.52
Standard Deviation	8.02	10.10	.96	6.98	13.90
Range	.04 to 42.50	.04 to 37.00	.04 to 3.29	.04 to 16.88	.33 to 58.50

MAJOR FINDINGS

A sample of 134 restructurings was extracted from the DRC's archival materials. These restructurings were enacted by 22 social units. Note that this sample represents only documented restructurings and not necessarily the totality of changes for any social unit. Table 6a presents the 134 cases by enacting unit, form type, and metric score. Restructurings are presented in chronological order for each social unit. Table 6b compares the frequencies and metric scores of these documented restructurings with those from Linn's study. Table 7a arrays by social unit the restructurings with respective lag times for element changes. Table 7b presents lag times by degree of restructuring for each study. Tables 8a and 8b distinguish pre- and post-event lag times for element changes. Tables 9a and 9b break down Table 6a into pre- and post-event restructurings. Table 10 presents pre- and post-event lag times by degree of restructuring.

Table 6a indicates that 21 of the 64 forms of association in Kreps' taxonomy (33%) are documented in this study. Empirically grounding these forms supports Linn and Kreps' (1988:in press) argument that there are many "alternative ways in which restructuring can and does occur." Table 6b indicates that the two studies combined document 26 of 64 forms (41%). The table also highlights where the studies overlap and where they differ with respect to documenting forms of restructuring. Overlap is evidenced by the flood study replicating all of the documented form types from the tornado for one- and two-element restructurings, plus two other form types (T, T-A). Difference is evidenced at the three- and four-element levels: The flood study documents both of the

Table 6a: Forms of Restructuring Documented and Derived Metric Scores for Each Case of Restructuring in the Sample (N=134)

<u>Unit</u>	<u>Forms Documented (Metric Score)</u>	<u>Unit Means</u>
1) Financial Unit 'A'	T-R-A, T-A, A-R, T-D-A-R, R-T-A, D-T-A, A-R, T-R-A (-1, +1, -7, +4, -3, +5, -7, -1)	-1.1
2) Financial Unit 'B'	A, T-D-A-R, R-D-T-A, A, A, R-A (-4, +4, 0, -4, -4, -7)	-2.5
3) Financial Unit 'C'	A, T-A-R, T-A-R, A, T-A, T-D-R-A, R, R (-4, -1, -1, -4, +1, +4, -4, -4)	-1.6
4) Financial Unit 'D'	T-R-A, T-A-R, T-A-R, A-R, R-T-A (-1, -1, -1, -7, -3)	-2.6
5) Financial Unit 'E'	R, T-A, R, R, T (-4, +1, -4, -4, +4)	-1.4
6) Law Enforcement 'A'	T-A, T-R-A, T-D-A-R, A (+1, -1, +4, -4)	0.0
7) Law Enforcement 'B'	T-R-A, A (-1, -4)	-2.5
8) Military Unit 'A'	A-D-T-R (0)	0.0
9) Military Unit 'B'	T-A, T-R-A, T-A, R, T-A (+1, -1, +1, -4, +1)	-0.4
10) Military Unit 'C'	T-A, T-A, T-R-A, T-D-R-A, T-D-R-A, T-A (+1, +1, -1, +4, +4, +1)	+1.7
11) Emergent Unit 'A'	R-A (-7)	-7.0
12) Emergent Unit 'B'	T-R-A, T-A, T-A (-1, +1, +1)	+0.3
13) Federal Agency 'A'	T-R-A, T-A, T-A-R, T-A-R, T-R-A, T-R-A, A-R, T-A (-1, +1, -1, -1, -1, -1, -7, +1)	-1.3
14) Federal Agency 'B'	T-R-A, A-R, A, R-A, A (-1, -7, -4, -7, -4)	-4.6

Table 6a: Forms of Restructuring Documented and Derived Metric Scores (Continued)

<u>Unit</u>	<u>Forms Documented (Metric Score)</u>	<u>Unit Means</u>
15) Government Agency	A, T-D-A-R, T-R, A, T-A, T-A-R, A, R-A, T-A, A-T, T-R-A-D (-4, +4, +1, -4, +1, -1, -4, -7, +1, -1, 0)	-1.3
16) State Agency 'A'	(None Documented)	----
17) State Agency 'B'	T-A-R, T-D-A, T-A, R (-1, +5, +1, -4)	+0.3
18) Hospital 'A'	T-D-A-R, R-A, T-D-A, T-R, T-A-D (+4, -7, +5, +1, +3)	+1.2
19) Hospital 'B'	T-A-R, A-R, R-A, T-A, A-T-R (-1, -7, -7, +1, -3)	-3.4
20) Hospital 'C'	D-T-A, T-A-R, T-R-A, T-A-R, T-A-R, T-A-R, T-A, A-T-R, T-R-A (+5, -1, -1, -1, -1, +1, -3, -1)	-0.3
21) Hospital 'D'	T-A, T-A-R, T-R-A, T-A, A-R, A-T, T-R-A, A, T-R-A (+1, -1, -1, +1, -7, +1, -1, -4, -1)	-1.3
22) Hospital 'E'	T-D-A-R, R-A-T-D, T-A, T-A, R-A, T-A, T-A, T-A-R, T-A, T-A-R, T-A, R-A, R, A-R, T-A, A, A, T-A-R (+4, -4, +1, +1, -7, +1, +1, -1, +1, -1, +1, -7, -4, -7, +1, -4, -4, -1)	-1.6
23) Mass Media	A, R, T-D-A-R, A, T-R-A, T-R-A (-4, -4, +4, -4, -1, -1)	-1.7

Distribution Measures:

Mean Metric Score = -1.3 Median Metric Score = -1.0
Standard Deviation = 3.2 Range = -7 to +5

3 of 4 One-Element Forms Documented	N= 27 (20.15%)
5 of 12 Two-Element Forms Documented	N= 48 (35.82%)
7 of 24 Three-Element Forms Documented	N= 45 (33.58%)
5 of 24 Four-Element Forms Documented	N= 14 (10.45%)
	<u>N=134</u> 100%

Table 6b: Comparison of Linn's and Crooks' Documented Forms of Restructurings*

Form	Linn Freq	Crooks Freq	Form	Linn Freq	Crooks Freq	Form	Linn Freq	Crooks Freq	Form	Linn Freq	Crooks Freq
D(+4)	-	-	DT(+7)	-	-	DTR(+5)	-	-	DTRA(+4)	6	-
T(+4)	-	1	DR(+1)	-	-	DTA(+5)	-	2	DTAR(+4)	-	-
R(-4)	14	9	DA(+1)	-	-	DRA(-1)	-	-	DRAT(0)	1	-
A(-4)	1	17	TR(+1)	1	2	DRT(+3)	-	-	DRTA(+2)	1	-
			TA(+1)	-	28	DAT(+3)	-	-	DATR(+2)	-	-
			TD(+7)	-	-	DAR(-1)	-	-	DART(0)	-	-
			RA(-7)	4	8	TRA(-1)	1	19	TRAD(0)	-	1
			RD(-1)	-	-	TRD(+3)	-	-	TRDA(+2)	-	-
			RT(-1)	-	-	TAD(+3)	-	1	TADR(+2)	-	-
			AD(-1)	-	-	TAR(-1)	-	17	TARD(0)	-	-
			AT(-1)	1	2	TDR(+5)	-	-	TDRA(+4)	-	3
			AR(-7)	1	8	TDA(+5)	-	2	TDAR(+4)	-	7
						RAD(-5)	-	-	RADT(-4)	-	-
						RAT(-5)	-	-	RATD(-4)	-	1
						RDT(+1)	-	-	RDTA(0)	-	1
						RDA(-3)	-	-	RDAT(-2)	-	-
						RTD(+1)	-	-	RTDA(0)	-	-
						RTA(-3)	-	2	RTAD(-2)	-	-
						ADT(+1)	-	-	ADTR(0)	-	1
						ADR(-3)	-	-	ADRT(-2)	-	-
						ATD(+1)	-	-	ATDR(0)	-	-
						ATR(-3)	1	2	ATRD(-2)	1	-
						ARD(-5)	-	-	ARDT(-4)	-	-
						ART(-5)	-	-	ARTD(-4)	-	-
4	15	27	12	7	48	24	2	45	24	9	14

*Metric Scores are parenthetically indicated

Total Number of Forms: Linn = 12 Mean Metric Scores = -2.3 (Linn); -1.3 (Crooks)
 Crooks = 21 Median Metric Scores = -4.0 (Linn); -1.0 (Crooks)
 Standard Deviations = 3.7 (Linn); 3.2 (Crooks)
 Ranges = -7 to +3 (Linn); -7 to +5 (Crooks)

three-element forms from Linn's study, plus five additional types (D-T-A, T-A-D, T-A-R, T-D-A, and R-T-A). At the four-element level no forms are similar: The flood study documents T-R-A-D, T-D-R-A, T-D-A-R, R-A-T-D, R-D-T-A, and A-D-T-R forms, while Linn's documented D-T-R-A, D-R-A-T, D-R-T-A and A-T-R-D forms. Note that with more complete restructurings there is less similarity. In part, this is due to more degrees of freedom in form types. It might also be due to unique demands on different social units studied in the two events, with the resulting changes reflecting degrees of efficiency, effectiveness, and/or a balance between them.

Less similarity in more complete restructurings is also indicative of an important difference between the two samples. Twenty-two of Linn's 33 cases (67%) were one- and two-element forms of restructuring. Similarly, of the 134 restructurings I documented a majority (75 or 56%) were one- and two-element forms. However, 93 (69%) of my cases were two- and three-element forms. In contrast, Linn grounded 9 (27%) two- and three-element forms. As is evidenced by the two-, three-, and four-element forms, then, my study documents, proportionally, greater degrees of change. Two-element forms (N=7) represented 21% of Linn's sample compared to 36% (N=48) of this sample; three-element forms (N=2) were 6% of Linn's sample compared to 34% (N=45) of mine; and four-element forms (N=9) were 27% of Linn's sample to 10% (N=14) of mine. In summary, 55% of Linn's sample was represented by more complete forms of restructuring (more elements restructured) compared to 80% of this sample.

Table 6b highlights differences in the two studies with respect to documented frequencies of ends (D,T) and means (R,A). For illustrative

purposes, consider the one- and two-element forms. One-element forms for both studies are predominantly means-related (A or R; 15 of 15 for Linn and 26 of 27 for this study). However, the studies differ with respect to which means-related element was more frequently evidenced. For Linn, resource changes were documented heavily (14 of 15 or 93%); whereas this study documents more changes in activities (17 of 26 or 65%). Linn's two-element forms were predominantly means-means (R-A, A-R; 5 of 7 or 71%); whereas this study has more mixed types (T-R, T-A, A-T; 32 of 48 or 68% ends-means or vice versa). In fact, at the one- and two-element levels only 2 of 29 (7%) of Linn's element changes related to ends. Of his total sample, 22 of the 71 element changes (31%) were ends-related. In comparison, 33 of my 123 element changes (27%) in the one- and two-element forms are ends-related. Overall, 108 of the 314 element changes (34%) are ends-related.

Linn suggested that the high prevalence of means-related restructurings in his sample reflects the constraint of extant ends (domains and tasks). Note that extant ends can be pre-disaster or improvised. Thus first restructurings comprised of only means-related changes reflect the constraint of pre-disaster ends. First restructurings involving ends-related changes reflect the constraint of improvised ends. All subsequent restructurings involving changes of ends point to similar improvisations. Keeping this in mind, 80% (16 of 20) of the first restructurings from the tornado sample evidence the constraint of pre-disaster ends (Units 1-2, 4-11, 13, and 15-20 on Table 5); and 55% (18 of 33) of the entire sample of restructurings evidence the constraint of pre-disaster ends. In contrast, 32% (7 of 22) of the first restructurings from the flood sample evidence the constraint of

pre-disaster ends (Units 2-3, 5, 8, 11, 15, and 23 on Table 6a); and only 6% (8 of 134) of the entire sample of restructurings evidence the constraint of pre-disaster ends. Therefore, the flood sample reflects the constraint of improvised ends to a greater degree while the tornado sample reflects the constraint of pre-disaster ends to a greater degree. The fluid nature of the flood is evidenced also by the fact that ends were changed repeatedly. Thus whether pre-disaster or improvised, extant ends were far less constraining for the flood than for the tornado. Note the cases where means (R,A) change following a change in ends (D,T): 88 restructurings (66%) of the flood sample compared to only 12 restructurings (36%) for the tornado sample. In short, for the flood there is a higher proportion of means-related restructurings taking place after an ends-related element restructures. There is less evidence, therefore, of constraint by pre-disaster or improvised ends of organization in my study. In fact, the flood sample evidences greater improvised means of organization tied to improvised ends.

Table 6b highlights the greater degree of balance of ends- and means-based changes in the present study (mean metric score = -1.3) as compared with Linn's earlier work (mean metric score = -2.3). One reason for this difference is the large impact of one- and two-element restructurings dominated by all means-related changes (constraint of pre-existing ends) in the tornado sample. Recall that 19% of the flood sample and 45% of the tornado sample were single-element forms (96% and 100% were means changes, respectively). To test the impact of restructurings evidencing either pre-existing or improvised ends, I compared one- and two-element restructurings with three- and four-element restructurings. For those restructurings having two

elements or less, Linn's derived metric mean score is -4.3 (N=22) and the present study's is -2.5 (N=75). Note that these metric means reflect greater means-based restructuring than the respective overall metric means. And as more ends-related changes come into play (and earlier in the process), there is less strain toward means-based restructuring. For both samples the metric means were almost cut by half after including the three- and four-element forms (from -2.5 to -1.3 for the flood and from -4.3 to -2.3 for the tornado). This suggests that ends-related restructurings occurred at strategic times for both studies at the three- and four-element stages. And these strategically placed ends-related changes resulted in forms being constrained by improvised ends for both samples. Note that the tornado had a large portion of cases evidencing improvised ends at the three- and four-element stages, thereby lowering the metric average (i.e., 6 of 11 restructurings were the form D-T-R-A having metric scores of +4.0).

The above discussion shows that the presence of a few outliers can lower an otherwise high means- or ends-based pattern of change. To counter the outliers' impact on the degree of balance for the studies, I compared restructurings that were balanced (metric score of 0). Due to a limited number of balanced restructurings in the two studies (see Table 6b), I adjusted the measure to include "relatively balanced" forms. Recall that only four-element restructurings can score 0 on the derived metric (pure balanced types). By logical extension, those forms closest to 0 in the metric scoring (metric scores of plus and minus 1) can be considered relatively balanced types. The types include several two-element (8 of 12) and three-element (8 of 24) restructurings. Thus all two-, three-, and four-element restructurings can be compared with

their counterparts (by stage and according to their assigned metric score) as having lesser or greater degrees of balance. Of course, single element restructurings do not allow for this kind of comparison. This being the case, I eliminated the single element forms from the analysis and then compared the amount of balanced forms and mean metric scores for the flood and tornado samples. The adjusted frequency of balanced restructurings exhibited in the flood sample increases to 66% of the adjusted sample (71 of the 107) and has a mean metric score -0.11. For the tornado sample, the adjusted frequency of balanced restructurings is 22% of the adjusted sample (4 of 18) and has a mean metric score -0.25. Note that the increase is by 68 restructurings for the flood and 3 restructurings for the tornado. The conclusion: The flood sample has more relatively balanced forms than the tornado. Note that this is in contrast to having counterbalanced forms indicating balance.

Linn suggested that balanced restructurings are more evident in sequences with two or more forms. The analysis used by Linn (e.g., comparing units with single restructurings with units having two or more restructurings) is not feasible for my study because only two units met the one restructuring criterion (see Table 6a). Note that those restructurings had metric scores of -7 and 0. I therefore decided to pursue the logic of Linn's argument by creating a dichotomous variable: Small sequences had 5 or fewer restructurings (N=12) and large sequences had more than 5 restructurings (N=10). The social unit without a single documented restructuring was eliminated from the analysis. The small sequences has an averaged mean metric score of -1.71 and the large sequences -1.04. The difference is not statistically significant.

Thus, there is no evidence to suggest that greater balance of ends- and means-based changes accompanies greater amounts of changes (long as opposed to short sequences).

Temporal Findings

Table 7a presents temporal data for the documented restructurings from the flood sample. They are presented in chronological order for each social unit. Recall that the first lag time represents the amount of time from the catalyst to the first element change; the second lag is the amount of time from the first to the second element changes; the third lag is the amount of time from the second to the third element changes; and the fourth lag is the amount of time from the third to the fourth element changes. The result is linear progression with no overlapping forms.

