From the Classroom to the Workplace:

Defining Collaboration in Technical Communication

By

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Chapter 1: Introduction

The traditional role of a technical communicator as a writer whose main deliverable is a technical document, such as a user or administrator guide, has changed significantly over the past thirty years. In the 1970s, technical communicators were focused on 'wordsmithing' technical specifications and documenting 'features and functions" of mainframes and mini-computers for, what was at the time, a very small and specific technical audience (Carliner, 2010, p.26). In the 1980s, with the advent of personal computers, the role of the technical communicator evolved into one focused on designing task-based technical information for a much broader and less skilled audience. While throughout the 1990s to the present day, technical communicators still design and develop technical documentation, their role has expanded across a variety of disciplines to include training, user interface design, usability testing, knowledge management, programming, and graphic design (Carliner, 2003; Carliner, 2010; Fisher & Bennion, 2005; Giammona, 2004).

Because of this interdisciplinary role expansion, technical communicators, and especially new graduates for technical communication programs, need to ensure that they have the teamwork and collaborative skills required to successfully navigate within multidisciplinary teams and projects (Larbi & Springfield, 2001; Conklin, 2007). The increased importance of teamwork and collaborative skills in the workplace is echoed in *Employability Skills 2000+* from the Conference Board of Canada (2000). In this publication, the Conference Board of Canada (2000) identified teamwork skills, such as being flexible, understanding and knowing how to work in a team, and recognizing and respecting diversity in the top three skill sets required by

students to ensure their success in obtaining, retaining, and progressing in today's work environment.

This continuing evolution of the nature of the technical communications profession is creating some tension for post-secondary technical communications programs trying to determine the skills and knowledge needed for a solid and useful curriculum (Whiteside, 2003; Rainey, Turner, & Dayton, 2005; Cook, 2003; Thomas & McShane, 2007). While programs continue to provide traditional offering of rhetoric and design, they also recognize the importance of ensuring that they not ignore the workplace if their students are to be prepared with the skills needed for securing employment (Miller, 1989).

From the perspective of the workplace, a similar tension exists in terms of determining the skills required for the classroom. The challenge in this case is with identifying the skills and knowledge that should embody technical communications as a profession (Hart & Conklin, 2006; Lanier, 2007; Miller, 1989). With all of these questions surrounding the technical communications profession, and the lack of any *one* definition of its professional knowledge and skills, it is no wonder that research in the area of workplace and classroom skills continues to grow but without any resolution in sight.

The challenges that exist for both the classroom and the workplace in researching and defining technical communication professional knowledge and skills will be examined in this project. It will be demonstrated that while the collection of qualitative and quantitative data is paramount to advancing technical communications' research, that by doing so exclusively, the lack of a theoretical base results in an ever-changing list of knowledge and skill "must-haves" that does little to advance any concrete discussion on professional knowledge.

By concentrating on developing lists of skills and knowledge, without taking the time to map these against a model that could help explain them, both the workplace and classroom remain unable to develop a solid definition that allows them to understand each other's context. Although some of the literature from academic contexts (Cook, 2003; Miller, 1989) and workplace contexts (Hart & Conklin, 2006) have explored different theoretical approaches to defining knowledge and skills for technical communicators, most of the approaches are very much confined to either the academic or the workplace and do not attempt to bridge the differences between the two. By exploring *genre theory* (Johnson, 1998; Luzon, 2005) as a theoretical framework for understanding skills and knowledge in technical communications, the classroom and workplace can be provided with a common base on which to begin understanding knowledge and skills from both contexts. Johnson (1998) defines genres as "taxonomic devices that provide order and meaning to everyday artifacts" (p.139), Luzon (2005) describes genre theory as:

> …a means for practitioners to learn specific characteristics about writing within a discipline and to be aware of the linguistic and rhetorical skills necessary to communicate successfully in the discipline. (p. 293)

Definition of Concepts

While none of the literature examined specifically defines the use of the terms teamwork, collaboration, professional knowledge, literacies, skills and competencies, any attempt to study these or use these concepts in a formal study, requires that they be defined to reduce any confusion or misinterpretation. Eraut (1994) defines professional knowledge as being

knowledge "constructed through experience and its nature depends on the cumulative acquisition, selection, and interpretation of that experience" (p.20). Moving from knowledge to literacies, for the purpose of this study, the definition of literacies is borrowed from a similar approach using Spilka's (2010) definition of "technical communication workplace literacies" as:

> …compiling the activities associated with the reciprocal relationship of theory (understanding, analysis) and practice (information, development, management, evaluation, revision, production, delivery) related to writing and communication that takes places across professional contexts for professional purposes. (p.7)

Competencies and skills, and often literacies, are often used interchangeably in the literature, but for the purpose of this study a distinction will be made. Competency is defined as "the collection of knowledge, skills and attitudes required to perform a task, usually described in terms of observable and measurable behaviours" (New South Wales Government, 2010). The Organisation for Economic Co-operation and Development, (as cited in Williams, 2005) defines skills as "an ability to perform complex motor and/or cognitive acts with ease, precision, and adaptability to changing conditions" (p.39).

Teamwork is an activity comprised of two main parts: collaboration and co-operation. Collaboration involves "working together" with shared commitment and goals that are "developed in partnership" (American Library Association, n.d). With collaboration, everything is shared including "Leadership, resources, risk, control and results" (American Library Association, n.d). In contrast, cooperation is more informal, where goals and plans are not "jointly defined" and the "leadership, resources, risk, control and results" are not shared (American Library Association, n.d).

Technical Communication Skills and Knowledge in the Classroom

Traditionally, much of the literature evaluating and examining the skills and knowledge that technical communication programs needed to be included in a well-rounded and competitive curriculum derived from surveying, interviewing, and analyzing a variety of sources including technical communication programs, former students, technical communication managers, supervisors, and writers (Rainey, Turner & Dayton, 2005; Whiteside, 2000; Thomas & McShane). In these studies, individuals were asked to identify the technical communication skills most needed in their program or workplace, or were asked to rank a list provided to them (Rainey, Turner & Dayton, 2005; Whiteside, 2000). While surveying the workplace to understand professional knowledge is critical to ensuring technical communication programs align with workplace needs, it also provides academics with a long list of random skills to distill and analyze without any theoretical framework or context on which to base findings.

Wilson and Ford (2003) and Kim and Tolley (2004) examined graduates of technical communications programs in an effort to identify how well these programs prepared students for entering the workplace. Both studies focused on students who were not recent graduates. Wilson and Ford (2003) examined graduates who had graduated ten years prior, and Kim and Tolley (2004) examined those who had graduated five years prior. Wilson and Ford's (2003) methodology evaluated listserv discussions of graduates of a technical communications master's program, and Kim and Tolley (2004) surveyed and interviewed graduates from an undergraduate program. Both studies provided first-hand personal accounts of the graduate- to-workplace transition but did not provide a core definition of professional knowledge as a starting point for either the classroom or the workplace, nor did they attempt to frame their analysis using a model or framework. Furthermore, the sample sizes of both studies were quite small, with Wilson and

Ford (2003) studying only 7 participants and Kim and Tolley (2004) studying only 5. In addition, Kim and Tolley's sample was also rather narrow and restrictive since all five graduates were female and had to conform to the following criteria to participate: "they must have excelled as students, graduated five or more years ago, and represent a variety of technical communications specialties" (p.380).

Unlike the studies of Kim and Tolley (2004) and Wilson and Ford (2003), which only focused on the experiences of student graduates, Whiteside's (2003) research examined both graduates and technical communication managers. Whiteside's study investigated whether a skills gap existed between 24 recent graduates from ten 10 university undergraduate technical communication programs in the American Midwest, and the skills identified as important by 37 managers of technical communication departments.

Whiteside (2003) surveyed and interviewed both recent graduates and managers; however, it is unclear if both students and managers received the same survey on which to rank skills. Managers were provided with the following twelve skill categories on which to rank, based on an analysis of the curricula of the participating schools: written communication, theory, oral communication, project management, visual communication, scientific knowledge, software tools, problem solving skills, computer languages, international communication, business operations and business correspondence (Whiteside, 2003). The categories are numerous and broad and it is unclear as to how they differ from each other in terms of a skills subset, especially in terms of the skills and tasks associated with categories such as written communication, international communication and business correspondence.

Although all of the programs surveyed by Whiteside (2003) had a course that was based in technical writing, they varied considerably in length of and types of courses offered, so it is

difficult to draw any conclusions based on a standard technical communication student population. According to Whiteside, over 50% of managers surveyed responded that the new technical communicators that they managed had a "solid foundation in written communication, software tools, and oral communications" and conversely, the same number of managers found "project management, problem-solving skills and business operations knowledge" to be the skills lacking (p.311). In addition, in a comparison of recent graduates and managers, both groups "strongly" agreed that technical communicators were in need of more of a solid foundation in business operations, project management, problem-solving skills and scientific and technical knowledge (p.313).

