Who Makes Engineering Knowledge? Changing Identities of Technical Writers in the 20th Century United States

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At the turn of the 20th century, technical writers in the United States were mostly engineers who both developed technology and wrote about it. During World War II, however, engineers seeking to increase the efficiency of technology development separated their engineering from their communication tasks. This trend opened up a new occupation for non-engineering technical writers who communicated knowledge made by engineers. While this specialization may have allowed engineers to develop technology more efficiently, it also allowed non-scientists to give voice to scientific knowledge and by the 1970s created tensions between practitioners in scientific fields and liberal arts-trained technical writers. How could non-scientists give scientific knowledge its material form through communication? And did this arrangement between engineers and writers too often render engineers mute within their own professions? This paper traces a history of technical writing practice in the United States and explores current trends in the academy which aim to prepare engineers more adequately for communicating about their work. Finally, this paper suggests that technical editors, as distinguished from traditional technical writers, can accommodate both an engineer's need to give voice to technology developments and a writer's contributions to shaping that voice into effective communication.

During the late 19th century, technical writing was the medium for engineers and scientists to convey their knowledge to fellow professionals. Other branches of writing, like English composition and literature, were separate from technical writing and were properly grouped with disciplines, such as history and philosophy, which depended on humanistic bases of knowledge. Technical writing, on the other hand, bore the stamp of science and was considered to be a part of scientific practice as long as engineers and scientists did their own writing. After World War II, however, technical writing was separated from engineering in an attempt to make technology development more efficient. This separation was reminiscent of the development of a new class of clerical workers which earlier in the century increased managers' efficiency within large systematized organizations. Unlike the example of clerical workers, though, specialized technical writers were responsible for making engineering knowledge, leading to tensions concerning who ought to produce this knowledge—engineers whose expertise was based in pure science or writers whose expertise was based in liberal arts.

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Clerical work splits from management for increased efficiency

When engineer-designed industrial management systems arose during the early 20th century, managers became increasingly distinct from engineers, and clerical workers took over much of the job of generating the communications through which the management systems were controlled. These clerical workers, however, had a constrained role within the system and did not use as much individual discretion in generating communications as clerks had in pre-systematized business organizations. Modern clerical workers served as transcribers of managers' words or generators of routine formulaic communications. Because of their constrained and routine functions, clerical workers could be paid at lower rates than managers, thus freeing managers to spend their higher paid time doing more important tasks than typing and filing routine communications. Because clerical workers freed managers to spend their time analyzing and planning operations for increased efficiency and productivity, creating a new occupation of lower paid clerical workers proved profitable even though this class of worker grew at a rapid rate.

As management systems became the dominant business organization sometime after the 1930s, a mechanism of technical writing grew that both communicated knowledge about management systems and enabled these systems to control workers and their work. Clerical workers were controlled by other clerical workers and managers enforcing standard methods, production standards for clerical workers' output, and standardized salary limits. Each clerical worker's production was compared to these standards by workers in personnel, finance, production, marketing, etc. to evaluate the individual's performance and determine pay and promotion possibilities. Clerical workers generated the technical communications through which the system was controlled; they themselves, in turn, were controlled by these technical communications.

After World War II, business communication was a specialized field of study, but its roots were in the same engineering history from which technical communication grew. It also shared with technical communication a concern for practical outcomes. As Cecil Williams and E. Glenn Griffin phrased this practicality in *Effective Business Communication*, "Business communication differs from general communication chiefly in being closer to the payoff—in being aimed more specifically at making something happen" (1966, p. 4). These authors saw business communication as being closely tied to advertising and promotion, with payoffs for business and individuals alike. In giving students a reason to study business communication, Williams and Griffin echoed an argument put forward since the turn of the century in technical writing textbooks, i.e., the study of business/technical writing will bring the student/worker personal financial benefits. In their iteration of the argument, Williams and Griffin framed the rationale in this way:

> "The practicality of your studying communication will soon become evident to you. Your first application and interview for employment will be the proving ground. And, in subsequent employment, proficient application of what you have learned will bring rewards, both personal and monetary" (1966, p. 4).

By the 1990s, workers, business owners, students, and teachers have accepted the connection between management control and communication which was once a concept

in tension between individual and group identity, labor and capital, worker or management control of how work was accomplished.

