How three heuristic documentation tools emerge from genre ecologies.

Genre Ecologies: An Open-System Approach to Understanding and Constructing Documentation

Clay Spinuzzi
Texas Tech University
Department of English
Box 43091
Lubbock, Texas 79409-3091
Home: (806) 788-0054
Office: (806) 742-2501 ext. 258
Fax: (806) 742-0989
Clay.Spinuzzi@ttu.edu

Mark Zachry
Utah State University
Department of English
3200 Old Main Hill
Logan, Utah 84321
Home: (435) 755-8237
Office: (435) 797-2606
Fax: (435) 797-3797
mzachry@english.usu.edu

Abstract

Arguing that current approaches to understanding and constructing computer documentation are based on the flawed assumption that documentation works as a closed system, the authors present an alternative way of thinking about the texts that make computer technologies usable for people. Using two historical case studies, the authors describe how a genre ecologies framework provides new insights into the complex ways that people use texts to make sense of computer technologies. The framework is designed to help researchers and documentors account for contingency, decentralization, and stability in the multiple texts the people use while working with computers. The authors conclude by proposing three heuristic tools to support the work of technical

ACM Journal of Computer Documentation, 2000,24:169-181
 ISSN 1527-6805

communicators engaged in developing documentation today: exploratory questions, genre ecology diagrams, and organic engineering.
H.5.2 Information Interfaces and Presentation: *User Interfaces—training, help, and documentation; user-centered design*
K. Computing Milieux: *History of computer—software*
General Terms: *Documentation, Human Factors*
Keywords: *genre theory, information ecologies, genre ecologie*s

Introduction

At a police station in the Midwest, a police officer named Barbara starts up the DOS-based database that she will use for locating and analyzing traffic accidents in a particular area. According to the software's manual, she should first unroll a two-by-two-foot map of the area, which is overlaid with six-digit numerical coordinates called node numbers. Then she should look up the node number for each intersection she is investigating and type them, one by one, into a dialog box. The cumbersome map is rich in unnecessary detail, takes the entire space of a cleared desk, and must be held down by paperweights so that it will not roll back up; it's no surprise that Barbara avoids using it. Instead, she opens a folder and takes out a Post-It note on which she had written down a series of node numbers some months before. The unwieldy node map is replaced by a conveniently sized note that holds only the details that she needs.

At a national production facility in the same Midwest state, supervisors from the Electronic Data Processing department meet with a team of industrial engineers to discuss how they will educate employees about using a newly developed database. They look to the documentation supplied with the mainframe computer on which the database will run and they laugh. Not a single sentence from that documentation is applicable to the work the employees will have to accomplish. Starting from scratch, the supervisors decide to write step-by-step instructions in the same way that instructions are developed for workers on the production line. Later, they will discover that they have to issue administrative memos to supplement and amend their original instructional documentation.

Computer documentation is traditionally assumed to function in a *closed system* in which workers use only the documentation shipped with the product, rather than drawing on more diverse resources. For instance, software documentation is typically produced in "documentation sets" which ideally provide all the information that a user will need to interact productively with a given technology. Likewise, traditional usability testing of documentation attempts to assess how people use the official documentation set to accomplish tasks. Yet in practice, documentation systems are rarely closed: people turn not only to the official documentation set, but also to third-party manuals, coworkers in the next cubicle, scribbled notes they have attached to their computer monitors, and a variety of other sources. In practice, then, the technology-in-use is not documented by a closed document set; it is documented by a perpetually open-ended, dynamic, shifting, and always unfinished ecology of resources encompassing a variety of media and domains.

Closed-system perspectives assume that document sets are centrally designed, officially produced, and authoritatively controlled sets of artifacts, and that improving user documentation involves consolidating a tight and rational control over these closed sets. Indeed, we argue in this article that the closed-system assumption limits in important ways how we as software documentors plan, develop, design, write, test, and understand documentation.

We contend that attempts to document any complex technology with a discrete, closed set of texts oversimplify the ways in which people come to understand and interact with technology. Instead, we argue, software documentation should be approached as an open system. An *open-system approach* entails recognizing that human interactions with complex technologies are inevitably mediated by dynamic and

unpredictable clusters of communication artifacts and activities (cf. Suchan and Dulek, 1998). Such clusters can be best described as *genre ecologies*.

Using examples from two case studies, we illustrate that genre ecologies are ruled by contingency, decentralization, and relative stability. These three characteristics of genre ecologies make them flexible enough to support people's innovations as they use new technologies to accomplish complex tasks (cf. Mirel, 1998a, 1998b), while still providing the anchors people need as they consolidate their knowledge of the technology and use it in repeated, more stable ways. The final section of this article suggests how professional communicators might use the concept of genre ecologies to facilitate human interaction with complex technologies in a way more responsive to the needs of people than traditional, closed conceptions of documentation sets.