While collaboration or teamwork did not appear as one of the twelve skill categories that were chosen for analysis, the study did receive feedback from managers indicating the need for collaborative work skills in new graduates (Whiteside, 2003). In addition, while this study touches upon software tool skills, software tools were not discussed relative to collaboration technologies, nor was there any discussion regarding collaboration in the classroom or workplace.

Rainey, Turner and Dayton's (2005) study used data retrieved from surveys and interviews with technical communication managers and the analysis of the curricula of the 10 largest undergraduate technical communications programs in the United States (by student enrollment). This study used competencies distilled from 156 course descriptions of these programs to design and develop a survey that was sent to technical communication managers. These competencies were broken down into six main groups: collaborative, writing, technical, self-activation, writing/editing/testing, and technology and were made up of 63 competencies in total, which were distilled from an original list of 141 ranked by mean. Once again, similar to

Whiteside's (2003) study, managers were provided with quite a long list of competencies on which to rank a wide variety of skills. It is questionable how valid the data of such a large ranking endeavor could be, given that it included everything from single-sourcing to the ability to develop brochures.

The results of the rankings identified the top four competencies as collaborative, writing, technical, and self-activation/evaluation. While the study of Rainey, Turner and Dayton (2005) evaluated the importance of technology skills for technical communicators, such as word processing and document design applications, it did not touch upon the collaborative use of these tools or whether CMC (Computer-Mediated-Communication) or Web 2.0 technologies were considered a part of workplace collaboration. Survey results from this study demonstrated that managers placed significant importance upon technical communication skills in terms of collaboration with both subject-matter experts (SMEs) and coworkers. Managers ranked the ability to collaborate with SMEs as "the most essential skill for technical communicators" (p. 327) with a rank of 4 on a 4-point scale. Also, with a ranking of 3.96 was collaboration with some of the highly-ranked collaborative technical communication skills identified by managers as:

> …the ability to conduct problem-solving interviews, to address communication conflicts in groups, and to conduct on-site interviews and observations for user and task analysis (contextual inquiry). (p. 327)

Technical Communication Skills and Knowledge in the Workplace

In relation to the workplace, there is much literature on the topic of professional knowledge and skills within technical communication from a variety of perspectives, but very

few have attempted to apply a theoretical framework to the technical communication workplace landscape (Carliner, 1992, Johnson-Eiola, 1995; Hart-Davidson, 2001).

Hart and Conklin (2006) focus their research on the differences that exist between the expectations of new graduates and the reality that they experience once they enter the workplace. According to Hart and Conklin (2006), educators are only beginning to realize that the technical communications profession is moving from a traditional focus on texts to a focus on people and collaborative and interpersonal skills. Hart and Conklin (2006) maintain that the curriculum needs to reflect these changes in the form of a new model:

> It is time for a new, more accurate and helpful model of technical communication was developed and accepted by the entire technical communication community (including employers, employees, and academics), to help technical communication professionals better understand their emerging role and contribute more fully to the contemporary workplace. (p.396)

Hart and Conklin's (2006) study was designed to examine "the current state of practice" of technical communication (p.397). Their methodology included holding focus groups and surveying experienced technical communicators (those with over five years of experience). The goal of their study was to develop a "visual and verbal" model that described technical communications practice (p.396). While collaboration was used to describe the types of roles of technical communicators, the research, however, focused more on the model of characterizing interaction styles between technical communicators and the organization within which they worked instead of establishing a model of core skills or competencies.

In an effort to analyze the professional skills and knowledge required of the technical communication workplace, Lanier (2009) used an entirely different methodology from those discussed previously. Instead of employing data collected from surveys, interviews and focus groups with managers and practitioners, Lanier based his analysis on the skills listed in technical communication job recruitment postings.

Lanier's (2009) methodology involved collecting job postings for the role of "technical writer" posted on the *Monster.com* job website over a three- month period (p.53). Since he was interested in analyzing skills that would only be required by new graduates, he narrowed his scope by examining ads that required two or more years of experience, and he excluded ads that required a specialized technical degree and those that didn't include any information about the industry of employment. Lanier's final analysis was applied to 327 job postings.

Much of Lanier's (2009) analysis supports the existing literature's identification of important skills and knowledge, which includes technical writing skills; however, it did diverge in the area of technology skills, finding that while technology skills were considered important, they were not the most important. Lanier also found in his review of job postings that employers valued context specialization, such as previous experience in a similar industry, because it allows them to more easily understand the subject matter.

Lanier (2009) based the development of the five main skills categories used in his study on his review of the technical communications literature, which was largely based on those identified by Rainey, Turner and Dayton (2005) , Whiteside (2003), Conklin (2006), Giammona (2004), Kim and Tolley (2004) and Wilson and Ford (2003). The categories used by Lanier (2009) to analyze the job postings included the following:

1. Experience,

2. Technical knowledge/experience,
3. Technical writing-specific knowledge,
4. Technology/tool knowledge
5. Project management

Lanier (2009) was surprised to find that only 17% of the postings called for what would be considered basic technical writing skills such as clear writing and audience analysis. Instead, the larger percentage of job postings, 24% were looking for experience with specific types of documents, such as user guides or reports.

Collaborative skills were identified in 15% of the job ads and were categorized by Lanier under project management, and defined as "Skills and experiences in carrying out collaborative or group projects" (Lanier, p. 57). Lanier (2009) does acknowledge that if interpersonal skills, which were a separate sub-category under project management, and defined as "Being able to engage in communication with people from different disciplines (such as subject matter experts)" (p. 59), could be considered in the category of collaboration skills, it would raise the percent of collaboration skills desired by employers to 32% of the postings. While examining job postings provides a unique approach to determining the skills required in the technical communication workplace, Lanier (2009) admits to some of the flaws in his study with the primary one being the uncertainty of how the job ads were created. According to Lanier (2009), it was not possible to know if the job posting was really reflective of a technical communication manager's needs and if all of the skills on the list were indeed the skills needed for the position. Examining job ads provides another perspective on the types of skills required in the workplace, but it really does not provide any further context for analyzing the skills. Once again, a list of skills was developed independently of any model or theory on which to analyze them.

Jones (2005) expanded on an earlier study of writing in the workplace to focus specifically on the collaborative writing activities of technical communicators. Referencing Rainey, Turner and Dayton's (2005) study for evidence of collaboration's importance in the workplace, Jones (2005) focuses specifically on collaborative writing activities and does not examine collaboration in terms of interdisciplinary project teams, or how technology is employed in the expanding workplace for technical communicators. He breaks down collaboration into three types of interaction by using a taxonomy of collaborative activities on the 'collaborative continuum"; contextual, group and hierarchical (p. 284).

Jones' (2005) survey of close to 13, 000 technical communicators resulted in a sample size of 1790. Survey questions focused very narrowly on the types of writing activities they were involved with and the process without spending any time on other, non-textual specific activities. While Jones (2005) acknowledges that a new definition of collaboration is needed, and that his definitions may be dated, he does not expand upon what this definition of collaboration might encompass or whether his taxonomy could be expanded to include collaborative activities that extended beyond writing activities and that included emerging technologies (p.293).

Developing a Theoretical Framework

While surveying the workplace to determine professional skills is not only important but also critical to ensuring that technical communication programs align with employer needs, this approach on its own also provides academics with a long list of skills that they need to try to categorize and characterize. Attempting to determine and define professional knowledge requirements solely from interviews and surveys without having any type of theoretical construct with which to organize these skills in a larger framework of core competencies creates confusion

and reinforces the tendency for programs to be unsure of what needs to be taught, leaving them at the mercy of industry trend watching (Cook, 2002; Miller, 1993).

For Cook (2002), one of the primary challenges preventing the development of a core pedagogy for technical communications is the lack of a 'concise identification of literacies that technical communicators should possess" (p. 6). To resolve this lack of identified literacies, Cook proposes a theoretical framework that defines the core skills required by technical communicators in terms of six layered literacies (p.5):

- basic
- rhetorical
- social
- technological
- ethical
- critical

These literacies, which represent the "repertoire of complex and interrelated skills" required of the workplace would be interdependent and layered throughout technical communication programs (pp.5-7). For Cook, by focusing on literacies instead of a specific skills-base, instructors would be better able to prepare their students for a variety of workplaces and "lifelong learning" instead of focusing on preparing them for one "specific vocation" (p. 24).

Collaboration appears in both the social and technological literacies as described by Cook (2002), but primarily in terms of a social literacy that is very much focused on rhetoric and the collaborative writing process. She does admit, however, that her definition of technological literacies needs to expand from one that narrowly focuses on evaluating an individual's competency with a tool or software, to one that promotes "social interactions and collaboration" (p. 13). While Cook briefly mentions some of the technologies students are currently using in

their coursework to communicate and collaborate such as "electronic forums, e-mail, listservs, Web-based bulletin boards, chats rooms and MOOs" (p.13), and maintains that these digital technologies are "profoundly influencing how students work within the classroom and later within the workplace" (p.13), she does not elaborate on how the tools are being used or on their influence.

