# A Study on Collaborative Invention of Discourse among Disciplinary Experts: The Admiral Elmo R. Zumwalt, Jr. National Program for Countermeasures to Biological and Chemical Threats as an Activity System

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*Few studies have addressed processes of collaborative invention of discourse among experts. Experts engaged in a collaborative process of invention will express ideas, thoughts, and attitudes that shape other contexts. These other contexts may include those that engage risk communication and policy formation. If this process contributes to discourse formation in other areas, then it becomes critical to study the interactions of these experts.*

*Experts participating with the Admiral Elmo R. Zumwalt, Jr. National Program for Countermeasures to Biological and Chemical Threats collaboratively invent discourse for proposals and reports. This paper contends that groups of experts operate as activity systems, and these systems negotiate uses of artifacts and pose objectives in order to achieve the goal of producing discourse.*

## INTRODUCTION

Collaborative writing and group dynamics have captivated technical and professional communication scholars for several years, and they have devoted considerable effort to studies addressing cross-functional teams and software documentation, writing classrooms and computer-based writing instruction, and collaboration in other work-place environments. Previous research has revealed that experts as members of organizations, tend to rely upon an organization's established mechanisms for communication without genuinely considering the values and attitudes of audiences or engaging them in legitimate dialogue. Technical and professional communication as well as rhetorical studies have analyzed document features and drawn conclusions about a document's communicative effectiveness based upon its sentence structure, tone, arrangement, style, or use of arguments. However, we have conducted relatively few studies to learn how experts begin their writing process, and in particular, how groups of experts from various disciplines work together to form discourse for audiences inside as well outside the organization. A study examining experts as they collaboratively "invent" discourse can shed new light upon the reasons for discoursal practices that may lead to instrumental communication.

This study examines how experts from science, engineering, mathematics as well as architecture collaboratively invent discourse for multiple audiences. One of my goals in conducting this study has become to learn how interdisciplinary group practices in professional writing ultimately influence audiences and shape decision-making. It is not difficult for me to contend that a group's practice of collaborative rhetorical invention eventually becomes a document and that document transcends the collaborative situation into other contexts that eventually shape the social, cultural, and political milieus. Expert discourse contributes to directing organizational formation as well as policy action, a point upon which most of us would agree. However, the greater questions become "how?" and "why?"

Not only do experts influence decisions in other contexts outside of those in which they collaborate, but the process these experts engage is worth exploring in and of itself. Experts from different academic disciplines bring with them disciplinary practices, perspectives, attitudes, and even biases from their particular field of expertise when engaging with others from academic areas very different from their own. A process of collaborative invention among these people many times brings radically different perspectives on academic practice, epistemological difference, and theoretical grounding into conflict. As a process, collaborative invention among and between different people from different professions causes numerous elements to surface, and it forces some sort of conflict resolution and consensus on issues for the sake of producing communication for a particular audience. Conflict, consensus, and resolution are inextricably intertwined in collaborative invention. How these elements emerge can tell us much about the anthropological formation of a particular group.

I use ethnographic field methodology and observe these individuals as they voice ideas about a document's content. In doing so, I have seen how one expert's idea does not always coincide with the idea of an engineer or a mathematician. Disagreement, conflict, multiple revision, and resolution finally result in a product that

becomes the culmination of an interdisciplinary perspective, at least in the particular case I have chosen to analyze for this research. The document that results from interdisciplinary collaboration represents a cohesive unit worthy of attention, but the process that has resulted in this unit is the focus of this study.