Limitations of the Closed-System Assumption: The Need for an Open-System Approach in Computer Documentation

The traditional closed-system approach to documentation dominates the business of planning, developing, designing, writing, usability testing, and understanding software documentation. Yet the closed-system assumption is unable to account for the open-endedness of users' real work—particularly work involving experienced users and complex tasks—and has resulted in documentation sets that are poorly designed for the ways in which users actually work (cf. Mirel, 1998a). In this section, we illustrate the consequences of that inability through a closer look at one part of the documentation development cycle: usability testing.

Traditionally, usability has been seen as a quality inherent in (or built into) a given document. For instance, Dumas and Redish state that "usability is an *attribute* of every product" (1993, p. 4, emphasis ours), and Grice and Ridgway describe usability as "an *attribute* that we would like our products and our information *to possess*" (1993, p. 431, emphasis ours). Consequently, usability tests have traditionally been based on the premise that documentation is a closed system—that documentation can be tested as a discrete unit, since those units themselves possess or do not possess the quality of usability. This unit-based approach to usability studies yields artificial insights into the communicative potential for computer documentation. A usability expert notes that

> Often organizations unknowingly exacerbate th[e] lack of [product and documentation] integration by usability testing each of the components separately. Documentation is tested separately from the interface, and the interface separately from the help. Ultimately, this approach is futile, since it matters little if each component is usable within itself. (Rubin, 1994, p. 8)

As Rubin's quote indicates, the closed-system approach to usability testing has been called into question. Newer approaches grounded in sociocultural theory and research move toward conceiving of usability as a quality of larger interactions among artifacts and users. These approaches locate usability in a social-cultural-historical milieu rather than in the document itself or in the document-user dyad, opening up opportunities to critically evaluate usability as a social practice (e.g., Beyer and Holtzblatt, 1998; Carroll, 1991; Dorazio and Stovall, 1997; Hackos and Redish, 1998; Johnson, 1998; Mirel, 1988, 1993, 1994; Ramey, 1989; Raven and Flanders, 1996).

This groundshift from an atomistic concept of usability to a sociocultural one opens up new possibilities for understanding the roles of society, culture, history, interpretation, and contingency in the design and use of documentation systems—not just in terms of usability, but throughout the document development cycle. Although other sociocultural approaches and frameworks have been applied to this agenda, we believe that the framework we describe below, that of the *genre ecology,*

is uniquely positioned to explore issues that are opaque to closed-system approaches. Such issues include how official and unofficial documentation genres are animated by and connected through contingency; how they are distributed, and in turn, how they distribute functionality among themselves; and how ecologies of genres achieve relative stability or equilibrium despite their dynamic, contingent nature.

Moving beyond the idea of an information or tool ecology to more adequately address concerns of technical communicators, we advocate a genre ecology.

Genre Ecologies: An Open-System Framework

In our recent work we have moved toward an open-system approach by adopting the metaphor of *ecology*. In this we are not alone, as many researchers examining the complexities of communication technologies have turned to ecology metaphors. For example, a recent study of print communication and society develops the premise that "[c]ontent, context, agents, and the communicative transaction" constitute "a single ecological system" (Kaufer and Carley, 1993, p. 88). Another study contends that the metaphors for describing information technology that became prominent in the twentieth century are insufficient; in their place, the authors develop a new metaphor—"information ecologies"—for describing "the strong interrelationships among the social, economic, and political contexts in which technology is invented and used" (Nardi and O'Day, 1999, p. 47). A third focuses on the "tool ecology," the artifacts that users enlist, modify, and coordinate to conduct their work (Hutchins, 1995). In a slightly different vein, researchers at the Xerox Palo Alto Research Center in California studying the complex interactions of Internet communication have described their work as "e-cology" as a way of acknowledging the lively, organism-like characteristics of communication in the Internet "ecosystem" (Taylor, 1999).

Similarly, in the field of usability, Rijken and Mulder develop an ecological perspective to argue that "an individual user not only *interacts with* a system, but rather *acts inside* an information ecology" (1996, p. 50; emphases in original). Supplementing this ecological perspective with phenomenological analysis, the authors advocate designing "meaningful relationships with users" in an activity they call "ecological ergonomics" (p. 57). The emphases these authors place on the symbioses between a user and information environment complements the genre ecologies framework we develop in this essay. However, the authors, who are clearly focused on design issues, never concretely address the role of strategic technical communication in information ecologies, and thus fail to address the concerns of those who work to develop documentation.