Technical writing splits from engineering for increased efficiency

In the early years of the 20th century, technical writing was one of the jobs carried out by engineers and scientists who needed to communicate knowledge to other people. As mining engineer and technical editor T. A. Rickard described this process in *A Guide to Technical Writing*, engineers and scientists had an obligation to contribute knowledge to a "general fund" of scientific and practical knowledge from which all other scientific workers could borrow to further their work and the progress of humankind: "Yet each man possesses some little bit of knowledge, whether as observation, theory, or experience, that is his very own. Thus each can contribute something to the general fund; and seeing how much he owes, it is asking but little that he give cheerfully what he can" (1910, p. 130). Engineers and scientists owed this debt to the general fund of knowledge because they borrowed contributions from their forebears in order to carry out their work. Scientific workers made their contributions directly to the general fund through the currency of technical communications. In this scheme of knowledge-making, technical communication was within the fields of science and engineering and clearly relied on scientific knowledge for is stamp as genuine currency.

By the end of World War II, however, technical communication did not clearly fall within the realm of engineering and science as it had in earlier days. Textbook authors George Crouch and Robert Zetler, for example, were not engineers as Rickard had been; they taught in the English Department at the University of Pittsburgh. Their 1948 *A Guide to Technical Writing* was organized more like a traditional composition text based on forms of writing rather than the topical organization of Rickard's earlier *Guide*. In the "Preface" to his second edition, Rickard described his role as a former engineer who had become a better-than-average technical writer through his practical experience as a writer and editor. He wanted to contribute his knowledge of technical writing to the general fund so that other engineers could benefit from his experience: "I write as a scribe, without authority, except in so far as the members of my old profession will concede it to me from the nature of my present occupation [as editor of *The Mining Magazine*]; I speak as a student, not a master; as an amateur who has become a professional, but not a professor" (p. 4). Readers of Rickard's *Guide* followed the author's path through the observations and interests of one engineer-turned-writer who presented his writing rules from the editor's desk, not the professor's lectern.

Crouch and Zetler, in comparison, placed themselves primarily within the academy by alluding in their "Preface" to their experience as teachers, while also differentiating technical writing from general composition courses:

> The authors are aware that many technical students feel that the usual English composition course lacks direct application to their future professional life. ... the materials for this book have been winnowed from work in English and Speech carried out by the authors, not only with students in technical schools, but also with technical men [sic] in industry (1948, p. iii).

Working from this academic base, Crouch and Zetler organized their material in chapters according to formal document categories. But Crouch and Zetler also appended a reading list of literary works for engineering students to read. They included this list in response to a notion that engineers were too specialized in their education and interests, to the detriment of the general human condition which they were to improve.

Crouch and Zetler may have seen a place for the humanities in a technical education, but other engineers did not completely share this view. In a 1928 essay, James Shotwell found a long-standing aversion to mechanical progress among artists and philosophers, going back to Socrates' objections to writing in *The Phaedrus*:

> It is an attitude to be found throughout the whole history of culture. Its most earnest advocates have been the artists, impatient of anything interposed between Nature and the individual. But idealists generally have joined in the denunciation or shared the contempt for mechanism, no matter what their field. Literature has held aloof, except in patronizing, romantic moods, until the present. History has ignored the very implements of progress (p. 202).

Shotwell saw this "contempt for mechanism" as a conspiracy threatening the stability of society, represented by the horrors of World War I:

> There have been, in recent years, some signs of a revolt against the conspiracy of the poetically-minded to ignore the creations of the practically-minded, but unless the revolt becomes a revolution we shall never square ourselves with reality. ... Idealism, left to itself, is futility. There is no sadder fact in the tragic circumstances of the present than that idealism failed to avert the desolation of Europe. It will always fail, so long as it holds itself aloof from the grimy facts of daily life (p. 203).

If engineers were to serve society and avert future threats from idealistic approaches to world stability, they must put ideas of literature and art to work in mechanisms that ensured progress and stability through science.

