The Roles of Technical Communication Researchers in Design Scholarship

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Abstract
Design has come to be understood as an essential aspect of the work that technical communicators claim. As a result, research in the field of technical communication has approached studies of design in numerous ways. This article showcases how technical communication researchers assume the roles of observers, testers, critics, creators, and consultants in their handling of design artifacts. Such a model regarding these roles may help us to better understand the design relationships researchers presume as they further knowledge of design within our field. This article offers a framework to leverage into a comprehensive and integrated model for explaining our work on design to others outside of technical communication.

Within the last few decades, visual design has become a commonplace skill that technical communicators have explicitly been expected to understand and implement in their work. As a result, technical communication researchers have devoted much attention to the study of design and its elements. In fact, in her review of the literature from over 10 years ago, Portewig (2004) noted that the technical communication scholarship on design at the time argued, in part, that we should pay attention to visuals and visualization in order to respond to their ascendance and to teach our students how to expand their role from authors to

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designers (p. 37). I think that it is safe to say that these arguments have won out in the field and that attention to design has simply been absorbed into technical communication and professional writing. This propagation has been further accelerated by new developments in UX (user experience design).

A simple online search shows that multiple technical communication or professional writing undergraduate programs feature courses in design or visualization and often the line between writer and designer is becoming somewhat blurred (e.g., the webpage for Michigan State University's professional writing major notes that "The program prompts students to become creative, imaginative, and expressive *writers and designers* who are able to work with a wide range of documents and in a variety of workplaces." my emphasis). Certainly, the ways that professionals in business and technical settings have come to envision the role of the designer within their environments have helped to place design (or portions of it at least) within the auspices of technical communication. Sawhney and Prahalad (2010) in *Bloomberg Business*, for example, define one role of the designer as "translat[ing] and communicat[ing] the value of a business idea to consumers" (para. 2). In essence, Sawhney and Prahalad make the case for a more user-centered approach to design in the business world because otherwise innovative ideas may fail to catch on if consumers can't connect with them. Such thinking has fallen within our purview since at least Robert Johnson's (1998) *User Centered Technology* was published.

That said, because design has become an understood facet of technical communication, it continues to be a subject of study within our field that gains importance and complexity—a complexity that can generate multiple (and sometimes contradictory) terms stemming from our own and borrowed from other fields. Given the latest move toward UX as a design and development component of the technical communicator's work then, it becomes necessary to review and revisit how design continues to be an important part of our field, in ways that include and even move beyond direct user testing. Evident in the technical communication research on design are terms, ranging from (to name a few) "document design" (Ding, 2000; Johnson, 2006; Lauer & Sanchez, 2011; Longo, Wienert, & Fountain, 2007), to "visual design," (Brumberger, 2007; Kimball, 2013; Lauer, 2012; Rude, 2004; Varpio, Spafford, Schryer, & Lingard, 2007), to "participatory design" (Salvo, 2001; Spinuzzi, 2002), to "user-centered-design" (Schneider, 2005; Scott, 2008), to "design studies" (Wickman, 2014), to "information design," (Ward, 2010; Williams, 2010; Willerton & Hereford, 2011) which is itself comprised of "fields such as architecture, advertising, cognitive psychology, computer science, graphic design, mass communication, information science, and rhetoric" (Cooke, 2003, p. 155). Some of these terms seem to coincide well. But we should also note that these terms are not necessarily exclusive. That is, researchers may (and do) fold document design into visual design or software design into experience design.

Essentially, the proliferation of design in technical communication has led to different terminology and varying starting points in the rich literature of design.

And yet, despite the expansive studies that investigate design, we do not have a larger, more integrated sense of how exactly people enact research on design in our field. This is particularly important, given the robust nature of the multifaceted approaches that are being taken in the study of design in technical communication. Whereas Portewig (2004) was curious about why we say we should study design, I think it is more timely now to begin asking *how* we say that we study it. More specifically, I ask, how do technical communication researchers position themselves in relation to the artifacts of design that they study?

Situating Design Research

This question requires us to take inventory of what types of artifacts show up most commonly in the technical communication literature. In the past 15 years, technical communication researchers have studied design through artifacts such as

- Posters (Lauer, 2012; Lauer & Sanchez, 2011; Ward, 2010);
- Databases and Content Management Systems (Bacha, 2012; Clark, 2007; Sapienza, 2002)
- Spaces (Carliner, 2000; Ramey, 2014; Salvo, Pflugfelder, & Prenosil, 2010; Welch, 2005)
- Software (Albers, 2011; de Jong & Lentz, 2001; Smart & Whiting, 2002; Wolfe & Neuwirth, 2001)
- Web 2.0 Interfaces (Potts & Jones, 2011; Rawlins & Wilson, 2014; Sherlock, 2009; Zdenek, 2007)
- Instructions/Manuals (Catanio & Catanio, 2010; Friess, 2010, 2011; Ganier, 2009; Longo, Weinert, & Fountain, 2007; Tebeaux, 2008; Willerton & Hereford, 2011)
- Websites (Albers, 2009; Andrews et al., 2012; Cushman, 2014; O'Hara, 2004; Richards 2009; St. Amant, 2005; Walker; 2002; Walters 2010).
- Forms (Kim, Young, Neimeyer, Baker, & Barfield, 2008; Lavid & Taboada, 2004; Tebeaux, 2000; Varpio et al., 2007)

This list is not meant to be exhaustive—more so, representative of articles that have invoked design in their abstracts published since 1999 in *the Journal of Technical Writing and Communication, the Journal of Business and Technical Communication,* and *Technical Communication Quarterly*. With such diversity in the artifacts that researchers study, it makes sense that multiple avenues to study these artifacts would make themselves available. What is needed then is a way to determine how these different types of studies speak to one another in some way.

Here, I draw from larger discussions that have transpired in the field of technical communication research. Much of the literature that focusses on research in technical communication has noted that methods, questions, and epistemologies that researchers bring to the scholarship are so varied as to have little order or consistency. As Blakeslee (2009) points out, because technical communication is interdisciplinary it draws from and does work "that has implications for other fields," which creates a sense of incoherence not only for those outside of the field who wonder what we do but also for those who work within technical communication as either practitioners or academics (pp. 129 and 128). Indeed, Blakeslee and Spilka (2004) have argued that "we need to agree upon specific broad questions that we consider important for our field to explore and we need to articulate these question in a clear and more focused manner" and to properly match methods with these questions (pp. 77 and 80).

What becomes salient here is a need for enacting more systematic and cohesive research methods on future studies in technical communication. In the face of such multiplicity, Rude (2009) constructed a cohesive narrative of the current literature in technical communication by mapping the types of research questions found in books that address technical communication (p. 180). Through this analysis, she found that books in technical communication are concerned with the basic question, "How do texts (print, digital, multimedia; visual, verbal) and related communication practices mediate knowledge, values, and action in a variety of social and professional contexts" (p. 176). This question concerns several areas in technical communication, spanning disciplinarity, social change, pedagogy, and practices. Despite the variance in questions and topics covered in these texts, their relationships can be mapped onto a particular framework that shows interconnectivity. In other words, her approach helps to find the connections that lurk behind disparate research questions in the field's most common texts.