Moving beyond the idea of an information or tool ecology to more adequately address the concerns of technical communicators, we advocate a *genre ecology* framework for conceptualizing and analyzing open systems of documentation. A *genre ecology* includes an interrelated group of genres (artifact types and the interpretive habits that have developed around them) used to jointly mediate the activities that allow people to accomplish complex objectives. In genre ecologies, multiple genres and constituent subtasks co-exist in a lively interplay as people grapple with information technologies (Spinuzzi, 1999b; Zachry, 1999; cf. Freedman and Smart, 1997).

Traditional understandings of the term *genre* are associated with stable, predictable forms, such as *the* resume and *the* trouble-shooting guide. While it is true that genres tend to be interpreted, used, and coordinated with each other in consistent ways over time and across the general population of users, recent genre studies (e.g., Bazerman, 1988; Berkenkotter

and Huckin, 1995; Myers, 1990; Schryer, 1993) have illustrated that genres are stable only within temporal limits and that the exact form and function of future instantiations of a genre cannot be accurately predicted. Genres are not static forms; they are dynamic, organic, and messy. To account for variations across instantiations of a given genre, a more robust, ecological perspective is required, one that accounts for the dynamism and interconnectedness of genres. In particular, we argue, the genre ecology framework must account for how official and unofficial documentation genres are animated by and connected through contingency; how the documentation's functionality is consequently decentralized, distributed across the ecology; and how ecologies of genres achieve relative stability despite their contingent, decentralized nature.

In the next section, we illustrate these issues, and describe how the genre ecology framework brings them out, by drawing from the computer documentation experiences of two organizations. We examine the two organizations' genre ecologies, but we also explore how a genre ecology perspective might help to design more open-ended, dynamic documentation sets.

Contingency, Decentralization, and Stability in Two Genre Ecologies

The genre ecologies that we discuss here are drawn from our own cultural-historical research projects dealing with a state Department of Transportation (DOT) (Spinuzzi, 1999a) and a national meatpacking company (Rath) (Zachry, 1998). We draw on these studies for examples as we discuss three issues that genre ecologies are uniquely positioned to explore, and that cannot be explored thoroughly (if at all) through a closed-system approach: contingency, decentralization, and stability.

Contingency: How Interconnections of Genres Affect the Ecology's Development

By *contingency* we mean uncertainty, the conditional dependence on the fulfillment of conditions. That is, contingency involves the complex, opportunistic, sometimes risky coordinations among genres that are made by people who are trying to accomplish certain things. Contingency involves making connections that were not planned by the system's designers; it entails opening a closed-system documentation set by coordinating it in unpredictable ways with materials at hand.

For instance, in the case of the police officer referred to at the beginning of this article, the innovation of the Post-It note caused a fundamental change to the officer's entire documentation system. The system's designers envisioned the official workings of the system as involving the map at all points: every time a user wanted to locate and investigate a point, she had to refer to the map (documentation), read numbers from it, and plug those numbers into the dialog box. The map was central to the system's official workings, and using the map properly meant coordinating various resources: clearing off a *surface* (such as a desk) in the crowded office to make space for the (2-by-2-foot) map, gathering and placing *paperweights* to keep the map from rolling up, using *writing implements* to find and point out relevant node numbers, and typing the numbers into the *dialog box*. Each of these resources was necessary for ensuring the smooth working of the system, each time that the user had to investigate a particular location. Yet by adopting as a surrogate the unofficial genre of the Post-It note—a genre that had no place in the closed-system documentation set—the user managed to push the node map to the periphery of the system's workings. At some point in months past she had had to coordinate resources such as the desk surface, paperweights, and writing implements. But she was able to consolidate that effort at one point in time—just long enough to copy down the node numbers. This innovation allowed the user to conserve resources that were important to her (such as time and office space); simplified a repeated task; consolidated the difficult work of converting map locations to node numbers; and, in short, transformed how she carried out the entire task.

Contingency likewise factored into the

decisions of the supervisors and industrial engineers at the meatpacking facility to supplement official documentation with other communicative forms. Whereas the official system for documenting how to use the company's mainframe computer was the manual set available from Electronic Data Processing (EDP), less officious genres clearly became more expedient for textually mediating the computing activities of company employees. When processing codes, for example, needed to be amended, the already familiar administrative memo genre was selected to augment the codes documented in the manual set. Such memos were obviously less cumbersome to produce than a revision of the manual and they had the advantage of already being a genre with which employees were familiar. This augmentation was, at first, an opportunistic divergence from the established system—the memo producers were improvising as they repurposed an existing genre (the administrative memo) to subsidize one that had not been designed for frequently changing content (the EDP manual set). When such augmentation was later repeated with additional memos revising codes and instructions in the manual set, it became clear that these memos were no longer simply a divergence; instead, they were a dynamic part of how documentation would be accomplished at the company. The improvised administrative memo genre emerged as a valuable stopgap tool, and supervisors in the company soon developed a habit of supplementing the official manual set with administrative memos to accomplish the company's computing tasks. As supervisors and employees alike were developing ways of designating which memos superseded previously issued memos and ways for keeping such memos at the workstations where such information was needed, the newly emerged genre slowly became coordinated with the official EDP manual set, and the company's documentation evolved into a complex, unpredictable, and open system.