Activity theory (AT) is the lens for analyzing ethnographic observations; I analyze group interactions according to Yrjö Engeström's triangular model for activity. Its elements identify the complex interworkings of groups operating as systems to achieve goals. Engestrom's model identifies subjects, rules, community, division of labor, object(ive), and mediating artifacts. His model allows us to view equally all elements interacting with one another in a particular situation, which becomes critically important as we attempt to understand the interworkings of these professional groups because these expert groups manifest each of Engestrom's elements in some way. . This research is very much a work in progress, and within the scope of this paper, I am only giving a glimpse into the overall project. As part of this ethnography, I have observed professionals from fields such as atmospheric science, neuroscience, toxicology, mechanical and electrical engineering, textile engineering, mathematics, and architecture. These professionals have come together to form the Admiral Elmo R. Zumwalt, Jr. National Program for Countermeasures to Biological and Chemical Threats (from this point forward I will refer to this project as the Zumwalt Program). This program has emerged as part of the Texas Tech University and Texas Tech University Health Sciences Center's Institute of Environmental and Human Health, which focuses upon research addressing toxic chemical effects on the environment and human beings. Zumwalt Program experts, comprised of faculty from both Texas Tech University and Texas Tech University Health Sciences Center, have formed interdisciplinary teams to research countermeasures to possible chemical and biological terrorism within the United States

Currently, I am posing these questions for the study:

- Do particular expert practices during collaborative invention lead to instrumental communication? If so, what are these practices?
- What decisions do they make about the documents they write? How do they use documents as tools for accomplishing their goals? How does this group resolve disagreement over document decisions?
- How does this group form a community: what terminologies become common to the group?
- What are expert expectations of document content?
- How do experts evaluate good writing in documents?
- How do individual experts perceive of the collaborative process?
- How does the individual expert perceive of his/her role in shaping public policy? In shaping organizational formation?

I have subdivided the following section into two parts. The first portion contains a brief historical account of this issue. The second portion explains the birth of the program I am examining at Texas Tech University in order to provide some basic context for readers.

## *Part I: Chemical and Biological Agents: The New National Security Threat*

In the 1990s, experts began identifying terrorist use of chemical and biological weapons, sometimes called weapons of mass destruction (WMDs), as a major threat to U.S. national security. Dialogues among experts began addressing the ease with which anyone with the wherewithal could create a device to discharge a WMD anywhere in the United States. Different federal agencies, including the FBI, CIA, Department of Justice, and Department of Defense, began hypothesizing how one could easily download the recipe for anthrax from the Internet then wreak havoc virtually anywhere one desired. However, legitimate incidents also lend credibility to those who argue the country is facing risk of these attacks. In 1995, the Aum Shinrikyo, a radical Japanese religious cult, released sarin gas into a Tokyo subway killing ten people. Within the U.S. borders, another extremist group poisoned a salad bar in Oregon in an effort to influence a local election. Such incidents have provided empirical evidence for those individuals who are attempting to convince other government leaders at the federal, state, and local levels that the United States must act now to prepare itself from other types of attacks.

Dr. Richard Danzig, Secretary of the Navy, published a policy study in February 1999 entitled, "The Big Three: Our Greatest Security Risks and How to Address Them," in which chemical and biological agents are identified as one of the gravest dangers the United States faces in the twenty-first century. In addition to urgency expressed in the top levels of federal bureacracy, fear from this threat has also manifested itself in the popular culture. Popular author and physician Robin Cook has written several novels depicting runaway viruses and conspiracies to

cover-up leaks from high-containment laboratories.. At times, these novels are not always far removed from reality. Supposedly based on a true story, Richard Preston's *The Hot Zone* tells of how the military attempted to contain the outbreak of an exotic airborne virus known to kill ninety percent of its victims.

In response to the alarming concern among government officials, federal agencies began offering funds for universities and other organizations to address this threat through such means as sensing and detection technology, medical processes, and protective clothing. In the following section, I explain how the Texas Tech University System and TIEHH became involved in this issue to nd how the Texas Tech and TIEHH became a part of this issue.

### *Part Ii: The Advent of the Admiral Elmo R. Zumwalt, Jr. National Program for Countermeasures to Biological and Chemical Threats*

Established in mid-1997, TIEHH (TIEHH, pronounced "tie") in Lubbock, Texas became part of both Texas Tech University and Texas Tech University Health Sciences Center. It was formed as a research program to assess the toxic chemical impacts on both the environment and the health of human beings.