While the provision of this layered literacy framework, as illustrated in comparison to the workplace framework from *Employability Skills 2000+* (Table 1), provides technical communication instructors with a more comprehensive and well-rounded means of understanding and teaching the skills required in the classroom, there would be value in taking this layered literacy approach and applying it to the workplace. Cook (2002) does not provide any discussion of how these literacies would be applied to the workplace nor does she suggest how they would transfer into the workplace environment.

Table 1

Six Layered Literacies (Cook, 2002) Mapped to Employability Skills 2000+

Cook (2002) Literacy	Cook (2002)Definition	Mapping to Employability Skills 2000+ Category*
Basic	"Making informed decisions about usage, grammar, mechanics, styles, and graphic representations based on knowledge of readers and writing situations is the goal of a layered basic literacy" (p.9).	Fundamental Skills • Communicate • Manage Information • Use Numbers • Think and solve problems
Rhetorical	"Because it affects so many decisions writers make, rhetorical literacy is most often viewed as a multifaceted knowledge that allows writers to conceptualize and shape documents whatever their specific purpose or audience" (p.10).	Fundamental Skills • Manage Information • Communicate

Social	"…the most important of these social skills is the ability to collaborate and work well with other" (p.11). "Students can demonstrate their developing social literacy skills by working effectively with others in a variety of capacities…." (p.12).	• Work with others
Technological	"a working knowledge of technologies that helps professional communicators to produce communications, documents, or products; an awareness of how these technologies promote social interactions can and collaboration; an ability to research how users work with technologies; and an ability to critique this research and act upon it to make decisions and produce documents designed with and for users" (p.13)	Teamwork Skills • Participate in Projects & Tasks • Think & Solve Problems
Ethical	"Ethical literacy can be defined as both, technical communicators' knowledge of professional ethical standards as well as their abilities to consider all stakeholders involved in a writing situation (p.15).	Personal Management Skills • Demonstrate Positive Attitudes & Behaviours
Critical	"…critical literacy can be defined as the ability to recognize and consider ideological stances and power structures and the willingness to take action to assist those in need" (p.16).	Fundamental Skills • Think & Solve Problems

*The complete Employability Skills 2000+ is reproduced in Table A1, Appendix A.

Where Cook (2002) applies a theoretical construct based on layered literacies to explain professional knowledge in technical communication pedagogy, Miller (1989) approaches with one that is rooted in praxis. Miller uses the term practice and praxis interchangeably and her definition of praxis is grounded in the social and practical traditions of Aristotle, Marx, Schön, and MacIntyre where practice is "creating knowledge and value and that the value thus created comprehends the good of the community in which the practice has a history" (p.23). According

to Miller, “If technical writing is the rhetoric of the ‘world of work’, it is the rhetoric of contemporary praxis” (p. 24).

Miller is critical of teachers and curriculum planners who ignore the current state of the workplace, and insists that teachers need to understand “how to think about practice” (Miller, p.17). This author also acknowledges the challenges and contradictions that exist for technical writing pedagogy where teachers experience a tension between wanting to adhere to a strong model of writing which sees non-academic practices as inferior, while recognizing that their instructional goals need to reflect nonacademic, workplace environments (p.15). According to Miller (1989), the technical communications professions seems “uncertain about where to locate norms, about whether the definition of ‘good writing’ is to be derived from academic knowledge or from nonacademic practices (p. 15).

Miller (1989) stresses the importance of thinking critically about “industry-university” collaboration which creates “mechanisms” in the form of “internships, advisory councils, and certification of graduates, and procedures for justifying and accrediting programs.” (p.19). She cautions teachers of technical communications against simply designing courses by copying existing practices and improving upon them without questioning them, and encourages teachers to “question those practices and encourage our students to do so too” (p.23). While Miller’s discussion of praxis does not provide any evaluation of what professional knowledge might look like or any discussion of specific skills, it does provide a useful model on which to build and reminds the technical communication profession that there is a literature from other professional programs on which to draw (p.19).

Where the previous theories have focused on either defining technical communications from a classroom or workplace context, *genre theory* is a framework that has the potential to

bridge and explain both worlds. Genre theory has, specifically in relation to writing and designing texts, been utilized to understand professional knowledge and skills in technical communications. With genre theory, writers understand how to approach writing or designing certain types of information based on the pre-existing structure or genre of the documents. For example, each type of document, whether it is a user guide, a report, or a letter, has a specific structure or genre attached to it. It is by understanding what is required for each type of genre that a writer can apply his/her skills to a variety of tasks, even if they change workplaces, because the genre remains the same. By understanding technical communications through genres, the classroom is better poised to reflect the needs of the workplace.

In their study investigating university preparation for workplace writing, Schneider and Andre (2005) point to the complexity involved with transferring skills from the "classroom to the workplace" and question whether "nonacademic genres" could be "learned outside the workplace" (p.196). While some of the students of the management, science, and communications programs interviewed did take technical communication courses, technical communications was not central to this study. Despite the focus of this study not being on technical communications, and having a small sample size of only nine students, the results are still significant because it is one of the few studies that attempted to understand professional knowledge and the differences between workplace and classroom researchers using a theoretical base.

Schneider and Andre (2005) interviewed students who had recently returned from an internship program. The students were from management, communications and science programs and were asked to evaluate whether their learning had prepared them for their experiences with workplace writing. Student evaluations of their preparedness varied considerably based on their

program. The students who were most satisfied with how they were prepared for writing in the workplace referenced the "research and analytic skills" that they had developed through their studies together with the "familiarity they had developed with the particular genres" that they had used in the workplace (p. 206). Results of the interviews also found a difference between how the different student groups regarded their experience and preparedness for workplace collaboration. While management students reported to have "extensively collaborated" (p. 202) in their program, especially with report writing, political science students found that collaboration was not central to their studies and preparation for workplace writing, and communications students reported to have experienced the best overall preparation for workplace writing (p. 204).

Despite their study not directly pertaining to technical communications, and being focused solely on the task of writing, Schneider and Andre's (2005) conclusions that instructors could benefit by using genre theory in the classroom to help students better understand the knowledge and skills needed to write for a variety of "workplace contexts" (p. 215) is still valuable and worthy of additional study, specifically in the field of technical communications. While genre theory is still very much based on text and writing, this theory does provide academics with a way of teaching technical communications and in understanding how what is taught in the classroom transfers to the workplace.

Conclusion and Research Questions

The technical communications literature on both the side of the classroom and the workplace attests to the need for continued research and study. The focus of the existing literature spans both academic and workplace contexts yet few apply any type of theoretical model to the process of defining professional skills and knowledge.

As discussed, managers in the field of technical communications hiring newly graduated college/university students often point to a gap that exists between the skills learned and the skills required to be successful in the workplace. Collaboration is often cited as one of the skills lacking in the newly graduated population as was illustrated in Rainey, Turner and Dayton's (2005) study of managerial expectations that asked managers to rank the skills necessary for technical communicators to be successful in the workplace. Of the 63 skills that were ranked by managers, collaborative skills - specifically the "ability to collaborate with subject-matter experts" and the "ability to collaborate with co-workers" as the most important competencies in overall ranking with a mean of 4.0, and 3.96, respectively (p. 328).

While Rainey, Turner and Dayton's (2005) study ranks collaboration as the most important skill for managers, it does not define the attributes of collaboration nor does it ask students to contribute to the definition so that a comparison can be made. The attributes required for collaborative competencies were, however, defined by Conference Board of Canada's *Employability Skills 2000+* (2000) brochure.

Research questions.

By considering the theoretical frameworks presented, it is clear from the literature that some key questions remain. In this study, we will specifically address two:

1. How do managers of technical communicators, and technical communications students define collaboration?
2. What role, if any, do collaborative Web 2.0 technologies, (such as wikis, instant messaging and Google Docs) play in helping or hindering teamwork and collaboration in the workplace?

Chapter 2: Methods

Students from the Seneca College Technical Communication post-graduate program and managers of technical communicators were surveyed on the topic of collaboration, teamwork and collaborative technology usage as part of this research study. The Seneca Technical Communication Certificate program is a one-year co-operative technical writing program (Seneca College, n.d.). The students from this program were selected as an appropriate sample for this study because the program is only focused on technical communications and because theyparticipated in a work-term as part of the program. Students were surveyed at the beginning of the fall school term and then again the beginning of the summer term once they had returned from their work-term. Managers of technical communicators were also surveyed on their perceptions of the collaborative skills of technical communicators and the use of collaborative technologies in the workplace. By surveying students and managers, this research project aims to understand if there is a difference in how technical communication students and managers of technical communicators define collaboration and to determine if the use of collaborative tools and technologies help or hinder the collaboration.