Decentralization: How Interconnections of Genres Resist Centralization

By *decentralization* we mean the distribution of usability, design, and intention across the ecology of genres. As we have seen, the traditional closed-set concept of documentation seeks to isolate usability, design, and intention in specific constituent artifacts: writers *design a manual to inform the user* or usability engineers *test the usability of online help.* But in an ecology of genres, usability cannot be localized in a single isolated artifact. The contingent interconnections between genres are complex, spontaneous, and dynamic: manuals and online help systems are never used in isolation, but always in connection with other genres. Once we acknowledge that an official documentation set is contingent on the myriad genres that users connect with it, we must acknowledge that the documentation's success rests as much on those genres and connections as it does in the documentation set itself. The documentation lives, as it were, in these interstices rather than in the specific artifacts that make up the official documentation set (cf. Mirel, 1988; Haas, 1999).

In the case of the police officer, the user has changed the system's usability, not by altering individual components, but by *adding* a component—and that addition mediates between two system components, making them easier to coordinate. Usability, then, cannot be located in any individual artifact, since it is only in their coordination that the artifacts gain meaning and can be perceived as usable. Indeed, if we regard the Post-It note in isolation—a scribbled list of nonconsecutive six-digit numbers—it would be hard to view it as "usable" either. (See Spinuzzi, 1999b, for a more detailed version of this argument.)

Similarly, at the meat-packing facility, the official and supplemental genres that came to constitute documentation developed a complex interrelationship. Between these co-existent genres of documentation, connections proliferated as the administrative memos worked in conjunction with the EDP documentation set to enable employees to enter codes and produce

the desired reports. However, the success of these two documentation genres increasingly rested on the connections that users made to other texts. Documentation was further decentralized, for example, as it emerged in the impromptu notes that employees made on the pages of their manuals, on the administrative memos they received, and on other pieces of paper that were available at the stations where they worked. These unique texts made the documentation genres produced by other people sensible to individuals who had their own ways of interpreting what it was they were supposed to do as they interacted with the company's computer technologies. Over time, both administrative memos and individually produced notes were sometimes incorporated into revisions of the company's official documentation. It was never long, however, before an administrative change or an individual's way of making sense of his or her interaction with the computer added another layer to what can best be described as a decentralized system of documentation.

Stability: How Interconnections Among Genres Become Concrete

By *stability* we mean the tendency of users to make the interconnections between the genres they use conventional and official. Just as genres themselves are *relatively stable* while still being dynamic enough to respond to contingency (Schryer, 1993), genre ecologies achieve relative stability—a dynamic equilibrium—over time. In relatively stable genre ecologies, certain connections among genres become commonplace; groups of users tend to use and interconnect genres in quite similar ways. And, once genre ecologies become stable, genres tend to survive in durable constellations, even though individual genres might move across media or take on additional functions. These durable constellations, we emphasize, are *relatively* stable rather than absolutely unchanging, dynamic rather than static, flexible rather than rigid.

For example, at the state Department of Transportation, individual genres moved across media over the past four decades. Recall that the police officer coordinated various documentary genres to perform her work, such as road maps and dialog boxes. Some of those ways of coordinating the two genres—for instance, by seeking out numbers on the map and typing them into the dialog box—are far older than the interface itself. In fact, the dialog box is based on older paper forms that were used by the police officer's predecessors, forms that date back to 1974. The genre of the paper form may have migrated to the interface and become the dialog box, but the basic relationship between it and the map genre continues to be relatively stable; habits developed for coordinating the two genres in 1974 persist today. Yet the ecology is continually changing. One might expect that future designs will import more genres into the interface, and that is exactly what happens: the latest version of the database incorporates the map itself into the interface. As these genres form relatively durable constellations, however, users constantly make new connections among genres. At no point is the genre ecology entirely stable.

