9. The Rhetoric, Science, and Technology of 21st Century Collaboration

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Abstract: We contend that collaboration is an imperative disciplinary assumption in technical and professional communication (TPC). Theorists, researchers, and practitioners grapple with ever-changing modes and models for collaborative work in academia, industry, and with communities. Technical and professional communicators today must be prepared to collaborate with engineers, subject matter experts, and programmers; they must be adept at using collaborative software and working with global virtual teams. The purpose of this chapter is to synthesize the rhetoric, science, and technology of collaboration to consolidate a guiding framework for understanding, teaching, and practicing TPC collaboration in the 21st century and beyond. This unified framework provides guidance from which to structure one's own collaboration and the collaborative projects we assign throughout our curriculum. We discuss collaborative software and team communication platforms and share example projects for preparing students for collaborative and global workplaces.

Keywords: collaboration, rhetoric, technology, platforms, global virtual teams

Key Takeaways:

- Collaboration across local and global contexts is an imperative disciplinary assumption in technical and professional communication (TPC).
- TPC instructors must prepare students for the collaborative frameworks and tools that practitioners use, including team management platforms, online repositories, and social media in support of local and global virtual teamwork.
- TPC students need experience in collaborating with clients, gathering customer feedback, and working as part of content development teams.

As an ongoing topic in our field, collaboration is multifaceted. We are invested in studying the rhetoric of collaboration, exploring the socio-cultural and social

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scientific factors influencing collaboration practices, and keeping our collective fingers on the pulse of collaboration technologies. However, we have yet to create a guiding framework for collaboration specific to technical and professional communication (TPC) that integrates these multiple dimensions of collaboration. Given the criticality of collaboration, the purpose of this chapter is to synthesize the rhetoric, science, and technology of collaboration to consolidate a guiding framework for understanding, teaching, and practicing TPC collaboration in the 21st century and beyond (see Figure 9.1). This unified framework provides guidance from which to structure one's own collaboration and the collaborative projects we assign throughout our curriculum.[2]

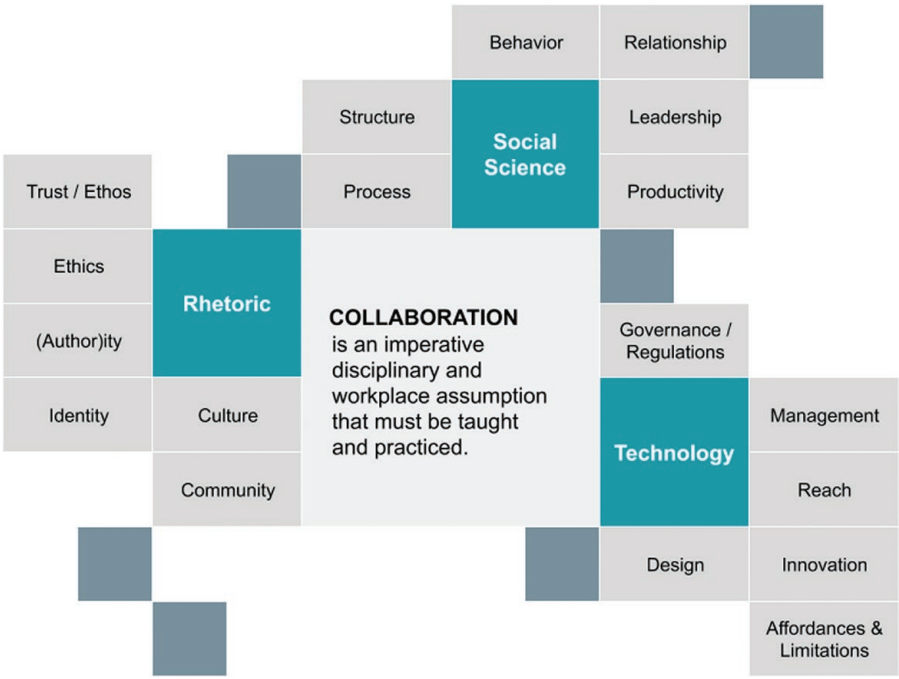

Figure 9.1. 21st century collaboration framework.

Our method in this chapter is focused literature review and constructivist theory building (Mills et al., 2006). We subscribe to constructivism as the epistemology for our study as it is congruent with our values and purpose. Knowing that no one project can truly encompass the magnitude of collaboration as a theory as well as practice, we do not attempt to infer a singular definition for collaboration. However, given the aforementioned exigence, we are motivated to construct a consolidated framework based on existing threads of scholarly discus-

2. Duin and Pedersen, in *Writing Futures: Collaborative, Algorithmic, Autonomous* (forthcoming), also discuss the socio-rhetorical roots in collaboration theories and the science of collaboration as evidenced in NSF and NIH publications.

sions and exemplary cases. A constructivist theory building methodology allows for co-construction of meaning between us as authors, the participants in studies we feature, and the literature we reference. Our co-constructed framework does not assume objectivity but instead acknowledges the social, cultural, and structural contexts within which our findings emerge.

Considering these contexts, in co-authoring this chapter, we demonstrate cross-generational, cross-disciplinary, and cross-cultural collaboration. Ann Hill Duin is a U.S. writing studies professor from the University of Minnesota with 30+ years of research on collaboration and shared leadership. Originating from Malaysia, Jason Tham is an assistant professor at Texas Tech, with his research positioned at the intersections of rhetoric, communication design, and emerging technologies. Isabel Pedersen, Canada Research Chair in Digital Life, Media, and Culture, is a professor at The University of Ontario Institute of Technology, where she studies digital life and transmedia cultures and leads the internationally known archive, the Fabric of Digital Life, discussed later in this chapter.