The distribution measures on Table 7a suggest that the first element changes are more tenuous than what follows. But this analysis is misleading because the distribution measures include single-element forms. Therefore, Linn's conclusion that a kind of structural momentum is created once restructuring is underway was based on an incorrect reading of the data. Recall that single-element forms constituted 45% of Linn's sample and 19% of the present sample. An alternative analysis is to compare lag times within each stage of restructuring. Table 7b presents each level of restructuring with respective mean lag times and total time of restructuring for both studies. For the present study (top of Table 7b), two-element forms (level 2) have a lag time increase from the first to the second lag; three-element forms (level 3) have a decrease in lag time from the first to the second lag but a slight increase between the second and third lag; and four-element forms

Table 7a: Forms of Restructuring and Timing
of Elements (Time Expressed in Days)

<u>Unit Type</u>	<u>Form</u>	<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>
1) Financial Unit 'A'	TRA	.01	.04	.01		.06
	TA	.19*	.02*			.21**
	AR	.01	.04			.05
	TDAR	2.71	.04	.17	.04	2.96
	RTA	4.00	.01	1.00		5.01
	DTA	---	---	---		27.00**
	AR	4.00	3.00*	---		7.00**
	TRA	10.00*	5.00*	---		---
2) Financial Unit 'B'	A	.08*				.08**
	TDAR	2.67	.01	1.00	.50	4.18
	RDTA	---	---	---	---	7.00**
	A	16.00*				16.00**
	A	7.00*				7.00**
	RA	10.00*	20.00*			30.00**
3) Financial Unit 'C'	A	.50*				.50**
	TAR	.25*	1.71*	.04*		2.00**
	TAR	.33*	.50*	2.17*		3.00**
	A	1.00*				1.00**
	TA	---	---	---		7.00**
	TDRA	---	---	---	---	5.00**
	R	42.00				42.00
	R	---				---
4) Financial Unit 'D'	TRA	.21	.04	.01		.26
	TAR	1.50*	.75*	2.75*		5.00**
	TAR	.04	.25	.01*		3.00**
	AR	3.00*	3.00*	---		6.00**
	RTA	---	---	---		30.00**

Table 7a: Forms of Restructuring and Timing (Continued)

<u>Unit Type</u>	<u>Form</u>	<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>
5) Financial Unit 'E'	R	1.00	----			1.00
	TA	----				.21**
	R	4.00*				4.00**
	R	1.50*				1.50**
	T	30.00*				30.00**
6) Law Enforcement 'A'	TA	.08	.08			.16
	TRA	.08*	.13*	.33*		.50**
	TDAR	----	----	----	----	1.00**
	A	1.21				1.21
7) Law Enforcement 'B'	TRA	----	----	----		.25**
	A	.33*				.33**
8) Military Unit 'A'	ADTR	.21	.54	.50	1.00	2.25
9) Military Unit 'B'	TA	.01	.25			.26
	TRA	.04*	.08*	.01*		.13**
	TA	----	----			.08**
	R	.13*				.13**
	TA	----	----			.33**
10) Military Unit 'C'	TA	.04	.17			.21
	TA	.01	.08			.09
	TRA	.08	----	----		.15**
	TDRA	.02*	.01*	.08*	.01*	.12**
	TDRA	----	----	----	----	.75**
	TA	----	----			1.00**

Table 7a: Forms of Restructuring and Timing (Continued)

Unit Type	Form	Lag 1st Element	Lag 2nd Element	Lag 3rd Element	Lag 4th Element	Total Time of Restructuring
11) Emergent Unit 'A'	RA	4.00*	11.00*			15.00**
12) Emergent Unit 'B'	TRA	.01	1.00	1.00		2.01
	TA	-----	-----	-----		4.00**
	TA	-----	-----	-----		-----
13) Federal Agency 'A'	TRA	.33*	-----	-----		5.00**
	TA	-----	-----	-----		2.00**
	TAR	-----	-----	-----		2.00**
	TAR	-----	-----	-----		4.00**
	TRA	-----	-----	-----		1.00**
	TRA	-----	-----	-----		10.00**
	AR	-----	-----	-----		15.00**
	TA	-----	-----	-----		30.00**
14) Federal Agency 'B'	TRA	.01*	.33*	-----		-----
	AR	.33*	.67*	-----		1.00**
	A	1.00*	-----	-----		1.00**
	RA	-----	-----	-----		3.00**
	A	3.00*	-----	-----		3.00**
15) Government Agency	A	.04				.04
	TDAR	.04	.01	.04	.01	.10
	TR	.01	.08			.09
	A	.08				.08
	TA	.01	.04			.05
	TAR	.01	.04	.04		.09
	A	.04*				.04**
	RA	.04	.01			.05
	TA	.25	.08*			.33**
	AT	.42	.04			.46
	TRAD	.50	.13	.75	2.00	3.38

Table 7a: Forms of Restructuring and Timing (Continued)

<u>Unit Type</u>	<u>Form</u>	<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>
16) State Agency 'A'	(None Documented)					
17) State Agency 'B'	TAR	.08*	.67*	1.75*		2.50**
	TDA	2.00	.01	.01		2.02
	TA	.04*	1.96*			2.00**
	R	----				----
18) Hospital 'A'	TDAR	.01	.01	.08	.08	.18
	RA	.50	.04			.54
	TDA	.01	.01	.50		.52
	TR	.01*	.24*			.25**
	TAD	----	----	----		15.00**
19) Hospital 'B'	TAR	.01	.04	.04		.09
	AR	.01	.08			.09
	RA	.01	1.00			1.01
	TA	2.50*	1.50*			4.00**
	ATR	2.00	.60*	.33*		2.93**
20) Hospital 'C'	DTA	.01	.01	.01		.03
	TAR	.01	.01	.13		.15
	TRA	.01	.04	.01		.06
	TAR	.04	.04	.01		.09
	TAR	.01	.01	.13		.15
	TAR	.02*	.03*	.08*		.13**
	TA	1.00*	.50*			1.50**
	ATR	3.00	1.54	7.00		11.54
	TRA	----	----	----		20.00**

Table 7a: Forms of Restructuring and Timing (Continued)

<u>Unit Type</u>	<u>Form</u>	<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>
21) Hospital 'D'	TA	.01	.08			.09
	TAR	.01	.01	.13		.15
	TRA	.01*	.06*	.01*		.08**
	TA	.02*	.15*			.17**
	AR	----	----			.17**
	AT	.01	.04			.05
	TRA	.25	.13	.01		.39
	A	1.00*				1.00**
	TRA	5.00*	1.00*	2.00*		8.00**
	22) Hospital 'E'	TDAR	.01	.01	.01	.04
RATD		.01	.01	.04	.01	.07
TA		.01	.01			.02
TA		.01	.01			.02
RA		.01	.04			.05
TA		.04	.01			.05
TA		.02*	.01*			.03**
TAR		.01	.01	.04		.06
TA		----	----			.04**
TAR		.04*	.02*	.02*		.08**
TA		----	----			.13**
RA		----	----			.04**
R		.13				.13
AR		----	----			.13**
TA		----	----			.04**
A		.25*				.25**
A		2.33*				2.33**
TAR		3.00	1.50	.50*		5.00**

Table 7a: Forms of Restructuring and Timing (Continued)

Unit Type	Form	Lag 1st Element	Lag 2nd Element	Lag 3rd Element	Lag 4th Element	Total Time of Restructuring
23) Mass Media	A	.13*				.13**
	R	.29*				.29**
	TDAR	.04*	.04*	.07*	.06*	.21**
	A	.08*				.08**
	TRA	---	---	---		.21**
	TRA	---	---	---		.42**
<u>Distribution Measures:</u>						
Total Number		Lag 1st Element	Lag 2nd Element	Lag 3rd Element	Lag 4th Element	Total Time of Restructuring
134		107	59	14	134	
Number Documented (N)		72 (67.29%)	39 (66.10%)	10 (91.43%)	129 (96.27%)	
Mean	1.75	.83	.58	.38	3.67	
Median	.08	.04	.08	.08	.38	
Standard Deviation	5.54	2.75	1.25	.67	7.71	
Range	.01 to 42.00	.01 to 20.00	.01 to 7.00	.01 to 2.00	.01 to 42.00	

* Indicates Estimated Elapsed/Lag Times

** Indicates Estimated Total Time of Restructuring

Table 7b: Levels of Restructuring for the Flood and Tornado
with Mean Lag Times (Time Expressed in Days)

Flood's Levels of Restructuring					
<u>Level of Restructuring</u>	<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>
Level One (N=27)	4.45 (N=25)				4.54 (N=25)
Level Two (N=48)	.88 (N=31)	1.46 (N=30)			3.54 (N=47)
Level Three (N=45)	.96 (N=34)	.50 (N=32)	.71 (N=29)		3.83 (N=43)
Level Four (N=14)	.63 (N=10)	.08 (N=10)	.29 (N=10)	.38 (N=10)	1.96 (N=14)
Tornado's Levels of Restructuring					
<u>Level of Restructuring</u>	<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>
Level One (N=15)	5.07 (N=15)				5.07 (N=15)
Level Two (N=7)	4.38 (N=7)	11.22 (N=7)			15.60 (N=7)
Level Three (N=2)	.27 (N=2)	.10 (N=2)	.19 (N=2)		.56 (N=2)
Level Four (N=9)	1.30 (N=9)	3.86 (N=9)	.55 (N=9)	5.05 (N=9)	10.54 (N=9)

(level 4) have a decrease in lag time from the first to the second lag but increases between the second and third and the third and fourth lags. Note that the third and fourth elements in the three- and four-element forms have only slightly slower times than the second element, but still faster than the first element. This suggests that for three- and four-element forms speed is maintained once the change is initiated. In fact, t-tests indicate that each level of restructuring has no statistically significant difference between any of the mean lag times. Therefore momentum is slight, when evidenced at all, because restructuring times are similar. Note that Linn's sample (see bottom of Table 7b) is similar because no level reflects a continuous decrease in time from the first to last lag time. Level two evidences increases throughout and levels three and four evidence a mixture (increase, decrease, and increase). The above analyses therefore suggests that initial change is not necessarily more tentative than what comes later.

Analyzing initial forms of restructuring (as opposed to the initial elements of each form as in the above analysis) is another way of testing if first restructurings are more tentative. I used lag times and total time of restructuring for each form to see if differences exist between initial forms and what follows. By eliminating the two units that had only one restructuring, and then selecting out the initial forms for each of the remaining sequences of restructurings, I was able to compare mean lag times and total times of restructurings of two subsamples (Ns of 20 for first restructurings and 112 for subsequent restructurings). T-tests indicate that there are significant differences for the mean lag times between catalyst and first element change (at the .004 level) and for the total time of restructuring (at

the .000 level). There are no statistically significant differences between the second and third element and third and fourth element lag times. Similar to the element analysis above, what comes first is not more tentative. To the contrary, initial restructurings are quicker than later ones.

I then tried to see if "relatively complete restructurings are as likely to be rapid as delayed" (Linn and Kreps, 1988:in press) in the following way: I grouped the forms of restructuring by degree of restructuring (one-, two-, three-, and four-elements changed), and then compared lag times (by element) and total time of restructuring (by form) across levels of restructurings. There are no statistically significant differences between less complete restructurings (one- and two-element forms) and more complete forms (three- and four-element forms). In fact, the only significant difference (at the .027 level) is between three- and four-element forms at the second lag time (lag between the first and second elements). The lag time is longer for the former as opposed to the latter. Note also that the total times of restructuring for one-, two-, three-, and four-element restructurings are quite similar. Regardless of the level of analysis (element or form), then, my work replicates Linn's conclusion that relatively complete restructurings are as likely to be rapid as delayed.

Linn suggested that the longer it takes to restructure initially the less likely would other restructurings follow. Linn's comparison is sequences with single restructurings versus sequences of 2 or more restructurings. Once again because I had only 2 sequences with a single restructuring, I used 5 or fewer restructurings and more than 5 restructurings in this analysis. The mean difference in the total time

of restructuring across the two subsamples is not statistically significant. In fact, there is no significant difference on any temporal comparisons made between small and large sequences. Whether initial restructurings are fast or slow has no bearing on the number of restructurings in a sequence.

Another temporal analysis compares differences in ends-based, means-based, and balanced restructurings. Grouping forms according to positive, negative, and balanced metric scores yielded an inadequate balanced subsample (N=3). To achieve an appropriate distribution of balanced forms, I adjusted the measure by including forms that are as balanced as possible for a given level (two- and three-element forms) with the pure balanced forms (four-element forms). This was accomplished by collapsing the metric scores accordingly: +2 to +7 (N=16), +1 to -1 (N=71), and -2 to -7 (N=47). T-tests indicate that means-based restructurings have significantly slower first lag times (at the .047 level) than balanced restructurings. The only other statistically significant temporal difference is between ends-based and balanced forms for the second lag time (at the .002 level): End-based restructurings are faster than balanced forms.

Type of Enacting Units and Events

One major contrast between the studies is the difference between the enacting social units. As Linn and Kreps (1988) stated, the tornado's enacting social units had little or no disaster experience. They implied that this lack of experience resulted in not knowing what action was needed (e.g., symbolic milling). The present study evidenced forms enacted by units, some of which had emergency training and experience. The number of restructurings (80) that were enacted by

trained or experienced units (12 of them) accounts for 60% of the total sample. By categorizing forms of restructuring that were enacted by social units that had formal training in emergency relevant situations (e.g., hospitals, law enforcement and government agencies, and military units) and those that did not, I found that restructurings enacted by the former are significantly faster in the first lag time (catalyst to first element) and total time of restructuring (t-test significance levels of .015 and .001, respectively). This suggests that disaster experience or training works to reduce symbolic milling.

Another variable shows statistically significant differences with respect to restructurings enacted by units having disaster experience or training and those which do not. A chi-square test indicates that restructurings enacted by experienced or trained units are significantly more likely to be enacted under the rubric of written plans: 81.8% of the restructurings enacted by experienced or trained units (N=80) were enacted also under the rubric of formal planning. In contrast, only 29.8% of the restructurings enacted by the remaining units (N=54) evidence formal planning. This finding, when combined with the considerable improvisation noted above, suggests that there is more innovative behavior when guidelines are given on ways to react under stress situations. Thus, I am not arguing that guidelines are firmly established procedures, but rather flexible outlines that give some insight on how to respond to the unique demands of an emergency. By comparing mean time lags between restructurings enacted by units with and without written emergency plans, I found that restructurings enacted by units having plans had significantly faster lag times from catalyst to the first element and in the total time of restructuring

(significance levels of .045 and .001, respectively). Once again, experience, training, and formal planning reduce symbolic milling, but not innovativeness.

Another major difference between the studies was the type of event. Recall that floods have a greater potential for forewarning than tornadoes. In contrast to Linn's study (tornado), my study has restructurings initiated within a 38 hour period prior to the event (dyke breaching). In order to capture this distinction, I identified restructurings as either pre- or post-event (pre-event includes restructurings started and completed prior to impact and those restructurings started prior but ending after impact). Tables 8a and 8b present pre- and post-event forms by social unit and respective lag times. Tables 9a and 9b present the pre- and post-event restructurings by social unit with derived metric scores.

As indicated on these tables, 46 restructurings were enacted by 16 social units prior to the event. The number of restructurings ranges from 1 to 10. Eighty-eight restructurings were enacted by 21 social units post-event. The number of restructurings ranges from 1 to 8. [Unit 8 has no documented post-event restructurings.] Note that 78.3% of the pre-event restructurings and 56.8% of the post-event restructurings are from larger sequences (five or more restructurings in the overall sequence).

Early responses (pre-event period) for this sample involve primarily units with written plans, experience, and/or training (t-test significance levels of .000 for both). Recalling the impact of pre-planning, experience, and/or training on the timing of responses, it should not be surprising to find faster times for the pre-event

restructurings for lags one, two, and three, and for the total time of restructuring (t-test levels of .002, .018, .016, and .000 respectively; see Tables 8a and 8b). These faster times might reflect the urgency of demands on social units to get things done prior to the forecasted impact. Stated another way, within rigid time constraints units proactively prepared to minimize the damage by the impending impact. In contrast, post-impact responses were reactive with more time to assess the damage and proceed accordingly. Recall that Linn's restructurings were entirely reactive.

Temporal urgency is interesting with respect to a comparison of derived metric scores (Tables 9a and 9b). For pre-event restructurings, the mean metric score is -0.761 (median -1.0). Post-event restructurings have a mean metric score of -1.57 (median -1.0). This suggests that means restructurings were more prevalent after impact and responses occurring prior to the event were more balanced. This difference is due, in part, to a greater amount of ends-initiated restructuring before impact: 34 (74%) of the 46 cases are ends-initiated with 30 (88%) of those 34 cases reflecting metric scores of plus or minus 1 (two- and three-element forms that are as balanced as possible). T-tests confirm (at the .033 level) that pre-event forms are on average significantly more ends-initiated (34 of 46 or 74%) than post-event forms (49 of 88 or 57%). This supports my earlier suggestion that pre-event responses reflect proactive responses to anticipated demands, while post-event responses reflect reactive responses to both anticipated and unanticipated demands. This also indicates that for pre-event forms, the means-related elements largely restructure following a change in ends. On the other hand, following impact more

Table 8a: Pre-Event Forms of Restructuring and Timing of Elements (Time Expressed in Days)

Unit Type	Form	Lag 1st Element	Lag 2nd Element	Lag 3rd Element	Lag 4th Element	Total Time of Restructuring
1) Financial Unit 'A'	TRA	.01	.04	.01		.06
	TA	.19*	.02*			.21**
2) Financial Unit 'B'	A	.08*				.08**
3) Financial Unit 'C'	A	.50*				.50**
4) Financial Unit 'D'	TRA	.21	.04	.01		.26
5) Financial Unit 'E'	(None Documented)					
6) Law Enforcement 'A'	TA	.08	.08			.16
	TRA	.08*	.13*	.33*		.50**
7) Law Enforcement 'B'	TRA	----	----	----		.25**
8) Military Unit 'A'	ADTR	.21	.54	.50	1.00	2.25
9) Military Unit 'B'	TA	.01	.25			.26
	TRA	.04*	.08*	.01*		.13**
10) Military Unit 'C'	TA	.04	.17			.21
	TA	.01	.08			.09
	TRA	.08	----	----		.15**

Table 8a: Pre-Event Forms of Restructuring and Timing (Continued)

<u>Unit Type</u>	<u>Form</u>	<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>
11) Emergent Unit 'A'	None Documented					
12) Emergent Unit 'B'	None Documented					
13) Federal Agency 'A'	None Documented					
14) Federal Agency 'B'	None Documented					
15) Government Agency	A	.04				.04
	TDAR	.04	.01	.04	.01	.10
	TR	.01	.08			.09
	A	.08				.08
	TA	.01	.04			.05
	TAR	.01	.04	.04		.09
16) State Agency 'A'	A	.04*				.04**
	RA	.04	.01			.05
16) State Agency 'A'	(None Documented)					
17) State Agency 'B'	(None Documented)					
18) Hospital 'A'	TDAR	.01	.01	.08	.08	.18
	TAR	.01	.04	.04		.09
19) Hospital 'B'	AR	.01	.08			.09

Table 8a: Pre-Event Forms of Restructuring and Timing (Continued)

Unit Type	Form	Lag 1st Element	Lag 2nd Element	Lag 3rd Element	Lag 4th Element	Total Time of Restructuring
20) Hospital 'C'	DTA	.01	.01	.01		.03
	TAR	.01	.01	.13		.15
	TRA	.01	.04	.01		.06
	TAR	.04	.04	.01		.09
	TAR	.01	.01	.13		.15
21) Hospital 'D'	TA	.01	.08			.09
	TAR	.01	.01	.13		.15
	TRA	.01*	.06*	.01*		.08**
22) Hospital 'E'	TDAR	.01	.01	.01	.04	.07
	RATD	.01	.01	.04	.01	.07
	TA	.01	.01			.02
	TA	.01	.01			.02
	RA	.01	.04			.05
	TA	.04	.01			.05
	TA	.02*	.01*			.03**
	TAR	.01	.01	.04		.06
	TA	-----	-----			.04**
	TAR	.04*	.02*	.02*		.08**
23) Mass Media	A	.13*				.13**
	R	.29*				.29**
	TDAR	.04*	.04*	.07*	.06*	.21**

Table 8a: Pre-Event Forms of Restructuring and Timing (Continued)

<u>Distribution Measures:</u>		<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>
Total Number	46	39	23	6	46	
Number Documented (N)	44 (95.65%)	36 (92.31%)	21 (91.30%)	6 (100%)	46 (100%)	
Mean	.04	.04	.08	.21	.16	
Median	.04	.04	.04	.08	.08	
Standard Deviation	.08	.08	.13	.38	.33	
Range	.01 to .50	.01 to .54	.01 to .50	.01 to 1.00	.04 to 2.25	

* Indicates Estimated Elapsed/Lag Times

** Indicates Estimated Total Time of Restructuring

Table 8b: Post-Event Forms of Restructuring and Timing of Elements (Time Expressed in Days)

Unit Type	Form	Lag 1st Element	Lag 2nd Element	Lag 3rd Element	Lag 4th Element	Total Time of Restructuring
1) Financial Unit 'A'	AR	.01	.04			.05
	TDAR	2.71	.04	.17	.04	2.96
	RTA	4.00	.01	1.00		5.01
	DTA	---	---	---		27.00**
	AR	4.00	3.00*	---		7.00**
	TRA	10.00*	5.00*	---		---
2) Financial Unit 'B'	TDAR	2.67	.01	1.00	.50	4.18
	RDTA	---	---	---	---	7.00**
	A	16.00*				16.00**
	A	7.00*				7.00**
	RA	10.00*	20.00*			30.00**
3) Financial Unit 'C'	TAR	.25*	1.71*	.04*		2.00**
	TAR	.33*	.50*	2.17*		3.00**
	A	1.00*				1.00**
	TA	---	---			7.00**
	TDRA	---	---	---	---	5.00**
	R	42.00				42.00
	R	---				---
4) Financial Unit 'D'	TAR	1.50*	.75*	2.75*		5.00**
	TAR	.04	.25	.01*		3.00**
	AR	3.00*	3.00*	---		6.00**
	RTA	---	---	---		30.00**