At the DOT, genres tended to retain their functions as they moved across media. But at Rath, functions tended to move from one genre to another, although the relationships among genres and the genres themselves remained relatively stable. For instance, initially documentation existed in manuals. However, when company-specific computer-based tools were developed, documentation also emerged in a collection of stand-alone procedures. Both forms of documentation, in turn, were supplemented by administrative memoranda and the notes that computer users made for themselves. Periodic company efforts to standardize documentation led to major revisions of the official EDP documentation set. Procedures for writing documentation were established and official methods of publication were mandated. While such efforts produced model documentation sets, only the official documentation genres fully complied with these procedural mandates, and the upheaval of technological, managerial, and economic change

always meant that this limited stability could be measured in terms of months. Unofficial genres of documentation—in their dynamic and uncodified forms—were certainly not stable or conventional in any traditional sense. However, the longevity of their existence and the relative stability of their role in mediating human-computer interaction suggest that such spurious genres are as likely to become staples of an open documentation system as are the more traditional genres.

In these two cases, then, we see that the genre ecology framework allows us to explore things that have been elided in closed-system perspectives of document sets. Yet if we abandon the closed-system perspective for a genre ecology perspective, we find a far greater role for contingency and a resulting need to account for the decentralization and stability of much broader sets of artifacts.

Implications of the Genre Ecology Framework: Three Heuristic Tools

The historical examples we have used thus far were selected to illustrate the considerations that a genre ecologies perspective foregrounds. In the remainder of this essay, we turn to what this perspective adds to the work of technical communicators engaged in documentation today. With the rapid changes in digital technologies, user demographics, and communication media now occurring, contemporary technical communicators have reason to be concerned about developing ways of understanding the complex ecologies within which documentation operates. In particular, we argue that the genre ecology framework should lead to an open-systems approach as documentors plan research studies; analyze data from the research of existing documents; and plan how to implement new forms of documentation. Below, we submit three heuristic tools for meeting those goals: exploratory questions, genre ecology diagrams, and organic engineering.

Exploratory Questions: Planning Research Studies

When researching documentation use, documentors might ask themselves a series of questions to guide their exploration of genre ecologies and their attempts at redesigning these ecologies. These questions are designed to explore the three issues of contingency, decentralization, and stability, and in doing so, to help documentors begin to think of their documentation as an open system rather than a closed system. These questions can serve as starting points for research questions, but they can also serve to guide design solutions (see Table 1).

We have found that addressing questions such as these provides a productive starting point for technical communicators interested in assessing and changing documentation in a given situation. In addition to these questions, technical communicators may find it helpful to develop situation-specific questions for identifying constraints that stifle development of the genre ecology and for relocating knowledge about a technology from documentation to the technology's design (e.g., the user interface).

Genre Ecology Diagrams: Analyzing and Modeling Observational Data

When analyzing data from observational research of existing documentation (data coming from field research, but possibly also from usability tests), researchers can construct a semi-formal model of mediatory relationships among genres. Some genres in an ecology will often be central in importance, connecting to almost every other genre, whereas others will be more peripheral, having far fewer connections. Ad hoc (unofficial) genres will tend to be peripheral since they are usually brought in to "glue together" or supplement the mediation between official genres. But, as we saw in the DOT example, ad hoc genres can become surrogates for an official genre that is difficult to coordinate with other genres. In these cases, the ad hoc genre can take over many of the connections that once belonged to the official genre, pushing the official genre to the periphery. This

Table 1. Exploratory questions for planning research studies.

Issue	Questions
Contingency	• What official and unofficial genres do workers currently use to mediate their work? That is, what printed documents, online texts, handwritten notes, templates, and other resources do they use to get things done?
	• To what other resources might they have access? How might those resources potentially help them to mediate work?
	• How can documentors build open-endedness into their documentation sets? That is, can documentation be designed in such a way that it supports users' inevitable attempts to widen the genre ecology?
Decentralization	• Since the documentation's success rests as much on the ecology's genres and connections as it does in the docmentation set itself, how can documentors find ways to contribute to that success? That is, can they trace usability problems and design obstacles to the connections among specific genres?
	• What ecological niches remain unfilled in the ecology? That is, have users attempted to adopt unofficial genres with little success? Can those niches be filled with documentation?
Stability	• When parts of the documentation set are redesigned or rewritten, how will those changes affect the many mediational relationships that have developed between the old documentation set and the rest of the genre ecology?
	• Can an unofficial genre be officialized/stabilized and its associated practices genres (such as the Post-It note) be officially sanctioned and promulgated?
	• How stable is the genre ecology? That is, how long have its relationships endured and across what percentage of users? How might that stability guide documentors as they attempt to add new genres to the ecology?

sort of "rerouting" of connections, then, can indicate usability issues that designers need to address. For instance, in Figure 1, lines connect node maps and dialog boxes, meaning that users can read numbers directly from a map and type them into a dialog box. But lines also connect those two genres with handwritten notes (such as the police officer's Post-It notes), indicating that connections between maps and dialog boxes are often routed through this third genre. In this way, genre ecology diagrams can model the contingency among genres and map how certain functions are distributed among genres in the ecology. Furthermore, they can help to identify stability: by drawing genre ecology diagrams for different periods in the genre ecology's development, a researcher can determine whether genres are still in use, whether they maintain the same mediatory relationships, and whether they have taken on additional or different functions.

