A Technology Transfer Model for Program Assessment in Technical Communication

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INTRODUCTION

Technical communicators are no strangers to accountability. In U.S. higher education, accountability often takes the shape of standardized assessment belonging to the accountability for results tradition. Defined by Ewell (2002), this tradition responds to reported demands of the nation’s regional agencies: the Middle States Association of Colleges and Schools, the New England Association of Schools and Colleges, the North Central Association of Colleges and Schools, the Northwest Commission on Colleges and Universities, the Southern Association of Colleges and Schools, and the Western Association of Colleges and Schools.

As an integral part of the higher education community, degree-granting programs in technical communication must be responsive not only to regional accreditation demands but also to disciplinary agencies, such as the Accrediting Board of Engineering and Technology, demanding evidence of effectively taught required courses in technical communication. Self-studies produced as part of the accountability tradition often yield information on courses taught, grades earned, student demographics, faculty qualifications—all serving as important summative evidence used to provide the accrediting agency snapshots of educational contexts.

Brady (2004) of West Virginia University provides a snapshot of the academic program review process undertaken in preparation for an external assessment by the Council of Writing Program Administrators (WPA). Details in the lengthy report on the university’s self-study included traditionally derived tables and charts identifying average number of sections per semester, maximum enrollments per section, percent of computer-aided instruction, and instructional allocation. Brady and her colleagues used such gathered empirical evidence to highlight key programmatic issues that would lead the evaluators to understand the context and purpose of the writing program under review.

Operating on a method similar to regional accreditation agencies, WPA evaluations require such a written program self-study; the organization then sends a team of two trained consultant-evaluators to campus for interviews and on-site evaluation, and then that team compiles a final report. A six-month follow-up report from the campus completes the process. The Council for Programs in Technical and Scientific Communication (CPTSC) offers a similar assessment program.

The primary emphasis in both program review models is self-study, a critical first step in collecting data about programmatic needs and strengths. In West Virginia University’s report, for example, a pie chart demonstrating that over half the department’s student credit hours were generated by composition courses strengthened its request for a new faculty hire. Nevertheless, traditional academic writing program assessment models offer only an auditing perspective. As Allen (2004) points out, the CPTSC program review process is more directly tied to performance indicators than to student learning assessment: What are students learning, and what are they capable of demonstrating as a result of their education?

Other than acceptance of tuition and conferral of degrees, it is fair to ask what outcomes may be expected for
the $315 billion USD in expenses allocated to colleges and universities during 2003–2004? What, exactly, may be expected for an investment in higher education during this period that totaled 2.9% of the U.S. Gross Domestic Product (Snyder, Tan, and Hoffman 2006, Table 25)? The question is not to be taken as either facetious or rhetorical, and it was certainly not taken as such by U.S. Secretary of Education Spellings (2006). She believes that there has been an erosion of the public trust within a mismanaged post-secondary education system.

To stop further erosion, Spellings and her committee recommend the creation of a robust culture of accountability and transparency, a transformation that embraces continuous innovation and quality improvement by developing new strategies to enhance learning. Reviewing the report, writing assessment specialist Huot (2007) suggests that the creation of a massive database on student performance is not the answer. The answer, rather, is to be found in reframing the questions. Huot asks us to engage in what Schön (1983) termed reflective practice, a process of understanding the context of the problem while attending to the realities of the situation.

In this article we seek to reframe accountability by means of an emphasis not on auditing but on student performance, not on the development of databases but on the creation of reflective practice. Historically, we began to reframe accountability in terms of student performance in 2003 within our Master of Science in Professional and Technical Communication (MSPTC) at New Jersey Institute of Technology (NJIT). What did our profession expect our students to be able to do on graduation? How could we communicate those performance expectations to our students? How could we design performance-based assessment measures that would allow our students to demonstrate that they were meeting these performance standards? And, if we were successful, could our assessment program be transferred to other communication programs—technical, professional, or composition—in a manner that would allow these programs to attend to their own reflective practices?

Goal-oriented practices do exist within the composition community, as The outcomes book: Debate and consensus after the WPA outcomes statement demonstrates in its articulated set of first-year composition goals, a project that humbly began with a 1996 listserv posting (White 2006). But the development of core competencies and the transfer of those competencies are different transactions, as the emergence and adoption of the WPA outcomes statement demonstrates. If we were successful in modeling a process of transfer, then we might be able to give something back to other groups within our diverse field, to those who have given us so much in the design of our own model.

This article, then, describes one program’s attempt to answer these questions first for itself and then to ask these questions yet again with other technical communication programs. We attempt to demonstrate one model of program assessment that focuses on student performance as the center of a reflective assessment framework that can act as a technology transfer model for the diffusion of program assessment knowledge.

ESTABLISHING CORE COMPETENCIES TO EVALUATE STUDENT PERFORMANCE IN E-PORTFOLIOS
For more than a decade, we have worked with our colleagues at NJIT to form an assessment community. Our university’s general university requirements programs in humanities, from the first through the senior years, are assessed through a portfolio system (Elliot, Briller, and Joshi 2007). We have established a long history of assessing the undergraduate technical writing service course (Elliot, Lynch, and Kilduff 1994; Coppola 1999; Johnson 2006). Recently, we have begun assessing the information literacy abilities of our undergraduates (Sharf, Elliot, Briller, Huey, and Joshi 2007). In all of these program assessment projects, we have worked with instructors and program developers to create core competencies that are, in turn, shared with students and used in the assessment. The culture of assessment that we have created is informed by what Tinder (1980) has seen as an essential, perhaps the sole, basis of community: the pursuit of inquiry (24–36).