Table 8b: Post-Event Forms of Restructuring and Timing (Continued)

Unit Type	Form	Lag 1st Element	Lag 2nd Element	Lag 3rd Element	Lag 4th Element	Total Time of Restructuring
5) Financial Unit 'E'	R	1.00	-----	-----	-----	1.00
	TA	-----	-----	-----	-----	.21**
	R	4.00*	-----	-----	-----	4.00**
	R	1.50*	-----	-----	-----	1.50**
	T	30.00*	-----	-----	-----	30.00**
6) Law Enforcement 'A'	TDAR	-----	-----	-----	-----	1.00**
	A	1.21	-----	-----	-----	1.21
7) Law Enforcement 'B'	A	.33*	-----	-----	-----	.33**
8) Military Unit 'A'	(None Documented)					
9) Military Unit 'B'	TA	-----	-----	-----	-----	.08**
	R	.13*	-----	-----	-----	.13**
	TA	-----	-----	-----	-----	.33**
10) Military Unit 'C'	TDRA	.02*	.01*	.08*	.01*	.12**
	TDRA	-----	-----	-----	-----	.75**
	TA	-----	-----	-----	-----	1.00**
11) Emergent Unit 'A'	RA	4.00*	11.00*	-----	-----	15.00**
12) Emergent Unit 'B'	TRA	.01	1.00	1.00	-----	2.01
	TA	-----	-----	-----	-----	4.00**
	TA	-----	-----	-----	-----	-----

Table 8b: Post-Event Forms of Restructuring and Timing (Continued)

<u>Unit Type</u>	<u>Form</u>	<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>
13) Federal Agency 'A'	TRA	.33*	----	----	----	5.00**
	TA	----	----	----	----	2.00**
	TAR	----	----	----	----	2.00**
	TAR	----	----	----	----	4.00**
	TRA	----	----	----	----	1.00**
	TRA	----	----	----	----	10.00**
	AR	----	----	----	----	15.00**
	TA	----	----	----	----	30.00**
14) Federal Agency 'B'	TRA	.01*	.33*	----	----	-----
	AR	.33*	.67*	----	----	1.00**
	A	1.00*	----	----	----	1.00**
	RA	----	----	----	----	3.00**
	A	3.00*	----	----	----	3.00**
15) Government Agency	TA	.25	.08*	----	----	.33**
	AT	.42	.04	----	----	.46
	TRAD	.50	.13	.75	2.00	3.38
16) State Agency 'A'	(None Documented)					
17) State Agency 'B'	TAR	.08*	.67*	1.75*	----	2.50**
	TDA	2.00	.01	.01	----	2.02
	TA	.04*	1.96*	----	----	2.00**
	R	----	----	----	----	-----
18) Hospital 'A'	RA	.50	.04	----	----	.54
	TDA	.01	.01	.50	----	.52
	TR	.01*	.24*	----	----	.25**
	TAD	----	----	----	----	15.00**

Table 8b: Post-Event Forms of Restructuring and Timing (Continued)

<u>Unit Type</u>	<u>Form</u>	<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>
19) Hospital 'B'	RA	.01	1.00			1.01
	TA	2.50*	1.50*			4.00**
	ATR	2.00	.60*	.33*		2.93**
20) Hospital 'C'	TAR	.02*	.03*	.08*		.13**
	TA	1.00*	.50*			1.50**
	ATR	3.00	1.54	7.00		11.54
	TRA	---	---	---		20.00**
21) Hospital 'D'	TA	.02*	.15*			.17**
	AR	---	---			.17**
	AT	.01	.04			.05
	TRA	.25	.13	.01		.39
	A	1.00*				1.00**
	TRA	5.00*	1.00*	2.00*		8.00**
22) Hospital 'E'	TA	---	---			.13**
	RA	---	---			.04**
	R	.13				.13
	AR	---	---			.13**
	TA	---	---			.04**
	A	.25*				.25**
	A	2.33*				2.33**
	TAR	3.00	1.50	.50*		5.00**
23) Mass Media	A	.08*				.08**
	TRA	---	---	---		.21**
	TRA	---	---	---		.42**

Table 8b: Post-Event Forms of Restructuring and Timing (Continued)

<u>Distribution Measures:</u>						
	<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>	
Total Number	86	67	36	8	86	
Number Documented (N)	56 (65.12%)	36 (53.73%)	18 (50.00%)	4 (50.00%)	83 (96.51%)	
Mean	3.13	1.63	1.17	.42	5.58	
Median	1.00	.42	.63	.29	2.00	
Standard Deviation	7.08	3.75	1.71	.96	9.08	
Range	.01 to 42.00	.01 to 20.00	.01 to 7.00	.01 to 2.00	.01 to 42.00	

* Indicates Estimated Elapsed/Lag Times

** Indicates Estimated Total Time of Restructuring

Table 9a: Forms of Restructuring Documented and Derived Metric Scores for Each Case of Restructuring Pre-Event (N=46)

<u>Unit</u>	<u>Forms Documented (Metric Score)</u>	<u>Unit Means</u>
1) Financial Unit 'A'	T-R-A, T-A (-1, +1)	0.0
2) Financial Unit 'B'	A (-4)	-4.0
3) Financial Unit 'C'	A (-4)	-4.0
4) Financial Unit 'D'	T-R-A (-1)	-1.0
5) Financial Unit 'E'	NONE DOCUMENTED	---
6) Law Enforcement 'A'	T-A, T-R-A (+1, -1)	0.0
7) Law Enforcement 'B'	T-R-A (-1)	-1.0
8) Military Unit 'A'	A-D-T-R (0)	0.0
9) Military Unit 'B'	T-A, T-R-A (+1, -1)	0.0
10) Military Unit 'C'	T-A, T-A, T-R-A (+1, +1, -1)	+0.3
11) Emergent Unit 'A'	NONE DOCUMENTED	---
12) Emergent Unit 'B'	NONE DOCUMENTED	---
13) Federal Agency 'A'	NONE DOCUMENTED	---
14) Federal Agency 'B'	NONE DOCUMENTED	---
15) Government Agency	A, T-D-A-R, T-R, A, T-A, T-A-R, A, R-A (-4, +4, +1, -4, +1, -1, -4, -7)	-1.8

Table 9a: Forms of Restructuring Documented and Derived Metric Scores (Continued)

<u>Unit</u>	<u>Forms Documented (Metric Score)</u>	<u>Unit Means</u>
16) State Agency 'A'	NONE DOCUMENTED	---
17) State Agency 'B'	NONE DOCUMENTED	---
18) Hospital 'A'	T-D-A-R (+4)	+4.0
19) Hospital 'B'	T-A-R, A-R (-1, -7)	-4.0
20) Hospital 'C'	D-T-A, T-A-R, T-R-A, T-A-R, T-A-R (+5, -1, -1, -1, -1)	+0.2
21) Hospital 'D'	T-A, T-A-R, T-R-A (+1, -1, -1)	-0.3
22) Hospital 'E'	T-D-A-R, R-A-T-D, T-A, T-A, R-A, T-A, T-A, T-A-R, T-A, T-A-R (+4, -4, +1, +1, -7, +1, +1, -1, -1, +1, -1)	-0.4
23) Mass Media	A, R, T-D-A-R (-4, -4, +4)	-1.3

Distribution Measures:

N=46

Mean Metric Score = -0.8 Median Metric Score = -1.0
 Standard Deviation = 2.9 Range = -7 to +5

7 One-Element Forms Documented (15.22%)
 16 Two-Element Forms Documented (34.78%)
 17 Three-Element Forms Documented (36.96%)
 6 Four-Element Forms Documented (13.04%)

Table 9b: Forms of Restructuring Documented and Derived Metric Scores
for Each Case of Restructuring Post-Event (N=88)

<u>Unit</u>	<u>Forms Documented (Metric Score)</u>	<u>Unit Means</u>
1) Financial Unit 'A'	A-R, T-D-A-R, R-T-A, D-T-A, A-R, T-R-A (-7, +4, -3, +5, -7, -1)	-1.5
2) Financial Unit 'B'	T-D-A-R, R-D-T-A, A, A, R-A (+4, 0, -4, -4, -7)	-2.2
3) Financial Unit 'C'	T-A-R, T-A-R, A, T-A, T-D-R-A, R, R (-1, -1, -4, +1, +4, -4, -4)	-1.3
4) Financial Unit 'D'	T-A-R, T-A-R, A-R, R-T-A (-1, -1, -7, -3)	-3.0
5) Financial Unit 'E'	R, T-A, R, R, T (-4, +1, -4, -4, +4)	-1.4
6) Law Enforcement 'A'	T-D-A-R, A (+4, -4)	0.0
7) Law Enforcement 'B'	A (-4)	-4.0
8) Military Unit 'A'	NONE DOCUMENTED	----
9) Military Unit 'B'	T-A, R, T-A (+1, -4, +1)	-0.7
10) Military Unit 'C'	T-D-R-A, T-D-R-A, T-A (+4, +4, +1)	+3.0
11) Emergent Unit 'A'	R-A (-7)	-7.0
12) Emergent Unit 'B'	T-R-A, T-A, T-A (-1, +1, +1)	+0.3
13) Federal Agency 'A'	T-R-A, T-A, T-A-R, T-A-R, T-R-A, T-R-A, A-R, T-A (-1, +1, -1, -1, -1, -1, -7, +1)	-1.3
14) Federal Agency 'B'	T-R-A, A-R, A, R-A, A (-1, -7, -4, -7, -4)	-5.0

Table 9b: Forms of Restructuring Documented and Derived Metric Scores (Continued)

<u>Unit</u>	<u>Forms Documented (Metric Score)</u>	<u>Unit Means</u>
15) Government Agency	T-A, A-T, T-R-A-D (+1, -1, 0)	0.0
16) State Agency 'A'	NONE DOCUMENTED	---
17) State Agency 'B'	T-A-R, T-D-A, T-A, R (-1, +5, +1, -4)	+0.3
18) Hospital 'A'	R-A, T-D-A, T-R, T-A-D (-7, +5, +1, +3)	+0.5
19) Hospital 'B'	R-A, T-A, A-T-R (-7, +1, -3)	-3.0
20) Hospital 'C'	T-A-R, T-A, A-T-R, T-R-A (-1, +1, -3, -1)	-1.0
21) Hospital 'D'	T-A, A-R, A-T, T-R-A, A, T-R-A (+1, -7, +1, -1, -4, -1)	-1.8
22) Hospital 'E'	T-A, R-A, R, A-R, T-A, A, A, T-A-R (+1, -7, -4, -7, +1, -4, -4, -1)	-3.1
23) Mass Media	A, T-R-A, T-R-A (-4, -1, -1)	-2.0

Distribution Measures:

N=88

Mean Metric Score = -2.9 Median Metric Score = -1.0
 Standard Deviation = 3.4 Range = -7 to +5

20 One-Element	Forms Documented	(22.7%)
32 Two-Element	Forms Documented	(36.4%)
28 Three-Element	Forms Documented	(31.8%)
8 Four-Element	Forms Documented	(9.1%)

forms are initiated by means-related elements. Note that 33 (38%) of the 88 post-event restructurings are documented as pure means-related forms [13 (15%) means-means and 20 (23%) means only]. In comparison, pre-event restructurings evidence 22% pure means-related forms (3 means-means and 7 means only).

Although there are statistically significant temporal differences in comparing pre- and post-event restructurings, there is no significant difference between their metric scores and degree of change (number of elements restructured). This indicates that the interplay between ends and means of organizing and level of restructuring were similar before and after the event. This is interesting because demands and responses changed after the event. Prior to impact social units were responding to anticipated demands of the impending flood. And recall that plans were available for most of the units that restructured pre-event. Post-event restructurings resulted from both anticipated and unanticipated demands.

Tables 8a and 8b break down Table 7a by pre- and post-event restructurings. Recall from an earlier discussion the problem of using aggregate distribution measures (that include single-element restructurings) and the alternative of analyzing each level individually and then across the levels. Breaking down the original sequences by pre- and post-event restructurings suggests that momentum is not evidenced for restructurings prior to the event. In fact, as indicated on Table 8a, from the first lag time to the last there is either no change or a slight increase in time. Table 8b, on the other hand, suggests that post-event lag times decrease throughout. Thus, by the distributional measures, structural momentum is evidenced across

post-event restructurings.

Analyzing pre- and post-event restructurings by level of restructuring tests the impact of the single-element forms. Table 10 presents mean lag times and the total time of restructuring for pre- and post-event restructurings at each level. The table does not show consistent decreases in lag times. Note that pre-event restructuring remains the same at the third level. Note also that levels two and four evidence increases throughout the lags. However, t-tests, by levels, confirm that pre-event restructurings do not evidence significant differences between the mean lag times for any level. Post-event restructurings evidence a mixture: the second level increases; the third level decreases from first to second lag then increases from second to third lag; and the fourth level has an initial decrease with the remaining lag times increasing. The temporal decrease between first and second lags is significant (at the .047 level) at the third stage. There are no other significant differences post-event. Therefore, for pre-event restructurings, similar conclusions result regardless of whether the analysis is based on distribution measures or levels of restructuring. But the analyses for post-event restructurings are contradictory. This is not surprising because proportionally more single element restructurings were documented post-event (20 of 88 or 23%) than pre-event (7 of 46 or 15%). Note that pre-event single element restructurings represent only 26% of all the single element restructurings. Note also that mean lag times for pre-event single element restructurings are relatively similar to the mean of the first lag for other pre-event restructurings; however, post-event single element restructurings mean time lags are considerably different from

Table 10: Pre- and Post-Event Levels of Restructurings with Mean Lag Times (Time Expressed in Days)

Pre-Event Levels of Restructuring						
<u>Level of Restructuring</u>	<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>	
Level One (N=7)	.16 (N=7)				.16 (N=7)	
Level Two (N=16)	.04 (N=15)	.08 (N=15)			.13 (N=16)	
Level Three (N=17)	.04 (N=16)	.04 (N=15)	.04 (N=15)		.13 (N=17)	
Level Four (N=6)	.04 (N=6)	.08 (N=6)	.13 (N=6)	.21 (N=6)	.46 (N=6)	
Post-Event Levels of Restructuring						
<u>Level of Restructuring</u>	<u>Lag 1st Element</u>	<u>Lag 2nd Element</u>	<u>Lag 3rd Element</u>	<u>Lag 4th Element</u>	<u>Total Time of Restructuring</u>	
Level One (N=20)	6.21 (N=18)				6.21 (N=18)	
Level Two (N=32)	1.63 (N=16)	2.83 (N=15)			5.33 (N=31)	
Level Three (N=28)	1.75 (N=18)	.88 (N=17)	1.33 (N=14)		6.25 (N=26)	
Level Four (N=8)	1.50 (N=4)	.04 (N=4)	.50 (N=4)	.63 (N=4)	3.04 (N=8)	

the first lag of the other post-event restructurings.

Rhythm Findings--Flood & Tornado

Recall that one rhythmic measure was a Guttman scale incorporating identical forms, identical metric scores, and similar direction. Scoring ranged from 0 to 3: nonrhythm = 0; similar direction = 1; similar direction and identical metric scores = 2; and similar direction, identical metric scores, and identical forms = 3. A criterion of 60% similarity (of forms, scores, or directions) within a sequence was required to reflect rhythm. The flood has 20 sequences meeting the criterion of two or more forms. [Units 8, 11, and 16 are eliminated.] Table 11a presents the sequences by the three measures, total rhythm scores, and mean metric scores. The distribution measures indicate that 7 (35%) of the 20 sequences evidenced were nonrhythmic on all the measures. The remaining 13 (65%) evidenced some degree of rhythm: Seven (35%) were scored 1, five (25%) were scored 2, and one (5%) was scored 3. The average mean metric score of nonrhythmic sequences (N=7) is -1.1. The average mean metric score of rhythmic sequences (N=13) is -1.3. Broken down by rhythm score, the average mean metric scores are: -1.8 for a rhythm score of 1 (N=7, range of +1.7 to -5.0); -0.4 for a rhythm score of 2 (N=5, range of +1.2 to -2.6); and -1.4 for a rhythm score of 3 (N=1).

Expressing rhythm by metric score (i.e., ends-based greater than 0, balance = 0, and means-based less than 0) offers additional insight on the dynamics of rhythm. Ends- and means-based sequences were mostly rhythmic: 80% of the former (4 of 5) and 71% of the latter (10 of 14) had minimal rhythm scores of 1. In fact, 60% (3 of 5) of the ends-based sequences received a rhythm score of 2 (similar direction and metric

Table 11a: Rhythm and Mean Metric Scores Across Sequences of Restructurings (Flood)

<u>Unit Type</u>	<u>Similar Direction*</u>	<u>Identical Scores*</u>	<u>Identical Forms*</u>	<u>Rhythm Scores</u>	<u>Mean Metric Scores</u>
1) Financial Unit 'A'	NO	NO	NO	0	-1.1
2) Financial Unit 'B'	YES	NO	NO	1	-2.5
3) Financial Unit 'C'	YES	NO	NO	1	-1.6
4) Financial Unit 'D'	YES	YES	NO	2	-2.6
5) Financial Unit 'E'	YES	YES	YES	3	-1.4
6) Law Enforcement 'A'	NO	NO	NO	0	0.0
7) Law Enforcement 'B'	YES	NO	NO	1	-2.5
8) Military Unit 'A'	--	--	--	-	----
9) Military Unit 'B'	NO	NO	NO	0	-0.4
10) Military Unit 'C'	YES	NO	NO	1	+1.7
11) Emergent Unit 'A'	--	--	--	-	----
12) Emergent Unit 'B'	YES	YES	NO	2	+0.3
13) Federal Agency 'A'	YES	YES	NO	2	-1.3
14) Federal Agency 'B'	YES	NO	NO	1	-5.0

*60% similarity within sequence was maintained.

Table 11a: Rhythm and Mean Metric Scores Across Sequences of Restructurings (Continued)

<u>Unit Type</u>	<u>Similar Direction*</u>	<u>Identical Scores*</u>	<u>Identical Forms*</u>	<u>Rhythm Scores</u>	<u>Mean Metric Scores</u>
15) Government Agency	NO	NO	NO	0	-1.3
16) State Agency 'A'	---	---	---	-	---
17) State Agency 'B'	NO	NO	NO	0	+0.3
18) Hospital 'A'	YES	YES	NO	2	+1.2
19) Hospital 'B'	NO	NO	NO	0	-3.4
20) Hospital 'C'	YES	YES	NO	2	+0.3
21) Hospital 'D'	YES	NO	NO	1	-1.3
22) Hospital 'E'	NO	NO	NO	0	-1.6
23) Mass Media	YES	NO	NO	1	-1.7

Distribution Measures:

<u>Rhythm Scores</u>	<u>Number of Sequences</u>	<u>Averaged Mean Metric Scores</u>
0	7	-1.1
1	7	-1.8
2	5	-0.4
3	1	-1.4

scores) and 43% (6 of 14) of the means-based sequences had a rhythm score of 1 (similar direction). The only balanced sequence (Unit 6) was nonrhythmic. These findings suggest that ends- and means-based sequences are more likely to evidence some degree of rhythm. However, means-based sequences evidence less degrees of rhythm than ends-based sequences.