Genre ecology diagrams can help designers to lay out relationships, analyze the interplay among genres, and identify which genres are central or peripheral to the use of the technology. The diagrams thus can be a resource for

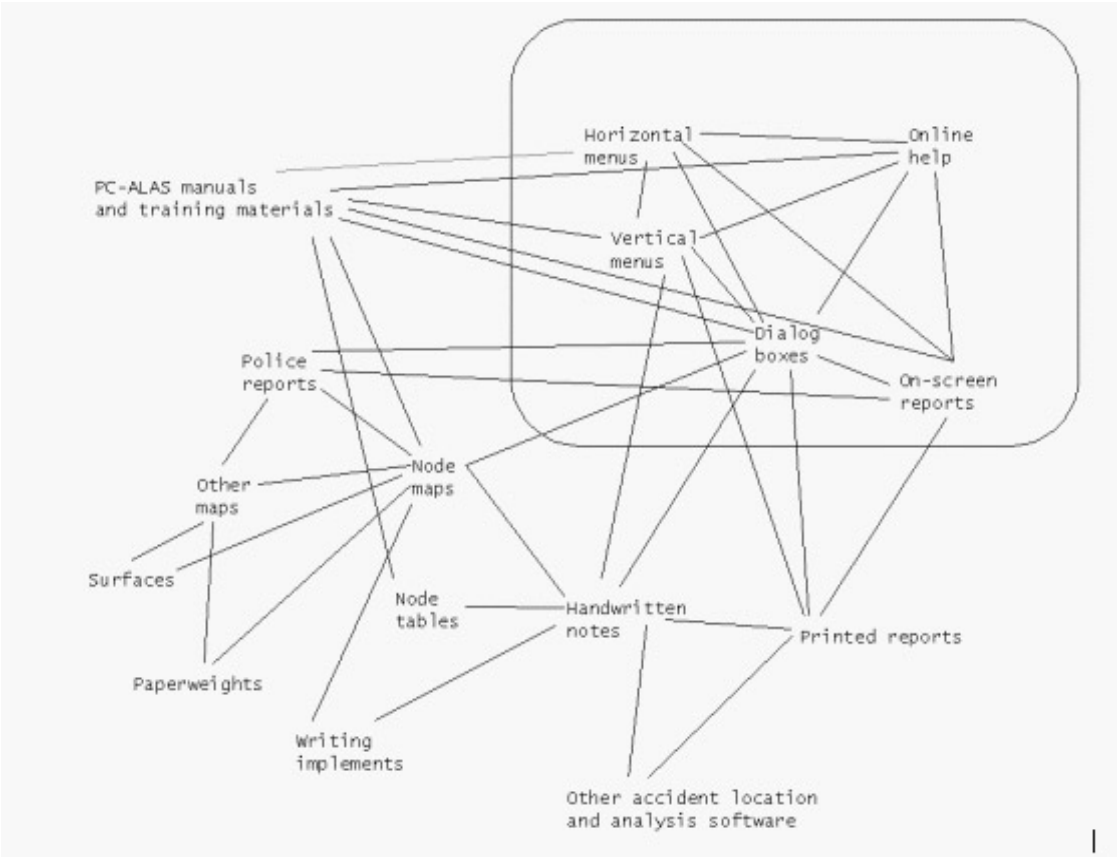

Fig 1. A diagram that illustrates the genre ecology used for locating and analyzing traffic accidents. Lines indicate coordination between genres (i.e., mediatory relationships).

replanning the ecology. For instance, suppose that designers for the DOT planned to replace the node map with a computerized representation of a map. Will the online map be able to fulfill all of the paper map's current mediatory relationships? For instance, will users, who are used to physically marking accident locations with pins, be able to similarly mark accident locations on the screen? If not, how can the online map be modified or supplemented to preserve this functionality?

As we continue to develop genre ecology diagrams, we hope to turn them into more formal models that can be automatically generated using observational data encoded in databases. We anticipate that artifacts (such as the computerized map above) could be speculatively modeled and placed in the larger model to assess how they might affect the genre ecology.