In this study, I apply and extend Rude's (2009) concept of mapping relevant relationships in technical communication research by focusing on a very particular subset of research in technical communication—design. Despite this narrower focus on a particular aspect of the existing research, technical communication research on design can be equally robust in terms of borrowing methodologies from diverse fields and also in aligning with research that stems from various design fields.

It can be expected that engagement with different types of artifacts of design yield different types of research questions. And these questions necessitate certain values and approaches for finding answers. I will provide a short illustration here using articles that focus on web and web 2.0 artifacts, respectively. Many of the articles that invoke design in their abstracts in regard to website design focus on cognitive approaches to design. While these articles are not necessarily driven

by design principles, guidelines are occasionally mentioned as important in the design of websites. For example, Albers (2009) provides a few design considerations to keep in mind when creating websites in order to assist users on their journey through a site. These include guidelines such as "People ignore difficult to understand information. If people can't understand the information or do not see how it is relevant, the information is disregarded even if they think it might be important" (p. 188) and "Location on the display is critical since top locations and larger text are more salient and mentally overweighted" (p. 189). Similarly, Henson (2005) notes the web design principles he kept in mind when designing a website for the Lincoln, IL, Chamber of Commerce: "[Gestalt] principles call for a designer to use visual features that achieve symmetry, enclose content, group similar elements and place them in close proximity, separate dissimilar elements, and provide consistency and figure-ground contrast" (p. 82) and "Vertical lines at the left and right sides of the page enclose content." (p. 84).

At the same time, while these articles mention the importance of adhering to standards and principles, researchers encourage technical communicators to move beyond them or to expand on them for particular users in specific contexts. For example, Youngblood (2013) states that technical communicators must keep usability standards in mind (p. 214), but that, at the same time, usability remains a "moving target" (p. 216) that must be balanced with the design skills that designers learn and contextualized to specific audiences (p. 218). Even the iconography and positioning of seemingly mundane elements of a webpage such as a menu bar, hyperlinks, and the main text take on greater significance in cross-cultural communicative contexts (St. Amant, 2005).

By contrast, in articles that focus on Web 2.0 artifacts, researchers very rarely talk about any cognitive design principles that guide them in their use and critique of these digital platforms. Rather, such articles tend to center on design in terms of interfaces, networks, and how their structures allow or preclude agency. Potts and Jones (2011), for example, map the affordances that social media applications such as Twitter, Brizzly, and Tweetback provide and foreclose through their respective designs. An important feature of design for the writers is how a technology's interface is linked to other human and nonhuman actors—"between tools and groups" which come together in the exchange of information (p. 342). Good design in these artifacts allows for Navigability, Discoverability, and Retrievability (Potts & Jones, 2011, pp. 354–355), but it is also invisible in that it links participants and messages with other communities while remaining unseen (Potts & Jones, 2011, p. 346). In essence, the best social media tools allow users the agency to connect with others in a way that hides the functions of the tool itself, making this connection seemingly instant and automatic. Similarly, Rawlins and Wilson (2014) create a

typology that categorizes data displays by the amount of agency that they provide for users to manipulate and engage with data. For example, the standard infographic may display information in a way that may be accessible for users to understand, but the designer remains solely responsible for the layout and information that is displayed. That is, the user of this information can only look at it from one perspective.

Yet, even when working with similar artifacts of design, researchers approach design from multiple perspectives. In articles that invoke design in their abstracts and that study the design of instructions and manuals, one can find studies of discourse that lean on user-centered design (Friess, 2010), cognitive approaches to wayfinding (Ganier, 2009), textual analyses of existing documents (Tebeaux, 2008; Willerton & Hereford, 2011; Longo, Weinert, & Fountain, 2007), and workplace interventions (Catanio & Catanio, 2010). In short, technical communication researchers study design through a multitude of avenues, most likely because each of their unique circumstances merits such diverse approaches. While these multiple perspectives and artifacts of study shed light on a variety of design issues, to outsiders, they may give the appearance of a lack of focus. To paraphrase Rude (2009), such patchwork of research might lead to charges of merely dabbling in design (p. 177).

The fact that *design* has been invoked so widely in our scholarship—as both something to be examined and as a way to create, for example—makes it necessary to develop a more comprehensive understanding of what we mean when we say that we study design. I would like to be clear here, however, that I am not seeking to consolidate these studies into comprehensive definitions of design that can be understood across contexts. Design will continue to be invoked, however, writers feel necessary for their own purposes. Indeed, in her content analysis of the differing definitions of information design used by leading authors and practitioners in the field, Herrera (2013) has shown the messiness of attempting to impose order on the numerous ways that design can be invoked. Moreover, definitions imply categories and categories don't necessarily always showcase each other's interconnectedness. That said, I do see value in showing how varied approaches to design can be theorized as integrated and thus part of a larger drive to understand ourselves as researchers of design.

As I will elaborate, a robust model that communicates our practices, values, and relationships in design could be of use when we speak to those outside (and even within) our own field about what it is we do when we research design in technical communication. That is, I extend Rude's (2009) efforts to create a "shared understanding" of research in our field in order to help us "recognize ourselves and describe ourselves to others" (p. 177). Specifically, I show how our studies of design, though diverse, function within a model of research that positions researchers as observers, critics, testers, creators, and consultants of design.

Method

To gain a comprehensive look at how researchers in technical communication and professional writing have discussed design, I searched through the abstracts from articles published in the *Journal of Technical Writing and Communication* (*JTWC*), the *Journal of Business and Technical Communication* (*JBTC*), and *Technical Communication Quarterly* (*TCQ*) between 1999 and 2013 and included them in this corpus if they included the word "design." Exploring how researchers have studied design necessitated first settling on what exactly was being/had been designed in these articles. I was mostly interested in exploring artifacts that could be found in industry settings—brochures, websites, Information Technology (IT) platforms and so forth. In this way, I hope to treat these artifacts as boundary objects which can, according to Star and Griesemer (1989), "live in multiple worlds . . . and have different identities in each" (p. 409) yet at the same time can connect different communities of practice (Wenger, 1998, p. 107). For example, researchers may approach IT artifacts in ways that both align with and deviate from the ways that practitioners do. Moreover, IT artifacts in industry settings are often also developed through collaborative efforts with stakeholders from different areas.