In order to be more sensitive to the near balanced sequences, I adjusted the metric groupings. I categorized the sequences by mean metric scores +7 through +1 (ends-based, N=2), less than +1 and greater than -1 (balanced, N=5), and -1 through -7 (means-based, N=13). This regrouping shows that 60% of the adjusted balanced sequences was nonrhythmic; 69% of the means-based sequences are rhythmic (46% at rhythm score 1, 15% at score 2, and 8% at score 3); and 100% of the ends-based sequences are rhythmic. Note that the remaining adjusted balanced sequences (N=2) have rhythm scores of 2 and the remaining means-based sequences (N=4) are nonrhythmic. Therefore, under this refined measure ends- and means-based sequences are still more rhythmic than balanced sequences, but the latter did evidence some rhythm.

By categorizing the sequences as large (more than five forms, N=10) or small (five or less forms, N=10) rhythm is evidenced in 7 (70%) of the larger sequences and 6 (60%) of the smaller sequences. Of the 7 larger sequences, five have rhythm scores of 1 and two have scores of 2. In contrast, of the 6 smaller sequences two had rhythm scores of 1; three had scores of 2; and one had a score of 3. Thus small sequences (N=4) tended to have slightly more nonrhythmic scores than larger sequences (N=3), had slightly higher average rhythm scores (1.09 to .89), and slightly lower mean metric scores (-1.35 to -1.04). This is

interesting because longer sequences should have a higher potential of deviation (in forms, scores, and direction), thus allowing for greater nonrhythmic tendencies.

Linn's enacting units were re-analyzed by the refined rhythm measures. Table 11b presents rhythmic tendencies of the social units responding to the tornado by sequence, Guttman measures, rhythm score, and mean metric scores. To ensure comparability, the 60% criterion was also maintained. The tornado had 7 sequences that met the two forms per sequence criterion. The distribution measures indicate that 5 sequences evidence rhythm to some degree: 2 have scores of 1 and 3 have scores of 3. Two of the 7 tornado sequences are nonrhythmic. Linn's nonrhythmic sequences have average mean metric scores of -0.8 and his rhythmic sequences have average scores of -1.9. One nonrhythmic sequence is balanced (metric score of 0) and another is means-based (mean metric score of -1.5). Two means-based sequences have rhythm scores of 1 with an averaged mean metric score of -2.7. Two means-based sequences have rhythm scores of 3 and each has a mean metric score of -4.0. Note that the only ends-based sequence (mean metric score of +4.0) has a rhythm score of 3. Overall, Linn's sequences have a mean metric score of -1.6 with a 1.6 mean rhythm score.

Rhythmic Comparison--Flood versus Tornado

Comparing rhythm between the studies illustrates similarities and differences for the social units and events (Tables 11a and 11b). First, the tornado evidences proportionally more sequences with some degree of rhythm than the flood: 71% (5 of 7) for the tornado versus 65% (13 of 20) for the flood. Note that the flood has 5 means-based sequences as nonrhythmic and the tornado has only 1. Note also that all

Table 11b: Rhythm and Mean Metric Scores Across Sequences of Restructurings (Tornado)

<u>Unit Type</u>	<u>Similar Direction*</u>	<u>Identical Scores*</u>	<u>Identical Forms*</u>	<u>Rhythm Scores</u>	<u>Mean Metric Scores</u>
12) County Mental Health Association	NO	NO	NO	0	-1.5
13) County Hospital	YES	YES	YES	3	-4.0
14) County Mental Health Group	YES	YES	YES	3	+4.0
15) Local Inter-Church Group	YES	YES	YES	3	-4.0
16) Mental Health Foundation	NO	NO	NO	0	0.0
17) Metropolitan Hospital	YES	NO	NO	1	-3.7
20) Counseling Intervention Unit	YES	NO	NO	1	-1.7

*60% similarity within sequence was maintained.

Distribution Measures:

<u>Rhythm Scores</u>	<u>Number of Sequences</u>	<u>Averaged Mean Metric Scores</u>
0	2	-0.8
1	2	-2.7
2	-	----
3	3	-1.3

of the balanced sequences from the flood and tornado are nonrhythmic. Next, the tornado evidences higher overall rhythm than the flood: 43% (3 of 7) of the tornado's sequences had rhythm scores of 3 compared to 5% (1 of 20) for the flood. Third, the tornado evidences a larger inconsistency between rhythmic and nonrhythmic sequences with respect to mean metric scores than the flood. The tornado's rhythmic sequences, on average, have a mean metric score of -1.9 (N=5) and its nonrhythmic sequences, on average, have a mean metric score of -0.8 (N=2). In contrast, the flood's rhythmic sequences, on average, have a mean metric score of -1.3 (N=13) and its nonrhythmic sequences, on average, have a mean metric score of -1.1 (N=7). Finally, both studies indicate that ends- and means-based sequences are more rhythmic than balanced sequences. However, lower metric scores do not necessarily coincide with lower rhythm scores.

Rhythm by Pre- and Post-Event

The warning period for the flood made it possible to analyze rhythm before and after the event. Tables 12a and 12b breakdown Table 11a by pre- and post-event responses. Note that distinguishing between pre- and post-event responses results in small sample sizes: 10 sequences for the warning period and 19 sequences following the event. Table 12a indicates that 3 (30%) pre-event sequences (N=10) were nonrhythmic; 3 (30%) had rhythm scores of 1; 2 (20%) had rhythm scores of 2; and 2 (20%) had rhythm scores of 3. The pre-event sequences, on average, have a mean metric score of -0.7 and a mean rhythm score of 1.3. Note that the balanced sequences (100%, 3 of 3) were nonrhythmic, while ends- and means-based sequences evidenced rhythm. It also appears that ends-based sequences evidence a higher degree of rhythm than means-based sequences.

Table 12a: Rhythm and Mean Metric Scores Across Sequences
of Restructurings Pre-Event (Flood)

<u>Unit Type</u>	<u>Similar Direction*</u>	<u>Identical Scores*</u>	<u>Identical Forms*</u>	<u>Rhythm Score</u>	<u>Mean Metric Scores</u>
1) Financial Unit 'A'	NO	NO	NO	0	0.0
2) Financial Unit 'B'	--	--	--	-	---
3) Financial Unit 'C'	--	--	--	-	---
4) Financial Unit 'D'	--	--	--	-	---
5) Financial Unit 'E'	--	--	--	-	---
6) Law Enforcement 'A'	NO	NO	NO	0	0.0
7) Law Enforcement 'B'	--	--	--	-	---
8) Military Unit 'A'	--	--	--	-	---
9) Military Unit 'B'	NO	NO	NO	0	0.0
10) Military Unit 'C'	YES	YES	YES	3	+0.3
11) Emergent Unit 'A'	--	--	--	-	---
12) Emergent Unit 'B'	--	--	--	-	---
13) Federal Agency 'A'	--	--	--	-	---
14) Federal Agency 'B'	--	--	--	-	---

*60% similarity within a sequence was maintained.

Table 12a: Rhythm and Mean Metric Scores Across Sequences (Continued)

<u>Unit Type</u>	<u>Similar Direction*</u>	<u>Identical Scores*</u>	<u>Identical Forms*</u>	<u>Rhythm Score</u>	<u>Mean Metric Scores</u>
15) Government Agency	YES	NO	NO	1	-1.8
16) State Agency 'A'	--	--	--	-	---
17) State Agency 'B'	--	--	--	-	---
18) Hospital 'A'	--	--	--	-	---
19) Hospital 'B'	YES	NO	NO	1	-4.0
20) Hospital 'C'	YES	YES	YES	3	+0.2
21) Hospital 'D'	YES	NO	NO	1	-0.3
22) Hospital 'E'	YES	YES	NO	2	-0.4
23) Mass Media	YES	YES	NO	2	-1.3

Distribution Measures:

<u>Rhythm Scores</u>	<u>Number of Sequences</u>	<u>Averaged Mean Metric Scores</u>
0	3	0.0
1	3	-2.0
2	2	-0.9
3	2	+0.3

Table 12b: Rhythm and Mean Metric Scores Across Sequences of Restructurings Post-Event (Flood)

<u>Unit Type</u>	<u>Similar Direction*</u>	<u>Identical Scores*</u>	<u>Identical Forms*</u>	<u>Rhythm Score</u>	<u>Mean Metric Scores</u>
1) Financial Unit 'A'	YES	NO	NO	1	-1.5
2) Financial Unit 'B'	YES	NO	NO	1	-2.2
3) Financial Unit 'C'	YES	NO	NO	1	-1.3
4) Financial Unit 'D'	YES	NO	NO	1	-3.0
5) Financial Unit 'E'	YES	YES	YES	3	-1.4
6) Law Enforcement 'A'	NO	NO	NO	0	0.0
7) Law Enforcement 'B'	--	--	--	-	----
8) Military Unit 'A'	--	--	--	-	----
9) Military Unit 'B'	NO	NO	NO	0	-0.7
10) Military Unit 'C'	NO	NO	NO	0	+3.0
11) Emergent Unit 'A'	--	--	--	-	----
12) Emergent Unit 'B'	YES	YES	NO	2	+0.3
13) Federal Agency 'A'	YES	YES	NO	2	-1.3
14) Federal Agency 'B'	YES	NO	NO	1	-5.0

*60% similarity within sequence was maintained.

Table 12b: Rhythm and Mean Metric Scores Across Sequences of Restructurings Post-Event (Flood)

<u>Unit Type</u>	<u>Similar Direction*</u>	<u>Identical Scores*</u>	<u>Identical Forms*</u>	<u>Rhythm Score</u>	<u>Mean Metric Scores</u>
15) Government Agency	NO	NO	NO	0	0.0
16) State Agency 'A'	--	--	--	-	---
17) State Agency 'B'	NO	NO	NO	0	+0.3
18) Hospital 'A'	YES	NO	NO	1	+0.5
19) Hospital 'B'	YES	NO	NO	1	-3.0
20) Hospital 'C'	YES	NO	NO	1	-1.0
21) Hospital 'D'	YES	NO	NO	1	-1.8
22) Hospital 'E'	YES	NO	NO	1	-3.1
23) Mass Media	YES	YES	YES	3	-2.0

Distribution Measures:

<u>Rhythm Scores</u>	<u>Number of Sequences</u>	<u>Averaged Mean Metric Scores</u>
0	5	+0.5
1	10	-2.1
2	2	-0.5
3	2	-1.7

Two ends-based sequences have rhythm scores of 3 (mean metric scores 0.2 and 0.3). Means-based sequences have rhythm scores of 1 and 2. Those sequences having rhythm scores of 1 (N=3), on average, have a mean metric score of -2.0; and those sequences having rhythm scores of 2 (N=2), on average, have a mean metric score of -0.9.

Three of 19 post-event sequences (16%) are nonrhythmic and, on average, have a mean metric score of +0.1 (Table 12b). Note that 2 of these sequences have metric scores of 0. Those sequences with rhythm scores of 1 (N=10), on average, have a mean metric score of -1.9. Note that the means-based sequences with rhythm scores of 1 (N=8), on average, have a metric score of -2.6. The sequences with rhythm scores of 2 (N=2), on average, have a mean metric score of -0.5. The sequences with rhythm scores of 3 (N=2), on average, have a mean metric score of -1.7. Overall, the post-event sequences, on average, have a mean metric score of -1.2 and a rhythm score of 1.5 (N=19). The above analysis again suggests that balanced sequences have nonrhythmic tendencies and ends- and means-based sequences have rhythmic tendencies.

Once again, I categorized the enacting units by large and small sequences and analyzed pre- and post-event sequences to gain further insights about rhythm. There were 3 small sequences and 7 large sequences for the pre-event period. Post-event sequences were more evenly split, with 9 small sequences and 10 large ones.

Although only 3 small pre-event sequences could be analyzed, 2 of them were nonrhythmic. Both of these sequences have mean metric scores of 0 (balance). The remaining sequence has a rhythm score of 1 and a mean metric score of -4.0 (means-based). Large pre-event sequences (N=7) evidenced one nonrhythmic sequence, with a mean metric score of 0;

two sequences (both means-based) with rhythm scores of 1 and, on average, a mean metric score of -1.1; two sequences (both means-based) with rhythm scores of 2 and, on average, a mean metric score of -0.9; and two sequences (both ends-based) with rhythm scores of 3 and, on average, a mean metric score of +0.3. This analysis suggests that balanced sequences (large or small) in the warning period tend to be nonrhythmic, while ends- and means-based sequences tend to be rhythmic.

For post-event small sequences, three are nonrhythmic with, on average, a mean metric scores of +0.1. Note that one of the three sequences is balanced. Four small sequences have rhythm scores of 1 with, on average, a mean metric score of -2.6 (one had a rhythm score of 3 and a mean metric score of -1.4 and another had a rhythm score of 2 and a mean metric score of +0.3). One post-event large sequence is nonrhythmic, with a metric score of 0 (balanced); six have rhythm scores of 1 with, on average, a mean metric score of -1.83; one sequence has a rhythm score of 2 with a mean metric score of -1.3; and two have rhythm scores of 3 with, on average, a mean metric score of +0.5. This suggests that balanced large and small post-event sequences are nonrhythmic, while ends- and means-based sequences are predominately rhythmic.

The association between balanced sequences and a lack of rhythm is further highlighted by examining changes from pre- to post-event. One small unit (Unit 9) changes with respect to degree of rhythm from pre-event to post-event. Its pre-event restructurings are nonrhythmic, with a mean metric score of 0 (balanced); and its post-event restructurings are rhythmic (score of 3) with a mean metric score of -0.7 (means-based). Note that overall Unit 9 is nonrhythmic and has a

mean metric score of -0.4.

Five of the 7 large sequences that had responses during both periods evidences changes in rhythm. Unit 1 increases from a rhythm score of 0 to 1. Its mean metric score also changes from 0 (pre-event) to -1.5 (post-event). Overall, Unit 1 is nonrhythmic and has a mean metric score of -1.1. Unit 6 is nonrhythmic overall and nonrhythmic during both pre- and post-event time periods. Unit 6 has a mean metric score of 0 (overall), 0 (pre-event), and 0 (post-event). Unit 15 has a pre-event rhythm score of 1 and post-event rhythm score of 0, with a corresponding shift in the mean metric score from -1.8 to 0. Overall, Unit 15 is nonrhythmic and has a mean metric score of -1.3. Unit 20 changes from a rhythm score of 3 to 1 and a mean metric score of +0.2 to -1.0. Overall, Unit 20 evidences rhythm (score of 2) and has a mean metric score of -0.3. Unit 22 goes from a rhythm score of 2 to 1, and a mean metric score of -0.4 to -3.1. Overall, Unit 22 is nonrhythmic and has a mean metric score of -1.6. Finally, Unit 23 increases in rhythm score (from 2 to 3) and decreases in mean metric score (from -1.3 to -2.0). Overall, Unit 23 evidences rhythm (score of 1) and has a mean metric score of -1.7. One final point is that mean metric scores of 0 are consistently nonrhythmic.

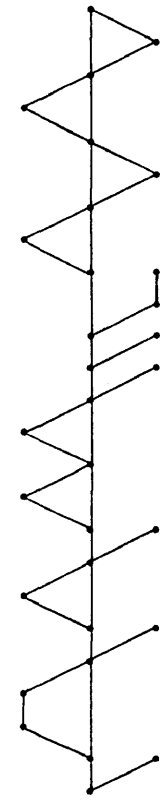
Cyclic Rhythm: Form by Form Analysis

Recall that the fourth criterion of rhythm was evidence of a rhythmic cycle. Recall also that relatively long sequences are required to measure this criterion. Accordingly, the two longest sequences (Units 15 and 22) in the present study and Farmer's (1986) two civil rights organizations (CORE and SNCC) are used for illustrative purposes. Note that CORE and SNCC are not circumscribed sequences (with responses

limited to a maximum of about 15 months), but are entire life histories covering 25 and 8 years, respectively. The significance of this difference will be clarified in the conclusion. For now, it is enough to say that comparing Units 15 and 22 (circumscribed sequences) and CORE and SNCC (entire life histories) is like comparing two hickory trees to a forest of pine trees. Table 13a presents Units 15, 22, CORE, and SNCC by forms of restructuring. The table indicates that 11 restructurings are documented for Unit 15, 18 for Unit 22, 40 for CORE, and 42 for SNCC. Table 13b presents these same social units by element changes irrespective of restructurings to which they relate, but maintaining the ordering in which they occurred. Documented are 24 element changes for Unit 15, 40 for Unit 22, 62 for CORE, and 68 for SNCC.

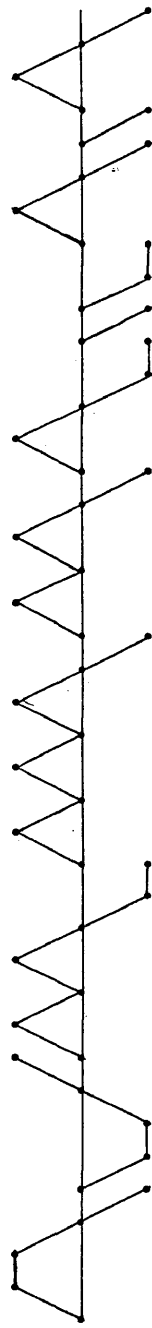
At first glance, Table 13a evidences sporadic changes because of the numerous breaks in the waves. However, some continuity is evidenced through the joining of two or more forms (no breaks). In fact, I suggest that in the form analysis of cyclic rhythm, cycles are evidenced only by two consecutive alternations (either similar or opposite). For example, SNCC's first two forms (R-D and T-R) are continuous and opposing alternations (completing a balanced cycle). The fifth, sixth, and seventh forms (R-D-A-T, T-R, and T) also reflect continuity. However, the fifth form displays an unbalanced cycle (two similar alternations) and the sixth and seventh forms combine for 3/4 of an unbalanced cycle. [Note a possible counterbalancing effect with the previous unbalanced cycle (means-dominated).] With two consecutive alternations needed to reflect a cycle, the number of cycles evidenced by the social units are: 3 by Unit 22; 3 by Unit 15 (2 balanced); 3 by CORE (2 balanced); and 2 by SNCC (1 balanced).