In 1998, the retired Chief of Naval Operations of the United States Navy, Admiral Elmo R. "Bud" Zumwalt, Jr., contacted the TTU System Chancellor inquiring about Texas Tech's capacity among its scientific faculty to contribute to the nation's efforts to address a growing national security problem.. Upon receiving this charge, one of TIEHH's faculty members organized a group of other faculty members from fields including biological sciences, microbiology, pharmacology, toxicology, mathematics, atmospheric science, physiology, civil engineering, electrical engineering, and chemical engineering. Later, they named the effort the Admiral Elmo R. Zumwalt, Jr. National Program for Countermeasures to Biological and Chemical Threats.

Currently, Zumwalt Program experts are writing proposals so that they may fund projects addressing countermeasures; these projects include technology that detects the presence of an agent, fabrics and clothing that resist chemical agents, and geographic and virtual modeling. My project explores group dynamics of professionals as they come together to write proposals and produce other kinds of written genres to advance this enterprise. The following section reviews the previous studies focusing upon organizational communication and collaboration and discourse as well as those studies that use activity theory as a critical lens.

## COLLABORATION AND THE CONTEXTS OF PROFESSIONAL DISCOURSE: ORGANIZATIONAL FORMATION, ACTIVITY SYSTEMS, AND CROSS-FUNCTIONAL TEAMS

I have found that the research addressing organizational formation and studies using activity theory to analyze groups are considerably interrelated.

### *Organizational Formation and the Collective Mind*

Karl Weick, a prominent scholar from the speech communication discipline, has identified the concept of the collective mind, which gives insight into how group dynamics evolve and how individuals within the group interact with one another as a unit. Weick and Roberts have likened groups of people working together in an organization to neural networks; activities occurring within these networks encode concepts and ideas:

> Sandelands and Stablein (1987: 139-141) found parallels between the organization of neurons in the brain and the organization of activities in organizations. They used this parallel to argue that connected activities encode concepts and ideas in organizations much like connected neurons encode concepts and ideas in brains. Ideas encoded in behaviors appear to interact in ways that suggest operations of intelligent processing. These parallels are consistent with the idea that organizations are minds. The important lessons from Sandelands and Stablein's analysis are that connections between behaviors, rather than people, may be the crucial "locus" for mind and that intelligence is to be found in patterns of behavior rather than in individual knowledge. (Pp. 359-60) (1)

Their last statement becomes extremely useful as this study pursues an activity theory analysis of professionals engaged in collaborative invention of discourse. The notion of collective mind indicates that activity itself (i.e., how individuals engage one another in a social context) becomes extremely important in the way groups reach understandings and form processes. Weick and Roberts' analysis offers that the behavior itself negotiates meaning for the group; however, they never draw a direct connection between behavior and meaning. They do explain that behavior drives the organization.

The concept of the collective mind does two things. First, it offers a basis for discussing how analyzing activity systems can provide insight into organizational

behaviors. Second, this insight into organizational behavior as a collective intelligence can tell us much about group interactions that produce discourse. This paper will elaborate these two points more specifically in later sections.

## *Activity Theory and Group Dynamics*

Engeström's triangular model for activity provides a method for systematically analyzing group interactions. The model can also help explain the organizational dynamics Weick and Roberts identify, and more importantly, it can aid in explaining how these elements interact with one another. Figure 1 identifies the elements of his model (2).

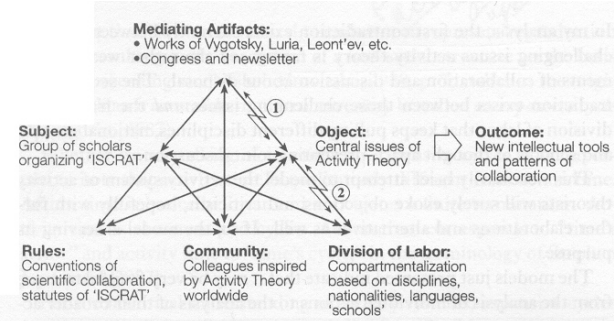

Figure 1.2. A complex model of an activity system.