In response to an internal review process scheduled by the NJIT provost, the MS program in technical communication (MSPTC) followed standardized assessment guidelines to collect and report traditional auditing information. We had tallied reports of commitment of institutional resources as measured by the allocated faculty lines, curricular and instructional design as evidenced in syllabi, student satisfaction and support as interpreted from course evaluations and student surveys, and faculty support as obtained from records of released time and professional activity.

Measuring student outcomes was more difficult. We looked to the literature of technical communication for empirically based and nationally recognized core competencies. Finding none, we developed our own criteria from published survey data and reports, the advice of our professional advisory board, and our own practitioner experience; thus, we have identified eight core competencies of technical communication: writing and editing, document design, rhetoric, problem solving, collaboration, interpersonal communication, specialized expertise, and technology (Copolla and Elliot 2004b, 2006a). The performance—an observed set of student behaviors—that would allow the students to demonstrate their abilities is the e-Portfolio. The eight core competencies would serve as
organizing principles for student portfolios such as that shown in Figure 1. Understood as independent (predictor) variables, these core competencies would then be related to a dependent (outcome) variable—the overall portfolio score.

Contemporary validity theory acknowledges that authentic educational assessment should be designed to promote teaching and learning within a process of critical reflection (Moss 1998). Thus, such assessment is best conducted within a context that privileges instructors and students (Huot 2002, 179; Barlow, Liparulo, and Reynolds 2007).

Following such theory and practice, as the program faculty came together to review and particularize core competencies, challenges arose regarding any and all attempts to simplify the term technical communication that would result in reductionistic definitions. Our instructor of visual design, for example, talked through his students’ Web sites using language of esthetics, not pragmatics, in a discussion of user-centered design: “I like the texture of this work. I encourage [the student] to do more of a graphic sense of adventure.” Articulating esthetic knowledge enacted in
practice allowed us to describe visual literacy with a consistent vocabulary of both symbolic and experimental forms (Ewenstein and Whyte 2007).

With a more robust understanding of the term, we went back to the drawing board and developed program-specific skills to be addressed in our courses, establishing a two-semester required course sequence to prepare students for communication in a visual world. Such rigorous questioning accompanied our understanding of each of the eight core competencies.

Just as examination of the construct of esthetics required examination, so too did our notions of collaboration and interpersonal (or oral) communication require unpacking. While we realized that students worked collaboratively within the platforms that host all of the courses within our learning community, we realized that those roles—for instance, the actions of a student who served as group leader in a collaborative project—were going to require that evidence be brought forward in the e-Portfolio. Such evidence, we realized, could include screen captures of leadership exhibited in threaded discussions or textual focus provided in edited documents.

As we moved forward in our discussions over time, we also realized that we could design course projects that would allow multiple core competencies to be demonstrated concurrently. In a new seminar on corporate communication, the instructor designed a course project that would call for a simulation in which three groups of students focused on a new company’s core values, product development and sales, and advertising. The new company, CorpCommPodcast, would develop a strategy by which present and future students in our graduate program would design, create, and post case studies on corporate communication.

Collaboration, interpersonal communication, and oral communication were each demonstrated as the students assumed leadership roles within the groups so that efficient collaboration could occur, tactfully reminded each other across groups of deadlines, and uploaded podcasts on topics such as AT&T’s rebranding of Cingular Wireless with confident voices that are the result of researched case studies. The students who participated in this seminar now proudly sport these podcasts as a link from their e-Portfolios.

Each fall, MSPTC instructors gather to comment collaboratively on the portfolios of each student in the program; each spring, the e-Portfolios are read independently, and observations of student achievement are rendered on a six-point scale. Although the study of inter-reader reliability has a long tradition in writing assessment (Elliot 2005, especially 277–292), nothing was known in 2003 about the ability of readers to render independent judgments congruently on work posted in an e-Portfolio.

The scoring system for agreement was traditional: If the readers awarded scores that were not adjacent regarding a particular trait (that is, a score of 5 and a score of 3), that portfolio was assigned to a third reader for adjudication. We would submit the unadjudicated and adjudicated scores to reliability analyses using a weighted Cohen’s Kappa, Cronbach’s alpha, and Pearson’s correlation coefficient. Once adjudicated, the score remained part of the analysis only if the variable was read reliably. That is, we enacted the Null Hypothesis Significance Test (NHST) and assumed that we would be unable to read the scores reliably ($H_0$), thus challenging ourselves to demonstrate the alternate hypothesis ($H_a$) of reliable reading. As a guard against Type I error (gullibility), we set the alpha coefficient as .05 for the Kappa and Pearson analysis.