Table 13a: Cyclic Analysis by Form



UNIT: #15

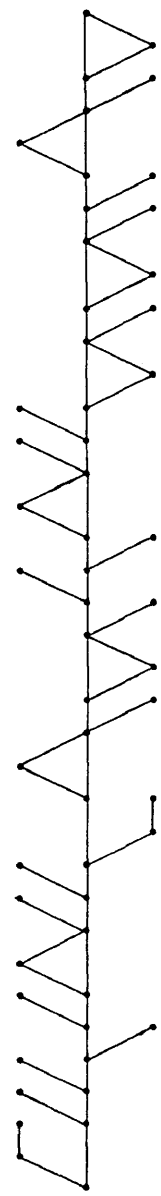
A/T-D-A-R/T-R/A/T-A/T-A-R/A/R-A/T-A/A-T/T-R-A-D



UNIT: #22

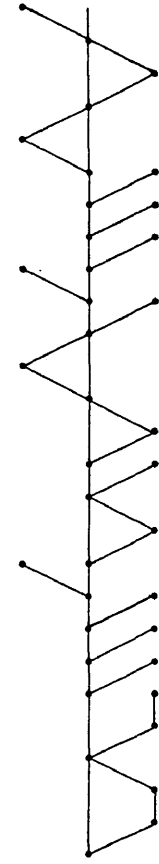
T-D-A-R/R-A-T-D/T-A/T-A/R-A/T-A/T-A-R/T-A/T-A-R/T-A/R-A/R/A-R/T-A/A/A/T-A-R

Table 13a: Cyclic Analysis by Form (Continued)

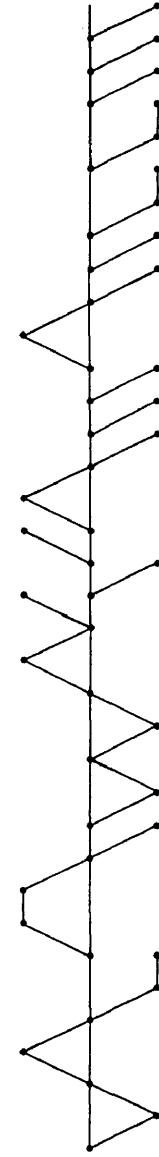


UNIT: CORE

D-T/T/A/T-T-R/D/T/A-R/T-R-A/R-T/R/T-R/T-A-D/T/A-T-R/R-T/R/A/D-A/R/R-T

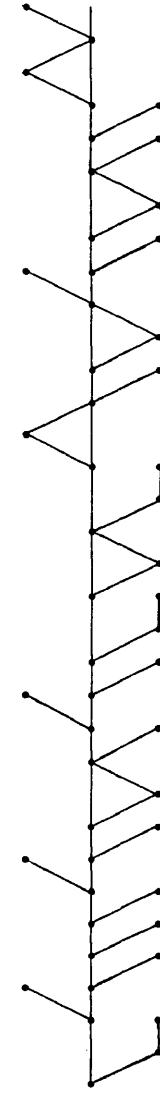


A-R-D/R-A/R/A/R/T/A-D/R/A-D/T-R/R/T/A/R/R/D-R/R-D-T



UNIT: SNCC

R-D/T-R/R-A/D-T-A-R/R-D-A-T/T-R/T/R/T/D-R/A/R/R/D-R-A/A-R/R-A/R/A/R



R-A/T/A/A/R/D/A/R-T/A/D/R/A-R/R-D/R-A/D-R/R/R-D-T/R/R/R/D-R-T

Table 13b: Cyclic Analysis by Element

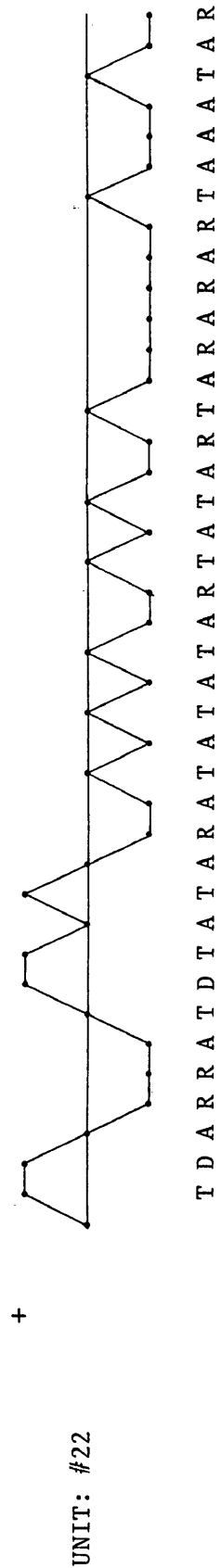
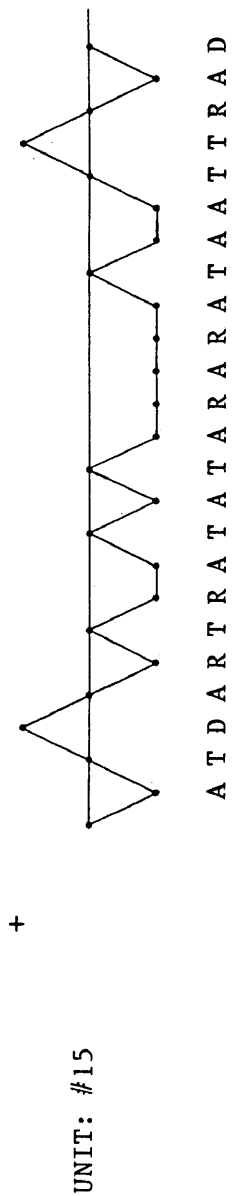
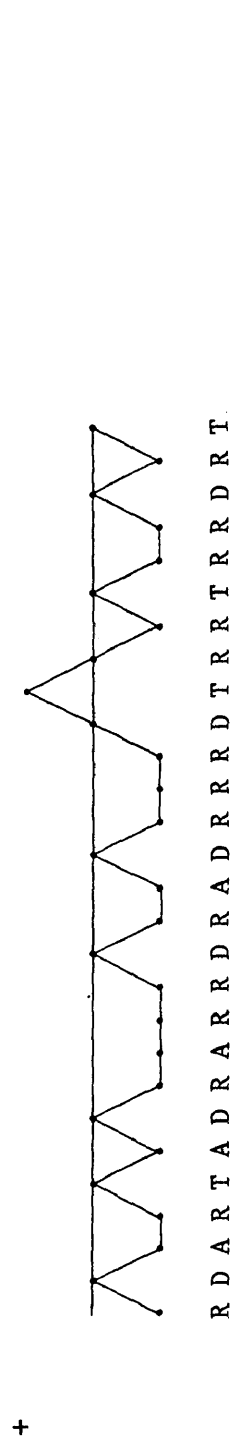
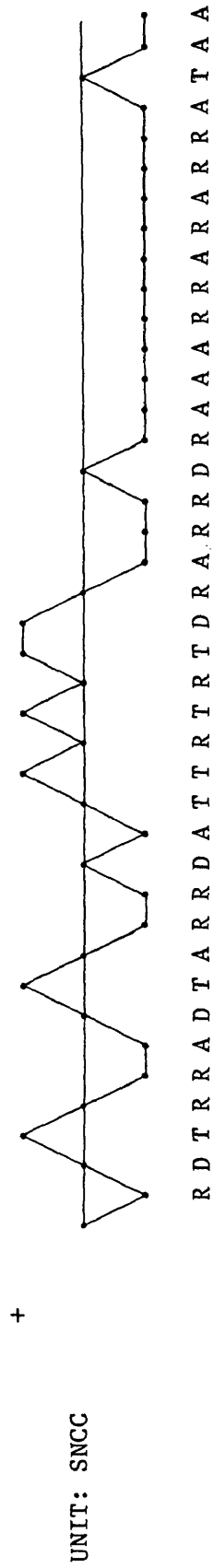
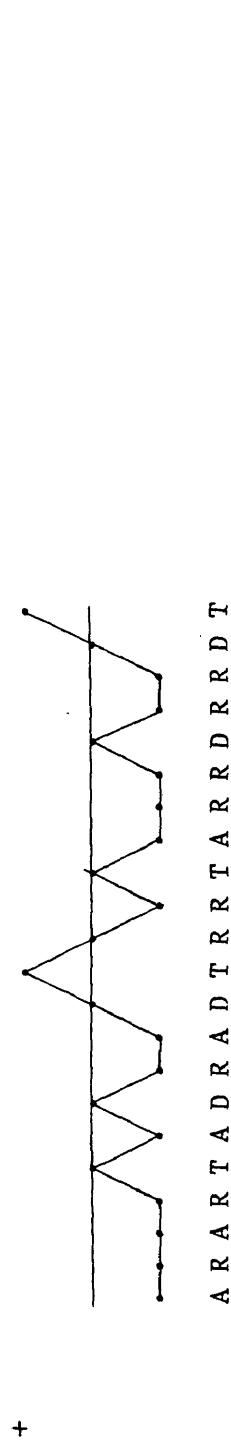
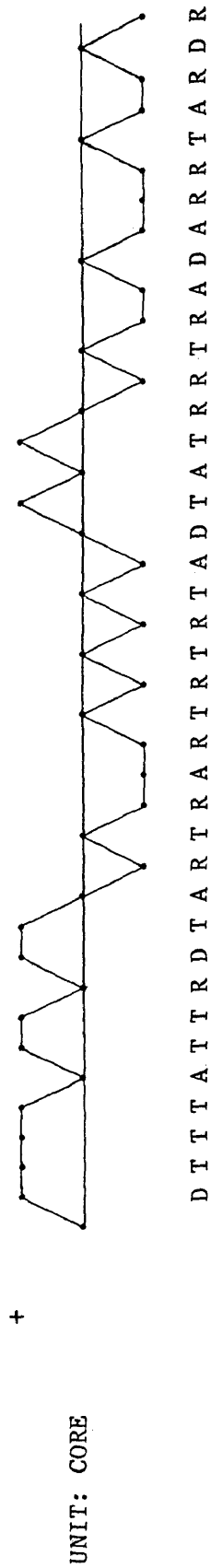


Table 13b: Cyclic Analysis by Element (Continued)



To measure a social unit's degree of continuity I used the ratio of the number of breaks over the number of forms. The higher the ratio of breaks per forms, the less the continuity of forms over the course of the sequence. The resulting ratios are: $10/18 = .56$ (Unit 22); $6/11 = .55$ (Unit 15); $29/40 = .73$ (CORE); and $32/42 = .76$ (SNCC). The ratios for the sequences of Units 15 and 22 display larger amounts of continuity than the ratios for the life histories of CORE and SNCC. Note that the units in the flood sample were quite similar to each other as were the two life history units to each other.

Cyclic Rhythm: Element by Element Analysis

A second analysis of cyclic rhythm involves element changes irrespective of the forms of restructuring to which they relate. Table 13b presents the same four social units analyzed above, now by element changes. Note that the smooth appearance of the waves suggests that responses are continuous. Recall the form depiction allows for intervening catalysts and a pattern of catalyst--change--steady state--catalyst--change--steady state--etc. As Table 13b highlights, discontinuities are not apparent in the depictions of element changes because discrete changes do not necessarily begin on the horizontal line (organization at rest or the steady state).

Table 13b indicates that Units 15 and 22 began with two opposing alternations (or a balanced cycle). Unit 15 had a means-initiated balanced cycle and Unit 22 had an ends-initiated balanced cycle. Note also that Unit 15 ends with a balanced cycle. Between its two balanced cycles are a series of unbalanced cycles differing in width because of varying numbers of similar intervening ends- or means-related changes coming into play. Overall, Unit 15 evidences $4 \frac{1}{2}$ cycles (2 balanced)

and Unit 22 6 1/4 cycles (1 balanced).

SNCC and CORE each present unique properties of cyclic rhythm. Note that SNCC begins with two means-initiated balanced cycles. Overall, SNCC has 4 balanced cycles (3 means-initiated) and 6 1/2 unbalanced cycles. CORE has 2 balanced cycles (1 means-initiated), with one occurring early (ends-initiated) and the other later. Note also that following the ends-initiated balanced cycle by CORE are several unbalanced cycles prior to the next balanced cycle. CORE has 6 unbalanced cycles interceding (5 were means-related) and SNCC has 3 unbalanced cycles (all means-related).

Another cyclic measure is the number of cycles documented to the number of cycles possible per sequence. Recall that at least 4 elements are required and in a particular order (EMME or MEEM; EMEM or MEME) for a cycle to be documented. By counting the number of elements and dividing by four the total number of cycles possible can be determined. For example, Unit 15 had 4.5 documented cycles and 6 possible cycles (24 element changes/4) for a ratio of $4.5/6 = .75$. The remaining ratios were: $6.25/10 = .63$ for Unit 22; $10.75/15.5 = .69$ for CORE; and $10.5/17 = .62$ for SNCC. In effect, the higher the ratio, the greater the evidence of cycles. Therefore, Unit 15 is proportionally more cyclic than Unit 22 and CORE moreso than SNCC.

In summary, both the element and form analyses have similar, yet unique characteristics. It should be noted however, that one of the analyses could be inappropriate. For example, it appears that Units 15 and 22 have unbalanced cycles which are depicted inversely in the forms and element graphs. Depicting the sequences in two different ways evidences cycles as ends-initiated under one analysis and

means-initiated under the other. I do not know which is the appropriate analysis.

Periodicity

Recall that two criteria are used to measure periodicity: plus or minus .03 days for pre-event restructurings and .57 days for post-event restructurings. Recall also the methodological requirements for the periodicity analyses. First, lag times for a sequence are compared within a stage and missing lag times are treated as missing values. Second, restructurings that begin pre-event but end post-event only have the pre-event criterion applied. Third, more than one form of restructuring per sequence is required for pre- or post-event analysis. If restructurings are dropped from an analysis (i.e., missing values) thereby not allowing for a minimum of two restructurings per sequence, the enacting unit is dropped from that temporal analysis. Therefore, Units 2-5, 8, 11-14, and 16-18 are dropped from the pre-event analysis and Units 6-13 and 23 are dropped from the post-event analysis (see Tables 8a and 8b). Fourth, restructurings with catalysts occurring outside the emergency period (30 days after the event) are eliminated. This results in 12 restructurings being eliminated from the flood's analysis: D-T-A, A-R, and T-R-A under Unit 1; A, R-A, and A under Unit 2; R and R under Unit 3; A-R and R-T-A under Unit 4; and A-R and T-A under Unit 13 (see Appendix A). Note that following this standard, Unit 2 is dropped from the post-event analysis because of insufficient restructurings and missing values. And fifth, the periodicity comparison to the tornado was eliminated because of the small sample size for the tornado.

Table 14 distinguishes which sequences are analyzed pre- and/or post-event with respective ratios of documented to possible periodicity and total periodicity. The table indicates that 10 social units could be analyzed for pre-event periodicity and 12 social units for post-event periodicity. Comparing pre- and post-event periodicity evidences the former documenting considerably more periodicity, with pre-event sequences accounting for 81% (140 of 172) of the total periodicity evidenced for the entire event. Overall, 69% (172 of 250) of the possible periodicity for the flood was evidenced by pre- and post-event sequences. Note that pre-event sequences document 82% (140 of 170) of the possible pre-event periodicity and post-event sequences documented 39% (32 of 80) of the possible post-event periodicity. Earlier I suggested that pre-event responses were proactive--getting things done prior to impact. Along the same lines, the pre- and post-event comparison suggests that restructuring under conditions of urgency (pre-event period) leads to higher degrees of periodicity.

Analysis of periodicity by mean metric scores indicates that balanced sequences evidence 5% (9 of 172) of the documented periodicity (Units 1, 6, and 9, pre-event; Unit 15, post-event), means-based sequences evidence 76% (131 of 172) of the documented periodicity (Units 15, 19, and 21-23, pre-event; Units 1, 3-5, 14, and 19-22, post-event), and ends-based sequences reflecting 19% (32 of 172) of the documented periodicity (Units 10 and 20, pre-event; Units 17 and 18, post-event). Distinguishing by pre- and post-event periods indicates that pre-event balanced sequences account for 2% (3 of 140), means-based sequences account for 80% (112 of 140), and ends-based sequences account for 18% (25 of 140) of the documented periodicity. For the post-event period,

Table 14: Measurement of Periodicity By Enacting Unit for Pre-Event, Post-Event, and Total Emergency Time Perids (Flood)

<u>Unit Type</u>	<u>Pre-event Periodicity*</u>	<u>Post-Event Periodicity**</u>	<u>Total Periodicity</u>
1) Financial Unit 'A'	50.0	42.9	44.4
3) Financial Unit 'C'	--	20.0	20.0
4) Financial Unit 'D'	--	33.3	33.3
5) Financial Unit 'E'	--	16.7	16.7
6) Law Enforcement 'A'	50.0	--	50.0
9) Military Unit 'B'	50.0	--	50.0
10) Military Unit 'C'	25.0	--	25.0
14) Federal Agency 'B'	--	28.6	28.6
15) Government Agency	71.8	100.0	75.6
17) State Agency 'B'	--	14.3	14.3
18) Hospital 'A'	--	100.0	100.0
19) Hospital 'B'	50.0	50.0	50.0
20) Hospital 'C'	80.0	14.3	24.0
21) Hospital 'D'	57.1	35.3	41.7
22) Hospital 'E'	100.0	16.7	94.1
23) Mass Media	0.0	--	0.0

Distribution Measures:

Sequence periodicity average: 53.4% pre-event
 39.3% post-event
 41.7 total event

Overall periodicity documented: 82% (140 of 170) pre-event
 40% (32 of 80) post-event
 69% (172 of 250) overall

* Criterion set at plus or minus .03

**Criterion set at plus or minus .57

balanced sequences account for 19% (6 of 32), means-based sequences 59% (19 of 32), and ends-based sequences 22% (7 of 32) of the documented periodicity. The above breakdowns indicate that means-based sequences evidence higher amounts of periodicity pre-event, post-event, and overall. Note however, that the means-based sequences evidence 86% (112 of 130) of their possible pre-event periodicity and only 31% (19 of 61) of their possible post-event periodicity. In contrast, balanced sequences evidence 50% (3 of 6) of their possible pre-event periodicity and 100% (6 of 6) of their possible post-event periodicity and ends-based sequences evidence 74% (25 of 34) of their possible pre-event periodicity and 54% (7 of 13) of their possible post-event periodicity.

One last analysis of periodicity relates to the circumstances under which it is evidenced. More pointedly, is periodicity evidenced between two identical elements (A-A), two similar elements (both ends or means, A-R or D-T) or mixed elements (one ends-related and another means-related, D-A). Table 15 indicates that periodicity is evidenced in high proportions for identical elements (74%, 87 of 118) and mixed types (70%, 64 of 92). With respect to stage of restructuring, levels one and two have the most periodicity evidenced (66% and 79%, respectively). Not indicated on Table 15 are pre- and post-event differences. Pre-event periodicity is evidenced as follows: 89% (77 of 87) of the identical element pairings; 55% (16 of 29) of the related element pairings; and 87% (47 of 54) of the mixed pairings. In contrast, post-event periodicity is evidenced as follows: 32% (10 of 31) of the identical element pairings; 46% (5 of 11) of the related element pairings; and 45% (17 of 38) of the mixed pairings.

Table 15: Ratio of Periodicity Relationships for the Flood
by Levels of Restructuring

<u>Level of Restructuring</u>	<u>Identical Elements</u>	<u>Both Ends or Means</u>	<u>Mixed Types (one each)</u>	<u>Totals</u>
Level One (documented)	N=65 71%	N=12 58%	N=57 63%	N=134 66%
Level Two (documented)	N=43 88%	N=17 53%	N=31 77%	N=90 79%
Level Three (documented)	N=10 30%	N=11 45%	N=3 100%	N=24 46%
Level Four (documented)	N=0 ---	N=0 ---	N=1 100%	N=1 100%
<u>Totals</u> (documented)	N=118 74%	N=40 53%	N=92 70%	

SUMMARY OF MAJOR FINDINGS

Realizing that the above discussion is very detailed I will summarize my findings in a series of major conclusions of the study.