This means that of the 118 articles that were gathered through this method, 26 were removed because they focus on pedagogical or research designs, which may not necessarily have corollaries or a prominent foothold in a practitioner's setting. For example, Mackiewicz (2012) describes "the motivation, design, and preliminary outcomes of a business-writing prototype at Auburn University" (p. 229). Similarly, Meyerring (2005) focusses on the development of professional communication curricula that address the implications of globalization within the university and the workplace. In part, her article should "help teachers and program developers design and revise courses and programs that foster global literacies" (p. 468). Of these 26 articles,[1] 6 mention design in terms of experiment or research design. Thatcher (2001), for example, begins his abstract by noting that he "explores three ways to design US empirical methods to be more valid and ethical in cross-cultural studies" (p. 458). As with the texts that discuss course or instructional design, these articles were omitted because they do not discuss an artifact. That said, it is telling that writers in technical communication have spent much time within the last 15 years discussing design in terms of research studies and curricula.

While I do not have the space in this article to discuss the different types of artifacts that appear in the literature in complete depth, I do present a list of the most common types of artifacts of design that were gathered from within the data set in Figure 1. Table 1 provides a brief description of how each of these most common types of artifacts that were coded. My definition of an *artifact* is rather broad. I mostly leave the writers of these articles to define what qualifies
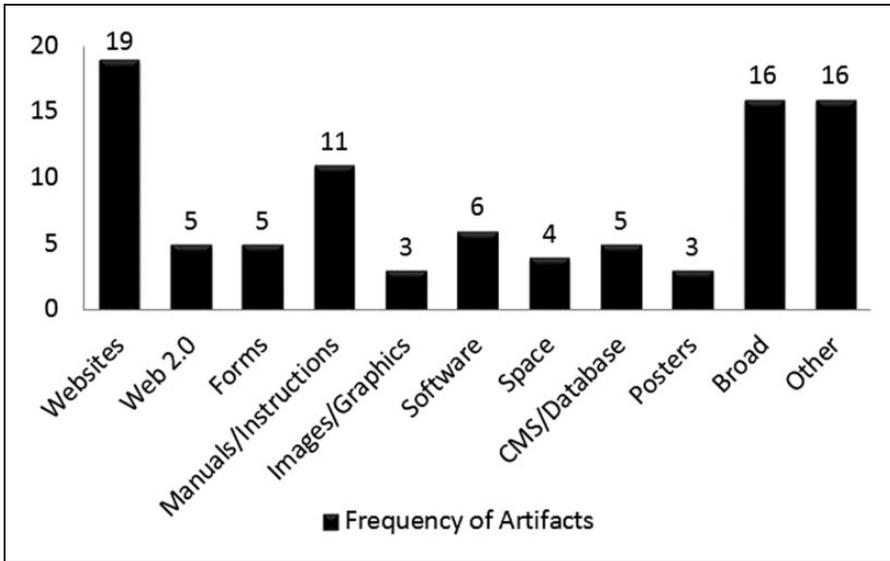
Figure 1. Frequency of artifacts.

as an artifact on their own terms based on their description. For example, Sun (2006) writes in her abstract:

> Current localization practices suffer from a narrow and static vision of culture resulting in usability problems for IT product and design. To address this problem, this article compares user localization efforts of mobile messaging technology in two different cultural contexts with a new methodology of cultural usability. It calls for expanding the scope of localization practices and linking user localization efforts to the IT product design cycle. (p. 457)

As Sun states, she explores mobile messaging technologies across cultural contexts. Design—in particular IT product design—is invoked via a study of text messaging platforms and technologies, which serve as an artifact worthy of examination in order to answer particular research questions. By artifact of design, I do not mean the affordances that lend to a design but rather that which is created. *Products* of design may serve as an alternate term. Once these types of artifacts were cemented over time, a similar approach was undertaken to determine how researchers described their positioning in regard to these artifacts (or in some instances, lack of artifacts). A description of the findings follows in the proceeding section.

While I do not rely on a pure, single method, parts of this study can be recognized as borrowing from grounded research because no preestablished

Table 1. Artifacts of Design in Technical Communication Research.

Artifact	Artifact description	Sample language of design
Websites	Digital online artifacts which may include a page of information or multiple pages linked together to produce a website. In both cases, information must be laid out appropriately for users to find. Larger discussions about purpose circulate around this type of artifact	"Websites are, essentially, visual media. That is, factors such as layout, design, and graphics often serve as either credibility markers individuals use to determine if a website merits consideration or as navigational items used to access information on a website. As a result, website designers must consider how visual factors can affect the user's perceptions of online information." St. Amant (2005, p. 73)
Web 2.0	Digital online artifacts that require multiple-user input in order to create collaborative and partici-patory webspaces and platforms	"[Delicious'] infrastructure allows individual Delicious users to cus-tomize and control their experience through the selection of one add-on over another until they have found an add-on that mediates the actions that best facilitate their work . . . Designers of these browser add-ons can accurately predict the bookmarking actions of individual users—bookmarking clearly takes place in a Web browser and not, for example, in a word processor or a page-design program." Stolley (2009, pp. 359–360)
Forms	Artifacts which require user infor-mation and confirmation. Forms may require extensive input (such as patient records) or may simply transmit information and require a signature from the user to communicate that the form has been read(as with Informed Consent Forms). These may also be paper-based forms or multi-modal in nature	"In its layout, the patient record is highly visually organized. Information to be collected by the optometry student is divided verti-cally into a series of framed sections . . . Within each of these framed sections, textual and visual cues are used to prompt the optometry students about what information they should collect from the patient." Varpio et al. (2007, pp. 353–354)
Content management systems and databases	Artifacts that uses online platform to collect data from users and store it for later use. Often this involves	"The present discussion will be most clear if I use a bird's-eye taxonomy that allows me to highlight the types of [Content Management Systems

Table 1. Continued

Artifact	Artifact description	Sample language of design
	working directly with different languages	(CMS)] that are the focus of this article: Web CMS and CMS." Clark (2007, p. 40)
Posters	Print-based artifacts that combine images and text in order to present information visually. Though instructions and manuals may also use these modes, posters may not necessarily instruct users on a process. Posters may, for instance, attempt to persuade users on the best qualities of a product for a variety of purposes	"Poster assignments afforded students the opportunity specifically to use elements of visual language, including images, shapes, symbols, colors, typography, and page layout." Lauer (2012, p. 176)
Software	Electronic program artifacts that require users to interact with some type of interface in order to be used. Like Instructions and Manuals, Software artifacts allow the user to complete a procedure or a task; however, software may complete a task for the user with the correct sequence of commands	"The [*Focus*] program generates two types of output. First, a general quantitative impression can be obtained of the number of problems detected per participant and the distribution of problems over the various problem categories. Second, and more importantly, the program yields a list of the problems detected by readers, which can be used as a guide to revise the document." de Jong and Lentz (2001, p. 391)
Instructions/manuals	Artifacts which instruct users on how to complete a task or to accomplish a procedure. These may be physical manuals or they may be embedded within software	"The study was presented as a pressure-cooker workshop, where participants were asked to boil potatoes. Prior to cooking, they had to perform seven tasks with the *aim* being to familiarize themselves with the appliance . . . . Three different versions of the documents [instructing participants how to use the pressure cooker to boil potatoes] were designed for this study and presented in A5 paper format." Ganier (2009, p. 404)
Images	Static artifacts which represent information graphically. These may be photographs, logos, or other visuals. Images are distinguished from Posters, though Posters may include images	"In order to gain a viewer's attention visuals must feature women's portraits in ways that attract notice and emphasize the power of the subjects and their achievements . . . A designer will give prominence to