Table 1 presents the results of our three-year study of reliability. Attention to the weighted Kappa statistic in 2004 reveals that readers achieved a fair level of agreement on the writing and editing competency ($r_{w} = .389, p < .05$) and moderate levels of agreement on document design ($r_{d} = .435, p < .05$), rhetoric ($r_{r} = .43, p < .05$), and specialized expertise ($r_{e} = .448, p < .05$). Collaboration ($r_{c} = .564, p < .05$) and the overall score ($r_{o} = .588, p < .05$) received more moderate levels of agreement. However, problem solving ($r_{p} = .279$), interpersonal communication ($r_{i} = .111$), and technology ($r_{t} = .076$) had poor levels of agreement.

When further analysis of problem solving, interpersonal communication, and technology using Cronbach’s alpha and Pearson’s correlation coefficient confirmed that the variables had not been read reliably, we elected to withdraw all three from further analysis of the 2004 data. Such applications of the NHST to inter-reader reliability analysis have informed our efforts, serving as a pre-condition to further analysis.

As Table 1 demonstrates, community formation has increased as the program has progressed over the years. By 2006, the three core competencies that had proven problematic were being read reliably, and each of the other competencies has remained consistently accessible to reliable evaluation. Each year the MSPTC community’s ability to make reliable judgments has been strengthened, and so Table 1 serves as empirical documentation of community formation.

In reflecting on the notion of agency in our reliability gains, we remain convinced that our adoption of contemporary validity theory and its emphasis on the promotion of teaching and learning demands that rigorous questioning accompany the assessment process. Assessment is often described as nothing more than a command and control method of brainwashing designed to result in reliability (Belenoff 1991), and we do not deny that this is often so. The results described in Table 1, however, have been
<table>
<thead>
<tr>
<th>Core Competencies</th>
<th>2004 (n varies from 3 to 17)</th>
<th>2005 (n = 22)</th>
<th>2006 (n = 31)</th>
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<tbody>
<tr>
<td>1. Writing and Editing</td>
<td>.31</td>
<td>.389*</td>
<td>.656</td>
</tr>
<tr>
<td>2. Document Design</td>
<td>.39</td>
<td>.435*</td>
<td>.602</td>
</tr>
<tr>
<td>3. Rhetoric</td>
<td>.48</td>
<td>.43*</td>
<td>.656</td>
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<tr>
<td>4. Problem Solving</td>
<td>.018</td>
<td>.279</td>
<td>.221</td>
</tr>
<tr>
<td>5. Collaboration</td>
<td>.308</td>
<td>.564**</td>
<td>.631</td>
</tr>
<tr>
<td>7. Specialized Expertise</td>
<td>.368*</td>
<td>.488**</td>
<td>.691</td>
</tr>
<tr>
<td>8. Technology</td>
<td>.071</td>
<td>.076*</td>
<td>.024</td>
</tr>
<tr>
<td>9. Overall Score</td>
<td>.472**</td>
<td>.588**</td>
<td>.73</td>
</tr>
</tbody>
</table>

*p < .05  **p < .01
gained through a process that Broad (2003) describes as one that allows and encourages problematization in the service of understanding. As Broad found, the more that dissent, conflict, and initial failure are treated as normal activities in intellectual life, the more opportunities there are for us to honor our responsibilities as teachers (255).

The discussion noted above regarding the venture-some use of esthetics was clearly provocative in orientation. Should we, we wondered, encourage adventure when basic skills were being formed among our students? Why not stick to a more traditional model of effective communication, such as the one offered by Evans and Thomas (2004)?

Conflicts such as this—often taking the form of a utilitarian versus a creative view of the core competencies—remain. It is precisely because these conflicts emerge that commonality is found—in hallway chats, in Web-based discussions, in formal meetings. The standard one-hour training session that takes place before a reading (a process that does indeed often result in brainwashing) is thus transformed into an iterative activity that takes place across time and circumstance. The relationship between Table 1 and the core competencies is achieved by the frequently messy, often contentious, and ever present pursuit of inquiry.

As evidence of model formation, a regression analysis of the spring 2006 portfolios relating the eight independent variables to the overall portfolio score revealed an extraordinarily high coefficient of determination ($r^2 = .89$, df (8, 22), $F = 22.23$, $p < .000$). That is, for the spring of 2006, 89% of the variability of the overall portfolio score represents the proportion of the variation in the dependent variable (the overall portfolio score) that is explained by the independent variables (the eight core competencies). The model is quite cohesive in capturing the relational aspects of the core competencies to the overall portfolio score.

Figure 2 presents student scores during the period described in Table 1. Three trend observations may be drawn from the figure.  

1. Following the application of the NHST, we have not included the scores on the core competencies of problem solving, interpersonal communication, or technology for 2004. Application of such standards of judgment has allowed us to build confidence around what we have done, rendering each gain more meaningful.

2. The range of scores (2 through 12) has grown over the three years. In 2004, for example, the range of scores for collaboration included only the score range of 6 to 11. In 2005, the readers used a fuller score range, from a score of 2 upward. The score range has, indeed, generally increased for each of the core competencies over the three-year period.

The importance of considering range as related to reliability suggests that the readers were more venturesome, more willing to risk reliability failure in the pursuit of a full range of scores. This full range of scores suggests that they are neither skewed nor abnormally distributed but, instead, exhibit the distribution associated with the standard bell-shaped curve (Lauer and Asher 1988, 234). Thus, the information in Table 1 becomes more meaningful as we realize that reliability was maintained and grew, even as the chance for reader disagreement increased.