1. Both similar and different forms of association in Kreps' taxonomy were documented for the two events. I suggest that the differences may result from event characteristics (e.g., the flood had a forewarning period) and the type of enacting social units studied (many units responding to the flood had emergency experience and/or training).

2. It appears that disaster experience, training, and formal planning reduce symbolic milling during the circumstance of a disaster. Units having these characteristics were involved earlier and restructured more as events unfolded.

3. Pre-event restructurings were aimed at anticipated demands on the respective social unit. Post-event responses were aimed at both anticipated and unanticipated demands. It appears that pre-event responses reflected more relatively balanced, ends-initiated forms compared to post-event responses.

4. Strategic placement of restructured ends (D,T) evidences improvisation in the face of changing demands. In comparison to the tornado, the flood had more complete restructurings (more elements changed) and a higher degree of ends-related changes earlier in the process.

5. Later restructurings in the flood were more tenuous than initial ones. Initial restructurings occurred mainly during the pre-event period, were more balanced, and were enacted more quickly in response to urgent demands.

6. Differences between the two studies point to unique demands placed on particular units. The resulting changes reflect what was required to ensure respective units' viability (varying degrees of efficiency, effectiveness, and/or a balance between them). It could be that for a particular social unit and particular catalyst, means- or ends-based changes are the most beneficial. Even with an identical catalyst but a different social unit, a totally different response might be required (more of one than the other or a balance). It might be argued that sacrificing efficiency for effectiveness (or vice versa) leads to failure. I would argue that for some units, not sacrificing either efficiency or effectiveness can lead to failure.

7. Misleading temporal analyses can result if researchers rely solely on aggregate distributional measures. I suggest that temporal comparisons across and within levels of restructuring (1-4 element changes) should be used instead of collapsing levels of restructurings. Apparent tentativeness of initial restructurings evidenced by the flood's aggregate distributions of lag times is more a product of including single element forms in the analysis than the tentativeness of the initial restructurings.

8. Whether initial restructurings are fast or slow has no bearing on the number of forms in a sequence for the flood. Recall that responses were fast overall and that the measurement of the extent of change had to be adjusted. Therefore, findings for the flood are not comparable to those from the tornado.

9. Ends changes are more evident for pre-event responses. Means changes are more evident for post-event responses. However, no significant difference between pre- and post-event mean metric scores

and level of restructuring (1-4 elements change) was evidenced. This is interesting because demands changed after the event.

10. A pure Guttman scale was constructed and used to measure rhythmic tendencies. Sequences with, on average, mean metric score of 0 (balanced) are consistently nonrhythmic, while means- and ends-based sequences evidence greater degrees of rhythm. It appears that means-based sequences evidence less rhythm than ends-based sequences. Tornado sequences had a higher degree of rhythm than flood sequences.

11. Cyclic rhythm was analyzed on two levels, form and element. Form analysis is sensitive to catalysts and periods of organizational stasis. With element analysis the organization is constantly changing and never at rest.

12. Two criteria were developed to measure periodicity. Social units that had larger amounts of possible periodicity had larger amounts of it documented. Pre-event sequences evidence greater periodicity than post-event sequences. I suggest that temporal urgency could be the driving force for higher degrees of pre-event periodicity.

COMMENTS AND SUGGESTIONS

The structural code offered by Kreps to depict the origins, changes, and dissolution of organization allows for the qualitative description of what takes place. The methodology developed by Linn allows for the quantification of the detailed descriptions, and comparisons of them within and across organizations and disaster events. Temporal concepts and measures have been refined or developed in the present study to make the processual character of the code more pointed.

Spatial properties of structure need to be given the same degree of attention. An important methodological advancement of this study is the concluding appendix. The appendix affords critics the opportunity to question my judgments about what took place. Debunking is part of the scientific process, and I welcome it.

Important to science is agreement on basic concepts. In order to get this there must be precision in definition and measurement. I do not believe that Kreps' research program has achieved this with respect to analysis of restructuring. For instance, by "restructuring" do we mean the entire form or just an element change? Is what follows a flood or tornado considered a series, sequence, or chain of restructurings? What I offer below are my insights from applying Kreps' code. The list below is in no way meant to be inclusive. The statements are listed hierarchically--least to most inclusive.

1. A form is comprised of 1 to 4 elements. Table 1 reflects all possible forms in the taxonomy (ARDT).
2. A chain exists when two or more forms are substantively linked (AR-TD-ATDR-A).
3. A sequence is comprised of one or more forms (and possibly one or more chains) resulting from a major event (ARDT, AR-TD, A, T).
4. A life history is comprised of a single or series of forms (possibly one or more chains and sequences). In other words, life histories include organizational formation, all organizational changes, and organizational demise.

Under this rubric then, the flood and tornado are nothing more than studies of various sequences--probably a small portion of their larger and longer life histories. Preliminary investigations of chains suggest

that the flood did evidence linkages between forms for some of the social units. However, this analysis is beyond the scope of this thesis.

Finally, there is a need for many life history studies. These studies would allow for analyses of the various hierarchical properties of forms of association (sequence, chain, form, and element). Realizing that life history studies would sacrifice the accumulation of information on a larger sample of units (characteristic of cross sectional studies), I believe much could be learned about the dynamics of organizations over a longer period of time.

ENDNOTES

1: Farmer used "ends-based" and "means-based". This terminology has been changed to clarify that means-initiated (or ends-initiated) does not necessarily equate with means-dominated/means-based (or end-dominated/ends-based). For example the form D-R-A is means-based but ends-initiated. This will be clarified in a later section.

2: "The key requirement for constructing the metric is to capture all the transitivity between D-T-R-A or social order and A-R-T-D or social action. This is done in the following way: At the social order end of the continuum D precedes T, R, and A (3 points); T precedes R and A (2 points); and R precedes A (1 point). Given one point for each conforming transitivity (3 + 2 + 1), D-T-R-A receives a score of six, while at the social action end of the continuum, A-R-T-D receives a score of zero. Beginning at the social action end would simply reverse the scores, but not change the distribution in any way. By subtracting a constant 3 from each derived level of social order or action, the resulting metric is +3 to -3 with a 0 midpoint. This was done to highlight where balance or tension between social action and social order is greatest" (Bosworth and Kreps, 1986:703).

3: Linn used "administrative" and "substantive" rationality in referring to ends- and means-based restructuring, respectively. I have dropped Linn's terminology to avoid excess conceptual baggage and the confusion that results.

APPENDIX A

Flood: Chronologies of Documented Catalysts, Restructurings,
and Metric Scores by Enacting Social Units

<u>Time of Restructuring</u>	<u>Form</u>	<u>Documented Restructurings</u>
<u>Unit 1: Financial Unit 'A'</u>		
Pre: -8 hrs	TRA (-1)	CATALYST:Phone call from local businessman. T:Established procedures to ensure safety of records, equipment, and money bags. R:Six people (4 employees and 2 volunteers) mobilized prior to normal working hours. A:All records, equipment, and money bags were moved.
Post: Day 1	TA (+1)	CATALYST:Dissatisfaction with above action. T:Established alternative security procedures for enacting unit's building. A:Maintained security; guarded 30 money bags previously taken out of vault.
Post: Day 1	AR (-7)	CATALYST:High level of water surrounding unit's building. A:Transported money to another financial unit. R:Used other financial unit's vault to store money bags.
Post: Day 3	TDAR (+4)	CATALYST:External meeting with holding company officials. T:Modified policies to assist employees and customers and to notify public of relocation; manager to do damage assessment. D:Expanded existing domain with respect to qualifications for loans/refinancing (more people eligible). A:Informed employees and public of changes; special efforts made to contact people on other side of river; contacted businesses of new policies; ordered trailer. R:Used car (trunk) to conduct business/operations.
Post: Day 7	RTA (-3)	CATALYST:Employee's knowledge of trailer location. R:Allowed quick delivery of previously ordered trailer. T:Determined procedures to supply and set up trailer. A:Increased working hours and days of week;

cross-trained personnel.

- Post: Day 132 DTA (+5) CATALYST:Idea by unit member.
 D:Expanded domain by initiating elderly housing project.
 T:Established procedures to obtain assessment of community's need for elderly project.
 A:Advertised in media; formulated waiting list (~300 families).
- Post: Day 159 AR (-7) CATALYST:Positive response to advertisements.
 A:Worked with federal agency to learn procedures and guidelines for submitting special federal applications.
 R:Knowledge resulting from above activities.
- Post: Day 198 TRA (-1) CATALYST:Presidential moratorium on disaster loans.
 T:Established procedures to get elderly housing project released.
 R:Hired/contracted (1) specialist on foundations and (2) architecture firms.
 A:Lobbied in Washington D.C..

Unit 2: Financial Unit 'B'

- Pre: -1 hr A (-4) CATALYST:Notification of pending disaster.
 A:Emptied vault of records; cancelled customer service.
- Post: Day 3 TDAR (+4) CATALYST:Loss of building.
 T:Established procedures to assist victims and to find and equip new location.
 D:Expanded existing domain with respect to qualifications for loans/refinancing (more people eligible).
 A:Retrieved supplies from branch office; consulted customers on options and government assistance; made damage assessment; dried records.
 R:Relocated at main office and used its equipment.
- Post: Day 9 RDTA (-3) CATALYST:Federal Government program to assist victims.
 R:Employee trained to become unit expert on federal programs.
 D:Restricted existing domain by (1) focusing on loans placed through federal government programs and (2) not soliciting customers to borrow or refinance through Financial Unit 'B'.
 T:Created procedures to assist customers applying for governmental assistance; had expert instruct employees on programs.
 A:Comprised list of affected mortgages

(300-400); made special appraisals for government loans; held board meeting to explain programs.

- Post: Day 37 A (-4) CATALYST:Government program policy changes.
A:Special effort made to notify customers of the relaxed regulations in loans--from 5% and \$2500 to 1% and \$5000 (interest and grace).
- Post: Day 75 A (-4) CATALYST:Government program policy changes.
A:Notified customers of decision to extend application deadline and grace period; extended application assistance to customers.
- Post: Day 281 RA (-7) CATALYST:All effected loans/mortgages paid off.
R:Increase of cash in savings accounts, increase of cash flow with 32% of all loans paid off.
A:Expanded to national investing; bought mortgages nationally.

Unit 3: Financial Unit 'C'

- Pre: -12 hrs A (-4) CATALYST:Notification of potential flooding.
A:Moved records and equipment prior to normal working hours.
- Post: Day 3 TAR (-1) CATALYST:Loss of building/customer service.
T:Established procedures to find and set up alternate facility.
A:All but two employees involved in searching for alternate building.
R:Located building (restaurant); equipment moved from main office.
- Post: Day 6 TAR (-1) CATALYST:Loss of building--damaged.
T:Established clean up procedures.
A:Cleaned up layers of mud; replaced/ordered equipment.
R:Hired contractor for vault door repair.
- Post: Day 12 A (-4) CATALYST:Alternate location committed.
A:Set up/equiped alternate location; started customer service.
- Post: Day 13 TA (+1) CATALYST:Idea of unit member(s).
T:Modified policies for loans; extended grace period to 7 months, to be handled on case by case basis.
A:Informed public of services--by radio and newspaper; weekly meetings with government agency to keep updated on regulation changes; supplied customers with information required for government applications.

- Post: Day 21 TDRA (+4) CATALYST:Directive from main office.
 T:Modified policies to further assist customers, extend working hours, and start issuing food stamps.
 D:Expanded with the issuance of food stamps.
 R:Expanded by receiving equipment, supplies, cash, food stamps, and information from main office.
 A:Extended working hours and days of week to include Saturdays and Sundays; gathered information to assist customers (government programs, etc); passed out food stamps.
- Post: Day 42 R (-4) CATALYST:Cleanup.
 R:Use of building for customer service.
- Post: Day 97 R (-4) CATALYST:Time increased for application filing.
 R:Drastic increase in deposits/cash flow and decrease in mortgages.

Unit 4: Financial Unit 'D'

- Pre: -7 hrs TRA (-1) CATALYST:Notification of potential area evacuation.
 T:Created procedures to secure supplies and equipment.
 R:Eight employees and one police officer mobilized prior to normal working hours.
 A:Moved records and some equipment (liftable) to higher ground.
- Post: Day 1 TAR (-1) CATALYST:Loss of building and services; concern over victims' needs for emergency cash.
 T:Developed procedures to get services to people as soon as possible; find place for easy relocation.
 A:Ordered three trailers; borrowed equipment and supplies; sent customers to another financial unit; gave out hundreds of loan extensions.
 R:Computer time rented at another financial unit; \$50,000 borrowed; typewriters, pencils, and scratchpads were bought or borrowed.
- Post: Day 6 TAR (-1) CATALYST:Board meeting with holding company.
 T:Developed steps necessary to get building back into service; cleanup procedures and contractors needed.
 A:Dried 6,000 folders on roof; cleaned basement first; coordinated printing service to replace everything ever printed; contracted for vault repair; removed mud; coordinated staff's authorization passes.
 R:Hired students and contractors for cleanup.

Post: Day 180 AR (-7) CATALYST:Government program assisting victims.
 A:Instead of dealing with customers directly, sent them to government office (99% of mortgages); enacting unit refinanced 1% of all mortgages; used memory to supply government agency with information on customers; provided information on assessments (pre- and post-flood value).
 R:Attorney hired by unit to explain government program and give advice.

Post: Day 270 RTA (-3) CATALYST:Loans/mortgages getting paid off.
 R:Drastic increase in deposits/cash flow.
 T:Modified investment procedures to increase scope of investing.
 A:Bought \$11 million worth of mortgages nationwide.

Unit 5: Financial Unit 'E'

Post: Day 4 R (-4) CATALYST:Visit by a vice president of an out-of-state financial unit.
 R:Hand operated adding machines, manual typewriters, pencils, and scratch pads were donated.

Post: Day 5 TA (+1) CATALYST:Unit members' ideas at special meeting.
 T:Established flexible procedures for assisting customers; decided to use best judgment and not follow regulations.
 A:Operated on an "organized anarchy" basis; more discretion used.

Post: Day 5 R (-4) CATALYST:Loss of main power supply.
 R:Government agency supplied small generator to be used by enacting unit.

Post: Day 6 R (-4) CATALYST:Inadequacy of small generator.
 R:Military unit donated 1600 amp power unit for temporary use.

Post: Day 46 T (+4) CATALYST:Knowledge of more time needed for customers.
 T:Established procedures to assist customers; extended moratorium (grace time on mortgage payments), to a total of 60 days.

Unit 6: Law Enforcement 'A'

Pre: -12 hrs TA (+1) CATALYST:Directive given at meeting.
 T:Developed procedures to ensure public's warning of impending flood.
 A:Toured areas announcing the warning using word of mouth and loud speakers.

Pre: -7 hrs TRA (-1) CATALYST:Directive issued to unit.
 T:Established procedures to secure impacted areas; curfew, boundary lines, and check points determined.
 R:80 state police, 1500 National Guardsmen, and 20 city police placed under enacting unit's command.
 A:Enforced curfew; patrolled impacted area; and did not allow people in areas.

Post: Day 1 TDAR (+4) CATALYST:Directive issued to unit.
 T:Developed search and rescue procedures and social unit assignments.
 D:Expanded to include search and rescue coordinative role.
 A:Extended working hours; toured areas by boats; rescued victims in coordination with another unit; all unit members except top officials aboard boats.
 R:Expanded original two boats by 50-60 (donated by unit members and military).

Post: Day 2 A (-4) CATALYST:Magnitude of flood.
 A:Daily meetings with mayor, military, fire and police officials.

Unit 7: Law Enforcement 'B'

Pre: -6 hrs TRA (-1) CATALYST:Directive issued to unit.
 T:Developed procedures for the "controlling unit's" communication system.
 R:Building committed to establish communication command center.
 A:Coordinated communications between controlling unit and all others; gave message clearances.

Post: Day 1 A (-4) CATALYST:Request for assistance from another unit.
 A:Blocked off areas; issued authorization passes into areas; conducted roving patrols; and put people on busses to go into impacted areas in coordination with local police and National Guard.

Unit 8: Military Unit 'A'

Pre: -12 hrs ADTR (0) CATALYST:Supplies arriving at airport.
 A:Received and dispatched supplies; dispatched helicopters and boats.
 D:Designated military command coordination center for all military flight services.
 T:Developed procedures for receiving and dispatching supplies via helicopters and boats.

R:All military aircraft (~50 nonfixed aircraft) were placed under their control.

Unit 9: Military Unit 'B'

Pre: -12 hrs TA (+1) CATALYST:Phone call asking for volunteers.
 T:Established procedures for placing unit members (who would volunteer) on alert (entire unit was not formally activated).
 A:Assisted in sandbagging operation and dyke preparation--sent four trucks and personnel.

Post: Day 1 TRA (-1) CATALYST:Dyke breached (event).
 T:Determined procedures to evacuate unit's facility and relocate personnel and equipment.
 R:New facility committed for unit's use.
 A:Headquarters moved into a building housing another unit's headquarters as well.

Post: Day 1 TA (+1) CATALYST:Directive issued to the enacting unit.
 T:Established procedures to evacuate victims from assigned areas and ensure a complete search and rescue effort in same.
 A:Coordinated trucks to evacuate victims and boats in search and rescue effort (trucks in shallow water on outskirts of areas).

Post: Day 1 R (-4) CATALYST:Perceived need for more equipment by local military unit's members.
 R:Much needed privately owned boats were donated to the unit.

Post: Day 3 TA (+1) CATALYST:Directive issued to unit.
 T:Developed procedures to ensure security of particular areas and dead body removal (displaced from cemetery).
 A:Stood security (not normal for this unit) and assisted with dead body removal; traffic control in joint effort with other units.

Unit 10: Military Unit 'C'

Pre: -19 hrs TA (+1) CATALYST:Request for the activation of the entire battalion by another unit.
 T:Established procedure to formally activate entire battalion for emergency functioning.
 A:Notified radio and television stations to air activation message; assembled members and broke out equipment and supplies.

Pre: -11 hrs TA (+1) CATALYST:Requested to assist with dyke preparation and other precautionary measures.
 T:Established assignments for battalion units:

some to assist at dyke and some to assist evacuation efforts.

A:Filling sand bags with civilians; evacuated evacuees in coordination with another social unit; developed communication line with this unit.

Pre: -8 hrs TRA (-1) CATALYST:Directive issued to unit to evacuate.
 T:Established procedures to undertake move/relocation.
 R:Two staff members to Military Unit 'C' from directive unit; two ham operators assigned from directive unit to new building to ensure that Military Unit 'C' maintained communications.
 A:Prepared for move; moved; during move scouted schools for relocating other social units if required to evacuate also.

Post: Day 1 TDRA (+4) CATALYST:Meeting with another unit.
 T:Developed procedures to ensure adequate search and rescue efforts in impacted areas.
 D:Mission of search and rescue given to unit; oversaw all other units in this operation (coordination and monitoring).
 R:Fishermen and boats, Coast Guard boats and police radios donated to unit.
 A:Coordinated search and rescue efforts; assigned two unit members to every boat.