We begin with definitions of collaboration, exploring the explicit and implicit messages about collaboration and critiquing the romantic notion of "sole" authorship. We discuss how "successful" collaboration is defined in TPC and the models of collaboration that have most influenced our field. We then explore the effect of collaboration on the traditional rhetor-audience relationship, with emphasis on dialectic as invention, discovery at the intersection of collaborative work, and the ethics and ethos of co-authorship and collaboration. We move next to science, highlighting the increased focus on team science and what makes a scientific team effective. We conclude by discussing technology, emphasizing our need to understand and deploy collaborative software and team communication platforms with our students, sharing example projects for preparing students for collaborative and global workplaces.

Tracing the Socio-Rhetorical Roots in Collaboration Theories

It is well established that technical communicators are expected to work in coordination, cooperation, and collaboration with content experts, designers, and developers to build products and test processes. Isabelle Thompson (2001) observes that "collaboration as a research issue and as practice seems firmly rooted in technical communication as a discipline" (p. 167). Over the last three decades, research on collaboration has generated a body of scholarship with broad conceptions of collaborative writing, group interactions, and team-based learning (e.g., Bruffee, 1984, 1998; Ede & Lunsford, 1990, 2001; Jones, 2007). Technical communication scholars borrow collaboration theories from rhetoric and composition scholars who have studied collaboration at the intersection of collaborative writing and learning. Kenneth Bruffee's (1984) influential scholarship emphasizes the useful-

ness of conversation and collaborative learning in the classroom. William Duffy (2014), in his review of the decades of scholarship on collaboration, notes that Bruffee's "conversational imperative" sets the stage for what is known largely as the social constructivist epistemology, or the "social turn" in our larger discipline (p. 417).

The social turn has served as a lasting lens within which rhetoricians theorize collaborative efforts. Some challenged the rigidity of style and value that views scholarly work (Sullivan, 1994), while others began to pay attention to the influence of cultural, emotional, and gender factors on rhetoric (Bleich, 1995). Kathleen Blake Yancey and Michael Spooner (1998), in echoing Charlotte Thrall's (1992) argument that "all writing is inherently collaborative" (p. 79), reflected on the impact of collaboration on the writer's sense of self. These pioneering works show that collaboration changes the traditional rhetor-audience relationship. David Frank and Michelle Bolduc (2010) demonstrate this notion through the examination of Lucie Olbrechts-Tyteca's collaboration with Chaim Perelman in their field-defining magnum opus, *The New Rhetoric: A Treatise on Argumentation* (1958/1969). The Perelman/Olbrechts-Tyteca partnership not only produced a groundbreaking audience theory, but also revealed the complexity (or blurred lines) in scholarship collaboration in terms of the author/rhetor's agency and relationships that "defy rigid classifications and proscribed roles" from the perspective of the audience (Frank & Bolduc, 2010, p. 160).

Of note is the emphasis on dialectic as invention in the body of scholarship that Lisa Ede and Andrea Lunsford (1984, 1985, 1990, 2001, 2009; Lunsford & Ede, 2011) have co-created. While their early research showed the focus on organizational patterns (hierarchical structure) in collaborative writing, Ede and Lunsford (1990) invoked a "dialogic" collaboration, which focuses on the dialectical tensions in the collaboration process. The dialogic approach is concerned with roles and process rather than the end product (Qualley & Chiseri-Strater, 1994). Likely building on Bruffee's conversation paradigm, Lunsford and Ede (1990) continued to explore how collaboration opens our disciplinary hearing of a "new key" that has been struck "clearly and repeatedly by many of the women and a few men [they] have mentioned, but which has not often been heard—by our professional organizations, by our institutions, by the culture within which we are all so deeply inscribed" (p. 240). Lunsford and Ede's work has inspired scholars to focus on gender and gender-related conflict or differences in collaboration (Blair & Nickoson, 2018; Burnett & Ewald, 1994; Fredlund, 2016; Karach & Roach, 1992; Lay, 1989; Monk et al., 2003; Morgan, 1994). Moreover, Bruce McComiskey (2015) offers a historic overview of the function of dialectic in its relationship to invention as a means to engage writing students who are learning about argumentation. In combination with invention, dialectic becomes the basis for a heuristic approach to teaching that helps avoid predetermined outcomes for writing.

Another important rhetorical investigation into the impact of collaboration on invention and discovery is made at the intersection of ethics and ethos. Mary

Lay (Schuster) and William Karis' (1991) early agenda in cultivating collaboration between academia and industry has generated a huge following among technical communication scholars. At a time when "micro" computers are entering mainstream workplaces and homes, technical communicators are in high demand. The work of technical communication became more hybrid to accommodate the needs of content producers and consumers alike. At this point, discussions of ethics emerged. Steve Katz (1992) blazed the trails by leading an important conversation on the ethics of technical communication through the examination of the so-called "productivity" or expediency that's afforded by communication technology. In the next two decades, scholars have continued to challenge, critique, and propose strategic frameworks for collaboration within technologically enhanced environments. For instance, Heidi McKee and James Porter (2017) in their recent examination of networked interactions urge technical communicators to be aware of the rhetorical situation in professional communication practices mediated by social networks and "smart" or assistive technologies such as artificial intelligence (AI) agents. In *Rhetoric as a Posthuman Practice* (2018), Casey Boyle wants us to reflect on how modern information technology practices, including technical communication, can be "transindividual" practices (p. 187) that require our attention to embodiment, nonhuman agents, and ethical consequences.