3. The scores tell us that, for all our efforts, our tale is not one of triumphalism. Each semester, the faculty reviews the student mean scores to study which core competencies are inadequate (a total score of 6 or below), which are being met adequately (a score of 7 or 8), and which scores suggest superior work (scores of 9 or above).

Figure 2 reveals that superior work has consistently been recorded in the student e-Portfolios in the core competencies of writing and editing, document design, and technology. Adequate scores that bear watchful analysis because of their falling nature are seen in rhetoric and the overall portfolio score; adequate scores that are somewhat rising are seen in problem solving and collaboration. Evidence of interpersonal communication has remained consistently inadequate, while a dramatic drop in the fall 2006 scores on specialized expertise is cause for alarm.

A TECHNOLOGY TRANSFER MODEL FOR PROGRAM ASSESSMENT IN TECHNICAL COMMUNICATION

The model we have described is, in fact, a technology. While it may be understood as unique in its use of certain classes of objects, range of activities, and varieties of social organization (distinctions of definition offered by Winner [1977, 11–12]), our model nevertheless does have in place formal traditions associated with psychology, policy, and advocacy.

Because we are influenced by the tradition of psychology, we frame our assessment findings so that we are compelled to recall that authentic proof discloses the presence of alternate possibility. That is, when analysis is offered, the accompanying conclusions demand that no single causal model is offered in cases where language processes are in play. Historically, such thinking accompanies the experimental process itself as one distinguished between the null ($H_0$) and alternative ($H_1$) hypotheses. NHST, complete with its cautions against gullibility (Type I error) and blindness (Type II error), establishes basic principles of logic demanding that naive assumptions of cause and effect behavior be abandoned in favor of relational investigation.

Although we are aware of the criticisms of the NHST (such as those offered by Harlow, Mulaik, and Steiger...
we are aware that most of the abuses arise from applying models of the physical universe to the social. As Hollis (1994) has concluded, there is simply no single analysis of causal explanation in the philosophy of the natural sciences that social scientists are bound to accept (91), especially when we consider that humans invent theories based in language and that human actions have meaning determined by that very language itself. "Language, and its alternate possibilities of meaning and interpretation," Hollis wryly observes, "is a prime candidate for the key to the peculiarity of social life" (144).

It is within just these language-based, relational peculiarities that program assessment may find its most meaningful activities. To meaningfully move between the abstract to the concrete, for example, we encourage both the elements of design that Evans and Thomas (2004) enumerate and the emergence of visual literacy as a vocabulary of symbolic and experimental forms that Ewenstein and Whyte (2007) tell us is beyond words. We remain committed to engaging, not denying, the subtle complexities of language.

Because we are influenced by the tradition of policy, we remind ourselves that technical communication is a substantial shareholder in the higher education commu-

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**Figure 2.** The New Jersey Institute of Technology core competencies: Student scores, 2004–2006.
nity. In 2003–2004, majors in communication, journalism, and related programs were awarded the seventh highest number of degrees (n = 70,968) among the 12 categories of undergraduate degrees established by the U.S. National Center for Education Statistic—an extraordinary 5% of the 1,399,542 degrees awarded (Snyder, Tan, and Hoffman 2006, Table 249). To give an idea of perspective, more degrees in the U.S. were awarded in our field and its associated fields than were awarded in engineering (n = 63,558), biology and biomedical sciences (n = 61,509), computer and information sciences (n = 59,488), physical sciences and science technologies (n = 17,983), engineering technologies (n = 14,669), or mathematics and statistics (n = 13,327). Required and elective courses in technical communication are often an integral part of each of these majors. During that same period, graduate degrees in communication (n = 6,535) ranked as the 12th highest number of awarded degrees (Snyder, Tan, and Hoffman 2006, Table 250). The field of technical communication is indeed an integral part of the higher education community.

Because we are influenced by the tradition of advocacy, we remind ourselves that we must frame our rhetorical roles carefully. In his advocacy of the adventurous ideal of cosmopolitanism, Appiah (2006) has emphasized a model of conversation in which the vocabulary of overlapping values is central. Appiah adopts the perspective of one deeply dedicated to understanding contextual nuance—that which is peculiar and local. Because such a stance begins with a rejection of positivism—the prevailing perceptual belief system that favors rational analysis of facts and dismisses beliefs as relativistic—the implications are vast.

If we refuse to allow the positivist distinction to be drawn between fact (the object of science) and value (the object of belief), then we cannot logically accept relativism—the dust heap where beliefs wind up. That is, if we acknowledge that values are indeed open to rational analysis, then we are logically compelled to take values as a serious base of activity. “Values guide our acts, our thoughts, our feelings,” Appiah concludes, and so we need to establish fresh starting points (25). Rather than focus on the exceptionless principles, Appiah presses the communal aspects of cosmopolitan curiosity—how we may manage to enjoy the discovery of those values which we do not share.

Whether we are reading Frieden’s *Global capitalism: Its fall and rise in the twentieth century* (2006) or Friedman’s *The world is flat: A brief history of the twenty-first century* (2006), the application of Appiah’s message is clear. An attitude of cosmopolitanism is the order of the contemporary world. Why? Because the kind of interactions Appiah describes in his treatment may be joyous, or they may be unsettling, but however we understand them, interaction is inevitable.