The attributes required for teamwork and collaboration are defined by Conference Board of Canada's (2000) *Employability Skills 2000+*. This publication highlights three primary key skills required to "enter, stay in, and progress in the world of work" (Conference Board of Canada, 2000, p.1). The three categories are defined in

Table 2.

Table 2

Employability Skills 2000+ Defined (Conference Board of Canada, 2000)

Skill	Description
Fundamental Skills	The skills as needed as a base for further development.
Personal Management Skills	The skills as needed as a base for further development.
Teamwork Skills	The skills and attributes needed to contribute productively.

In the teamwork category, skills were further divided by "work with others" and "participate in project tasks" each with its own defined attributes (p.2). The first four survey questions of this study are based on five of the nine attributes associated with the "work with others skills". The five attributes and questions used in the student and managers surveys are shown in Table 3.

Table 3

Teamwork Related Survey Questions and Teamwork Attributes

Student Survey Question	Manager Survey Question	Related "Work with Others" Attribute (Conference Board of Canada, 2000)
Q1. Dynamics I work well within the dynamics of a team.	Q.1 Dynamics Technical communicators that I manage/supervise need to work well within the dynamics of a team.	"understand and work within the dynamics of a group"
Q2. Opinions When working in a team, I am open to the opinions of team members.	Q2: Opinions When working in a team, technical communicators that I manage/supervise need to be open to the opinions of team members.	"be flexible: respect, be open to and supportive of the thoughts, opinions and contributions of others in a group" "recognize and respect people's diversity, individual differences and perspectives"
Q3. Contributions When working in a team I readily share my expertise.	Q3. Contributions When working in a team, technical communicators that I manage/supervise need to readily contribute.	"contribute to a team by sharing information and expertise"

Q. 4. Leading & Supporting When working in a team I know when to lead and when to support.	Q.4. Leading & Supporting When working in a team, technical communicators that I manage/supervise need to understand when to lead and when to support.	"lead or support when appropriate motivating a group for high performance"

The remaining survey questions in this study focused on students and managers defining their preferences for collaboration with and without the use of technology. These will be described in detail later, with data to illustrate.

Participant Selection

The students surveyed in this study were enrolled in the Seneca College Technical Communication program in Toronto, which is an Ontario college post graduate certificate program. The Technical Communication program at Seneca College is a one-year co-op program where students take the first term of the program from September-December, and then participate in a paid co-op work term from January-April followed by a return to complete the final summer term from May to August. Students were surveyed during the 2010-2011 program year. The enrollment for the program during 2010-2011 was 30 students. The requirements for admission to the program include "a degree or three-year diploma from a recognized college/university or mature student with three to five years of documented related work experience including references" (Seneca College, n.d, para. 2). Nine out of ten of Group 2 respondents (N=22) indicated that they held at least one university degree and a B.A. was the most frequently cited degree held. The age range of the students spanned twenty years with birth years ranging from 1961-1982. All 22 respondents of the Group 2 students completed a co-op work-term placement in the Winter term.

Managers/supervisors who supervised at least one technical communication report were invited to participate in the survey. Managers were recruited from those known by the principle investigator and from invitations posted on the Society of Technical Communication members-only online LinkedIn group.

Survey Methods

Sample 1: Students

Students received an invitation and a copy of the consent form in the body of an email from the researcher that was forwarded to them by the Program Coordinator. The invitation to the survey and a copy of the consent form was forwarded by the Program Coordinator twice during 2010-2011; once in September (Group 1) and again in May (Group 2). The invitation contained a hyperlink that took the student to the online consent form on Survey Monkey. When the student agreed to participate in the study, the survey opened the Survey Monkey website. The online survey administered to the students was both anonymous and confidential. The data was retrieved in Excel format and did not include any identifying data.

The surveys were a combination of structured and unstructured format. The structured survey questions used a 5-point Likert scale and True/False. Likert scale options were as follows: Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5). As illustrated in Appendix B, Group 1 and Group 2 were asked to respond to the same 14 structured and 3 unstructured questions and Group 2 were asked to respond to 4 additional unstructured survey questions related to their use of social media and their experiences using collaborative technologies during their work term.

Quantitative Data collection

Group 1 and Group 2 were asked to respond to nine 5-Point Likert Scale statements. Of the 9 Likert statements, questions 1, 2, 3 and 4 focused on the Skills 2000+ (Conference Board of Canada, 2000) teamwork attributes of working with others, which included team dynamics, opinions, contributions and leading and supporting. Questions 5, 6, 7, 8 and 9 were Yes/No questions that focused on the types of collaborative technologies that students had used to collaborate on team projects. These technologies included collaborative tools, email, chat tools, online conferencing and mobile phones. Statements 10, 11, 12 and 13 used the 5-point Likert scale to determine how both Group 1 and Group 2 students compared relative to how they defined their own preferences for collaboration. Students were asked to respond on their preferences for working on a team to complete a project, working individually to complete a project, and for working face-to-face in a team project, and working using collaborative technologies. Using the 5-point Likert scale, students were also asked to provide their opinion on whether the technical communications program at Seneca College was preparing them for the workplace.

Qualitative Data Collection

Group 1 and Group 2 students were provided with the same unstructured survey questions related to the types of technologies they typically used to collaborate on a project or activity. The unstructured responses from before and after the work-term captured additional details on how the groups may have changed between fall and summer terms. By categorizing the unstructured responses by each student group according to those attributes used by *Employability Skills 2000+*, it was possible to compare their responses to each other and to the manager group. Both groups were also asked unstructured questions related to the collaboration skills they had and

what collaborative skills they wanted. These unstructured responses allowed a comparison of whether the students' definition of collaborative skills changed after their technical communication workplace experience on their work-term.

In addition, Group 2 was asked four additional unstructured survey questions related to their use of technology following their work-term. Three of the four questions (19, 20, and 21), were specific to Group 2 students' use with social media in their program, their workplace, and in their personal use, respectively. Question 16 asked Group 2 students to identify the technologies they used, if any, during their work-term.

Sample 2: Managers

Managers/supervisors were invited to participate in an anonymous survey conducted in the absence of the primary investigator. The invitation to participate and the link to the anonymous survey hosted on *Survey Monkey* was posted on the *Society for Technical Communication* (STC) online group on the social networking site LinkedIn (linkedin.com), which is a private group for members of the STC. The invitation was also sent out to five technical communicators known to the primary investigator. The sample surveyed is a convenience sample of those managers who responded to the survey invitation. The respondents were internationally based, with 11 from the United States, 5 from Canada, and 1from "other" responded. Manager/supervisor for the purpose of the survey is someone who supervised at least one technical communication report.

Since technical communicators do not always belong to a technical communications team, but could belong to a product or development team or another interdisciplinary group, it was not required for the managers/supervisors to be, by discipline, technical communicators themselves. Seventeen managers responded to the survey. Sixteen of the managers (N=17) reported to having

supervised technical communicators in the 12 months prior to taking the survey and 13 managers (N=17) had technical communicators reporting to them at the time of the survey. Slightly over half of the respondents (N=17) had supervised newly-graduated technical communicators. Newly-graduated technical communicators were defined as those who had graduated from a technical communications program. Of the 17 respondents, one manager had managed a student that had graduated from the Technical communication program at Seneca College.

Quantitative Data Collection.

Managers were surveyed using structured and unstructured questions. The structured questions closely followed the same survey questions used in student surveys so that the responses between groups could be compared. Managers were asked to respond to 10 structured statements using True/False and a 5- point Likert scale with options as follows: Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5).

Managers responded to the same 5-point Likert scale survey statements related to the importance of technical communicators working for them having collaborative skills (dynamics, opinions, contributions and leading and supporting) in questions 1, 2, 3, and 4. Questions 5, 6, 7, 8 and 9 asked respondents to answer True/False on technical communicator use of technologies (email, chat tools, online conferencing tools, mobile phones). Managers were also asked to respond to the 5-point Likert scale where they rated whether collaborative technologies improved the teamwork of the technical communicators that they managed.

Qualitative Data Collection

Managers responded to 6 unstructured questions. Questions 11 and 15 focused on technologies, both collaborative and general, that would be used by technical communicators in the workplace. Questions 12 and 13 asked managers to identify the collaborative and other skills

that might be lacking in newly graduated technical communicators. Question 14 asked managers to identify who technical communicators collaborated with in the workplace. Managers were also provided with the opportunity to provide any additional comments on the topic of technical communicators and collaboration.

Ethics Approval

This project was submitted to review and approved by the UOIT Research Ethics Board (REB# 09-122) and by the Seneca College Research Ethics Board (REB# 10-09). The consent form for both student groups and the manager group is included in the supporting materials provided with this study.