Pedagogical Implications

The rhetorical perspectives on collaboration translate into practical implications in technical communication and writing pedagogy. To simulate collaboration, instructors usually assign group projects in technical communication courses so students can gain such experience. Typically, students are asked to collectively brainstorm ideas, draft outlines, conduct research, write sections of a paper, and present findings as a group. Coherence in the work students produce as well as the team working process are normally expectations from instructors. However, instructors often face challenges in motivating students to strive while completing group work and in finding systematic ways to evaluate progress and the quality of collaborative projects.

Early research has revealed some issues dealing with collaborative writing in the technical communication and writing classroom, including resistance from students, students' lack of experience in working together, group conflict and friction, and the instructor's evaluation of group work (Chisholm, 1990). In *Foundations for Teaching Technical Communication*, Rebecca Burnett, Christianna White, and Ann Hill Duin (1997) argued that the nature of collaboration is revealed through exploration of culture, authority, conflict, and gender. More recently, Laurie Cella and Jessica Restaino (2014) remind us that many instructors and students still struggle with practicing team projects. In stories we have heard about team projects, students often describe negative experiences working with others they have just met during the semester, while instructors battle with

the stigma about the slackers and sluggards in student teams—and together they paint an unattractive picture for team work. To that end, Elizabeth Adams St. Pierre (2014) invites us to consider the ontology in posthumanism and how such perspective may shift our perspectives on collaborative writing. St. Pierre argues that collaborators may not always be "present" in collaborative projects, but collaboration is always already enabled through an assemblage view of reading, writing, and the world.

Following the proliferation of new theoretical perspectives and advancement of collaboration technologies, evidence-based guides to creating group projects, such as Joanna Wolfe's (2010) *Team Writing*, as well as innovative approaches, such as Agile project management (Moses, 2015; Pope-Ruark, 2012, 2015), design thinking powered collaboration models (Duin et al., 2017), and makerspaces (Gierdowski & Reis, 2015; Tham, 2019b) are making their way into the classroom as potential remedies for negative student learning experience. These approaches focus on a flexible "openness" that supports individual team members as they move from "peripheral participants" to potentially "longstanding members engaged in ongoing projects" (Gierdowski & Reis, 2015, p. 17). Social constructivists in writing studies believe "individual writers compose not in isolation but as members of communities whose discursive practices constrain the ways they structure meaning" (Nystrand et al., 1993, p. 289). The primary assumption behind this learning theory is that social interaction and participation, particularly with instructors, peers, and other members of the knowledge community, have a significant impact on learning (Chism, 2006; Lave & Wenger, 1991; Wenger, 1998). Jean Lave (1991) has contended, "learning, thinking, and knowing are relations among people engaged in activity in, with, and arising from the socially and culturally structured world" (p. 67).

When students work in cross-functional teams to support others through cross pollination of knowledge and skills, they offer different perspectives to spur innovation and challenge conventional practices (i.e., "we have always done it that way"). Peer collaboration also levels the "playing field" for learning—students at any level or with any amount of content knowledge can participate in innovation and execution of ideas, which may increase overall engagement. The role of the instructor is to facilitate a learning atmosphere that encourages students to claim shared ownership of their project. Kenneth Rainey, Roy Turner, and David Dayton's (2005) research on technical communication core competencies is notable for its emphasis on collaboration and collaborative knowledge. Their work has been tested (Hart & Conklin, 2006) and continues to influence competency-based education for both scholarly and professional organizations, such as the Association for Teachers of Technical Writing (ATTW) and the Society for Technical Communication (STC) as well as for technical communication program administrators, even impacting the collaborative design of international curricula and the development of competency statements and learning objectives (Paretti et al., 2007).

Contemporary technical communication scholars follow Rainey et al.'s direction, voicing parallel calls to better understand and meet the needs of students demanding a learning-focused education. For example, Annie Mendenhall (2013) argues that "we need to think vertically, horizontally, and institutionally about how to create courses and curricula. In other words, minors, majors, and graduate programs increase the field's legitimacy by shaping it into a model discipline, but our work might also operate outside the vertical model to engage other disciplines and communities in writing instruction or interdisciplinary programs of study" (p. 97). Sally Henschel and Lisa Melonçon (2014) push for a similar collaborative shift. They state that "even though technical communication programs maintain specific strengths tied to faculty expertise and to local situations, programs should be embracing common conceptual and practical skill sets that will prepare students to become successful professionals" (p. 22). Henschel and Melonçon's (2014) suggestion to make comparisons and to discover commonalities within and outside of a TPC program demonstrates the valuable connections and information that can be gained by joining the learning paradigm shift, which means choosing to collaborate and share conceptual and practical skill sets across writing programs, departments, and an institution.