The three traditions, at the end of the day, come down to an applied framework. To recall Lévi-Strauss’s terminology, the framework is that of a *bricolage*, a representation that is appropriate to context-rich, complex situations (1966). While we have argued for a research alternative in technical communication that embraces such a model (Coppola and Elliot 2005), we also maintain that the orientation nevertheless be considered as a form of technology.

The technological artifact, our model, embodies politics that are influenced by our interpretation, unpacked briefly above, of psychology, policy, and advocacy traditions. Table 1 and Figure 2 incorporate the logic of examined evidence, the politics of applied localization, and the advocacy of community cosmopolitanism. Because of such politics, the model has little chance of becoming the master narrative associated with determinism, a product that, if adopted, would render program developers powerless as, to use Winner’s phrase, the “ineluctable process” unfolds (1986, 10).

Because technology transfer is defined as a series of complex social processes that move technology from bench to market, it is also essential to understand the nature of the historical processes that inform the model. As Finnish researcher Tumoi (2002) explains, in practice, innovations involve “complex, iterative process in which communication, learning, and social interaction play important roles” (8). Tumoi’s important work, *Networks of innovation*, traces the history of Internet-based innovations in the last decade and is an important guide for framing deeply contextualized contemporary technology transfer models in the global economy.

Important as well is an understanding of the national role of technology transfer scholarship in the U.S. that exploded after 1980 when President Carter signed two acts into law: the Stevenson-Wydler Technology Innovation Act that pushed federally developed technology to private interests, and the Bayh-Doyle Act that allowed universities to license and patent results from federally funded projects or grants.

During this early period of U.S. federal government interest, researchers attempted to frame and model the elusive process of technology transfer. In 1978, Bradbury emphasized that the transfer process could not be modeled because of its dynamic and phenomenological nature, a claim that Doheny-Farina would later support in his important work: “Because of the contingent nature of this phenomenon, it is difficult to generalize across transfers” (1992, 7).

In the present case, we agree that there is no master model that will fit all organizations and occasions. Rather, as the Rand report on best practices in technology transfer finds, “There are several key steps or activities included in
most technology transfer processes, and an individual process is tailored to fit organizational needs” (Wang, Pfleeger, Adamson, et al. 2003, viii). Souder and his colleagues (1990) also studied best practices of a broad cross-section of government agencies, research institutions, and national and industrial laboratories, to create the common stages of technology transfer. Their process-stage model is the basis for our model, Figure 3.

Rather than present the stages as boxes leading from one to the other, we show the process as circular, with stages overlapping, interacting, and carried out in parallel. The transfer stages are prospecting (preliminary analyzing, searching, and screening to find a new technology); developing (enhancing, elaborating, embodying, and tailoring selected technologies from the prospecting stage to meet the user's requirements); trial (field testing the developed technology); and adoption (final development, technology modification, and commercialization). Once technology is commercialized, it becomes an innovation, which leads us directly to the second part of our model, the diffusion of the innovation or technology adoption process described by the bell-shaped curve.

The model for technology diffusion, created by the field’s bibliographer of diffusion of innovations has stood the test of time. Rogers' original theory (1962) has been validated in more than 5,000 studies published in over a dozen disciplines. Rogers standardized the classification scheme for innovation adopters, differentiated by innovativeness and measured by time of diffusion. Therefore, innovators are the first technology enthusiasts, early adopters are visionaries, early majority are pragmatics, late majority are conservatives, and laggards are skeptics.

Plotted over time and based on frequency, the adoption normally follows a bell-shaped curve. Moore (2002) cracked the symmetric innovation adoption cycle. He agrees that innovators and early adopters drive demand for new technology but that they also represent a small percentage of a technology market. He finds a metaphorical chasm that separates the early adopters from the early majority and mainstream adoption of a technology. Early adopters want a revolutionary technology while the early majority wants an evolution to enhance, not overthrow, established ways of doing business. To cross the chasm from the innovative few to the pragmatic many is to move from techno-centric product or service to a user-centric perspective.

Figure 3. The landscape of technology transfer and diffusion.
Consider the so-called Web 2.0. Early adopters of Web 2.0 were recognized in one ZDnet blog as "highly connected geeks with short attention spans, high levels of curiosity, and a penchant for easy distraction by the next bright shiny object " (Orchant 2006). But Web 2.0 developers may have crossed the chasm by trumping the geek factor with user-friendly features. Now U.S.-based mainstream media publications, such as nytimes.com, washingtonpost.com, and Time magazine online, include Web 2.0 buttons for RSS feed, social bookmarks, and social networking sites. Read/Write Web columnist MacManus (2007) predicts that we are nearing a tipping point for the mass adoption of prominent Web 2.0 services.

These conceptual models of transfer and diffusion well suit the present discussion. In the circle of technology transfer stages described in Figure 3, colleagues at NJIT were prospecting (Stage 1) or searching for a technology that could meet their needs, just as certain others forms of assessment had met the needs of similar researchers both within and beyond NJIT. We found that an e-Portfolio such as that shown in Figure 1 could, if planned around a well-designed set of core competencies, demonstrate a set of student behaviors and begin what could be termed our β-technology.