The model identifies six major elements of activity: mediating artifacts, subject, object(ive), rules, community, and division of labor. Mediating artifacts define and shape the group and can include the different genres the group uses to convey its message. Subjects are those individuals who comprise the group; the object or objective is the group's goal. The rules are the guidelines the group follows in adhering to those goals. The group itself is a community; however, the group exists as part of a larger community which/that may adhere to the same conventions, goals, and objectives. The division of labor speaks to how the group divides itself according to tasks. The group members may come from different disciplines; however, each of the members is bound by a common objective.

Recent analyses among writing scholars have limited themselves mostly to collaborative interactions within the writing classroom. David Russell's analysis of general writing skills instruction (GWSI) has given writing studies insights into the uses of activity theory as a lens for studying written communication (3). His text explains the paradox with the GWSI curriculum by explaining that the course itself attempts to transcend all contexts into a universalized context. Writing takes place within a given context. Moreover, Russell indicates that "writing does not exist apart from its uses, for it is a tool for accomplishing object(ive)s beyond itself." Russell's analysis sees the classroom system as a set of factors coming together to form meaning and shape context. Witte concurs that writing theory brings together the "textual, cognitive, and social and viability with regard to how writing is defined operationally (i.e., in practice) through its production and use in the culture" (4).

Written communication within a given cultural context is precisely the focus of this research. Although Witte and Russell make excellent points about socially negotiated meaning and cultural contexts for writing, very few studies have addressed professional experts as they come together to negotiate and create meaning within a given context. However, scholarship from software design and human computer interaction has touched upon how groups come together to form cross-functional teams who produce discourse.

## *Cross Functional Teams and Communication*

Bishop defines a cross-functional team as a "team that brings together an array of specialists who jointly and simultaneously make design and manufacturing decisions" (5). She also states that "the decision-making and action-producing process used by cross-functional teams act together to speed up the overall cycle time by reducing sequential knowledge transfer activities, reducing rework, improving the flow of communication, and increasing knowledge at lower levels of organization."

*Technical Communication* recently devoted its entire February/March 2000 edition to describing the technical communicator's role in initiating and establishing cross functional teams as well as maintaining good communication among members Marchiwinski and Mandziuk's piece, "The Technical Communicator's Role in Initiating Cross-functional Teams" identifies case studies in which the technical communicator can act as the facilitator for cross-functional processes (6). Corey Wick echoes these sentiments in the November 2000 edition of this journal when he argues that technical communicators can play a key role in cross-functional teams as knowledge managers (7).

Although very informative, the previously mentioned research does not explore in any considerable detail what occurs amongst groups of experts. The literature addressing cross-functionality does become somewhat limited because it fails to adequately describe for audiences how cross-functional teams, which are essentially teams of interdisciplinary experts,

specifically work together to achieve the goal of writing a document. Therefore, activity theory as a lens to describe collaborative interactions that produce documents again becomes important so that we may better understand the details of complex interactions among professionals

# METHODOLOGY

I have conducted interviews, ethnographic field observations, and observations f three to four meetings of this group. However, in this paper I focus only upon one six-hour meeting for the scope of this particular essay. In this meeting, the group met to construct a proposal soliciting funds to build a test bed for an "immune" building scenario. These experts use the term "immune" building to describe a building that can detect, withstand, and/or even minimize the impact of a particular biological and/or chemical agent's release within the structure itself. A broad-based activity system analysis moves beyond the scope of this particular text; therefore, I will discuss issues that coincide with Engeström's triangular model for activity in a rather abbreviated way, here.

# RESULTS AND ANALYSIS: A WORK IN PROGRESS

## *Zumwalt Experts Prepare a Proposal*

***Subjects.*** This group has included persons from a wide range of disciplines and organizational affiliations. I have assured group members of confidentiality, so I will acknowledge members according to their respective discipline or affiliation:

- Electrophysicist
- Corporate Engineer
- Corporate Mathematician
- Corporate Representative
- Neuroscientist
- Architect Firm Director (AFD)
- Architect from Firm (AF)

***Object(ive)s.*** The Zumwalt Program experts' goal for this particular meeting was to attain as much data as possible for future writing tasks. The group continually referred to "data mining" in order to gather as much information as possible about each other's capabilities, products, and contributions to this effort. Electrophysicist constantly requested specification sheets and additional information from each of the group's respective organizations.