In the midst of this tension between engineering and literary studies, technical writing instruction within the academy was moving from engineering and the sciences into disciplines traditionally allied with the classical liberal arts. Concurrently, technical writing practice was moving out of engineering and into a separate specialization, much as communication in industry had moved from being a management function to a clerical specialization early in the 20th century. The separation of technical writing from engineering took place during and shortly after World War II, as Jay Gould described in his 1964 edition of *Opportunities in Technical Writing*:

> World War II is an important date for the technical writing profession for at that time the great industries involved in turning out guns, planes, and chemicals came to realize that communicating was nearly as important as manufacturing all the necessary things for the war machine. Reports had to be written for the men and women who were inventing the machines and the electronic systems ... The engineers and scientists were just too busy to do all this writing themselves. They had more important jobs to do (p. 12).

The role of technical writer was transformed into lower paid help to relieve higher paid engineers and scientists of the burden for generating communications that stabilized the

dominance of scientific knowledge in our industrialized society. Like the increasing paperwork that made paying clerical workers more profitable than using managers' high-priced time for generating communications, the burden of increased technology development made paying technical writers profitable. According to *Technical Writing* authors Wellborn, Green, and Nall, the demand for technical writers by 1960 had grown in importance and in numbers: "This ever-increasing demand is the necessary result of accelerated experimentation in science, agriculture, engineering, and industry. Technical communication is the indispensable clearing house for information and ideas in an era of rapidly accumulating knowledge" (p. 4). Engineers and scientists could no longer profitably spend their time writing reports when they could be developing technologies to improve general living conditions. The role of the technical writer, therefore, was separated from that of the scientist and an opportunity was created for specialized writers to take over the communication function for engineers and scientists.

Technical writing instruction migrated from the scientific realm of engineers to the literary realm of English instructors as technical writing practice became specialized and separated from engineering practice. Perhaps this migration fueled tensions between scientific and artistic knowledge. After all, as Rickard set the argument early in the century, "writing is an instrument for transmitting ideas" (1910, p. 9) and if the scientist's ideas are not transmitted, they are not knowledge. Without technical writing—the currency of science—the scientist's ideas are worthless. The question of who controls technical writing is really a question of who controls the material value of scientific knowledge. It is no wonder that engineers did not simply stand by idly while technical writing was taken over by liberal arts scholars.

Perhaps when technical writing separated from engineering, engineers were complacent thinking that they, too, would have a malleable group of subordinates—technical writers as stenographers—to take their dictation and transcribe their words. After all, the addition of clerical support staff had worked well for the engineers who became managers some years earlier. Why not let the English Department see to the training of this engineering support staff? In the academic system, the science and engineering faculty could better use their time developing scientific knowledge and technological applications than teaching engineering support staff to write.

By the mid-1950s the new occupation of technical writing was rapidly organizing and expanding. Jay Gould described these early years in the field:

> By March, 1955, technical writers from the Boston area had organized themselves to such an extent that they felt the time had come to draw up a constitution. This was the Society of Technical Writers, which by that time had informal chapters in Connecticut, Illinois, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, and Tennessee (1964, p. 59).

Other technical writing associations came together in New York City, and on the West Coast. By the mid-1960s, Gould stated that "the official professional society of the technical writing profession is the Society of Technical Writers and Publishers" (1964, p. 62). Clearly, the technical writing profession grew rapidly after World War II.

In 1954, textbook authors Gordon Mills and John Walter published the first edition of *Technical Writing* following the new model of technical writing practice. Instead of instructing engineers in managerial communication skills, as Crouch and Zetler had done in 1948, Mills and Walter sought to redefine technical writing as a specialized practice of its own. In the "Preface" they described their initial uncertainty about the boundaries of technical writing instruction: "The difficulty was partly that the limits of the subject were uncertain; apparently nobody had ever seriously explored the concept of technical writing with the purpose of trying to say precisely what technical writing is" (1954, p. viii). Since technical writing was a new profession, it is understandable that nobody had yet mapped its boundaries. Technical writing was formerly contained within the boundaries of engineering and science. Now Mills and Walter sought to draw new boundaries around technical writing as a specialized practice separate from—but related to—engineering and science. Taken as a whole, though, Mills and Walter's approach to technical writing instruction was heavily influenced by traditional English composition approaches to writing instruction, placing their textbook solidly in the classical liberal arts tradition.