Stage 2 focused on elaborating the model and detailing the student outcomes. The research design at this stage was the set of eight core competencies, or predator variables, used to assess the dependent variable of graduate student ability. This phase also included practitioner validation, when program faculty came together to review and particularize these competencies, and advisory board review.

In Stage 3, faculty met together in the fall of 2003 to evaluate collaboratively the e-Portfolios. This review, which assessed individual student achievements, provided important feedback to students. At the close of the spring 2004 semester, program faculty met once again to evaluate independently the e-Portfolios according to the six-point ordinal scale we had designed. Two years later, we had formed a model that had the potential to demonstrate program performance because the model was centered on student performance. Longitudinal study, captured in a sheaf of documents from which Table 1 and Figure 2 were drawn, provided evidence of a sustainable and informative system. Keeping the assessment of student work at the center of the model, we were ready to move outward, as the arrow of Stage 4 demonstrates, and begin the conversation with others.

Supported by a research grant from the Council for Programs in Technical and Scientific Communication (CPTSC), "A Communication Research Model for Assessment of Programs in Technical and Scientific Communication," we sought to partner with another graduate technical communication program that used e-Portfolios for outcomes assessment in the early spring of 2006. If we were the first technology enthusiasts, the Innovators in Figure 3, then Texas Tech University (TTU) would be the visionaries as Early Adopters. The Master of Arts in Technical Communication (MATC) team at Texas Tech accepted our invitation to partner in a field test, share assessment strategies, and work toward a common set of core competencies.

After a series of synchronous online discussions—discussions that focused on the creation and application of a newly derived set of core competencies—colleagues from both programs have been able to identify, collaboratively, the presence of these new core competencies, on an ordinal scale, within the e-Portfolios of each other's students. That is, with some modification in process, the members of the NJIT-TTU combined team are now at the same stage, described above, that NJIT faculty encountered during the fall of 2003. Table 2 records the results of our present effort, a set of core competencies common between both programs.

Can the model be transferred? At present, transfer does indeed appear possible. Will the process now proceed to one of diffusion to other post-secondary institutions sponsoring programs in technical communication?

A literature review (Coppola 2006b) suggests that the received view of technology diffusion is simply too difficult to tackle; the variables can prove overwhelming, the metaphors used to depict them too complex. If we return to the idea of rearticulating our field around a core of intersecting disciplines in which context is key, however, we might identify traditional barriers from technology transfer and diffusion scholarship and attempt to see those barriers within the realities of technical communication program assessment. Each of the five barriers, or tropes to resistance, is illustrated in Figure 3.

When a technology is identified as beneficial or neutral, it begins to move through the stages of diffusion. Each actor in the process, quite naturally, will have different goals and motivation. The literature of technology diffusion provides useful examples of cases in which differing goals and motivations result in barriers.

A university faculty member, for example, may be interested in grant-funding and in publication, while a federal colleague may be interested in the outcomes and applications. Employees at the federal laboratories thus feel less incentive than their counterparts in universities or in industry to contribute to technology transfer (Wang, Pfleeger, Adamson, and others 2003). To overcome this barrier, Gibson and Smilor (1991) found that the greater the degree of variety of incentives reward and recognition, the higher the motivation for those engaged in the process.

In the case of program assessment, it is painfully well
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<th>Trait</th>
<th>Aims</th>
<th>Example</th>
<th>Descriptor</th>
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<tr>
<td><strong>1. Balance of theoretical knowledge and practical skills</strong></td>
<td>The portfolio will demonstrate technical communication practice explicitly informed by an awareness of theory and research in the field.</td>
<td>Theoretical justifications of practice; research skills (ability to do research, familiarity with research literature); project management; knowledge management; business practices; communication of scientific and technical practice informed by concepts of technology transfer</td>
<td>Displays primary and secondary research skills Engages critically with a variety of theoretical approaches to technical and scientific communication Justifies practice with relevant theory and research</td>
</tr>
<tr>
<td><strong>2. User-centered design</strong></td>
<td>The portfolio will demonstrate user-centered values and practices in both the learning artifacts it includes and in the design of the portfolio itself.</td>
<td>Visual communication, format, graphic design, usability, user-centered design</td>
<td>Combines aesthetics (graphic design) with usability Implements consistent principles of design (consistency, alignment, contrast/similarity, proximity) Demonstrates command of design in both print and electronic formats Demonstrates ability to communicate visually through graphics Demonstrates effective page layout, navigation, and typography</td>
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<tr>
<td><strong>3. Rhetorical awareness</strong></td>
<td>The portfolio will demonstrate an awareness of the differing goals and situations of audiences, organizations, and societies.</td>
<td>Audience analysis, ability to adapt communication to context and purpose; genre knowledge; rhetorical problem solving; cultural interpretation; reflective practice; disciplinary history</td>
<td>Demonstrates understanding of rhetorical strategies used to inform or persuade users Documents capability to conduct user, task, and needs analyses Demonstrates ability to develop and adapt content for audiences</td>
</tr>
<tr>
<td><strong>4. Writing and editing</strong></td>
<td>The portfolio will demonstrate that the student has competent writing and editing skills</td>
<td>Context-appropriate style, correctness, and organization</td>
<td>Demonstrates context-appropriate, thorough, relevant, and coherent content Demonstrates correct written language (usage, grammar, punctuation, spelling) Exhibits clear context-appropriate style (readable, euphonious, concise, cohesive) Exhibits ability to adapt tone for audience and purpose Demonstrates ability to develop content for web-based applications</td>
</tr>
<tr>
<td><strong>5. Professionalism</strong></td>
<td>The portfolio will demonstrate that the student has competent professional skills.</td>
<td>Presentation skills, listening</td>
<td>Demonstrates command of interpersonal communication Delivers effective informal presentations Develops “alternate” synchronous and asynchronous communication skills</td>
</tr>
</tbody>
</table>