(continued)

Table 1. Continued

Artifact	Artifact description	Sample language of design
		certain elements to assure that they attract the reader's attention."
		David (2001, p. 19)
Broad	No particular artifacts are mentioned, though discussions of values of design are clear.	". . . in stressing 'good figures,' semiotic theory is creating today's sex roles of images, as Burke and Lessing did more than a century ago."
		Ding (2000, pp. 37–38)
		". . . a pleasure-based model [of design] extends beyond just a concern for efficiency and cognition; it employs a holistic approach that concerns itself with a person's body, feelings, thoughts, social relationships, and values as well as the degree to which they can accomplish their goals."
		Williams (2010, p. 442)

categories existed prior to analyzing the data. Rather, the categories (both in terms of artifact types and roles that technical communication researchers have with design) emerged only after months of systematic analysis, coding, and recoding of a theoretical and homogeneous sampling—in this case, articles that refer specifically to *design* in their abstracts (Creswell, 1998, p. 118). For example, coding in this way required moving beyond the simple categorization of articles based on whether they referred to keyterms such as "document design" because I realized that the term document design was being invoked in service of different types of artifacts (websites, manuals, etc.). However, I depart from a grounded theory approach in that I do not seek to create a theory and confirm or disconfirm it through the creation of subsequent categories; nor do I form a conditional matrix that describes the conditions influencing the focus on these particular artifacts of design or the reason for these particular roles (as per Creswell, 1998, p. 57).

Here, my approach can also be seen to line up closely with Inductive Thematic Data Analysis, wherein an entire data set is analyzed for specific themes (Braun & Clarke, 2006, p. 81). These themes emerge only after a "careful reading and re-reading of the data" (Rice & Ezzy, 1999, p. 258). Samples of how articles were coded for the roles that technical communication researchers describe can be found in Table 2, which I describe in the following section. Additional aspects of the study can be identified as being closely related to meta-analysis in that patterns and relationships are being articulated from existing studies, though through nonstatistical means. The Online Appendix[2] combines all of this

information into one spreadsheet: the articles in the data set, the artifacts examined (when applicable), and the positions taken by researchers regarding design.[3]

Positioning the Role of Technical Communication in Designed Artifacts

Having highlighted some of the artifacts that appear in the technical communication literature on design, I turn to my main focus of this study: mapping how researchers discuss their roles in studying design through these artifacts. Mapping is certainly not new to professional writing and technical communication as it has been used to help trace out relevant relationships in the field. Most notably, Sullivan and Porter (1993) first mapped the curricular placement of the then-emerging professional writing programs (in terms of establishing research agendas and disciplinary majors) within the larger English departments in which they resided. Sullivan and Porter present numerous representations of these relationships arguing that "professional writing can exist as one of the separate-but-equal fields [under English at large]...or it can be subordinate to rhetoric/composition, sharing part of the space of advanced composition" (p. 396). Moreover, Peeples and Hart-Davidson (2012) extend this work by mapping professional writing's relationship with composition studies specifically, finding that in the 20 years since Sullivan and Porter's article, curricular geographies have shifted the placement of professional writing more toward the former conceptualization—one that treats professional writing as being separate yet equal to composition and rhetoric.

Though these studies look very broadly at the intricate relationships shared by English studies, composition and rhetoric, and professional writing, I focus particularly on the connections that exist between technical communication and design—a connection that is loosely hinted at in Sullivan and Porter (1993) but not fully explored (p. 410). In much the same way, in this section, I articulate a map that captures the complex ways in which technical communication researchers approach design.

Seemingly, technical communicators have differing relationships to design that can be represented in lateral and vertical ways. Technical communicators can work vertically (above, within, or below a design) and also laterally (before, during, and after something is designed). While most of these positions and roles may seem straightforward, I define them below in order to show the difference between the vertical and lateral positions. Because these two spatial paths are better described when they are placed on top of one another, I will refrain from providing examples of these positions until I discuss how they are integrated. That is, I cannot talk about vertical movement in a vacuum without also referring to the lateral movement that is also mapped to the role of the technical communicator.

Table 2. Roles of Technical Communication Researcher.

Description	Sample Language
Observing (Before/During and Below) The TC/TC researcher gathers information on how users interact with a particular artifact so that a similar one can be designed either by the TC or by a design team.	"If an instructor does not have access to a guest speaker who can bring a laptop with a screen reader, or if the class does not include a student who uses a screen reader and would voluntarily provide a demonstration, the next best option is video. Two particular videos can be helpful: one that introduces the range of accessibility issues and the impact of poor design and one that further and more dramatically illustrates the impact of poor design on users with visual impairments with a guided tour of a screen reader in use." Youngblood (2009, p. 219) "In our website design, three teams conducted independent surveys and interviews to gather information about the users and later shared this information with the other teams. By gathering information separately and then sharing findings, we established a better understanding of who our users were, what tasks they might need to perform on the website, and how they typically perform those tasks." Andrews et al. (2012, p. 127)
Testing (During/After and Below) The TC/TC researcher has a role to play in an artifact's design after it has been (or while it is being) designed. Research efforts go toward improving the usability of a product that is in the middle or final stages of production.	"When given a specific task to accomplish, instead of selecting the appropriate option in the tutor task menu, the users would usually navigate aimlessly around the system, hitting just about every link they could mouse over until they accidentally found a page that looked like it would allow them to complete the task they were attempting to fulfill. … Although it is still too early to tell if the new labeling structure has made the VCaP system more "usable," by semantically attaching meaning to the tutor task navigation menu we can already see a reduction in the amount of frustration tutors experience when they log into the system for the first time." Bacha (2012, pp. 257and 281)

(continued)

Table 2. Continued

Description	Sample Language
	"Among other things, students suggested communicating with users throughout the process, of starting usability efforts earlier and planning them more, of allowing for numerous stages of user testing, and of getting to know users better." Scott (2008, p. 393)
Critiquing (After and Above) The TC/TC researcher analyzes the design of an artifact or analyzes the interactions users have with an artifact. Unlike with Observing (Above), the TC/TC researcher sustain an engagement with a particular artifact after it has been released for public use. Unlike with Testing, however, this analysis may not lead to a direct change in the artifact, but it may push forward ideas for broader usability practices.	"The research involved both a textual analysis component (involving four specific pieces of documentation) and a primary research component of user usability issues.... [The findings] highlight the complex legal, political, and sociocultural issues involved in the transfer, importation, and exportation of technology and information products central to which are manufacturers, distributors, regulatory officials, communicators, and the interagency system of regulatory procedures and channels involved in controlling drug distribution and usage." Agboka (2013, pp. 31 and 40) "In this article I analyze Nightingale's use of visual and verbal rhetoric in the design and presentation of her rose diagrams. This analysis is important not only because it highlights a woman's role in the early development of information design, but also because it examines all three of the rose diagrams that appeared in the annex to her report on poor sanitary conditions in military hospitals on the front during the Crimean War." Brasseur (2005, p. 161)
Observing (Before and Above) The TC/TC researcher posits on design in general. While he or she cites examples of artifacts and observes how people	[Articles are identified only through *lack* of language that aligns them with an artifact.]