Chapter 3: Data & Analysis

The literature in the technical communications field relative to the skills that are needed for new graduates to succeed in the workplace have largely relied on surveying or interviewing technical communication managers or academics. While these studies have revealed collaboration as a key skill of importance in both the classroom and the workplace, there is no indication of how students define the strengths and weaknesses of their own collaborative skills relative the priorities of the manager and instructor. In addition to defining collaborative skills, the proliferation of collaborative Web 2.0 tools and technologies like Google Docs, wikis and social media tools like Twitter and Facebook adds another component that should be included in the analysis of teamwork and collaboration to determine if it plays a role in helping or hindering collaboration in the workplace.

Employability Skills 2000+ (The Conference Board of Canada, 2000) defines teamwork skills as "the skills and attributes needed to contribute productively" (p.2). A selection of attributes listed under Teamwork: Work with Others of the *Employability Skills 2000+* identified by the Conference Board of Canada (2000) was used in design of the survey questions for both students and managers. The teamwork skills' attributes selected for the survey include team dynamics, opinions, contributions and leading and supporting. In addition to structured survey questions, students and managers were also provided with the opportunity to respond to a series of unstructured collaboration and technology related questions.

Student Work Preferences

Prior to examining student responses to survey questions regarding their collaboration skills and collaborative technology, it is important to start with an understanding of the students' own workplace collaboration preferences. When asked to respond to the statement "I like

working on a team to complete a project", close to half of Group 1, pre-work term students answered neutrally (M= 3.11; SD=.96; N=18). Following their work-term, eight out of ten Group 2 students agreed (M=3.48; SD=1.07; N=21) to the same statement. When responding to the statement of preference for working on their own to complete a project, Group 1 (M=4.28; SD=.89; N=18) and Group 2 agreed. (M=4.24; SD=.62; N=21).

As illustrated in

Figure 1 andFigure 2, it appears that Group 1, new students to the program, were ambivalent about the value of working with a team to complete a project. In contrast, Group 2, who had just returned from their work-term, appear to be responding more confidently about working in a team to complete a project. However, the level of confidence in their enjoyment of working in team could be questioned as they also appear to more strongly agree that they prefer to work on their own to complete a project. The appearance of a change in preference from before and after the work term related to teamwork could be illustrative of a difference between the perception of teamwork in the technical communications classroom and the reality of teamwork as a necessity to be successful in the workplace. Furthermore, this could explain how Group 2 students could maintain their strong preference for working independently, but at the same experience a slight change in their preference for collaboration.

Figure 1

Student Responses to "I like working on a team to complete a project"

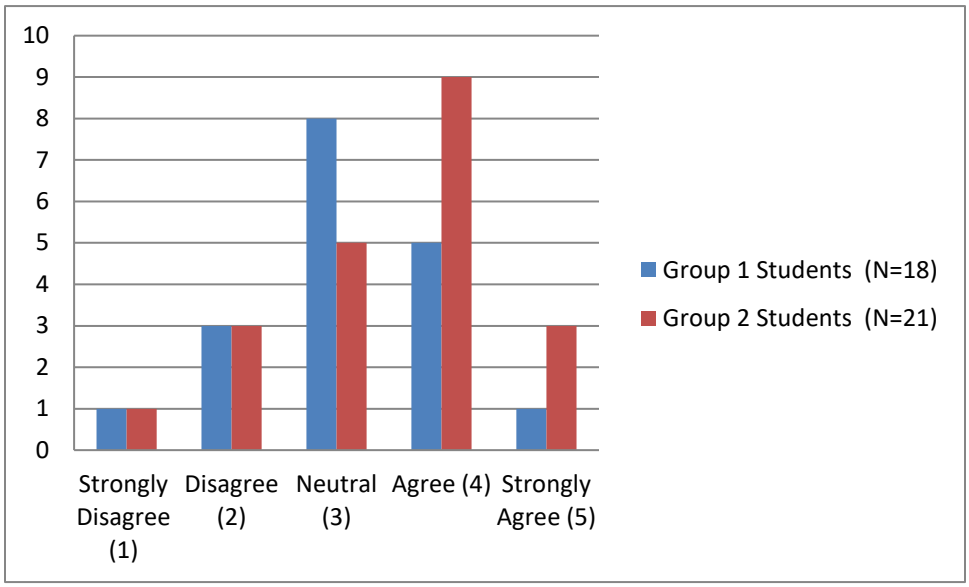
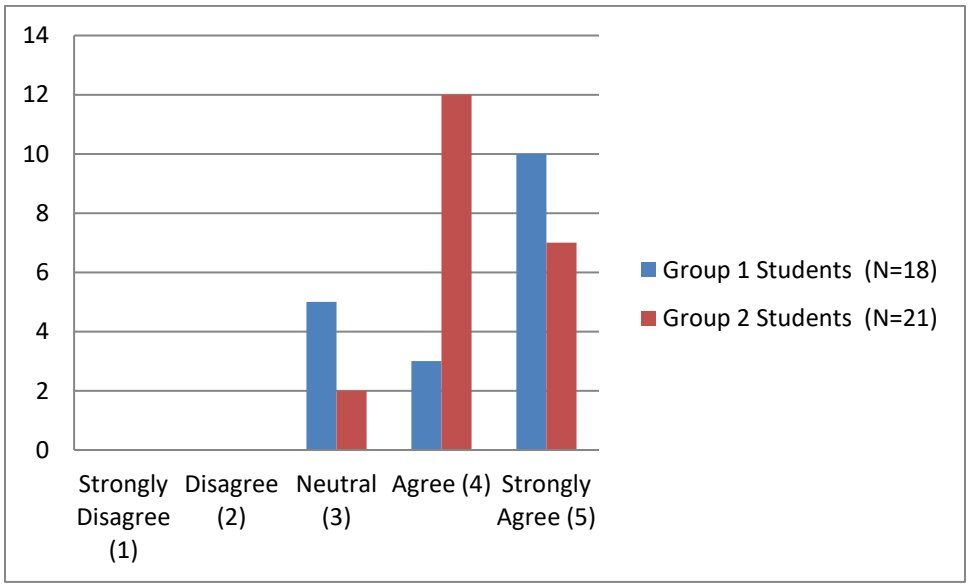


Figure 2

Student Responses to "I like working on my own to complete a project"



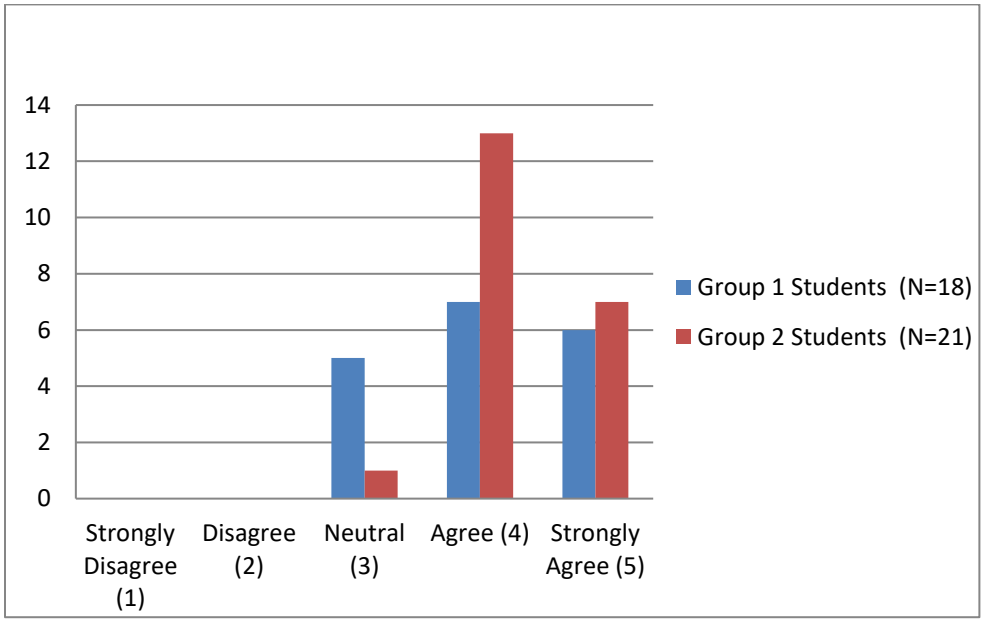
Working with Others

Team dynamics.

Employability Skills 2000+ defines "understand and work within the dynamics of a group" as an attribute of teamwork skills (Conference Board of Canada, 2000). When responding to the statement "Technical communicators that I manage/supervise need to work well within the dynamics of a team", all of the managers agreed with the importance of this skill for technical communicators (M =4.71; SD =.47; N=17). Figure 3 illustrates how Group 1 (M=4.05; SD=.80; N=18) and Group 2 (M=4.05; SD=.56; N=21) students defined how they work within the dynamics of a team.

Figure 3

Student Responses to "I work well within the dynamics of a team"



Openness to opinions.