***Community.*** Except for one, experts were members of other organizations independent of Texas Tech University or Texas Tech University Health Sciences Center. The corporate representatives held a different function than the scientists because they were promoting their products for the research. Similarly, the architects held different viewpoints than both the architects and the scientists. However, the unified goal of writing a proposal with a specific purpose for a specific audience bound this group together.

***Division of Labor.*** It is fairly easy to state that each of these individuals can be subdivided according to his or her respective profession. However, the notion of "division of labor" became somewhat skewed once these persons entered this collaborative situation. The context changed the individual's role within the group because a person who may ordinarily lead amongst his or her immediate disciplinary colleagues may be forced to become a follower once he or she becomes a member of this group.

Almost immediately, a leader emerged who assigned tasks and who would write what portion of the document. Electrophysicist asserted himself as the dominant person within the group, and he became the self-appointed manager. He articulated the need for a test bed and that they group needed to determine the "virulence of the subject to be studied." He always related the project itself back to the document; in other words, he stressed the need to represent in considerable detail what the group planned to do within the proposal itself.

***Rules.*** The group did not abide by any stringent guidelines in order to produce this document. The federal agency that served as the audience for this particular document did identify conventions that the group must follow. However, the group itself became loosely organized and everyone was accountable to the other members of the group "to get the job done."

***Mediating Artifacts.*** The proposal eventually acts as a mediating artifact for this group because it defines and represents this group's ideas. However, several other mediating artifacts emerged for this group that shape the proposal. For example, Electrophysicist presented the group with a chart depicting the "flow of actions" between an initial terrorist incident and its resolution. This chart, which Electrophysicist drew with a pencil while traveling on an airplane, became the focus of much dispute during the meeting. This chart became an important heuristic for purposes of invention for the group, and it established the categories of information for the group as it engaged the process of writing this document.

Neuroscientist disputed certain aspects of the chart arguing that the group should change the sequence to address more effectively a potential terrorist scenario. He said that decontamination "should not come at the end. It should come at the beginning. This is the most important element." Such disagreements over sequence and category as well as appropriate use of terms became common during this session.

In addition to disagreement over sequence, the group argued over criterion for assessing the risk and impacts of these agents. Electrophysicist argued that "dose" is the most important criteria in determining an agent's effect. Corporate Engineer disputed this assertion in part contending that dose "is important when discussing human beings, but not necessarily when discussing the environment in which the agent is released." Corporate engineer indicated that the group should consider "concentration." The term "dose" carried with it certain medical implications for human beings and other life form; the engineer argued for a more comprehensive term to address both human and non-human elements.

Not only did these experts dispute terms, but they also argued from their own disciplinary bias. Electrophysicist continually pushed for more "solid facts" that will enhance the credibility of the proposal's argument. Corporate Engineer constantly supported the need for more controls and products to support the effectiveness of their idea. AFD returned to the "containment" idea arguing that containable space "should be held in high regard" because they needed to determine what happens to material within the room. I raise this issue of disciplinary bias because it illustrates how disciplinary perspective shapes the document's construction. The proposal document did not adhere to the perspective of only one discipline, but it conformed to the biases, attitudes, and values of several.

The group continually negotiated and renegotiated meaning over artifacts like Electrophysicist's chart drawing. They argued over terms until they reached a common understanding over terms contained within such artifacts, or in some cases, they did not reach consensus. The consensus building over mediating artifacts has become a critical part of this study, and it is one in which I will make an important part of this study's conclusions.

## CURRENT CONCLUSIONS

To date, argument over definitions, concepts, and sequence of information contained within the document have become the most interesting elements of this particular study. I anticipate that upon the completion of the study, I will contend that experts discourse creation during an invention process directly inform other discourse practices in other contexts. In other words, the expert who invents discourse engages a process of not only inventing for a particular document, but also for shaping other cultural, social, and political issues. A point I hope to reemphasize upon completing this research is that documents transcend the contexts in which these documents are produced. The ideas exchanged in this particular meeting formed a proposal, but others will use these arguments to support policy decisions

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