Organic Engineering: Planning for Dynamic Forms of Documentation

When planning documentation, it may be possible to identify spaces—ecological niches—in which "documentation" (in the wider sense) could be encouraged to emerge. Taking advantage of the configurable spaces in contemporary digital technologies, contemporary technical communicators might, for example, discover ways to reconfigure the tool tray in Windows, the speakers on desktop computer systems, and user-sensitive instructional data posted to word-processing templates. Configuring such spaces (both in print and digital form) presents technical communicators with a productive way of disrupting current user-support strategies.

Technical communicators who decide to pursue an organic engineering approach to their work would begin treating the documentation supplied with a product as first-generation

genres in an evolving ecology. These first-generation genres would soon be eclipsed by second-generation genres, which could be produced—at least in part—by the technology documented in the first-generation genres. Several companies are already experimenting with such configurable documentation tools. The IBM Software Solutions Laboratory in Canada, for example, has recently developed ways to "componentize" and deliver documentation for help systems that need to be updated on a frequent basis (Green, 1999). Dividing documentation into discrete components and delivering them on an as-needed basis via the Internet allows IBM to release software products quickly and then to supplement them with company- and customer-driven components afterwards. In such a situation, documentation is not a single, all-encompassing entity. Rather, it is dynamically configured based on user contingencies, such as the software components that have been removed or installed on a given system.

User-defined help that is dynamically tied to the software tools on a local computer marks a productive step in the direction of organic engineering. However, the possibilities for generating other varied and unfamiliar sorts of documentation "texts" based on operating conditions, host equipment, existing system data, etc. have not yet been explored by technical communicators. To further support the development of documentation in ecological niches, technical communicators could use the following points to guide their documentation work:

- **Contribute to interface design.** Technical communicators should become an advocate for user interfaces that include space (or spaces) that users can fill with their own ideas. Such spaces may be textual passages selected from an embedded online help file, from a third-party Web site, or they may be a note that the user has drafted while working. The ability to save and revise the text in such spaces would make this a valued niche for computer users.
- **Integrate database technologies into the documentation process.** Technical communicators should provide users with varied options for receiving the documentation supplied with a product. Documentation that has been segmented into small, task-based units can be delivered in multiple ways to users if technical communicators understand how to structure such units in database files and how to move those units into a variety delivery mechanisms that are meaningful to users (Ray and Ray, 2000). By doing this, technical communicators can begin to engineer dynamic forms of documentation that support the diverse ways texts are used to mediate human-computer interaction.
- **Use dynamic equipment and user profiles to construct documentation.** Technical communicators should become familiar with the emerging data-gathering technologies that are used to condition how information is delivered to users. For example, the ways in which e-commerce vendors now use "cookies" to profile previous visitors could be explored by documentors who typically worked with limited data about typical users. With knowledge about the software and hardware that a user has available—as well as information about the habits and past computing experiences of the user—a skilled technical communicator would be able to design more appropriate documentation than typical-user profiles allow.

Conclusion

One of us recently noted that "despite the shift from system-oriented to task-oriented documentation and the great variety of documentation strategies developed in recent years, it would be difficult to argue that computer documentation is any more advanced than it was at its inception" (Zachry, 1999, p.22). Indeed, closed-system approaches to documentation are still as prevalent as ever. Yet, as we have argued here and elsewhere, *closed-system approaches do*

not produce closed documentation systems: all documentation systems are open-ended because users inevitably import ad hoc, unofficial genres into the genre ecology to help them mediate their work. Our project leads to the conclusion that computer documentors do not actually design documentation systems—at best, we are *co-designers* with our users. Given that, how can we develop documentation systems that are easy for users to co-design? What can we do to help users expand, adapt, and incorporate official documentation into their own lifeworlds?

To answer these questions, we have abandoned the closed-system approach for an open-system approach based on the framework of genre ecologies. Such an approach, we suggest, can account for the roles of contingency, decentralization, and relative stability that are typically downplayed or ignored in closed-system approaches. The heuristics we have provided here—the exploratory questions, genre ecology diagrams, and guidelines for organic engineering—can make these principles more concrete for documentors as they move toward open-system models of documentation.

References

Bazerman, C. (1988). S*haping written knowledge: The genre and activity of the experimental article in science*. Madison, WI: University of Wisconsin Press.

Berkenkotter, C., and Huckin, T. N. (1995). *Genre knowledge in disciplinary communication: Cognition/culture/power*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Beyer, H., and Holtzblatt, K. (1998). *Contextual design: Defining customer-centered systems.* San Francisco: Morgan Kaufmann Publishers, Inc.

Carroll, J. M. (1991). Deliberated evolution: Stalking the View Matcher in design space. *Human-Computer Interaction*, 6, 281-318.

Dorazio, P., and Stovall, J. (1997). Research in context: Ethnographic usability. *Journal of Technical Writing and Communication*, 27(1), 57-67.