The programmatic and practical emphasis on collaboration is justifiably ever-present. Thomas Kent (1993) argues that "without collaboration . . . no communicative interaction is possible. . . . If we are communicating, we are collaborating" (cited in Burnett et al., 1997, pp. 136-137). This point resonates in both academic and workplace settings, yet collaboration in academic contexts varies from collaboration in the workplace. For instance, Thompson (2001) has found evidence of these differences in how collaboration is considered in the academy and in industry after conducting a qualitative content analysis of articles on collaboration in technical communication. In workplace terms, Rebecca Burnett, Andrew Cooper, and Candice Welhausen (2013) assert that "[c]ollaboration is important because virtually all workplaces rely on group-based decision making and projects, often increasing creativity, productivity, and the quality of both process and product" (p. 454). Empirical studies of writing in workplace settings (Allen et al., 1987; Cross, 2001; Jones, 2007; Winsor, 2003) have helped to clarify the nature of workplace writing collaboration as well.

Scientific and Workplace Collaboration

What is clear is that scientific and workplace collaboration is common, that it is necessary, and that it has become a critical competency for practicing technical communicators. As teachers, we have a pedagogical imperative to learn about and practice collaboration so that we can instruct our students proficiently in its practice. As scholars, we have an experiential imperative to collaborate; this collaboration, as we argue below, reinforces our pedagogy.

A search on "the science of collaboration" results in a plethora of articles em-

phasizing the importance of collaboration across the academy and industry, the increase in demand for those with collaboration skills, and the exponential increase in tools that support collaboration. Blog postings, webinars, and "top ten" lists populate these search findings; numerous collaborative visualizations allow for articulation of scientific collaborations and future research questions (Isenberg et al., 2011); and publishers such as Elsevier encourage and possibly mandate researchers to visualize their data and scientific research networks (Elsevier, 2019).

Adjacent to rhetoric and writing studies, researchers in speech and organizational communication studies have examined group dynamics and collaborative interactions through functional and interpretive perspectives. In the 20th century, scholars like George Herbert Mead (1934) and Herbert Blumer (1986) applied philosophical methodologies to theorize group communication as symbolic interactionism. Ernest Bormann's (1972) symbolic convergence theory pulls from the rhetorical and socio-psychological traditions, arguing that sharing of common "fantasies" can transform collaborative groups. Symbolic convergence occurs when group members spontaneously create fantasy chains that display an energized, unified response to common goals. The analysis of these themes may reveal a rhetorical vision that contains vision to enact the joint objectives of the group. Paul Watzlawick (1978) followed a cybernetic tradition and theorized collaborative dynamic as merely the interaction of content (what) and relationship (how). These central realms of group interactions have influenced early theories of collaboration. Bruce Tuckman (1965) hypothesized a four-stage model—what's well known today as the Tuckman Model—in which each stage needed to be navigated sequentially in order to reach effective group functioning. The four stages are forming, storming, norming, and performing. Tuckman and Mary Ann Conover Jensen (1977) later revised this model to include adjourning as the final stage of group interactions.

Perhaps the most respected group interaction theorists, Randy Hirokawa (1994) and Dennis Gouran (1988, 2003) are known for their functional perspective on group decision making. They dismissed pessimistic views about collaboration as unwarranted by actual group processes. Gouran's early writing on group decision making laid the groundwork for Hirokawa's later functional roles in collaborative groups. Their collective work theorized that groups make high-quality decisions when members fulfill four requisite functions: 1) problem analysis, 2) goal setting, 3) identification of alternatives, and 4) evaluation of positive and negative consequences. Erring on the interpretive end, Marshall Scott Poole's (1997, 2003; Poole & Doelger, 1986) adaptive structuration theory uses a "phase" model to complicate Anthony Giddens's (1984) structuration theory, which refers to "the production and reproduction of [sic] social systems through members' use of rules and resources in interaction" (Poole, 2003, p. 50). Poole's phases concern the production of change and reproduction and stability through a duality structure—what is affected by the group and its effect upon rules and resources. More recent, Barnett Pearce (2004, 2008) and Vernon Cronen (2001) used co-constructionism to understand collaboration as coordinated management of meaning.

What also is clear across the literature is that workplace and scientific collaboration is imperative. As research questions increase in complexity and science struggles "to swim through big data, major funders, including the National Science Foundation (NSF) and the National Institutes of Health (NIH), are pushing scientists to collaborate more across disciplines, institutions, and even nations under the banner of *team science*" (Baker, 2015, p. 639). In the past decade, a new field—the science of team science (SciTS)—has emerged, with its aim "to better understand the circumstances that facilitate or hinder effective team-based research and practice and to identify the unique outcomes of these approaches in the areas of productivity, innovation, and translation [of science]" (Stokols et al., 2013, p. 4). The Team Science Toolkit (2019) states:

> Over the past two decades, there has been an emerging emphasis on scientifically addressing multi-factorial problems, such as climate change, the rise of chronic disease, and the health impacts of social stratification. This has contributed to a surge of interest and investment in team science. Increasingly, scientists across many disciplines and settings are engaging in team-based research initiatives. These include small and large teams, uni- and multi-disciplinary groups, and efforts that engage multiple stakeholders such as scientists, community members, and policy makers. Academic institutions, industry, national governments, and other funders are also investing in team science initiatives.

According to Nancy Cooke and Margaret Hilton (2015), team science "focuses on science teams and groups and their individual members as the principal units of study" (p. 49). Most recently, as part of a review of 109 empirical articles on collaboration in science, Kara Hall and colleagues (2018) define team science as "the approach of conducting research in teams within complex social, organizational, political, and technological milieu that heavily influence how that work occurs" (p. 533), ultimately finding that "the degree to which researchers achieve team-based and integrative science is driven by a complex mix of attitudes, behaviors, and cognition, which, in turn, may be influenced by features of the team, organization, and broader context" (p. 544).