Table 2. Continued

Description	Sample Language
use them, he or she does not sustain an engagement with a particular artifact to Critique it. The focus is on discussing design broadly to influence the design of future artifacts.	
Creating (Within and During) The TC/TC researcher is involved in the making of an artifact.	"The service-learning projects in these two classes required students to work in small group-s—this time five groups of four and one group of five—to produce recruitment, orientation, and training texts needed by the Planning Council." Scott (2008, p. 387)
	"Because of our distance from patients, we wanted to develop the tools using plain language whenever possible. We had also already decided that we wanted the entire multimedia presentation to be as close to 5 minutes as possible." Wright (2012, p. 156)
Consulting (Outside) The TC/TC researcher studies design after or while an artifact is created. However, she or he analyzes the ways in which a design is presented, described, or explained by designers of the artifact, not the design itself.	"At the end of the semester, each team prepared and completed a final presentation for the client, faculty advisors, and peers that detailed their design solution. Per the syllabus, the purpose of the design presentation was to describe the final design solution to a technically knowledgeable audience unfamiliar with the design." Dannels (2009, p. 406)

Note: TC/TC = technical communicator/ technical communication.

## The Positions of the Technical Communication Researcher

Vertical positioning. The positioning of technical communication researcher within the process of an artifact's design can look different depending on how and whether the researcher interacts with the artifact in question (Figure 2). Researchers can study artifacts *under* its design, meaning that their work directly serves as a basis for the design decisions that go into the creation of an artifact. In the articles that make up this data set on design, researchers also seem to work *above* a design, theorizing the role of technology and how an artifact should function. Finally, technical communication researchers sometimes also work *within* a design, being directly responsible for an artifact's creation. This is seen more often in literacy-based artifacts such as website content and manuals, but as the frequency of artifacts shows, researchers have also taken charge of creating or reappropriating visually based artifacts such as posters, images, and website layouts and graphics. These different roles do not necessarily function independently of one another. A technical communicator may posit on the usability of good software design principles (above), observe how users engage with similar software that already exists (below), and create the software itself (within). However, these roles look different depending on *where* in the process the technical communicator plays a part.

Lateral positioning. The technical communication researcher may also study an artifact at various points of its design process (Figure 3). While this process may be iterative, there is an amorphous sense of an artifact's beginning, middle, and end. Most of these phases seem self-explanatory. A technical communication researcher, for example, may study an artifact *before* it is created, or *during* its design phase, or *after* it has been designed in order to revise it and make it more usable. At the same time, the researcher may play a role *outside* of the design process itself and may give feedback to designers on their presentations regarding their designs (see, e.g., Galbraith, McKinney, DeNoble, & Ehrlich, 2014; Dannels, 2009; or Gaffney, 2014).

   Again, much like vertical positioning, these lateral positions may be occupied at various points by one individual. A technical communication researcher may conduct observations before the artifact is designed, provide input on a current draft of a design, conduct user testing with a rough draft of a design, and provide feedback on designer's descriptions of the artifact designed all for the same project.

The Roles of the Technical Communicator

When these positions interact and are mapped on top of each other, more complex roles become evident. Figure 4 shows how we can begin to map these multiple roles across the life span of a project and in terms of the contact that he or she has with the artifact being designed. Table 2 presents a different version
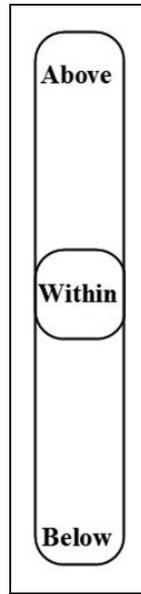
Figure 2. Vertical positions.

of this map—one that includes descriptions and sample language overlaid on each role.

Observing (before/during and below). Researchers may be brought in to assess how individuals interact with an artifact before a new or similar one is devised. This takes the form of considering user needs at the outset of a project by observing user's experience and cultural needs. Susan Youngblood's (2013) discussion of applying web accessibility principles is a prominent example here. With the intention of teaching her students strategies for developing accessible websites for users with disabilities, Youngblood introduces them to readings on disability but also has them watch videos that feature individuals in need of accessible sites (p. 219). However, for instructors hoping to teach students about designing accessible sites, Youngblood recommends the videos second only to a guest speaker "who can bring a laptop with a screen reader" to provide a demonstration. The thought here is that students will see how individuals with disabilities work with technology as a starting point so that they keep access and usability in mind as they design.

   In this specific scenario, students take what they learn about usability and directly apply it to the code that they are manipulating, but the technical communicator does not necessarily have to be the designer in order to observe. Sometimes, particularly with technical or technological systems, the technical
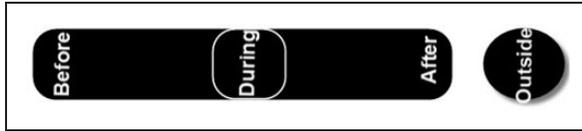
Figure 3. Lateral positions.
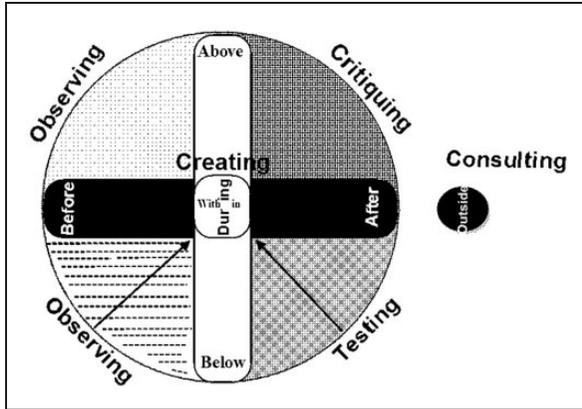
Figure 4. Roles of the technical communication researcher.

communicator serves as part of a team that is responsible for an entire project's research, design, and development. For example, Kim et al.'s (2008) development of a handheld device that would display informed consent information in a usable way required a multidisciplinary team composed of "researchers and practitioners in technical communication, health communication, design, psychology, and medicine" (p. 336). Although Kim et al. discuss their roles in obtaining user data and testing the application, very little is mentioned in terms of the actual creation of the application itself.

