Introduction

. . . there is no obsolescence in individual case studies that reveal flaws in the logic or practice of design; indeed, the more distant the case study in time, the more objective our analysis and interpretation of it can often be. But, in the end, it is the generalizations that can be drawn from individual case studies, old and new, that provide the conceptual framework into which new examples of . . . failure can be placed so that they can be most effective warnings against future folly.

Henry Petroski, **To Engineer Is Human:
The Role of Failure in Successful Design**

A. Overview

The electronic frontier offers a wide range of opportunities to teachers, researchers, students, and administrators in all areas of study and work. Its relative ease of use and almost ubiquitous access on university campuses have made the World Wide Web a tool of choice for many projects, courses, and publications. Teachers are empowered to experiment with presentation and class participation, students are encouraged to explore information and presentations of what they learn, and researchers both publish on and study the effects of the Internet. Meanwhile university libraries and computing centers are both leading the way and struggling to keep up with the expanding use of and uses for the Internet and electronic communication. We are in the midst of rapid change and growth, in a direction that could be either democratically decided or mob ruled, and only our future history will tell us which.

As many questions arise regarding Internet use as do possibilities — perhaps more, as each new direction and experiment easily raises more questions than answers. One area of great interest, possibility, and question is in scholarly publishing on the Internet. Questions and experiments address as broad a range as presentation ergonomics and technology, social effects of technological haves versus have-nots, copyright assignment and plagiarism, licensing and financial support, reader and author motivation, and financial and labor costs and requirements of publishing. How will electronic

publication affect the scholarly (university) community? What role will publishers play? What roles will be played by authors and readers? Or will their distinction fade as new forms of "living articles" arise in the crossover between review and reading, as readers add comments and hence become authors, and articles change with each new addition? How will libraries support their own purchases, their own readers? Who will their readers be? What technological investment is needed? Is desirable? And perhaps most important for teaching, how can the university prepare its students to face this onslaught of rapid change, to be informed players in the democratic participation that is the chaos of the market?

To look at how students can and would participate in the electronic publication arena, in 1996 NC State's Center for Communication in Science, Technology, and Management undertook a two-year experimental electronic journal for excellent undergraduate research: the *NCSU Student Researcher* (*NSR*; http://www.chass.ncsu.edu /ccstm/journal). Our goal was to examine the elements involved in providing undergraduates with an entrée to electronic publication, to reward and enhance the research they have already performed for their classes, to highlight excellent NC State student writing across the campus and beyond, and to provide a forum for exploration in electronic participation and presentation.

Ultimately the *NSR* was not successful, owing to a completely unexpected lack of participation from both students and faculty: we received only two submissions over its two-year history. This thesis, the final report for the project, is a case study of the factors we considered in our journal design, and an examination of the factors that affected the participation of our audience. Chapter 1 describes the conception and development of the journal, outlining the factors we did consider and how we addressed them. Chapter 2 discusses additional factors I found in the literature on electronic publishing, and how the *NSR* addressed them to provide undergraduates with realistic electronic journal publication experience. Chapter 3 outlines the results of my interviews with teachers and advisers across campus, and feedback from students, as I tried to understand the lack of participation we encountered, despite our best efforts at design and marketing. Chapter 4 then explains the fundamental design process flaw that led to lack of participation, and

points the way toward an interactive approach that should bring much greater success to anyone establishing an electronic periodical, as described in Chapter 5.

B. Theoretical Stance

The journal was conceived and designed based on a broad range of experience and intuition from faculty in many departments. Issues regarding electronic publication were identified and classified, and we made sure the journal addressed them. Yet what we were lacking was direct feedback from our audience in a systematic, detailed fashion throughout the journal conception and design. We may not have considered such an approach at the outset of this experiment, particularly because curtailing expense and labor was a major focus of both the experiment and electronic publication in general.