Also key to team science is the specific study of what makes a scientific team effective. Dimensions of team science under study include diversity of team or group membership, disciplinary integration, team or group size, goal alignment across teams, permeable team and organizational boundaries, proximity of team or group members, and task interdependence (Cooke & Hilton, 2015). In their study of key elements critical to the success of collaboration and team science, L. Michelle Bennett and Howard Gadlin (2012) found the most important element to be that of trust: "without trust, the team dynamic runs the risk of deteriorating over time" (p. 768). Other key elements included "developing a shared vision, strategically identifying team members and purposefully building the team, pro-

moting disagreement while containing conflict, and setting clear expectations for sharing credit and authorship" (p. 768).

Margaret Hinrichs and colleagues (2017), in their review of the 2015 National Academies report, address the need to attend to the relational side of collaboration. Their recommendations include "a renewed focus on the process of organizing through communication rather than focusing on organization as an outcome or consequence of teamwork" (p. 144). We use technology as the ultimate means to organize communication.

The Technology of Collaboration

Advances in writing technology bolster collaboration. As James Porter (2009) notes, "The computer plus the internet and the World Wide Web provide publishing capacity to the individual writer" (p. 219). The individual writer's capacity is motivated by social impulses: "people write because they want to interact, to share, to learn, to play, to feel valued, and to help others. And that drive to interact socially is a key feature of the new digital era" (Porter, 2009, p. 219). Laura Gurak and Ann Hill Duin (2004) contend that emerging digital technologies foster collaboration in technical communication pedagogy and research. Powered by open access and open collaborative tools, many modern classrooms are reimagined as hubs of learning where individuals come to share ideas and work on projects together. These spaces invite students to come out from their silo workspaces and combine resources to tackle complex communicative issues. Such tendency is deemed favorable by public and private sectors today where collective intelligence (Levy, 2000) is considered valuable in social capital. Thus, to integrate such learning in technical communication education is to acculturate learners into their future work environments, where collaboration and cross-functional teams are already commonplace.

Jessica Behles, in her 2013 survey of the use of collaborative writing technologies by technical communication practitioners and students, identified wikis, online word processors, learning management systems, SharePoint, and Google Docs as tools used daily by practitioners, but at that time, only weekly by students. She found that students were "features driven" while practitioners primarily used tools chosen by their companies (p. 28). More recently, Stephanie Vie (2017), based on her national survey of 30 TPC programs' use of social media, identified as "crucial that online TPC courses consider moving past the familiar 'big three' of Facebook, Twitter, and YouTube and examine other social media tools of interest to the field" (p. 353), calling for "pedagogical artifacts and reflections that specifically respond to the exigencies of increased social media use" (p. 354). Jason Tham (2017) edited a collection on collaboration technologies, with technical communication instructors sharing such a suite of artifacts and collections in their discussion of how Join.me, Facebook Messenger, Scalar, and WebEx technologies transform our collaborative work and pedagogy.

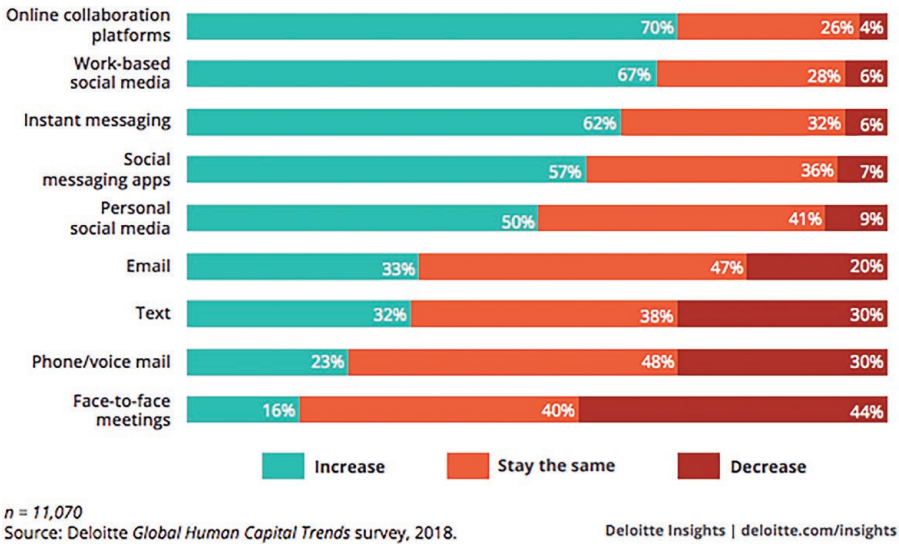

Figure 9.2. Expected use of communications channels in the next three to five years. (Deloitte, 2018, p. 82).

Professionals indeed get things done through the use of social, collaborative, and virtual tools, and a myriad of such tools now crowds the marketspace (Capterra, 2019). The most recent Deloitte *Global Human Capital Trends* survey examined this "flood of new tools" in support of "the hyper-connected workplace," finding online collaboration platforms, work-based social media, instant messaging, and social messaging apps to be increasing, while face-to-face meetings, the use of the phone and voice mail, text, and email are decreasing (see Figure 9.2). In comparison to Behles' 2013 study, it's commonplace for technical communication students to regularly use email, learning management systems, and collaboration systems such as shared Google Drive files and folders as part of their coursework. However, they are likely to have less knowledge of specific collaboration software and management directions designed for industry use.