This contrasts with Wright (2012), who also discusses his students' design (or redesign rather) of digital informed consent forms and who explicitly states that such production can be implemented and instituted by tech writers or tech writing students. One of his suggestions is to make sure that students who undertake the redesign of materials have a background in layout and design software and video editing software (p. 163). Youngblood's and Wright's respective students move from observing to creating while Kim et al.'s (2008) work remains below the design, undergirding it from the observation phase to testing phase. I do not mean to imply that one type of role with an artifact is more desirable or better—merely that researchers can engage differently with similar artifacts throughout the design process and that it is worth exploring these different relationships.

Testing (during/after and below). For technical communication researchers who study an artifact's design after it has been (or while it is being) designed, the bulk of their efforts go toward improving the usability of a product that is in the middle or final stages of production and make claims about findings. The researcher plays a role when a product has been designed—or when there is a prototype to test.

Bacha (2012) explains such a role in his discussion of the user testing conducted for the Virtual Consultant at Purdue—"an asynchronous online tutorial system" used by the writing lab consultants to respond to student papers (p. 258). Once the first round of user testing had been conducted and the artifact had been developed, a second round of user testing revealed that tutors could not expertly complete the necessary tasks to access and respond to papers. Bacha suggests that technical communicators switch from language that prioritizes the system to language that more accurately captures the interaction that users have with systems. Here, for example, this would mean using such labels as "View Saved Tutorials" or "View Your Past Tutorials" instead of simply "queue" which, as Bacha points out, "does not tell the tutor anything about the status of the information they will find when they click the link" (p. 260). Bacha's changes to this artifact hit on many of the values of *good design* (findability, user-centered language, and leading to action) and they stem from a sustained engagement with the artifact, testing one of its iterations.

Few articles discuss this testing work in isolation of other roles, however. To illustrate, Andrews et al. (2012) discuss the diffused usability testing that they conducted in order to build a website with information about an annual seminar. They begin in the role of observers by conducting surveys and interviews in order to gain a better understanding of who their user groups are and the tasks that they normally complete on similar websites (p. 127). They then create numerous paper prototypes and conduct testing in order to determine how to redesign their artifact.

Interestingly, discussions of the testing role also focus on testing an artifact after it has been designed, not necessarily to redesign the artifact itself but to help us learn more about how these types of artifacts should be designed, hence moving the technical communicator from testing to critiquing. As I explain in the following section, critiquing also involves the *testing* of artifacts, but critiquing relies on minimal research protocols and often involves mostly *self-testing* an artifact. In situations where a technical communicator moves from a testing role to a critiquing role, the technical communicator sets up a testing protocol but the findings derived from it don't necessarily go back to improve an artifact's usability in any direct way.

For example, Ganier[3] (2009) and Albers (2011) each set out to test users' interaction with a specific artifact (crock pot instructions and the military command and control [C2] system, respectively), but they do so not necessarily with the aim of redesigning these specific instructional materials or simulation

systems. The ultimate goal of their studies is portability, each making the argument that the results are applicable to other similar types of artifacts, which shifts Ganier and Albers into a critiquing role.

Regardless of how researchers move toward or away from the testing role, occupying this space for whatever duration of time during or after an artifact's design or prototype commonly involves paying attention to the relationship between user and artifact. It means being attuned to bodily engagement or sustained cognitive interaction with what someone has created. Often, in situations where the technical communicator's work impacts the design itself, this role serves as the final opportunity to witness how an artifact will meet the needs of a public.

Critiquing (after and above). Technical communication researchers may also discuss their own experience with an artifact in order to develop principles of design. As stated earlier, these principles do not necessarily lead to any direct changes in the redesign of any specific artifact but may help to push the conversation forward in terms of what good design should do or look like.

Potts and Jones (2011), for example, conduct their analysis of social media platforms in part to "better understand how such technologies help or hinder participants who use them" (p. 356), noting that both academic and industry experts must "make greater contributions toward designing more contextually aware experiences for participants" (p. 356). Though not directly associated with the production or redesign of these platforms, Potts and Jones nevertheless see their Actor Network approach to social media applications as important to the conversations that occur when discussing the design process.

Writers of comparative and historical studies also take this same role. Elizabeth Tebeaux (1999), for instance, examines the Mexican cultural practices in writing letters, noting that U.S. businesses frequently have to communicate with Mexican or Mexican American partners who value courtesy, dignity, and tact in written exchanges, to name a few characteristics from her findings (p. 78). Again, Tebeaux cannot directly influence the design of these letters, but she does hope that her analysis will provide "a basic understanding of these differences [between Mexican and American cultural values in written communication]" in order to "*aid in the development* of effective written documents" (emphasis mine, p. 80).

Not surprisingly, given that the sources for this data set are derived from academic articles, the vast majority of the articles present or advocate a Critiquing role for the technical communicator. However, these findings somewhat conflict with Rude's (2009) point that "much of the research on design . . . is done by people who are aligned more with practice than academics" (p. 201). Or perhaps it may make more sense to say that in addition to the writers who hold primary affiliations in nonacademic workplaces, researchers with academic positions are well represented in this data set, perhaps signaling that discourse of design may be opening up to academic researchers.

Observing (before and above). Much like articles operating above and after an artifact is designed (critiquing), articles that observe from above and before an artifact is designed tend to posit on design in general prior to (or independent of) any artifacts' production. However, because they do not look at any artifact in particular, discussions of design remain broad. Most of the articles found in the category I define as Broad in Table 1 reside here. While they cite examples of artifacts and observe how people use them, they do not sustain an engagement with a particular artifact to critique it; nor do they record their observations in order to impact the design of a particular artifact. Rather, the focus is on moving forth the discussion regarding design as a whole in order to help with the design of *future* artifacts.

In this role, technical communication researchers (re)articulating the work of the technical communicator and technical communication researcher around design. Not surprisingly, rather than providing a list of prescriptive tenets of good design, they problematize common or long-held beliefs about the role of the technical communicator in regard to design in order to raise awareness of hidden issues. Space and time constraints prohibit me from engaging in a long discussion of each of these articles but when put into conversation with one another, broader topics with implications for technical communication and design become evident in these articles; for example, the place of functionality in document design looks very different from Ding's (2000) frame of reference than from Williams's (2010). The former traces the emphasis on aesthetics to patriarchal values, which associate beautifully designed documents with aesthetically pleasing (women's) bodies. These associations remain embedded in the work of technical communicators today through implicit values and language (e.g., widow control). He concludes that technical communicators should move beyond document aesthetics for their own sake and instead focus on the utility of a document's design. In essence, there should not be a single standard for external beauty but should rather be connected to its main purpose.