Employability Skills 2000+ defines the following attributes as teamwork skills:

> Be flexible…respect, be open to and supportive of the thoughts, opinions and contributions of others in a group….recognize and respect people's diversity, individual differences and perspectives… (Conference Board of Canada, 2000)

All 17 managers surveyed agreed that the technical communicators working for them needed to be open to the opinions of others when working on a team (M=4.88; SD=. 33; N=17). When students were asked to respond to the statement "When working in a team, I am open to the opinions of team members", Group 1 students (M=4.33; SD=.59; N=19) and Group 2 students (M=4.48; SD=.67; N=21) agreed. While it appears from the responses that both groups of students have the openness to opinion skills valued by managers, their responses to the unstructured survey question "What collaboration/teamwork skills do you want?" suggest that not all of the students in Group 1 and Group 2 are as confident in these skills as their survey responses suggest. As shown in their responses in Table 4, students in both groups appear to have confidence in their openness to opinions skills. Students in both groups also appear to want stronger skills in the areas of patience and tolerance.

Table 4

Responses to "What collaboration/teamwork skills would you like to have?

Group 1 (N=12)	"Patience, tolerance for opposing ideas" "More patience with others" "More patience!!!"
Group 2 (N=14)	"Patience" "More tolerance for other opinions" "More patience!" "I think it would be good to learn how to cope with differences in personalities and working styles within a group."

Contributing to a team.

Employability Skills 2000+ defines "contribute to a team by sharing information and expertise" as an attribute of teamwork skills (The Conference Board of Canada, 2000).

Managers responded with complete agreement to the statement "When working in a team, technical communicators that I manage/supervise need to readily contribute my expertise" (M=4.82; SD=.39;N=17). When students responded to a statement on how readily they shared their expertise when working in a team, Group 1 (M=4.22; SD=.80;N=18) and Group 2 (M=4.14;SD=.79;N=21) agreed. Table 2 shows a selection of unstructured student responses from both groups that illustrate how they define their skills in this area.

Table 5

Responses to "What collaboration/teamwork skills do you have?"

Group 1 Students	"I like to contribute to the best of my ability" "I can work well individually sharing via email/tools and face to face with team" "Make myself available to participate" "Active participation in team"
Group 2 Students	"I try to find a niche for myself based on skills that I already bring to the table. In other words, I try to fill in the gap with what I can do best." "I work better when I can share ideas and build on them with other people, but I become frustrated with team members don't work as quickly as I do."

Leading and supporting in a team.

The Employability Skills 2000+ defines "lead or support when appropriate, motivating a group for high performance" as an attribute of teamwork skills (Conference Board of Canada, 2000).

All of the managers that responded agreed with the statement "When working in a team, technical communicators that I manage/supervise need to understand when to lead and when to support" (M=4.53; SD=.51; N=17). Figure 4 shows that Group 1 (M=4.22; SD=.73;N=18) and Group 2 (M=4.00;SD=.63;N=21) students agree with the statement that they know when to lead and support while working in a team environment. The student responses to the structured statement on leading and supporting are also reflected in their unstructured responses to questions asking what collaboration/teamwork skills that they have and want. Figure 3 shows a selection of the open responses relating to leadership for both groups, which illustrates that leadership is a key attribute in the way Group 1 and Group 2 define collaboration and teamwork skills.

Figure 4

Student Responses to "When working in a team, I know when to lead and when to support"

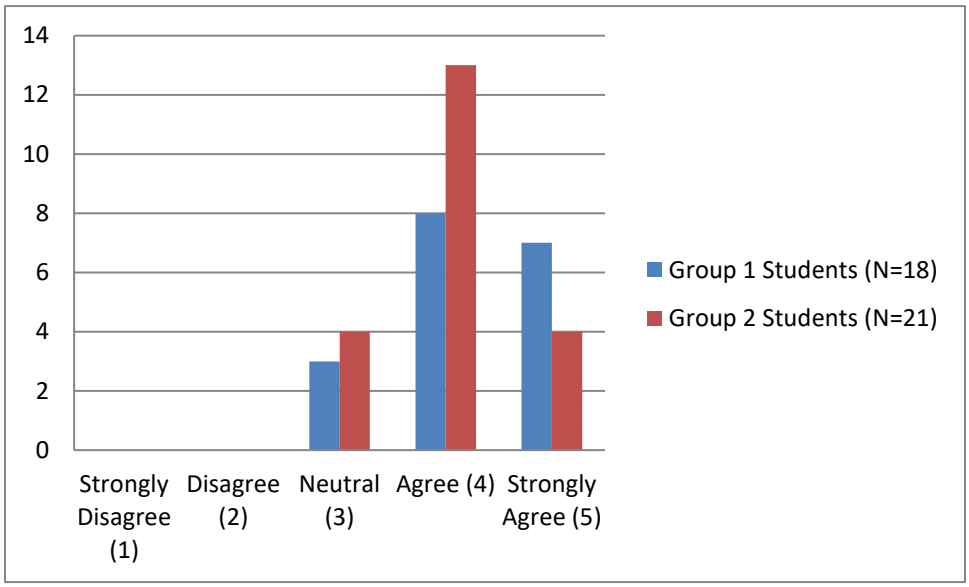


Table 6

Student Responses to collaboration/teamwork skills questions

	What collaboration/teamwork skills do you have? (selection related to leading & supporting)	What collaboration/teamwork skills do you want? (selection related to leading & supporting)
Group 1 Students	"Communication, leadership, project management" " work well in teams, I usually get assigned the team leader role" "I know when to lead and when to follow…." "Lots- leadership…." "Leading, following…."	"Leadership" "Leadership" "Improved leadership abilities" "Better personal leadership abilities."
Group 2 Students	"Know how to delegate responsibilities. Know when to lead and when to support." "….Ability to lead or follow as needed." "Leadership, communication, empathy"	"I often lead in teamwork and collaboration but it would be good to have even more leadership skills in this" "Leadership" "… more confidence in leading a group" "Gain stronger leadership skills."

	Leadership and making sure everyone is on the same page organizational, leader	

While managers overwhelmingly agreed to the importance of leadership skills in technical communicators (in contrast to the student open responses in Table 6), their own unstructured responses suggest that their definition of collaboration definition differs in comparison. When they were asked to identify what collaborative/teamwork skills were missing in newly graduated technical communicators, managers emphasized the ability to work within a team that is diverse in culture, background and skill levels, not leadership.

Of the fifteen manager responses, not one response mentioned leadership as a skill that was significant or lacking. As illustrated in Table 7, manager responses to questions asking them to identify missing collaboration skills in new graduates, or to provide additional feedback on the topic of collaboration, appear to suggest that new technical communication graduates don't appear to have difficulties using collaborative tools in the workplace. However, while not appearing to having difficulties with the technologies, manager responses did suggest new technical communicator skills were missing in the act of collaboration and of team interaction, especially in the increased global context of the workplace.

Table 7

Manager Responses to Missing Skills

Question	Manager Response
Q. What collaboration/teamwork skills are missing in newly graduated technical communicators? (N=15)	"Social networking. Not Twitter/Facebook, but the ability to interact well with others. It's better with mature grads, but under 25 can have issues."
	"I think graduates are generally quite comfortable with the tools. The problem sometimes is that they use the tools instead of face-to-face discussions. This can lead to mis-communication. This is true of new graduates and others. Also, a growing need is to collaborate globally.

	It can be tricky getting good answers from someone on the other side of the world."
	"Although I haven't supervised newly graduated tech comms, the big skill in collaborating that I need is being able to do this with remote teams, from diverse cultures, backgrounds, and skill levels."
Q. Additional Comments (N=8)	"Newer workers often have superior technical skills compared to older workers, but inferior interpersonal skills. This has always been true – it's not just a Gen Y think – and can only be fixed by gaining work experience."
Q.Are there any others skills that newly graduated technical communicators are lacking in the workplace? (N=13)	"Ability to understand the various ways each team member can contribute"
	"team work, idea sharing"

To better understand the nature of collaboration for technical communicators in the workplace, managers were asked to indicate who technical communicators collaborated with in the work environment. The importance of collaboration for technical communicators in multidisciplinary contexts as discussed in the literature (Larbi & Springfield, 2001; Conklin, 2007) appears to be supported in the unstructured responses from managers to the question "Who do technical communicators collaborate with at your company?" The different types of roles in the workplace that collaborate with technical communicators, as identified by the managers, not only span disciplines but also levels of hierarchy within an organization. As demonstrated in Table A2, roles that were identified include, but are not limited to, product marketing, editors, graphic artists, engineers, quality assurance, software developers, business analysts, management, translators, customers, sales people, customer support, executives and administrative staff.

When asked to define the collaborative/teamwork skills they had and wanted, Group 1 and Group 2 students frequently referred to tactical attributes similar to those in the "Participate in Projects & Tasks" section of *Employability 2000+* teamwork skills. For example, Group 1

students (N=13) frequently listed skills that relate to the "plan, design or carry out a project or task from start to finish with well-defined objectives and outcomes" (The Conference Board of Canada, 2000, p.2) attributes.