Dumas, J. S., and Redish, J. (1993). *A practical guide to usability testing*. Norwood, NJ: Ablex Publishing Corp.

Freedman, A., and Smart, G. (1997). Navigating the current of economic policy: Written genres and the distribution of cognitive work at a financial institution. *Mind, Culture, and Activity*, 4(4), 238-255.

Green, R. (1999). Component-Based Software Development: Implications for Documentation, In *ACM SIGDOC '99 Conference Proceedings* (pp. 159-164). New York: Association for Computing Machinery,

Grice, R. A., and Ridgway, L. S. (1993). Usability and hypermedia: Toward a set of usability criteria and measures. *Technical Communication*, 40(3), 429-437.

Haas, C. (1999). On the relationship between old and new technologies. *Computers and Composition*, 16, 209-228.

Hackos, J. T., and Redish, J. C. (1998). *User and task analysis for interface design*. New York: John Wiley and Sons.

Hutchins, E. (1995). *Cognition in the wild. Cambridge*, MA: MIT Press.

Johnson, R. R. (1998). *User-centered technology: A rhetorical theory for computers and other mundane artifacts.* New York: SUNY Press.

Kaufer, D. S., and Carley, K. M. (1993). *Communication at a distance: The influence of print on sociocultural organization and change.* Hillsdale NJ: Lawrence Erlbaum Associates.

Mirel, B. (1988). The politics of usability: The organizational functions of an in-house manual. In S. Doheny-Farina (Ed.), *Effective documentation: What we have learned from research* (pp. 277-298). Cambridge, MA: MIT Press.

Mirel, B. (1993). Beyond the monkey house: Audience analyses in complex workplaces. In R. Spilka (Ed.), *Writing in the workplace: New research perspectives*. Carbondale: Southern Illinois University Press.

Mirel, B. (1994). Analyzing electronic help exchanges: An inquiry into instructions for complex tasks. *Technical Communication, 41*, 210-223.

Mirel, B. (1998a). "Applied constructivism" for user documentation. *Journal of Business and Technical Communication, 12*(1), 7-49.

Mirel, B. (1998b). Minimalism for complex tasks. In J. M. Carroll (Ed.), *Minimalism beyond the Nurnberg Funnel* (pp. 179-218). Cambridge, MA: MIT Press.

Myers, G. (1990). *Writing biology: Texts in the social construction of scientific knowledge*. Madison,

WI: University of Wisconsin Press.

Nardi, B. A., and O'Day, V. L. (1999). *Information Ecologies: Using Technology with Heart*. Cambridge, MA: MIT Press.

Ramey, J. (1989). Usability evaluation and its relationship to traditional approaches in research and design. *IEEE Transactions on Professional Communication, 32*(4), 207-209.

Raven, M. E., and Flanders, A. (1996). Using contextual inquiry to learn about your audiences. *Journal of Computer Documentation, 20*(1), 1-13.

Ray, D.S., and Ray, E.J. (2000, in press). Using database-supported information to overcome online information publication challenges. *Technical Communication,* 47(4).

Rijken, D., and Mulder, B. (1996). Information ecologies, experience and ergonomics. In P.W. Jordan et al. (Eds.), *Usability Evaluation in Industry* (pp. 49-57). London: Taylor and Francis.

Rubin, J. (1994). *Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests*. New York: John Wiley.

Schryer, C. F. (1993). Records as genre. *Written Communication, 10*(2), 200-234.

Spinuzzi, C. (1999a). *Designing for lifeworlds: Genre and activity in information system design and evaluation*. Unpublished Dissertation, Iowa State University, Ames, IA.

Spinuzzi, C. (1999b). Grappling with distributed usability: A cultural-historical examination of documentation genres over four decades. In *ACM SIGDOC '99 Conference Proceedings* (pp. 16-21). New York: Association for Computing Machinery.

Suchan, J., and Dulek, R. (1998). From text to context: An open systems approach to research in written business communication. *Journal of Business Communication*, 35(1), 87-110.

Taylor, C. (1999). Inside the Geekosystem: Researchers who poke, prod and map the Net are discovering the laws that govern it. *Time Digital*, December. http://www.pathfinder.com/time/digital/feature/0,2955,35339-1,00.html

Zachry, M. (1998). *Workplace genres: A sociohistorical study of communicative practices in a production company*. Unpublished Dissertation, Iowa State University, Ames, IA.

Zachry, M. (1999). Constructing usable documentation: A study of communicative practices and the early uses of mainframe computing in industry. In *ACM SIGDOC '99 Conference Proceedings* (pp. 22-25). New York: Association for Computing Machinery.