Post: Day 1 TDRA (+4) CATALYST:Meeting with another unit.
 T:Established procedures to secure effected areas and maintain curfew.
 D:Assumed military police function which is not in their mission statement.
 R:Radios with pre-set police frequencies and 4 extra strong flood lights donated and used.
 A:Enforced curfew, detained violators, coordinated with police for arrests, traffic control in and out of impacted areas, and improvised civilian directives as needed.

Post: Day 3 TA (+1) CATALYST:Meeting with another unit.
 T:Developed procedures to initiate cleanup in particular areas.
 A:Worked with local agencies in trash removal.

Unit 11: Emergent Unit 'A'

Post: Day 8 RA (-7) CATALYST:Received large supply shipments.
 R:Largest warehouse in area committed to unit and used; free rental trucks and military trucks also committed to unit.
 A:Increase in distribution of supplies (e.g., 30,000 blankets in one day); made and

distributed memos to advertise locations of distribution centers.

Unit 12: Emergent Unit 'B'

Post: Day 11 TRA (-1) CATALYST: Perceived need to assist victims.
 T: Developed strategy to get housing assistance proposal approved by Congress.
 R: Private jet donated for trips to Washington D.C.
 A: Promoted/lobbied proposal in both houses of Congress.

Post: Day 17 TA (+1) CATALYST: Foresaw denial of proposal.
 T: Developed strategy to get current bill modified--lower interest rate and larger grace amount.
 A: Lobbied to get bill modified and simplified.

Post: Day 25 TA (+1) CATALYST: Federal agency's red tape problem.
 T: Developed procedure to assist federal agency in handling red tape problem.
 A: Held weekly meetings with troubled agency; assisted in creation of new filing system to resolve problem.

Unit 13: Federal Agency 'A'

Post: Day 1 TRA (-1) CATALYST: Member's idea to assist victims.
 T: Established procedures to assist disaster victims; created new department with particular objectives.
 R: Hired 5 people with disaster experience (two internally and three externally).
 A: Distributed applications for assistance which included information pamphlets outlining various programs available; created pamphlets.

Post: Day 6 TA (+1) CATALYST: Requests by other units and individuals.
 T: Determined procedure to assess housing needs and to relocate families into alternate housing.
 A: Made assessments (drastic increase in quantity) and lined up alternate housing.

Post: Day 8 TAR (-1) CATALYST: Completion of the assessment and receipt of applications.
 T: Established procedures to locate useable housing units in immediate area.
 A: Advertised in media (newspapers, television) and by word of mouth.
 R: Located 1000-1500 housing units that could be acquired (the estimated number in area was 350).

- Post: Day 10 TAR (-1) CATALYST:Member's idea to ensure obligation of unit to disaster victims.
 T:Created procedure to assist victims with alternative housing; created formal maintenance department with management staff.
 A:Found location for (and set up) maintenance department; hired staff and contractors.
 R:Crews hired for 24 hour coverage; contractors and several housing advisors contracted.
- Post: Day 14 TRA (-1) CATALYST:Knowledge of housing units arriving (in large quantity).
 T:Developed procedures to relocate and install arriving housing units and to coordinate group site construction.
 R:25 sites given to enacting unit as housing unit parks.
 A:Coordinated development of parks and installation of housing units.
- Post: Day 22 TRA (-1) CATALYST:Insufficient housing available for victims.
 T:Determined procedures to institute special program of getting families into their own dwelling.
 R:Contractors and military units committed to unit and used.
 A:Located dwellings with limited damage and coordinated repairs.
- Post: Day 134 AR (-7) CATALYST:Water getting in housing unit's gas lines.
 A:Coordinated with utility company to convert housing units to L.P. gas.
 R:Hired additional maintenance personnel (unit size grew from 700 to 1200).
- Post: Day 365 TA (+1) CATALYST:Housing needs decreased (60% of the families in group sites in own dwellings).
 T:Established procedures to remove and restore housing units.
 A:Removed and restored by deactivation crews; if needed, units sent to other disaster locations.

Unit 14: Federal Agency 'B'

- Post: Day 1 TRA (-1) CATALYST:State requested enacting unit's assistance.
 T:Determined procedures to assist in health service operations.
 R:Aligned and received supplies and people with expertise (e.g., doctors and nurses) from across nation.

A:Opened 20 clinics and one pharmacy; issued equipment and some personnel to hospitals.

Post: Day 5 AR (-7) CATALYST:Trouble with established curfew.
 A:Meeting held with particular social unit.
 R:Received government transportation and badges/signs permitting entrance into areas.

Post: Day 6 A (-4) CATALYST:Opening of emergency center at a school.
 A:Phased out pharmacy and moved it to the emergency center.

Post: Day 10 RA (-7) CATALYST:Decreasing flood waters.
 R:Local doctors became available and were put to use by unit in clinics.
 A:Phased local doctors into their operation so that they would take over the clinics and relieve doctors from out of state.

Post: Day 21 A (-4) CATALYST:Area doctor offices opening.
 A:Coordinated closing of all clinics so that area demand was still met.

Unit 15: Local Government Agency

Pre: -38 hrs A (-4) CATALYST:Notification of official flood warning.
 A:Unscheduled staff meeting called to consider steps to be taken and units to notify if magnitude of emergency increased.
 Computed potential impact of predicted crest.

Pre: -15 hrs T-D-A-R (+4) CATALYST:Updated prediction of flood crest.
 T:Top official determined two hospitals would have to be evacuated and ensured compliancy. Notified the two hospitals to partially evacuate, and three other hospitals to prepare for evacuees.
 D:One hospital recognized unit's authority and complied; other hospital questioned authority, but eventually complied.
 A:Coordinated precautionary partial evacuation of the two hospitals.
 R:Mass media provided expanded emergency communication equipment.

Pre: -13 hrs TR (+1) CATALYST:Impromptu staff meeting.
 T:Established criteria for selecting units to be contacted.
 R:Units contacted assigned personnel and committed equipment to agency.

Pre: -12 hrs A (-4) CATALYST:Noncompliance of hospital to partially evacuate.
 A:Official directive sent to noncompliant

hospital.

Pre: -7 hrs TA (+1) CATALYST:Increase of crest prediction.
 T:Decided to totally evacuate the two hospitals.
 Staff members to contact hospitals and transport services.
 A:Coordinated total evacuation by contacting the five hospitals (two evacuating, three preparing for evacuees) and transport services.

Pre: -6 hrs TAR (-1) CATALYST:Continued noncompliance of one hospital to evacuate partially.
 T:Steps set up to ensure all five hospitals complied with total evacuation:
 (1) contact and brief local authority figures,
 (2) authority figures deliver total evacuation directive.
 A:Two independent authority figures contacted and meeting held to brief them on importance of hospital compliance to directive.
 R:Directives delivered by authority figures acting as official representatives of agency.

Pre: -1 hr A (-4) CATALYST:Large amount of water seeping into operations center.
 A:Equipment and members moved to higher floors, temporarily disrupting ongoing activities.

Pre: -.5 hrs RA (-7) CATALYST:Loss of electrical power.
 R:Alternative facility sought, located, and committed for new command center.
 A:Equipment moved to new location, communications reestablished, other units informed of move.

Post: Day 3 TA (+1) CATALYST:Decrease of water in impacted area
 T:Determined clean up efforts would include selected units assigned specific duties; agency was to monitor and coordinate clean up.
 A:Began implementing task structure by notifying selected units.

Post: Day 4 AT (-1) CATALYST:Slow progression of clean up.
 A:Held meeting of top officials from agency and units assigned to clean up.
 T:Established new policies and procedures including who to inform of problems encountered and access to restricted areas.

Post: Day 5 TRAD (0) CATALYST:Criticism of agency's response by local political leaders.
 T:Local officials decided to contact

state council (authority over local agency) for advise and consent in relinquishing emergency command and control.
 R:Requested and received council's support for relinquishing command.
 A:Political officials notified and briefings started to ensure smooth transition of command.
 D:Took on pre-disaster domain of consultant to local political authorities.

Unit 16: State Agency 'A'

Post: Day 1 TAR (-1) CATALYST:Requested to provide assessment of impact on area housing.
 T:Developed procedures to acquire estimates of damage to area housing.
 A:Computed estimates after locating data (existing data bank).
 R:American Red Cross Field Service donated some statistics; another unit provided quantitative data on damage estimates for this disaster.

Post: Day 5 TDA (+5) CATALYST:Widening magnitude and scope of impact known to unit members.
 T:Determined procedures to assist victims in housing efforts.
 D:Relinquished part of unit's authority pertaining to housing assistance.
 A:Held meeting and transferred authority and responsibilities; coordinated as needed with other units in housing assistance.

Post: Day 10 TA (+1) CATALYST:Requested to provide sites for alternate housing units.
 T:Established procedures for locating and acquiring locations/property.
 A:Acquired property, negotiated contracts, prepared properties, and coordinated housing unit hookups (power supply, etc).

Post: Day 14 R (-4) CATALYST:Work load placed on enacting unit and scope of impact.
 R:Hired more employees for flood recovery teams; 13 offices in area.

Unit 18: Hospital 'A'

Pre: -7 hrs TDAR (+4) CATALYST:Phone call notifying enacting unit of incoming evacuees and the approximate number.
 T:Determined procedures to provide treatment to 91 patients expected from an evacuating

hospital.

D:Expanded with the inclusion of who was eligible to be admitted.

A:54 "patient moves" (normally have 25 per day); called in extra personnel and key people; lengthened working hours; suspended educational classes and meetings; called in retired nurses and volunteers for specific duties.

R:Extra staff during non-normal hours; evacuees' records and extra supplies.

Post: Day 2 RA (-7) CATALYST:Loss of electrical power.
R:Emergency generator and short wave radios used.
A:Used volunteers as messengers; used alternative communication system; made supply list and took to supplier by car.

Post: Day 5 TDA (+5) CATALYST:Directive issued to enacting unit.
T:Established procedures for accomodating 53 patients (47 of which were females).
D:Expanded eligibility for admittance even further.
A:Adjusted nursing service due to type (sex) of patients admitted; did only absolute necessary things; normal red tape put aside--adjusted working procedures as needed (118 patient moves--another increase).

Post: Day 5 TR (+1) CATALYST:Loss of main electrical power.
T:Established procedures to locate and obtain alternate energy source.
R:Located alternate generator, was airlifted to the unit.

Post: Day 7 TAD (+3) CATALYST:Area hospitals able to admit patients and patients being discharged.
T:Determined procedures to arrange for normally noneligibile patients to be relocated.
A:Coordinated the placement of particular patients into public/private hospitals and nursing homes; transported patients to new location.
D:Reverted to pre-disaster eligibility requirements for patients.

Unit 19: Hospital 'B'

Pre: -9 hrs TAR (-1) CATALYST:Phone call notifying unit to prepare to receive evacuees.
T:Determined procedures to be used in receiving evacuees.
A:Started emergency planning; discharged 25-30 patients; cancelled elective surgery; notified families and physicians of discharges; all hospital personnel notified to come in as soon

as possible.

R:Physicians in early, extra beds in hallways, knowledge of what type and how many patients to expect prior to their arrival.

- Pre: -6 hrs AR (-7) CATALYST:Arrival of evacuated patients.
 A:Set up emergency room as dispensary; 24 hour coverages started for physicians; coordinated extra linen service.
 R:The evacuated patients' records and the evacuated hospital's nurses became unit resources; used one ham operator and radio.
- Post: Day 1 RA (-7) CATALYST:Loss of main electrical power and phones.
 R:Emergency generator and alternative communication lines used (radio, 6 field phones).
 A:Carried patients up and down stairs; coordinated phone messages to be relayed by another hospital; messengers used to contact various units.
- Post: Day 2 TA (+1) CATALYST:Concern over water contamination and the increasing number of patients.
 T:Determined procedures to establish and supply a water center.
 A:Filled water cans (~20); secured water fountains; boiled and treated water; sent out messages of water need.
- Post: Day 3 ATR (-3) CATALYST:Secured impacted areas opening up.
 A:Large numbers of fractures, wounds, and cardiac arrests increased burden of the emergency room, x-ray, and laboratory; departments placed on 24 hour coverage; special meetings held as needed (especially obstetrics).
 T:Established/modified working procedures for the increase of patients--only patients in serious condition to be seen by doctors.
 R:Evacuated hospital's doctors and beds; part-time nurses now full-time; added 75-80 beds.

Unit 20: Hospital 'C'

- Pre: -9 hrs DTA (+5) CATALYST:Notification to receive evacuated patients.
 D:Domain expanded when unit identified as the official evacuation center.
 T:Determined procedures to allow maximum space for incoming evacuees.
 A:Toured school of nursing; made bed count; estimated dischargeables; meeting held; patients classified as ambulatory or not.

- Pre: -7 hrs TAR (-1) CATALYST:Notification to partially evacuate.
 T:Established procedures/guidelines for the evacuation of all dischargeables.
 A:Contacted families; called in doctors to man the emergency room; earlier plans accelerated; contacted other hospitals to get number and types of beds available.
 R:Employees in early and night shifts stayed beyond normal quitting time, substantially increasing human resources; doctors came in early (12 assigned to patient evaluations).
- Pre: -4 hrs TRA (-1) CATALYST:Insufficient transportation for evacuees.
 T:Determined procedure to acquire more transportation.
 R:Bus company sent busses; ambulances and stationwagons provided; ambulance crews mobilized.
 A:Speed of evacuation increased with more transportation arriving; 3-4 nurses placed on each bus; two wings evacuated at the same time.
- Pre: -2 hrs TAR (-1) CATALYST:Meeting of enacting unit members.
 T:Determined procedures to be followed once patients evacuated.
 A:Concentrated on equipment and supply evacuation and relocation; employees either assisted in equipment movement or sent to other hospitals to assist with evacuees.
 R:Used volunteers to assist in equipment/supply movement (~30 volunteers in basement).
- Post: Day 1 TAR (-1) CATALYST:Directive issued to enacting unit to evacuate premises.
 T:Established procedures to ensure building security.
 A:Maintained fire and safety watch--roving patrols every 2 hours; locked all doors; moved supplies as water increased inside building.
 R:Special phones installed for external communications.
- Post: Day 1 TAR (-1) CATALYST:Requests received for unit's personnel to assist other social units.
 T:Established procedures to assist other hospitals.
 A:Individual departments from enacting unit sought hospitals that needed assistance and then relocated (in some cases took over duties).
 R:Received another unit's equipment and supplies

(e.g., pharmacy).

- Post: Day 2 TA (+1) CATALYST:Requests for drugs and supplies.
 T:Established procedures necessary to get into impacted area.
 A:Went by boat (twice) to enacting unit's building to get supplies; sent supplies to evacuation centers and hospitals.
- Post: Day 3 ATR (-3) CATALYST:Loss of building--damaged.
 A:Started cleanup operations--pushing mud; expanded working hours.
 T:Determined procedures to ensure adequate cleanup operations and security.
 R:Military security, contractors, volunteers, architect, private investigating agency hired; tractor trailer loads of germicides donated.
- Post: Day 21 TRA (-1) CATALYST:Cleanup operations.
 T:Determined procedures for reopening (restocking and changing admission procedures).
 R:Supplier restocked (for free) all basic inventory items (12,000).
 A:Admitted patients under new procedures; inventoried all restocked supplies; relocated some services and eliminated others; opened one floor at a time.
- Unit 21: Hospital 'D'
- Pre: -12 hrs TA (+1) CATALYST:Notified to prepare for hospital evacuees.
 T:Determined procedure to prepare for 100 patients.
 A:Discharged (~40) walking and post surgical patients; made bed checks and computed beds available.
- Pre: -9 hrs TAR (-1) CATALYST:Unit directed to evacuate.
 T:Established procedures to evacuate entire hospital; seriously ill evacuated first; initiated evacuation plan.
 A:Meeting held and staff informed; each department made bed check; doctors and patients' families notified; packed supplies; employees notified to come in and assist; nurses placed on every bus; patients evacuated to two hospitals and one nursing home.
 R:Extra staff during non-normal working hours; extra busses, ambulances committed and used.
- Pre: -4 hrs TRA (-1) CATALYST:Routes used to evacuate closed; bridges out.
 T:Determined procedures to locate alternative location.

R:Facility located and committed to enacting unit; equipped with hospital equipment and some supplies.
A:69-70 patients were evacuated to new location; advance team sent to set up new building; supplies, equipment and personnel sent to new location.

Post: Day 1 TA (+1) CATALYST:Hospital evacuation.
T:Established procedures to ensure safety of building and equipment.
A:Maintained fire and safety watch; security watch--2 hour patrols.

Post: Day 1 AR (-7) CATALYST:Relocation and increased patient load.
A:Set up various departments (OB, ICU, OR); inventoried existing supplies and ordered as needed.
R:Purchasing agent assisted--in charge of general stores; volunteers used (had too many); military doctors added to staff; out-dated medication available but discarded.

Post: Day 1 AT (-1) CATALYST:Request by mayor; refugees showed up at inundated building.
A:Placed refugees (~200) in empty, dry rooms; checked refugees' medical conditions; checked food supply.
T:Established procedures to ensure refugees received adequate care with supplies and personnel available.

Post: Day 2 TRA (-1) CATALYST:Increasing water level and concern over refugees' welfare.
T:Determined procedures to evacuate refugees.
R:Boats, trucks and busses used in transporting refugees to alternate location.
A:Placed refugees on boats, then trucks and then busses; took supplies also.

Post: Day 3 A (-4) CATALYST:Impacted areas opening for clean up.
A:Drastic increase in the number of people receiving treatment; doctors placed on 24 hour shifts.

Post: Day 5 TRA (-1) CATALYST:Loss of building--damaged.
T:Determined procedures for acquiring funding to re-establish hospital.
R:Federal and state agencies provided funding.
A:Started major repairs; relocated various departments and equipment.

Unit 22: Hospital 'E'

- Pre: -10 hrs TDAR (+4) CATALYST:Notified of incoming hospital evacuees.
 T:Determined procedures to prepare for receiving evacuees.
 D:Assumed role of "Disaster Center" delegated years before.
 A:Doctors notified; cancelled elective surgery and admissions; discharged patients; sent transportation to evacuating hospitals; out-patient clinics curtailed.
 R:Medical students and staff mobilized; medical school building provided; volunteers used; knowledge of number and type of evacuees expected.
- Pre: -8 hrs RATD (-4) CATALYST:Evacuees arriving at enacting unit's building.
 R:Evacuated patients' records; arriving ambulance crews' knowledge of hospital.
 A:Employees relocated (laboratory staff to emergency room) to assist with patient transportation.
 T:Developed procedures to assist in evacuation of hospitals (transportation).
 D:Expanded when ambulance service was taken over by enacting unit and directed by enacting unit members.
- Pre: -6 hrs TA (+1) CATALYST:Confusion when patients arrived in large quantities (all at once).
 T:Modified procedures to facilitate handling large number of patients.
 A:Set up triage in emergency room and made patient profiles as admitted.
- Pre: -5 hrs TA (+1) CATALYST:Volume of patients already received and potential of more coming.
 T:Established procedures to ensure enough space for more patients.
 A:Set up nursing school residence for patients, opened two floors of classrooms and set up disaster beds; used library and corridors for extra bed space.
- Pre: -5 hrs RA (-7) CATALYST:Notified of more evacuees arriving.
 R:Gained knowledge of number, type, and how the evacuees were tagged.
 A:Rechecked bed space available and prepared for incoming patients.
- Pre: -4 hrs TA (+1) CATALYST:Patients arriving at building.
 T:Modified procedures for determining where and how patients were to be placed (support vs hospital vs ICU care)--normally based solely

on diagnosis.