Industry reviews of collaboration software or groupware note that use of these tools "allows the managing, sharing and processing of files, documents and other types of data among several users and systems anytime and anywhere" (Seymour, 2019). Given that industry markets the benefits of these tools as saving time, enhancing project management, strengthening team relationships, and improving overall organization, as instructors, we should expand our pedagogy well beyond the "group project," framing, discussing, and studying our use of technologies in these expanded terms as a means to prepare students for industry.

In terms of project management as collaboration, Nancy Allen and Steven Benninghoff's (2004) survey of TPC programs in the US found 30 of 42 programs to include project management courses, and more recently, Lisa Melonçon

and Sally Henschel (2013) found that 18 percent of 65 TPC programs included emphasis on project management. This comes with increased discussion and use of Agile project management strategies across TPC. As Rebecca Pope-Ruark (2015) notes, when working in Agile software development environments, "writers have much more opportunity to advocate for users, express concerns and insights, and create more lightweight external documentation throughout short, iterative development cycles rather than focus on heavyweight internal documentation, ensuring better products and better supporting documents" (p. 113). Pope-Ruark used Scrum, "the most popular Agile framework," to structure her course on Grant Writing for Nonprofit Organizations. Use of Scrum resulted in breaking down the main collaborative project into small slices where teams meet regularly to share what has been done, what each member will do next, and the challenges or issues needing team input. She emphasizes that Scrum "was designed for complex, multifaceted projects that require close collaboration" (p. 129), recommending the use of Agile practices for more complex collaborative projects. Joseph Moses, Trey Conner, and Jason Tham (2019) agree with Pope-Ruark, using Agile-informed strategies to inspire team-based learning through collaborative projects in the classroom. Their framework is focused on using design thinking as guiding principles for making team commitment, adaption, and evaluation visible components of the collaborative process (Tham & Moses, 2019).

In short, we must prepare our students for the collaborative frameworks and tools that technical communication practitioners now are called upon to use. These include team management platforms, online repositories, and any number of platforms and social media in support of global virtual teamwork. Therefore, we turn next to more detailed discussion of a team communication platform (Slack), an online repository (GitHub), and the importance of practice in collaborating and leading global virtual teams.

Online Collaboration Platforms

In his opening to a special issue examining the potential of online collaborative platforms, Peter Cardon (2016) notes that most organizations adopt these platforms based on the promise for more open, transparent, and collaborative communication; however, most have experienced "little or no change," leading to research showing "that the transformative potential of these platforms depends on a communication [vs. a technological] perspective" (p. 141). As a means to emphasize the need to expose TPC students to the use of collaborative platforms, we highlight Abram Anders' (2016) study of team communication (collaboration) platforms and emergent social collaboration practices that concludes Cardon's special issue.

Specifically, Anders examined a prominent team communication platform (TCP), Slack (https://slack.com/), used by one million people at the time of his study, and now (in 2019) used by ten million people a day across all types of industries and organizations. TCPs integrate multiple media in support of collab-

orative work, and conversations are organized into groups for specific teams and projects and channels for knowledge sharing and topic-based communication. TCPs also include notifications (alerts) managed by the team member as well as mentions or alerts that team members can send to others. Users can integrate services like Google Drive and Dropbox or various video-conferencing services. The overall design makes communication and collaboration visible, searchable, and available across organizational boundaries. In Anders' analysis of 100 self-published blog posts by Slack users, he found this TCP to support knowledge sharing and collaborative workflows: "The communication visibility afforded by TCPs . . . had direct impacts on collaboration processes. Users noted that communication visibility--especially when supported by compartmentalization of groups, projects, and topics--enabled more distributed and self-organized styles of collaboration" (p. 247). The use of Slack also resulted in greater engagement and presence, context awareness, generative role taking, leadership awareness, and synchronicity. As Anders quotes a user, "'It [Slack] compresses a lot of the stuff you might otherwise do in meetings into a Slack channel, so that information is visible to everyone it should be visible to, and it saves people time: They don't necessarily have to meet but can stay updated on a project's status'" (p. 252).

Today's technical communication students need to be prepared for a workplace that deploys collaborative software or team communication platforms. Rich McCue (2015), Systems Administrator for the University of Victoria Libraries, provides access to a vast set of research and collaboration tools for use by students, staff, and faculty as a means to create a "modern memex." As part of our courses, we should integrate media capabilities that make routine communication and collaborative workflows visible and shareable. At the University of Minnesota, we are a Google campus, so students become increasingly adept in their use of Google Drive applications along with sharing of files and folders throughout their collegiate work. However, we could certainly adopt and integrate a TCP such as Slack as part of a group assignment. In doing so, we should focus on the communicative affordances of the collaborative software platform along with how each platform supports community and team development.

Collaborative Use of Online Repositories

The Center for Information Design Management (CIDM) conducts a yearly survey of trends in the development and delivery of content. Based on this ongoing analysis, JoAnn Hackos (2015) emphasizes that technical communication students need experience in collaborating with clients and with gathering customer feedback as well as requisite knowledge and practice with content management systems as preparation for collaborating in content development teams and challenging the assumed authority of product developers. In response to this need, we offer two project directions for providing TPC students with exposure to and practice with collaborative use of online repositories.