Reuniting technical writing with engineering

By the mid-1950s, Jay Gould had worked with other technical writers to professionalize their practice and Mills and Walter had followed that trend by authoring a textbook that was suitable for training technical writers in traditionally liberal arts-based university departments. Two decades after these developments, however, J. C. Mathes and Dwight Stevenson published a textbook in the traditional engineering-based model of technical writing. In *Designing Technical Reports*, Mathes and Stevenson distinguished between reasoning, perceiving, and experiencing in the humanities, and analyzing and observing in the empirical sciences. In these authors' opinions, writing using observational and analytic skills in the humanities did "not really communicate," yet writing in academic science did not fare a much better in their judgment:

> As engineers you have had other, somewhat more appropriate, types of writing experiences. ... However, even these experiences contain pitfalls that continue to trap engineers when they start writing technical reports on the job. Many of your writing activities as an engineering student lacked an appropriate communication purpose. The "system" survives if a student produces a poorly written laboratory report; the only thing that happens is the student flunks (1976, p. 4).

This concern with system was paramount in Mathes and Stevenson's technical writing textbook for engineering students: the engineer's job was to serve a management system and ensure its survival, thereby ensuring continuing progress, improvement in the general living conditions, and a stable democracy. The relationship between engineering, technical writing, management systems, and society which was developed at the turn of the 20th century was reconstructed in Mathes and Stevenson's 1976 textbook. Technical writing was not seen as a specialized practice apart from engineering. Legitimate knowledge was not made outside of science, in the classic liberal arts-based curricula of English composition. People trained in English did not communicate knowledge on behalf of mute scientists.

An important question to ask here is, "Why did Mathes and Stevenson's textbook pressure engineering and systematic management to reclaim technical writing?" One answer to this question would be that engineering and systematic management could lose control of scientific knowledge-making by separating technical writing from engineering. As long as engineers wrote about their technological developments, they were the scientific knowledge-making agents in a culture dominated by scientific knowledge. But when engineers relinquished their agency in this transaction, they became powerless.

Another answer to this question is caught in the venerable tension between science and speculation as knowledge-making activities. At the end of the last century, mechanical engineers designed the functional management system upon which rested 20th-century industrial success in the United States. Up until World War II, engineer/managers had maintained this system by controlling the communications which, in turn, controlled the system and its workers. After the war, though, managers continued to control communication and information within increasingly computerized management systems, but engineers had taken themselves out of the loop by relinquishing their communication function to specialized technical writers. Unlike the clerical workers who helped managers generate communications, however, technical writers did not only transcribe engineers' words. They gained knowledge of engineering practices and invented their own words to define and describe the technology that engineers developed.

Losing control of scientific knowledge to technical writers posed a threat to the position of scientists and engineers in our culture. If technical writers could have been trained only in the sciences, this knowledge-making dilemma might have been less acute. But writing instruction had deep roots in liberal arts and the scholasticism. Because technical writers have an inescapable liberal arts history, they are not fully integrated into the scientific practices about which they write. They are on the margins of this activity in a supplementary position, yet their function is the very stuff of knowledge-making. Without communication, scientific knowledge does not exist materially in our culture. Without technical communication, the coin of science does not exist. And to be authentic coin, the stamp of science must be impressed on the communication, not the stamp of speculation. A dilemma for technical writers is how to transform their stamp of speculation into a stamp of science, thereby ensuring stability for the system based on scientific knowledge.

Technical writer or technical editor?

Current academic trends increasingly place technical writing instruction within science and engineering classrooms in an attempt to reunite scientific knowledge-making and communication. These trends toward integrating writing across the curriculum suggest one approach to coping with the liberal arts-trained technical writer's dilemma of giving voice to scientific knowledge: transform the writer's function into an editor's function.

When technical writers give voice to scientific and technological knowledge, they stand in stead of the developers of this knowledge and render the scientists and engineers mute. Not only does this situation leave scientists and engineers powerless to make knowledge in their disciplines, it too often requires technical writers to work outside their fields of expertise. An alternative working relationship, built on the idea of content

experts making knowledge in their own fields, trains specialized technical editors who can work with scientists and engineers to improve the substance and style of their communications. By reconceiving the function of writer to one of editor, liberal arts-trained specialists can contribute their own expertise—built on long traditions of knowledge and practice—to scientific knowledge-making. Yet in this editorial function, editors would not take sole responsibility for making scientific knowledge. This responsibility would be shared more equitably between communication and subject matter experts, cultivating a closer collaboration between the arts and sciences.

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