A: Did triage in hallways; record keeping altered; 92 patients received at one time.

- Pre: -3 hrs TA (+1) CATALYST: All patients admitted; increased number of patients.
 T: Determined procedures to ensure adequate supplies (food and drugs) for this number of patients.
 A: Employees went out and purchased supplies directly and sent bill to purchasing department; sacrificed concise, accurate and normal record keeping.
- Pre: -3 hrs TAR (-1) CATALYST: Lost all external communications (phones).
 T: Established procedures to acquire communications.
 A: Messages taken to another unit's radio setup to order supplies, locate people, and find out where to send patients.
 R: Car phone, short-wave radio and operator, and radio telephone donated.
- Pre: -1 hr TA (+1) CATALYST: Bad communications; distorted facts.
 T: Determined procedures to ensure accuracy in communication system; authorization needed and only select few could authorize.
 A: Got messages approved by superiors; used messengers to relay messages.
- Post: Day 1 TAR (-1) CATALYST: More patients than unit could care for.
 T: Determined procedures to get assistance from evacuated hospitals.
 A: Sent messages (by radio and messenger) to particular units for personnel; had to care for 4-5 extra nursing units.
 R: Evacuated hospital's staff cared for own patients; federal agency's doctors provided; high school students served as volunteers; ~50 beds donated from furniture company.
- Post: Day 1 TA (+1) CATALYST: Requests for supplies from emergency centers.
 T: Established flexible procedures to assist centers in filling requests.
 A: Filled requests, especially for places with dispensary; sterilized equipment for centers.
- Post: Day 1 RA (-7) CATALYST: Loss of main electrical power.
 R: Emergency generator used.
 A: Placed all nonessential equipment on standby.
- Post: Day 1 R (-4) CATALYST: Emergency generator overheating.
 R: 100 KW generator donated and used.

Post: Day 1 AR (-7) CATALYST:Suppliers not allowed in area.
 A:Coordinated with another unit to get supplies through barriers; served 1800 meals per day.
 R:Military donated trucks; supplies came from surrounding areas; wholesaler delivered daily; large quantities of vaccine donated.

Post: Day 1 TA (+1) CATALYST:Decreasing supplies.
 T:Modified procedures to limit supply output.
 A:Sorted requests; started checking for internal thefts; referred requests to military distribution center.

Post: Day 3 A (-4) CATALYST:Inability or desire of a particular hospital to receive certain types of patients.
 A:Increased record handling to find out which patients would qualify to be sent to this other unit; sent those qualified.

Post: Day 3 A (-4) CATALYST:Notification of nursing home evacuation.
 A:Refused patients; sent employee to nursing home to inform them that no ambulatory patients would be admitted--only surgical.

Post: Day 6 TAR (-1) CATALYST:Large influx of patients and no area physician offices opened yet.
 T:Established procedures to create space in nursing school residence for physician offices.
 A:Started internal triage to discharge patients; increased use of home health services (out-patient services doubled).
 R:Relocated personnel and services to meet increase in out-patient services.

Unit 23: Mass Media

Pre: -12 hrs A (-4) CATALYST:Reports of potential flood magnitude getting progressively worse.
 A:Met at another unit's command center to obtain current information; got information verified; maintained contact with command center for further updates.

Pre: -9 hrs R (-4) CATALYST:Competitive social unit's building evacuated.
 R:Received employees experienced in operating equipment.

Pre: -2 hrs TDAR (+4) CATALYST:Suggestion from another social unit.
 T:Determined procedures to establish communication network.
 D:Domain expanded when unit assumed command of network's operation (Civil Defense

determined that one local EBS station was insufficient for this disaster).

A:Contacted other social units and explained network procedures and purpose; tried to get assistance and compliance from all relevant social units.

R:12 to 13 social units included in network (2 social units refused to join).

- Post: Day 1 A (-4) CATALYST:Loss of building and equipment.
 A:Contacted social units by phone with information to be distributed; did not distribute information to public themselves.
- Post: Day 1 TRA (-1) CATALYST:Increasing water surrounding building.
 T:Established procedures to evacuate and relocate in building with mass communication capabilities.
 R:Building committed that had needed equipment.
 A:Contacted military unit to re-establish communication lines; re-established network and started disseminating information directly.
- Post: Day 1 TRA (-1) CATALYST:Lost lines of communication.
 T:Determined procedure to get lines repaired/replaced.
 R:Military unit replaced damaged lines.
 A:Started network operations once lines replaced; informed various units that the network was back in operation.

APPENDIX B

CODE BOOK

<u>ITEM: Variable label</u>	<u>COLUMNS</u>
<u>Case identification: CASEID</u>	3 (1-3)___
<u>Event number: EVENTN</u>	2 (4-5)___
<u>Event type: EVENTTP</u>	1 (6)___
1 = earthquake	
2 = tornado	
3 = flood	
4 = hurricane	
<u>Type of enacting organization:</u>	
<u>ORG-TYP</u>	1 (7)___
1 = emergency relevant public bureaucracy	
2 = other public bureaucracy	
3 = emergency relevant volunteer agency	
4 = special interest group	
5 = private firms	
6 = emergent groups of individuals	
7 = emergent groups of other groups and organizations	
8 = local military	
9 = religious group	
0 = uncertain	
<u>Description:</u> _____	

<u>Organization activity type:</u>	
<u>ACTN</u>	2 (8-9)___
1 = hazard-vulnerability analysis	
2 = maintenance of standby human and material resources	
3 = disaster preparedness, planning, and training	
4 = public education	
5 = hazard mitigation-structural	
6 = hazard mitigation- nonstructural	
7 = insurance	
8 = issuance of predictions and warnings	
9 = dissemination of predictions and warnings	
10 = evacuation	
11 = mobilization of emergency personnel	

- 12 = protective action
- 13 = search and rescue
- 14 = medical care
- 15 = providing victim basic needs
(problems in living)
- 16 = damage and needs assessments and
inventory of available resources
- 17 = damage control
- 18 = restoration of essential public
services
- 19 = public information
- 20 = traffic control
- 21 = law enforcement
- 22 = local governance
- 23 = coordination and control (organization
of emergency personnel and resources)
- 24 = reconstruction of physical structures
- 25 = re-establishment of production,
distribution, and consumption activities
(economic functioning)
- 26 = resumption of other social institutions
- 27 = determination of responsibility and
legal liability for the event
- 28 = meeting victim basic needs
- 29 = financial services/assistance*
- 88 = other
- 99 = uncertain

Description: _____

Specialized domain type: SDOM1

2 (10-11) _____

- 1 = public education
- 2 = mental health delivery
service
- 3 = medical health care
- 4 = alcohol abuse services
- 5 = drug abuse services
- 6 = state hospital aftercare
programs
- 7 = day care service programs
- 8 = religious health care
programs
- 9 = child guidance center
- 10 = suicide crisis center
- 11 = institutional advocacy
services
- 12 = state and county
hospitals
- 13 = head start programs
- 14 = churches
- 15 = health and welfare

agencies

- 16 = senior citizens groups
- 17 = banking/savings and loan*
- 18 = social control/policing*
- 19 = military reserve/preparedness*
- 20 = public information*
- 21 = disaster monitoring/preparedness*
- 22 = housing assistance*
- 88 = other
- 99 = uncertain

Tasks description: _____

Resources description: _____

Activities description: _____

Domain implicated: DOMI

1 (12)___

- 1 = yes
- 2 = no
- 9 = uncertain

Description: _____

Tasks implicated: TASI

1 (13)___

- 1 = yes
- 2 = no
- 9 = uncertain

Description _____

Resources implicated: RESI 1 (14)___

- 1 = yes
- 2 = no
- 9 = uncertain

Description: _____

Activities implicated: ACTI 1 (15)___

- 1 = yes
- 2 = no
- 9 = uncertain

Description: _____

Elapsed time from initiation to restructuring of element 1: ETR-E1 5 (16-20)___

- number of days-hours
- 88888 = non-used element
- 99999 = uncertain

Description: _____

Elapsed time of restructuring from element 1 to element 2: ETR-E2 5 (21-25)___

- number of days-hours
- 88888 = non-used element
- 99999 = uncertain

Description: _____

Elapsed time of restructuring from element 2 to element 3: ETR-E3 5 (26-30)___

- number of days-hours
- 88888 = non-used element
- 99999 = uncertain

Description: _____

Elapsed time of restructuring from element
3 to element 4: ETR-E4

5 (31-35)___

number of days-hours
88888 = non-used element
99999 = uncertain

Description: _____

Total time of restructuring (form) E1 to end:
TOT-RES

5 (36-40)___

number of days-hours
88888 = non-used
99999 = uncertain

Description: _____

Form of restructuring:
FOR-RES

2 (41-42)___

1 = d
2 = t
3 = r
4 = a
5 = dt
6 = dr
7 = da
8 = td
9 = tr
10 = ta
11 = rd
12 = rt
13 = ra
14 = ad
15 = at
16 = ar
17 = dat
18 = dar
19 = dtr
20 = dta
21 = drt
22 = dra
23 = trd
24 = tra
25 = tda
26 = tdr
27 = tar
28 = tad
29 = rda
30 = rdt
31 = rat

- 32 = rad
- 33 = rtd
- 34 = rta
- 35 = atr
- 36 = atd
- 37 = art
- 38 = ard
- 39 = adr
- 40 = adt
- 41 = dtra
- 42 = dtar
- 43 = drat
- 44 = drta
- 45 = datr
- 46 = dart
- 47 = trad
- 48 = trda
- 49 = tadr
- 50 = tard
- 51 = tdra
- 52 = tdar
- 53 = radt
- 54 = ratd
- 55 = rdta
- 56 = rdat
- 57 = rtda
- 58 = rtad
- 59 = adtr
- 60 = adrt
- 61 = atrd
- 62 = atrd
- 63 = ardt
- 64 = artd

Description: _____

Number of social links during
restructuring: SOC-LK
 number of links
 99 = uncertain

2 (43-44)_____

Description: _____

Number of social linkages - local:LLINKS

2 (45-46)___

number of links

99 = uncertain

Description: _____

Number of social linkages - county:CLINKS

2 (47-48)___

number of links

99 = uncertain

Description: _____

Number of social linkages - state:SLINKS

2 (49-50)___

number of links

99 = uncertain

Description: _____

Number of social linkages - national:NLINKS

1 (51)___

number of links

9 = uncertain

Description: _____

Size of organization: ORGSZ

1 (52)___

1 = 9 or less members

2 = 10-20 members

3 = 21-50 members

4 = 51-100 members

5 = 101 or more members

9 = uncertain

Description: _____

Number of subunits in predisaster organization: PRE-SUB

2 (53-54)___

number of subunits
99 = uncertain

Description: _____

Number of ranks in formal hierarchy:

NUM-RKS

1 (55)___

1 = 3 or fewer ranks in authority structure
2 = 4 or more ranks in authority structure
3 = not applicable
9 = uncertain

Description: _____

Unit task structure:

UNT-STR

2 (56-57)___

number of tasks
99 = uncertain

Description: _____

Unit proximity to impacted area:

UNT-PRO

1 (58)___

0 = directly impacted*
1 = local
2 = county
3 = state
4 = national
5 = not relevant - emergent unit
9 = uncertain

Description: _____

Locus of pre-disaster activities: LOC-PDA 1 (59)___

- 1 = local
- 2 = county
- 3 = state
- 4 = national
- 5 = not relevent - emergent unit
- 9 = uncertain

Description: _____

Extent of unit disaster experience:

UNT-EXP 1 (60)___

- 1 = no experience
- 2 = limited experience
- 3 = moderate experience
- 4 = extensive experience
- 9 = uncertain

Description: _____

Unit pre-planning: UNT-PLN 1 (61)___

- 1 = written program - regularly updated
- 2 = written plan - filed
- 3 = no written plan
- 4 = not relevent - emergent unit*
- 9 = uncertain

Description: _____

Dispersion of social unit activities-
pre-disaster: DIS-PRE 1 (62)___

- 1 = concentrated in one area
- 2 = 2 to 4 areas
- 3 = 5 or more areas
- 4 = not relevent - emergent unit*
- 9 = uncertain

Description: _____

Dispersion of social unit activities-
post-disaster: DIS-POS

1 (63)___

- 1 = concentrated in one area
- 2 = 2 to 4 areas
- 3 = 5 or more areas
- 9 = uncertain

Description: _____

Initiation of unit disaster response:

UNT-IDR

1 (64)___

- 1 = self-contained
- 2 = boundary spanning local
- 3 = boundary spanning state
- 4 = boundary spanning national
- 5 = boundary spanning (mixed state and local)
- 6 = boundary spanning (mixed local and national)
- 7 = boundary spanning (mixed state and national)
- 8 = boundary spanning (mixed local, state, and national)
- 9 = uncertain

Description: _____

Focus of domain
at restructuring: DIS-LOC

1 (65)___

- 1 = municipality proper
- 2 = county proper
- 3 = mixed municipality and county
- 4 = state*
- 5 = national*
- 6 = state and national*
- 9 = uncertain

Description: _____

Reason for suspension of disaster relevent activity: REA-SUS

1 (66)___

- 1 = demand met, activities terminated
- 2 = loss or depletion of human or material resources
- 3 = absorbtion of domain and tasks by another entity
- 4 = task structure breaks down
- 5 = impact of event*
- 9 = uncertain

Description: _____

Total time of disaster response: TTRES

5 (67-71)___

- number of days-hours
- 88888 = non-used
- 99999 = uncertain

Description: _____

Response continuing at point of final interview: RES-CON

1 (72)___

- 1 = yes
- 2 = no
- 9 = uncertain

Description: _____

Restructuring beneficial to social unit: RES-BEN

1 (73)___

- 1 = yes
- 2 = no
- 3 = neutral*
- 9 = uncertain

Description: _____

Restructuring related to social unitsspecialized domain: RES-REL

1 (74)___

- 1 = related
- 2 = unrelated
- 3 = partially related
- 9 = uncertain

Description: _____

Unit identification: UNID

2 (75-76)___

- 1 = Health Foundation
- 2 = County United Health Foundation
- 3 = Child Counseling Center
- 4 = Metropolitan Hospital
- 5 = Drug Encounter Group
- 6 = County Mental Health Clinic
- 7 = Board of Education
- 8 = Community Mental Health Group
- 9 = County Welfare Department
- 10 = Local Church
- 11 = Public School
- 12 = Multiple County Mental Health Association
- 13 = Children's Head Start Program
- 14 = County Health Department
- 15 = County Hospital
- 16 = County Mental Health Group
- 17 = Multi-faith Church Group
- 18 = Adult-Child Guidance Center
- 19 = County Health Commission
- 20 = County Health And Welfare Planning Council
- 21 = College Health Care Center
- 22 = Children's Service Group
- 23 = Community Mental Health Center
- 24 = Religious Social Services Group
- 25 = Family Mental Health Unit
- 26 = County Mental Health Association
- 27 = County Hospital
- 28 = Senior Citizens Group
- 29 = County Welfare Department
- 30 = Senior Citizens Council
- 31 = State Hospital
- 32 = Counseling-Intervention Unit
- 33 = County Mental Health Board
- 34 = Local Inter-Church Group
- 35 = Disaster Outreach Group
- 36 = Bank/Savings & Loan*
- 37 = Military*

- 38 = Military Reserve*
- 39 = Media*
- 40 = Law Enforcement Agency*
- 41 = Military Hospital*
- 42 = Disaster Firm*
- 43 = Hospital*
- 44 = Federal Housing/Welfare Firm*
- 45 = Event Task Force - Emergent*
- 46 = Federal Urban Firm*
- 47 = Federal Community Firm*
- 99 = Other

Description: _____

Elements symmetrically related: ELE-SYM

1 (77)___

- 1 = No - one element form
- 2 = Yes - two element symmetrical
- 3 = No - two element non-symmetrical
- 4 = No - three element non-tendency
- 5 = Yes - symmetrical tendency
- 6 = Yes - four element symmetrical
- 7 = No - four element non-symmetrical
- 9 = Uncertain

Description: _____

Logical metric - weighted first element:

BMET

2 (78-79)___

- 1 = -5
- 2 = -4
- 3 = -3
- 4 = -2
- 5 = -1
- 6 = 0
- 7 = +1
- 8 = +2
- 9 = +3
- 10 = +4
- 11 = +5

Description: _____

Logical metric - non weighted first element:

JMET

1 (80)___

- 1 = -2
- 2 = -1
- 3 = 0
- 4 = +1
- 5 = +2

Description: _____

Logical metric - origins:

GMET

1 (81)___

- 1 = -3
- 2 = -2
- 3 = -1
- 4 = 0
- 5 = +1
- 6 = +2
- 7 = +3

Description: _____

Conflict within social unit:

CONFIN

1 (82)___

- 0 = benign
- 1 = conflictual
- 9 = uncertain

Description: _____

Conflict outside social unit:

CONFOUT

1 (83)___

- 0 = benign
- 1 = conflictual
- 9 = uncertain

Description: _____

Total time of social units involvment
in disaster related activities: TTINVO

5 (84-88)___

number of days-hours

88888 = non-used

99999 = uncertain

Description: _____

Agent for restructuring of social unit:

AGENT

1 (89)___

1 = internal

2 = external

9 = uncertain

Description: _____

Source for restructuring: SOURCE

1 (90)___

1 = collective

2 = individual

9 = uncertain

Description: _____

Derived logical metric: METRIC

2 (91-92)___

1 = -7

2 = -6

3 = -5

4 = -4

5 = -3

6 = -2

7 = -1

8 = 0

9 = +1

10 = +2

11 = +3

12 = +4

13 = +5

14 = +6

15 = +7

Description: _____

<u>Catalyst for restructuring: CATA</u>	1	(93)___
1 = element related contingency		
2 = disaster event		
3 = competition		
4 = cooperation		
5 = forewarning*		
6 = conflict*		
7 = impending (increase in magnitude)*		
8 = wanning (impact receding)*		
9 = uncertain		
Description: _____		

<u>Social unit identification number: UNITID*</u>	2	(94-95)___
Description: _____		

<u>Social unit a subunit: SUBIT*</u>	1	(96)___
1 = yes		
2 = no		
9 = uncertain		
Description: _____		

<u>Disaster specific plan: DPLAN*</u>	1	(97)___
1 = internal and external		
2 = internal		
3 = external		
4 = none		
8 = not relevent - emergenet unit		
9 = uncertain		
Description: _____		

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VITA

John Gregory Crooks

Born in Indianapolis, Indiana, February 12, 1957. Graduated from Thomas Carr Howe High School in that city, June 1975. A.A., John Tyler Community College, 1983; B.A., The College of William and Mary, 1985; M.A. candidate, The College of William and Mary, 1988, with a concentration in Sociology. The course requirements for this degree have been completed, but not the thesis: Organizational Restructuring: Responses to a Natural Disaster.