As one example, Duin and Tham (2018) used Hackos' work as a springboard for their redesign of a course titled Writing with Digital Technologies. As part of the redesigned course, students are instructed in the use of an open-source online repository, GitHub (https://github.com/), for recording, editing, and sharing of their HTML and XML work. GitHub is an online repository used by over 28 million developers and 1.5 million companies across the world (Wan, 2018). While most popular for use by programmers and software companies, GitHub also serves as a portfolio where technical communication students can showcase their individual projects and contributions to others. While development and use of an online repository such as GitHub is a stretch for most technical communication students, knowledge and use of such a collaborative online repository provides them with greater understanding of how technical communicators and software engineers host, review code, and manage projects; it also results in a student's competitive advantage when entering the workplace. As one student shared in a response to this instruction,

> Once I figured it out, GitHub is one of the greatest tools I have encountered. I am fortunate to have been introduced to this and to better understand its collaborative functions. Since the beginning of the semester, I have used GitHub as a temporary hosting source for a total of five web projects and have also used it to download other resources.

As another example, we encourage instructors and students to identify and use online repositories such as the Fabric of Digital Life ("Fabric") research archive (https://fabricofdigitallife.com/) to examine and/or curate emerging technologies and their impact on technical communication. Fabric monitors the emergence of digital technology prototypes, inventions, news, and research by archiving representations in several categories and media types (text, images, video, etc.), concentrating on platforms of human-computer interaction to reveal the multiple ways that embodied technologies emerge in society.

As students examine and/or curate artifacts, they use instructions that guide them in learning a common language of classification to ground their understanding of technical emergence. Here, a broader goal is to reveal rhetorical motivations across interdisciplinary discourses in order to study sociotechnical tradeoffs among technical innovations (Iliadis & Pedersen, 2018). With specific focus on wearables, carriables, implantables, ingestibles, embeddables, and roboticals, students can use this customized metadata system to archive representations and facilitate simultaneous content collaboration on the database. One component is a keyword schema that helps students to standardize the constantly evolving language used to describe emerging technology. Three categories distinguish between *technology keywords* (e.g., fitness monitor, smartwatch, accelerometer), *marketing keywords* (e.g., Apple, Forbes, Fitbit), and general *thematic keywords* (e.g., health, education, children, manufacturing, climate change).

This classification standard helps when archiving primary research items. For example, the archiving of a video of engineers demonstrating a humanoid robot communicating with factory workers would use keywords to track the technological ability of the robot (e.g., natural language processing; human-robot communication), the corporate backing designated by marketing keywords (e.g., SoftBank Robotics), and the application in a real-world scenario under general keywords (e.g., manufacturing, factory, work, dialog, polite, posthuman). The standardized keyword system becomes useful over time when different archiving teams build upon previous content. To extend the example, if the same robot appears in a concept video for a childcare fitness scenario at a daycare several years later, it might be able to *play*, extending its general keyword profile to be classified under *children, toy, caregiver*, *fitness*, etc. One important pedagogical goal might be met if rich sociotechnical themes arise, such as the realization that emergent robots were previously trained in factories before daycares, leading to a nuanced understanding technology emergence.

Most important, Fabric enables team-based collaboration. The keyword system affords students the opportunity to revisit previous items in order to enhance them as vocabularies evolve, leading to collaborative archiving practices for globally-dispersed work groups. In our case, a recent collaboration between the University of Minnesota's Emerging Technology Research Collaboratory (ETRC; https://etrc.umn.edu/) and Fabric is resulting in multiple undergraduate and graduate student collections, the first of which is titled "Emerging Technologies for Technical Communication" found directly on the site (Tham, 2019a).

Global Virtual Teams

Moreover, today's technical communicators increasingly perform their work as part of global virtual teams (GVTs). Technical communication researchers such as Clay Spinuzzi (2007) emphasize the need for adjusting to multiple stakeholders in global virtual environments, stating, "Currently we face work structures that were hardly conceivable a few decades ago, and these work structures again require different rhetorical skills and communication practices" (p. 266); and contributions to Rich Rice and Kirk St.Amant's (2018) edited collection, *Thinking Globally, Composing Locally*, provide direction for rethinking perceptions of global communication and reconsidering approaches to writing online. Organizational researchers such as Scott I. Tannenbaum, John E. Mathieu, Eduardo Salas, and Debra Cohen (2012) agree that we have entered a new era in that teams operate in a more fluid, dynamic, and complex environment than in the past. They change and adapt more frequently, operate with looser boundaries, and are more likely to be geographically dispersed. They experience more competing demands, are likely to be more heterogeneous in composition, and rely more on technology than did teams in prior generations. Moreover, teams have become so ubiquitous that many employees and managers take them for granted and assume that they will be effective (Tannenbaum et al., 2012).

We contend that practice as part of global virtual teams should be a required component of TPC curricula. According to Giuseppe Palumbo and Ann Hill Duin, "GVTs are those teams connected via technology and comprised of people in various locations around the globe. . . . The primary objective of virtual collaboration is for a technology-mediated globally-dispersed work group to launch, develop, and complete its assigned task" (2018, p. 109). A 2018 survey of 1,620 respondents from 90 countries found 89 percent of respondents to be working on global virtual teams, 88 percent reporting that this virtual teamwork is critical to their productivity, and 84 percent reporting virtual collaboration to be more difficult than in-person collaboration, especially considering that 89 percent of virtual teams include at least two cultures (CultureWizard, 2018). This survey aligns with the earlier Deloitte findings, with 48 percent of respondents reporting that they never meet other virtual team members in person. Unfortunately, but perhaps not surprisingly, 80 percent report that they received no formal training in leading or being part of GVTs, often leading to differing assumptions, misunderstandings, and resentment during collaboration across cultures.