Williams, however, pushes back against technical communication's focus on functionality and advocates for a design that "employs a holistic approach that concerns itself with a person's body, feelings, thoughts, social relations, and values . . ." (p. 442). When Ding writes that "a page layout must be functional to be attractive," the implication is that good design should evoke clarity. But as Williams notes, while clarity is perhaps the main concern of the designer, it may ignore the user holistically who interacts with the artifact not only cognitively but also emotionally and culturally. Both articles attempt to move design away from the exclusive world of the designer and his or her edicts; but where Ding shifts the focus from the communicator to the text, Williams moves it from the communicator to the audience.

Creating (within and during). This role remains slippery in the literature. As mentioned earlier, creating occurs when the researcher is involved within an artifact

and whose role requires him or her to build, design, or make an artifact. That is, regardless of whether the researcher observes or tests, he or she is also responsible for making the necessary changes to an artifact when needed. Not surprisingly, most of the artifacts that are created by technical communicators themselves require alphabetic literacy as a foundation, for example, proposals, brochures, and manuals (Johnson, 2006; Friess, 2011; and Scott, 2008, showcase a few instances). Perhaps, because of websites' transmission of alphabet text and because they allow for the creation and exchange of text with little need for printing materials and circulation services, they are most commonly presented not only as artifacts worthy of study by technical communicators but also as artifacts that technical communicators can (and sometimes should) actually create. However, as the Online Appendix suggests, technical communication researchers can also create artifacts that require other types of literacy—for example, visual literacy (Lauer & Sanchez, 2011; Salinas, 2002).

In some cases, researchers may create more technical artifacts that have a textual literacy component embedded, such as de Jong and Lentz (2001), whose designed software aids in the collection of user feedback for technical communicators to use in their testing activities. More often researchers may design textual documentation artifacts that provide support for a mechanical or technical artifact, but admittedly, it can be difficult to know where one ends and the other begins. In fact, Smart and Whiting (2002) argue that such resources be integrated (at least in the context of software artifacts), so that users can gain the help that they need as they are learning to use programs.

Indeed, the role and responsibility for creating artifacts can be a contentious and political one. For instance, when Sapienza (2002) discusses the proliferation of XML language that has afforded the creation of systems that manage data and content, he notes that technical communicators need to become more involved in the process of learning and designing with XML, primarily because of the rhetorical skills necessary in order to effectively create systems that can anticipate matters of genre, audience, and *kairos* (p. 156; see also Andersen, 2014, for a more recent argument). This shift in role will necessitate that technical communicators expand their knowledgebase and become more familiar and proficient with concepts such as "nodes, trees, objects, abstractions, classes, inheritance, and recusion" (p. 166). That said, proficiency with technological tools does not necessarily guarantee that technical communicators will be allowed to slip into this role. He writes

> The slippery issue concerning schemas and DTDs [Document Type Definitions] is what exactly should constitute a valid document structure, grammar, and syntax, and who should develop it? This latter question is not simply a bureaucratic issue but a political one, because in effect the person developing a DTD will be asked to write a new linguistic context, and perhaps a new language, that an entire organization...must be willing to adopt...In short, the technical

communicator designing a DTD acquires a position of significant power, potentially shaping how the organization structures knowledge about products and processes. (p. 161)

While we may move easily about in the creation of brochures and websites, it could be that the technical communicator will have to fight for the ability to design other artifacts in highly regulated realms. However, something that at times remains in need of articulation is the relationship between technical communicators (or researchers) and designers when it comes to creating artifacts. Certainly, we have seen that researchers have positioned themselves within a design during its production in a way almost qualifying us as de facto designers of certain objects. But to what extent are designers also charged with tasks suitable for technical communicators by default? In her description, Friess (2010) notes how

Prior to my investigation, a design department at a highly selective, research-oriented private university entered into a contract with the United States Postal Service (USPS). This contract stipulated that the design department would reenvision several important documents for the USPS, including its core procedural and legal document, the more than 1,000-paged Domestic Mail Manual (DMM), as well as several smaller documents aimed at particular audiences within certain market segments (e.g., small businesses and nonprofit organizations). The goal of redesigning these smaller documents was to rebuild internal and external confidence in the USPS after the anthrax threats in the fall of 2001. The goal of redesigning the DMM was to make it easier for postal employees and large-volume mailing customers to locate specific information quickly and accurately. (p. 408)

In this example, Friess refers to the team as designers, yet they have a very rhetorical task to complete. We must therefore consider whether successful attention to usability, cognitive layout, ethical representation of groups, or any of the other values that we have teased out in the literature make these designers technical communicators in that regard.

Likewise, notice how Salvo et al. (2010) collapse designer and technical communicator into the same role. Or rather, they see the responsibilities of both tied together within the same network, sharing the responsibilities of listening to both human and nonhuman agents. Note the (I believe) intentional slippage from technical communicator to designer when they ask, "How does a *technical communicator* know how to articulate voices from a project like Morgantown's PRT [Personal Rapid Transit], where, until only a few years ago, different actors in the network held radically different beliefs about the system?" and then respond with "the *designer* must look at the 'whole cloth' of the past project in order to understand the voice of the chora" (emphasis mine 251–252). In essence, it becomes murkier to know where the role of the designer ends and where the

role of the technical communicator and even the technical communication researcher begins when dealing with complex systems. The three roles may be lumped into one, hopefully with the understanding of and adherence to usability practices. At the same time, however, we must be mindful of Carliner's discussion of the Hi Tech Museum's designers, who seemingly conducted their own "testing" but were ultimately unable to accurately read their users' cues in a way that made their spaces any more usable, as we would expect a technical communicator would.

But even if we were to tease out the designer from the technical communicator in these certain instances, the process of creating is not and should not be seen as one in which experts vie for control of a design. There are also the users to take into account. Certainly, many studies observe, test, or consider users in their discussions of design, but Bellwoar (2012), who traces how Meagan, a 28-year-old woman trying to get pregnant, uses unsanctioned texts and artifacts in order to "understand, regulate, and control her body" (p. 335), emphasizes that users should be seen as "co-constructors and co-designers of texts" (p. 343). To illustrate, when Meagan developed colitis and other complications due to her pregnancy, she relied on charts and diagrams of the human digestive tract in order to teach herself technical terms that would help her better communicate what she was feeling to doctors. In that regard, instances such as these show that Meagan broke from the accepted role of a passive patient and reappropriated the extant designs to meet her own needs (p. 343). Similar arguments about the role of user as designer can also be traced in Rawlins and Wilson (2014) and Salinas (2002).

Consulting (outside). Several studies also examine the presentation or communication of designers or design students. For example, Artemeva and Freedman (2001) use genre theory and activity theory to study how "tension, contradiction, and dissonance" emerge in engineering and software design firms (p. 164). Similarly, Dannels (2009) explores the genre of design presentations, wherein students presented "on their design of a new processing technique for nutritional beverages" (p. 400). In these scenarios—and ones similar that fall into this role—the artifact in question (if one is mentioned) has already been designed or is in the process of being designed, but the technical communication researcher acts as a consultant for larger disciplinary or organizational communication issues. Of course, because any recommendations or illuminations in workplace or classroom culture may have an impact on the design work that takes place within these settings, we cannot say that researchers who study design discourse have absolutely no influence on an artifact, only that their concerns are on other matters only loosely connected to design.