For example, a Group 1 student noted that his collaborative/teamwork skills included "staying in contact, setting meetings and deadlines, dividing tasks" and another student from the same group added "follow-up, goal setting, meeting facilitation." Of the thirteen open responses from Group 1, tactical skills relating to planning, designing and carrying out project related tasks appeared in seven of the "have" responses. In contrast, the frequency of these tactical skills appearing in the 'have' category seem to have decreased for Group 2 following the work-term, demonstrating perhaps that their definition of collaborative/teamwork skills may have expanded from the tactical following their experience on their work term. However, tactical project related skills were not part of the unstructured manager responses whatsoever when asked what collaboration/teamwork skills were missing.

Face-to-Face and Technology Collaboration Preferences

Both groups of students were surveyed on their preferences relative to face-to-face and technology-based collaboration. The assumption of the author was that face-to-face collaboration referred to in-person only and that collaborative technology/tools included any and all tools (email, web conferencing, chat, and social media). As illustrated in Figure 5, when asked to respond to the statement "I like to collaborate face-to-face with team project" Group 1 (M=4.06; SD=.72; N=18) and post work-term Group 2 students were close in their agreement (M=4.05; SD=.97; N=21) with the statement.

When asked to respond to their preference for collaborating on team projects using collaborative technology/tools, there appears to be a slight difference between the student

groups, as shown in Figure 6, Group 1 students who responded to the survey at the beginning of the program, and before their work term, responded with less agreement (M=3.67, SD=.90; N=18) than the post work-term Group 2 (M=3.86; SD=.85; N=21). As illustrated in Figure 6, it appears that following the work-term, Group 2 had a more positive attitude towards using technology for collaboration for team projects, which could possibly be explained by having an increased level of exposure to technology used on projects in the workplace.

Figure 5

Student Responses to "I like to collaborate face-to-face with team projects"

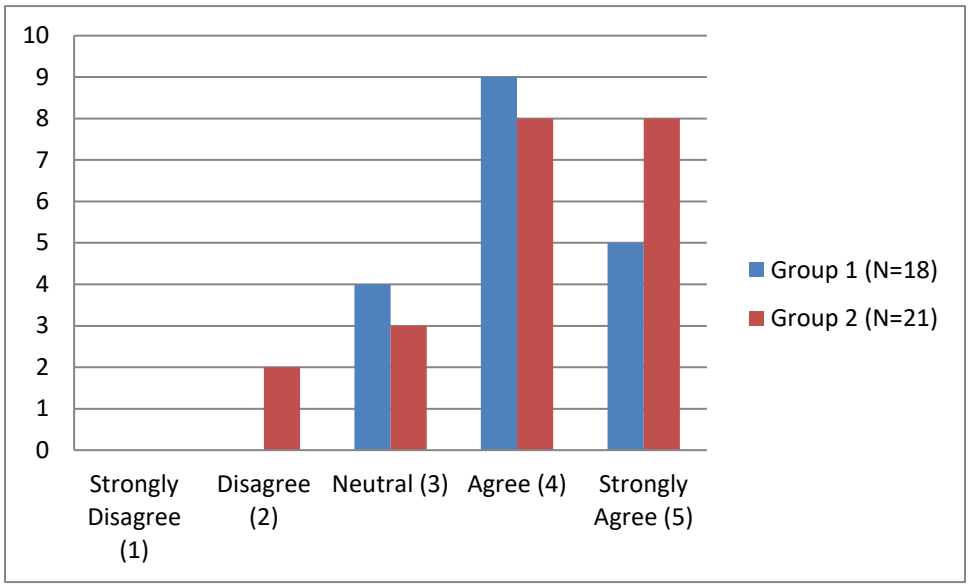
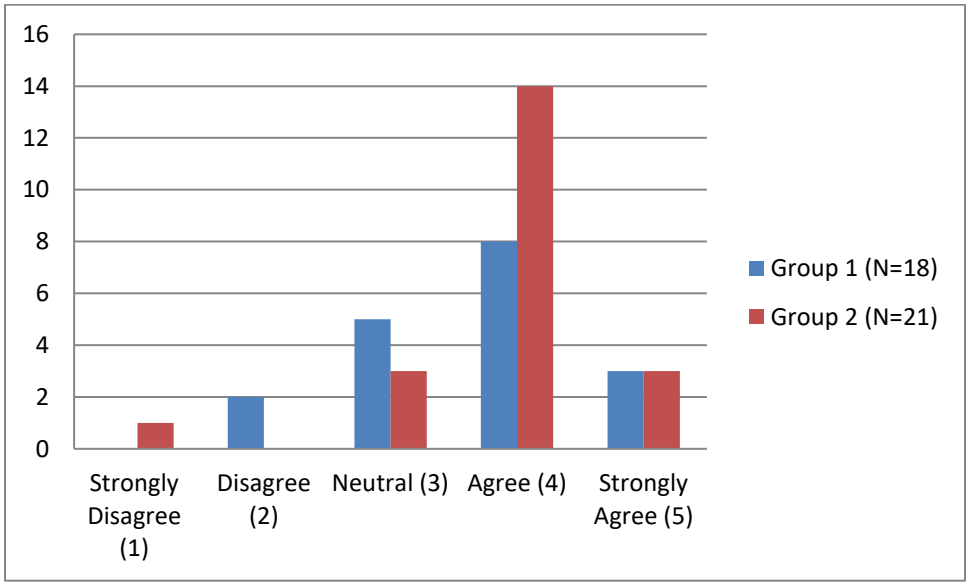


Figure 6

Student Responses to "I like to collaborate on team projects using collaborative technology/tools"



Use of Tools and Technologies

Group 1 and Group 2 students and the managers group were asked to respond to structured and unstructured survey questions related to their use of tools and technology for collaboration. The structured questions asked all three groups to respond with yes/no on their usage of the following: collaborative tools (e.g., Google Docs, Wikis, Online Communities), email, chat tools (MSN/Yahoo, Google), online conferencing tools (like Skype or WebEx) and mobile phones.

Email.

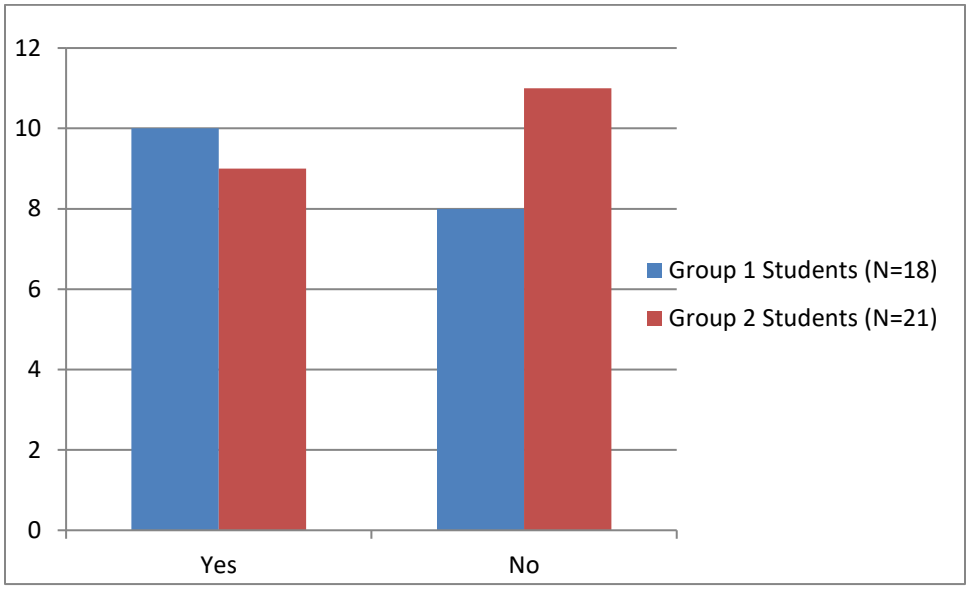
All of Group 1 (N=18) and Group 2 (N=21) students responded yes to the statement "I have used email to collaborate on team projects" and all of the manager group (N=17) responded yes to the statement "Technical Communicators that I have managed/supervised have used email to collaborate on team projects".

Online Collaborative Tools (e.g., Google Docs, Wikis, Online Communities).

Group 1 was almost evenly divided in their responses when asked if they had used online collaborative tools to collaborate on team projects with 10 answering yes and 8 answering no (N=18). As illustrated in Figure 7, most of Group 2 post work-term students (N=21) responded yes that they had used online collaborative tools to collaborate on team projects suggesting their experience with online collaborative tools working on team projects almost doubled over their work-term.

Figure 7

Student Responses to "I have used online collaborative tools (e.g., Google Docs, Wikis, Online Communities) to collaborate on team projects"



The manager group (N=17) responded yes that technical communicators that they had managed used online collaborative tools (e.g., Google Docs, Wikis, Online Communities) to collaborate on team projects.