To begin, students can read and provide reflections on GVT research, such as a study on building swift trust in global virtual teams (Crisp & Jarvenpaa, 2013), a study on the effects of a dyad's cultural intelligence on global virtual collaboration (Li et al., 2017), and a study on managing multicultural teams (Behfar et al., 2006). More important, however, is the experiential practice of being part of a "real" global virtual team. To address this need, since 1999, Bruce Maylath and colleagues have supported the Trans-Atlantic and Pacific Project (TAPP), a network of partners that "establishes links between students in different countries so that each learns from the other. In so doing, students become aware of the diversity of the world community in which their documents travel" (2019, para. 1).

In the standard TAPP format, U.S. students prepare a set of instructions, conduct a usability test on the document with the help of students from another country, and then finalize the same document for later translation into another language by students from the partnering country. Instructions for joining and materials for beginning this type of project are provided by current TAPP instructors on the Google site, TAPP2018 (Duin et al., 2018, https://sites.google.com/a/umn.edu/tapp2018/). In one study of a standard TAPP project, Palumbo and Duin (2018) reported on their study of U.S.-Italian student interactions and use of visualizations of their personal learning networks as a means to build cross-cultural competence, trust, and learning strategies and attitudes—aspects that the authors found to be characteristic of the students' collaboration besides the obvious and more immediate focus on questions of language and translation.

Given the need for technical communication students to receive training in the management of GVTs, Duin and Palumbo recently adapted the standard TAPP format with the goal of having the U.S. (UMN) students serve as project managers of teams of Italian (University of Trieste) students practicing translation. In this model, each U.S. student leads the GVT of five members, providing

oversight of team building, project preparation, translation and submission of final materials as well as post-mortem work to evaluate the overall project, and the professors represent the clients for each team's project. This adaptation of the TAPP model to support a six-week project includes use of an abridged version of *A Guide to Translation Project Management* (2016) by David Russi and Rebecca Schneider (used with permission) as a student guide for this work, videos on translation workflow, articles on the role of a translation project manager, and use of the above noted readings by the U.S. students. During the recent 2019 deployment, project managers (U.S. students) primarily used Skype for weekly meetings, shared Google Drive folders and files for organizing the work and used WhatsApp for secure messaging as part of daily communication.

Artificial Intelligence

As we consider the future of collaboration, we call on readers to recognize our increased collaboration with artificial intelligence (AI) agents and nonhuman collaborators. The higher education landscape already includes "smart writers" to assist with academic writing and AI-based teachers at universities including Michigan, Miami, Georgia Tech, and others, where students no longer can distinguish between human and AI teaching assistants (Goel & Polepeddi, 2016). In industry, Microsoft, Salesforce, and Oracle have integrated AI into their enterprise collaboration platforms, including Slack, discussed earlier (Fluckinger, 2019). And in a recent *Harvard Business Review* article on collaborative intelligence, H. James Wilson and Paul R. Daugherty (2018) found from their research of 1,500 companies that firms achieve the most significant performance improvements when humans and machines work together. Through such collaborative intelligence, humans and AI actively enhance each other's complementary strengths: the leadership, teamwork, creativity, and social skills of the former, and the speed, scalability, and quantitative capabilities of the latter. (p. 117)

Adapting pedagogical models for collaborative AI may well be our next task as we evolve in designing effective teaching of technical communication.

Guiding Framework for Collaboration in TPC

In this chapter, we have employed focused literature review and constructivist theory building to frame how collaboration is defined and practiced in the 21st century and to provide pedagogical direction for active use of online repositories and collaboration platforms as a means to prepare TPC students for their current and future work in industry.

Collaboration is an imperative disciplinary assumption that must be taught and practiced in ways that expand student understanding of the rhetoric, science, and technology of collaboration. Returning to Figure 9.1, we demonstrate that collaboration is informed by socio-rhetorical traditions concerned with shared

authority, trust, identity, ethics, community, and culture. As a process, collaboration can be examined through social structures, human behaviors, relationships, leadership, and productivity. And since 21st century collaboration is greatly affected by technology, it should include considerations of governance, regulations, and management of collaborative technology, its reach, and the affordances and limitations of various technology design and innovation.

We hope that instructors will use this as a guide in designing assignments for students to practice 21st century collaboration. A 21st century pedagogical collaboration framework includes multiple assignments, projects, and experiences for students to practice co-authoring and collaboration, with emphasis on dialectic as invention. It includes exposure to the complex contexts of team science and workplace collaboration along with understanding of innovative approaches such as Agile project management and design thinking as they approach their work. In our move from the use of the desktop to mobile technologies to social media to desktop videoconferencing and online collaboration platforms, technical communicators increasingly have worked in collaboration with others and with the evolving technologies supporting such collaboration. Powered by open access and open collaborative tools and repositories, we have the ability to reimagine our on-campus and online courses as hubs of learning where individuals come to share ideas and work on projects both together and with collaborators throughout the world.

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