However, in the process of trying to understand *why* we received so little participation in a project so carefully conceived and an *idea* accepted so enthusiastically welcomed by students and colleagues, we did find a method of incorporating audience feedback that seemed to work extremely well. Senge's (1990) approach to systems organizational theory helped greatly in gathering information concerning factors affecting participation (Chapter 3), and Schriver's (1997) approaches to audience analysis helped interpret the information gathered (Chapter 4). This case study confirms the pitfalls Schriver describes for classification- and intuition-driven audience analysis, on which the journal design was based. Also, combined with Senge's systems approach, it expands her concept of feedback-driven audience analysis to apply not only to documents but also to "interactive communication environments," a planned, dynamic series of documents that relies on its audience for input in order to survive, for example, journals, listservs, and chat/workrooms comprising many reader-generated documents spread over time (Chapter 5), or a planned series of documents, each a revision of the last based on reader feedback (such as planned updates/revisions of user material).

Schriver describes three basic approaches to understanding an audience in designing a document: intuition-driven, classification-driven, and feedback-driven. In intuition-driven audience analysis, the audience is an imagined group constructed out of introspection and experience. This is the approach we had used in conceiving and

designing the journal (Chapter 1). The strength of this model is that it captures the intuitive communication strengths of communicators; the weakness is that it does not question the accuracy of the imagined audience. In classification-driven audience analysis, a document designer derives profiles of the target audience, which helps classify their specific needs and expectations regarding documents. And this is the approach I had followed in identifying factors from the literature on electronic publishing (Chapter 2). The strength of this approach, according to Schriver, is that it prompts us to think about the needs and expectations of readers; the weakness is that it encourages a static view of the audience.

In feedback-driven audience analysis, on the other hand, documents are designed with continual feedback from segments of the prospective audience. The audience is polled at each stage of the design process, and their feedback helps form not merely decisions on document details (in our case, e.g., submission guidelines, review process), but also the entire conception of the document — the overall format, the range of content, the order of presentation, and so on. The audience is given a depth of input that may take the project in directions entirely different from ones conceived through intuition- or classification-driven feedback. And this is the strength of this model: it creates a much more accurate picture of the audience, and a much more desirable product in the eyes of the audience. However, the weakness is that it can create mountains of data sometimes difficult to apply to designing the document itself, and can increase the time to produce the document.

While Schriver's discussion of audience analysis focuses primarily on single-document design, her models of audience adaptation applied equally well to the design and implementation of a periodical, a more "interactive communication environment" that requires not only reader interpretation of documents but also ongoing support from its audience as they continually provide feedback in generating, reading, and using new documents presented by the environment (e.g., in a periodical via continued submissions, readership, and reference citation). Whereas a single document, once produced, in essence becomes a static artifact that is received or not, used or not, by its intended audience, a periodical is a series of such documents that relies on its audience not only to

receive the documents already produced but also to produce new documents for others to receive. In this sense audience participation is more critical because the audience is the lifeblood of the journal, interacting within the journal "environment" that is originally created by the designer but then changes as its audience participates within that space and thus shapes it while in turn being shaped by it. This is true for a paper journal, but is especially true for an electronic journal because of the much broader range of submission formats, range of readers (provided its circulation is not limited by site licenses), and publication "space" that is not limited by the cost of paper in a bound volume.

This case study demonstrates, in hindsight, how audience-driven audience analysis, particularly combined with systems theory, could have boosted audience participation in this experimental electronic journal by identifying audience composition, needs, and situations that were invisible to both intuition- and classification-driven audience analysis, and in the process could have helped gain audience support during the design/implementation process — support that is critical for the success of any interactive communication environment. Schriver's models of audience analysis were very useful in understanding why this design on an interactive communication environment (periodical) had failed, and systems theory provided the means to gather and analyze the large quantities of organizational data and garner support needed to design such a self-sustaining, interactive environment. Audience participation early in the journal design process, as suggested by Schriver's audience-driven audience analysis model and as implemented by Senge's systems theory analysis, could have allowed the design process and the journal itself to adapt flexibly to the needs of the complex audience situation it attempted to enter, gaining audience support as they took "ownership" in the project, which would have greatly increased the potential for the journal's success.