Caveats and Limitations

Before concluding, several key points should be considered here. Regarding the creation of the data set, centering in on only those articles that explicitly used the

word *design* in their abstract may have disqualified other worthy voices from being included. I am aware that much of technical communication as a whole deals with various facets of design. Indeed, technical communication has long involved, in part, the creation and exchange of instructional delivery materials for using tools (Connors, 1982, p. 329), so one could certainly make the case for the inclusion of similar words such as "create," "build," or "make." However, focusing specifically on articles where *design* as a term was important enough to be mentioned in the abstract created a systematized way for including and excluding articles from the original sources of data.

Also, we must remember that these results are gathered from a review of the literature that exists in a very specific set of journals. As Greenland and O'Rourke note, "no meta-analysis can compensate for the inherent limits of non-experimental data" (p. 654). As such, opportunity for further research into the artifacts of design and the roles that technical communicators play within design exists through more direct interaction via research instruments such as surveys, interviews, and focus groups.

On a related note, this review has only focused on the roles and artifacts of technical communication researchers; the next step in painting a more complete picture of design in technical communication would be to conduct an analysis of the artifacts and roles that are relevant to the work of practitioners and explore how the two converge and diverge. As Kimball (2013) has noted, practitioners can sometimes hold differing values of design from their "ivory tower" counterparts when it comes to visual design and design principles (p. 35). Given the expansiveness of the artifacts with which researchers interact and the roles they play with said artifacts, it would be beneficial to map out a similar model for practitioners to gain a fuller sense of what artifacts are coming to be seen as meriting attention in the field at large.

Implications, Discussion, and Conclusion

Technical communication researchers study design artifacts from numerous positions and through various relationships with artifacts. They can posit on design before any artifact is created, observe how similar designs are used, test prototypes, critique designs, create an artifact, or consult on communicating design effectively—and often, researchers assume more than one of these roles. Because technical communicators can work with subject matter experts in a wide array of fields on a range of projects (Society for Technical Communication, n.d.), it makes sense that researchers would choose to engage with a number of artifacts in their discussion of design. We can see how the literature is shaped by these disparate fields through the variety of epistemologies and methodologies that ground the work of the studies in this corpus.

To answer research questions, researchers not only investigate a plethora of artifacts but also they draw on numerous theories to guide their research, such as

cognitive studies, actor-network, localization theories, and genre theory, to name a few. The implication here is that each one of these disparate fields brings with it its own set of epistemologies and research questions that shapes how researchers think about their research approaches. Overlapping approaches to design that stem from an array of other fields make it difficult to find a single method for conducting research in technical communication. An integrated model helps to show how these approaches might interconnect. By moving beyond individual methods and methodologies and fields of study, we can see the ways that technical communication research engages in knowledge-making at all points of the development of artifacts, regardless of the stances taken by individual researchers.

This study has made certain assumptions more concrete. For example, technical communicators' main design artifact of study in the outset of the 21st century has been the website. At the same time, other less-often thought of artifacts of design are becoming available for study (such as spaces and software) as the role of the technical communicator has spread. Additionally, while Gunter Kress's (1999) assertion that design—and not critique—should play a larger role in the 21st century, many technical communication researchers still reside within the role of Critiquing regardless of the artifacts that they are analyzing. However, as I have discussed, technical communicators also inhabit numerous other roles in their study of design artifacts—often simultaneously (see the Online Appendix). Still, it should be noted that researchers are, in fact, placing themselves into the role of the Creating artifacts when they conduct research. While websites are certainly represented in force, researchers also create brochures, videos, software, and databases.

Taken together, having looked at the different types of artifacts that we consider when we invoke the term design in our research and having mapped the different relationships that are conveyed (implicitly or explicitly) in this body of literature, we are reminded of Blakeslee's (2009) point that "we use so many different methods for our research and we define ourselves so broadly" (p. 146). However, I don't see this as being necessarily a negative development. The model I put forth is not meant to necessarily impose order on the variety of approaches to studying design as much as it is meant to showcase the multiplicity of voices and experiences that researchers have brought to design. That is, I articulate the relationships that we bring into design and how each role highlights a unique engagement with an artifact. What one studies from an Observing standpoint can be just as thought-provoking and worthy of exploration as someone who Tests. As design becomes a commonly expected competency for technical communicators, researchers in the field will have to develop multifaceted ways of studying the subject of design.

That means, as we have already seen, adopting and adapting to multiple roles in our study of design. Sullivan and Porter (1997) use the analogy of watching a basketball game to showcase how different roles yield different types of data.

One's role as a fan sitting in the seats yields different information from that obtained through the role of a camera operator from "the crow's nest"—each set of data "encourage and suppress story lines we may spin to recount and explain the game" (pp. 6–7). The same is true for our research of design but it has been difficult to realize how we have all been positioned within the same arena, connected to one another as researchers. What I hope this model does is make it easier to develop an intentionality about moving from one point of engagement to another in order to develop a fuller comprehension of design. In the end, a rich tapestry of methodologies and epistemologies that takes all of these viewpoints into account can help us move past the patchwork of the field and see the interconnectedness of what brings researchers to the field. While it is true that technical communication borrows from different fields, prominent patterns and values can emerge when we map out the seemingly disparate research topics and artifacts that are brought in to the research of the field.

Moving forward, this model may help us articulate how we talk about the plethora of our interactions with artifacts in the research that we conduct, and it can also provide our students with a method of seeing how their experiences line up with what employers look for. Recently, Lauer, Brumberger, and Hannah (2015) noted that professional writing majors have to sell the skills that they develop in the major as professional experience when applying for a professional writing job. If a job requires "experience with design," it may help students to not simply state that they have "redesigned" a website, but to clearly state what roles they occupied in the redesign process to provide a more robust description of their skills. They may have, for example, begun by critiquing a technology or artifact, then proceeded to design a prototype, and then observed several users' engagement with that prototype. As each role requires different skills and level of engagement with artifacts, it is important that students be able to articulate fully their engagement with design—particularly as the field comes to embrace a wider array of artifact types which may fall outside the more "standard" instructions or forms.

Acknowledgments

Declaration of Conflicting Interests

Funding

Notes

1. Richard Johnson-Sheehan and Lawrence Morgan's (2008) abstract in "Darwin's Dilemma: Science in the Public Forum" makes reference to "creationism and intelligent design" (p. 53). There was no way to categorize this use of design, given the initial patterns that emerged so it was also included as 1 of the 26 articles that was eliminated.
2. Note that the Online Appendix can be viewed at http://bit.ly/1WugWJn on the author's personal webspace: fernandosanchez.org or by contacting the author directly.
3. Curiously, most of the research on Instructions/Manuals use empirical data in order to critique.

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