(Continued)
known that faculty rarely receive any compensation or recognition either for participating in assessment or for demonstrating improved student learning. Other goals (such as the creation of an aims-directed environment for students) and other motivations (professional practice in presentations and publications) should therefore be considered. In the present CPTSC-sponsored research, colleagues at NJIT and TTU presented an update of their efforts at the 2007 annual conference of the Association of Teachers of Technical Writing—a presentation that included reflection on reconsiderations of each university’s own established variables of e-Portfolio evaluation.

The early literature of technology diffusion points to wide-ranging geographical dispersion as a barrier to technology transfer and diffusion. Global interconnectedness enabled by Web technologies has reduced spatial and temporal distances. But cultural differences in values, attitudes, and conduct can present hurdles. Williams and Gibson (1990) found barriers when people of widely varying backgrounds, such as those found in research and development consortia and in university-industry or government-industry partnerships, attempt to share information and technology with one another. Differences in vocabulary, ethos, and motivations amount to a communication effort between what are essentially different cultures (11). Cultural differences thus become a barrier to mutual perspective taking (Tenkasi and Mohrman 1995, 147).

It is thus important to realize that understanding and interpreting events in any group or community involve a great deal of knowledge that is not explicit and yet must be explicitly communicated (159). Because these are tacit and taken for granted, another group may falsely assume that the knowledge and meaning systems are more similar to its own than they actually are.

In our current work with TTU, online discussion transcripts reveal different attitudes toward the presence of reflective statements of work captured in the e-Portfolio, as well as different interpretations of linking ethical and multicultural practice. The following transcript excerpt demonstrates how contentious issues arise seemingly out of context and how contention nevertheless may result in positive effects.

NJIT: If you do not see theory-based work under the specialized skills section, then score down for NJIT students.

TTU: I guess I’m really missing the reflective aspect of [the NJIT] portfolios; I’m not sure how to assess theoretical awareness without the student explaining her theoretical awareness to me.

TTU: Can you be reflective without articulating your reflections?

NJIT: While I certainly agree that articulated reflection is important, I would not want to dismiss [the student’s] use of Killingsworth [1992] because [the student] did not consciously write about semiotics.

TTU: I’d say that explicit reflection usually trumps implicit reflection, at least in my mind.

NJIT: I am convinced that we need more reflective statements at NJIT.

TTU: And I think we need to get students to show more technological sophistications, as yours do. It’s interesting to compare.

The presence, or absence, of a reflective statement in a student’s e-Portfolio arose out of thin air in discussion of a

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**TABLE 2: (Continued)**

<table>
<thead>
<tr>
<th>Trait</th>
<th>Aims</th>
<th>Example</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Ethical and multicultural practice</td>
<td>The contents of the portfolio demonstrate ethical behavior and a sensitivity to the ethical and multicultural issues that face technical communicators.</td>
<td>Facility with, critical understanding of, and ability to learn technologies</td>
<td>Uses variety of technical tools appropriate to the context of production and the context of use</td>
</tr>
<tr>
<td>7. Facility with multiple technologies</td>
<td>The contents of the portfolio demonstrate the author’s ability to use multiple communication technologies and media.</td>
<td>Demonstrates understanding of ethical and multicultural practice and capability to enact ethical and multicultural practice to achieve context-appropriate communication</td>
<td></td>
</tr>
</tbody>
</table>

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**TABLE 2: (Continued)**

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core competency (ethical and multicultural practice). Yet it was the extent of evidence of this competency that drove the discussion. What, we were wondering, would serve as evidence? Can a student observe the process of semiosis and receive a high score on this core competency in an e-Portfolio without recalling the work of the researcher who promoted the perspective in our field?

Rather than seeing different assumptions as barriers—is explicit reflection really better than implicit reflection?—the two groups agreed that more reflective statements are needed in both sets of e-Portfolios and that further discussion needed to take place before a core competency entitled ethical and multicultural practice can—or should—be evaluated independently by two readers. As was the case with the discussion of aesthetics, the discussion of reflective statements appeared as an emerging concept that was becoming clearer. The net effect of the discussion was positive.

In examining the issue of technical complexity, Gibson and Smilor (1991) found that more understandable, demonstrable, and unambiguous technology is easier to transfer. This concept is known as equivocality—the degree to which interpretations of a technology vary across technologies and cultures (Avery and Smilor 1990). Complex or ambiguous technology is difficult to understand, demonstrate, and apply.

As a remedy, Souder and his colleagues (1990) found that complex or radical technologies may be transferred and diffused if broken into smaller pieces that are less imposing to users and if the benefits are clearly drawn. Because it has often been so poorly used, empirical psychology is often mistrusted (Gould 1981). To some, statistical analysis is a technology that is difficult to understand and seen as limited in its application. Reduction of complex human activities to a mere number is a fear expressed by those who most know how quantitative analysis can be misused.

Such reductionism need not be the case. In the NJIT-TTU collaboration, a quantitatively oriented scoring sheet served the unintended purpose of providing further qualitative analysis of the core competencies. As Thomas Barker of the TTU team pointed out in discussion, the range-finders that were to be used for independent analysis served the unintended purpose of leading to further discussion of the core competencies themselves, as expressed in Table 2.

Although it is clear that further empirical evaluation must take place in the collaborative effort—Table 2 does not yet include the team’s final vocabulary of value—it is not clear yet what form that evaluation may take. The product of the analysis of student work such as that shown in Figure 1 may appear as a set of results seen in Figure 2 and Table 1, or it may appear as the Dynamic Criteria Mapping proposed by Broad (2003). What is clear is that none of the many forms of empirical analysis, both quantitative and qualitative, will emerge unless the fourth barrier is addressed.

Souder (1988) studied the types of inter-group barriers between R&D and marketing in new product ventures, characterizing the barriers as contributing to “states of harmony” or “states of disharmony” among the groups. Distrust, he found, is a severe state of disharmony creating jealousy, fear, and hostile behaviors. In his study, he found that representatives from marketing believed that those in research and development could not be trusted to follow instructions; in turn, those in research and development believed they were being blamed for failure while marketing was credited with success (11).

Trust, if formed early in a partnership, enables teams to keep their focus on the project. Trust propels innovation. In the NJIT-TTU research, various aspects of the presence of swiftly formed trust (Coppola, Hiltz, and Rotter 2004a) were apparent early in the process. Because members of the team offer seminars asynchronously for their students, they were highly skilled in such communication forms. As such, postings that reveal group solidarity, congeniality, and affiliation emerged within the first chat meeting and were maintained in all transactions. As an element of task expectation—key to the development of trust—TTU colleagues Thomas Barker, Locke Carter, and Miles Kimball maintained a Web site with meeting agendas and milestones. Often, follow-up phone calls reinforced and clarified issues raised during online discussions, thus establishing a pattern of predictable communication that extended beyond the platform.

INNOVATE 2004 and INNOVATE 2006, two surveys of German communication experts and journalists, report successes and challenges for communicating innovation within corporations and to the public. Survey authors Mast, Huck, and Zerfass (2005) describe the main barrier for successful innovation as the imminent potential for change, including a high market risk (Huck 2006). Spann, Adams, and Souder (1993) identify barriers in users’ overall resistance to change that are often derived from lack of interest, risk aversion, and refusal to admit technical problems.

Users may be uncertain about the value of technology compared with current practices. Often the movement of the transfer is propelled by investments, interests, and advantages that tend to seek further advantage. Alliances and personal agendas—articulations of power—can take precedence over common goals and lead to a politicized environment. Seen in such a light, faculty reticence—that any form of assessment may impact academic freedom and erase intellectual diversity—is well taken. Faculty resistance to any assessment that will force conformity in teaching methods is a valid fear.
However, rather than rejecting strategies that do not fit, we should use our disciplinary expertise to develop those that do. Adopting the barrier model that permeates technology transfer and innovation diffusion only fore- stalls the important dialog about communication pro- gram review that needs to take place. The costs of formal assessment are forbidding if we insist on going it alone. If each program struggles to develop localized practices in isolation, the financial drain on resources will be prohibitive.

In our nascent work with TTU, rather than seeing different assumptions as barriers, we agreed on strategies to improve both sets of e-Portfolios and to celebrate the fact that further discussion needs to take place. Both programs place student performance at the center of an assessment framework. The two teams were able to find a collaborative set of core competencies for our programs. Our pilot project suggests that transfer is possible.

If we were able to continue testing the model across technical communication programs, we might begin the critical work of establishing a body of knowledge for our field. Hayhoe (2007) is worth quoting: “As soon as possible, we need to commit the resources required to plan, execute, and publish the technical communication body of knowledge” (144). A program assessment model based on core competencies—reframing accountability by means of an emphasis not on auditing but on student performance—is surely an innovative first step for our profession.

While the WPA outcomes statement serves as a test- ament to goal-oriented curriculum development within academic settings, perhaps our profession should look outward to the efforts undertaken by the Council on Linkages between Academic and Public Health Practice. Since 1991, the Council has taken as its mission the improvement of links between practitioners and educa- tors to transfer innovative strategies to build the nation’s public health infrastructure. In 2001, a list of collabora- tively developed core competencies were adopted by the Council. Today, these competencies continue to as- sist the academic community in developing and evaluating competency-based curriculum, which enables students to identify and meet their educational needs, and to help practitioners to craft job descriptions, implement performance reviews, and assess knowledge within their organizations. Within the community of technical communication, CPTSC is currently expanding its own assessment program to develop the kind of linkages evident in fields such as public health. As in the case of health, there is much at stake and much to be done.

Who will be included in the process of designing core competencies and assessing their usefulness? As we have demonstrated, we believe that those who will shape the future will be those who seek to form communities of inquiry. The future will be determined by those who see the potential, as well as the barriers, in the landscape of technology transfer and diffusion.

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