Chat tools.

All three groups were asked to respond to a statement on the use of chat tools to collaborate. When asked if the technical communicators they have managed used online chat tools (e.g. MSN, Yahoo, Google) to collaborate on team projects, 11 managers (N=17) responded yes. In the student groups, 12 of Group 1 (N=18) and 15 of Group 2 (N=20) responded that they had used chat tools to collaborate on team projects.

Online conferencing tools (e.g, Skype or WebEx).

According to 12 of the manager respondents (N=15), the technical communicators they have managed used online conferencing tools like Skype or WebEx to collaborate on team projects. In contrast to the large usage of online conferencing tools reported by managers, 8

Group 1 (N= 18) and 9 Group 2 (N=21) students responded that they had not used online conferencing tools such as Skype or WebEx to collaborate on team projects which suggests that they were not exposed to this particular type of collaborative technology over their work term.

Mobile phones.

Student groups and managers were asked to respond on their general usage of mobile phones for project team collaboration. Due to the fact that it was a general statement, it is impossible to discern how the phones were used (i.e., text, voice, email, web or social media). Ten managers responded (N=16) that the technical communicators that they managed did not use mobile phones to collaborate on team projects. Student Group 1 (N=18) and Group 2 (N=20) answered similarly with close to half having used mobile phones to collaborate on team projects. The difference in responses between managers and the student groups could be attributed to technical communicators not being provided with a company phone to collaborate, but students may have used their own personal mobile phones instead.

Student Qualitative Responses to Technology Used.

The responses to the question "What type of technologies, if any, would you typically use to collaborate on a project or activity?" were unstructured from both student groups and provide some additional context on types of tools and technologies. Thirteen Group 1 students and eighteen Group 2 students responded to the unstructured question. From their responses, the five most frequently mentioned technologies from both groups fell into the same five main categories used in the structured survey questions: online collaborative tools (Wikis/Google Docs), email, chat/IM, video conferencing (Skype/WebEx) and cell phone. As illustrated in Figure 8 and Figure 9, the responses from both Group 1 and Group 2 students support their responses in the structured questions related the use of each type of technology.

Figure 8

Group 1 Most Frequently Cited Collaborative Technologies Used in Unstructured Responses

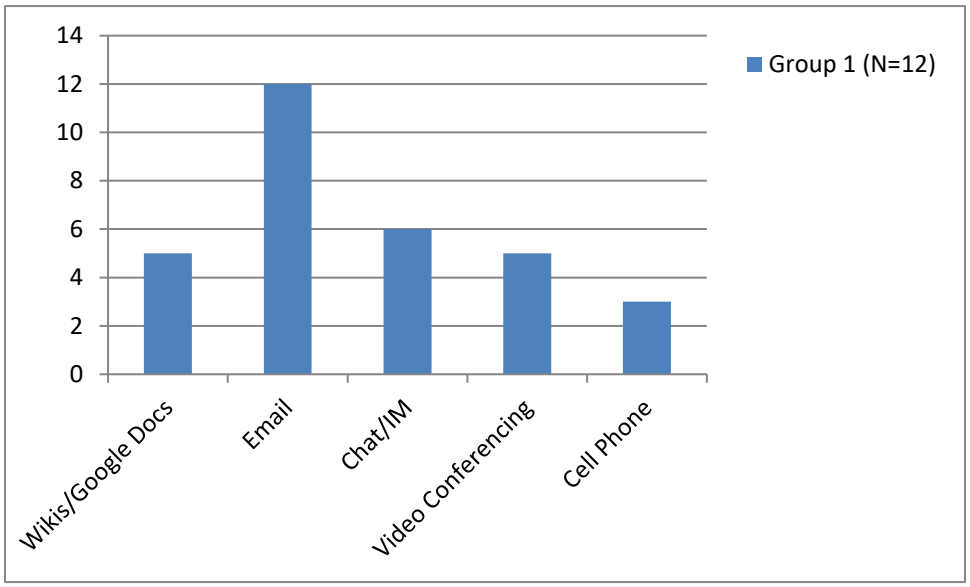
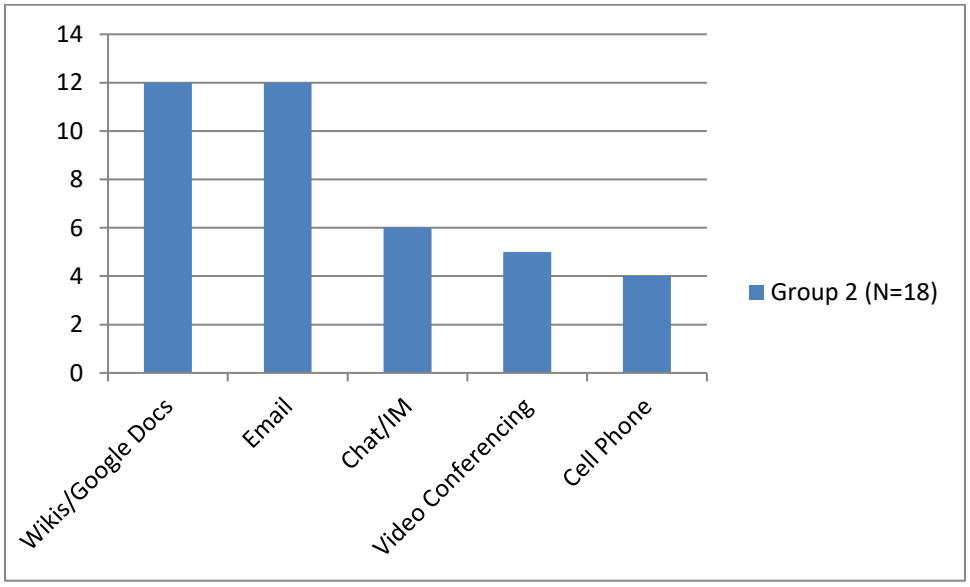


Figure 9

Group 2 Most Frequently Cited Collaborative Technologies Used in Unstructured Responses



Group 2 Students: Additional Use of Collaborative Technology

Group 2 students were asked an additional series of unstructured questions related to their use of collaborative technologies in their work term, in their technical communications program and in their own personal use. Group 2 students (N=18) reported most frequently using email, web conferencing, and IM/Chat during their work term. With the exception of one reference to a wiki, there was no reference to the use of Google Docs during the work-term, but there are two references to SharePoint. In addition to the tools mentioned, word processing and content development tools were included among the responses.

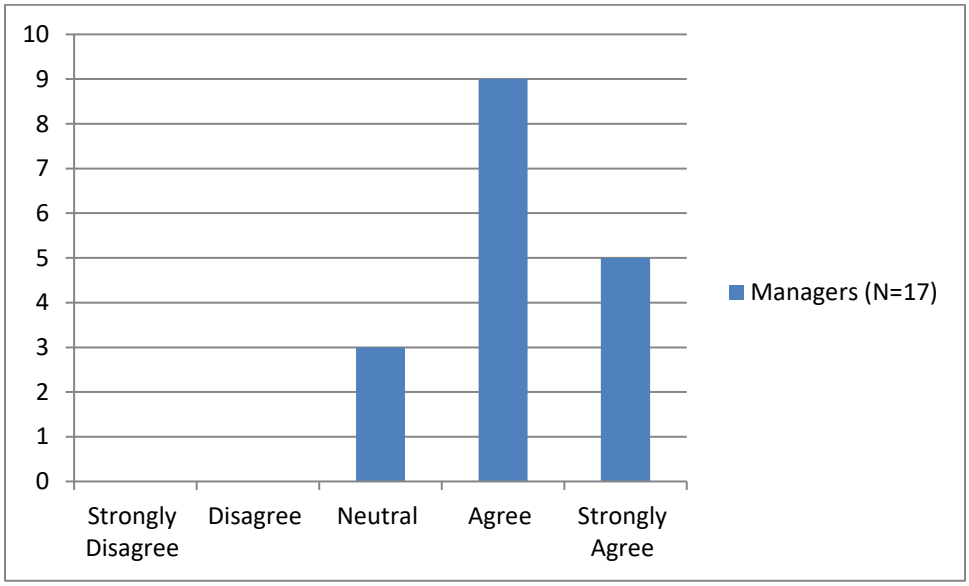
In addition to collaborative technologies like Google Docs and wikis, Group 2 students were asked what social media technologies (Twitter, Facebook, Ning) they used in the technical communications program, during their work-term and for personal use. Ten of 16 respondents of Group 2 students indicated that they had used social media in the program. Of the 16 responses, the most frequently cited social media tools used in the Seneca Technical Communications program were Facebook, Twitter and LinkedIn. These tools were used by students to connect and support each other in course activities and to keep up-to-date on course announcements. In contrast, Group 2's use of social media during its work-term was almost non-existent with only four (N=15) responding that they had used social media during their work-term. Lastly, when asked to respond to the social media technologies personally used, 16 Group 2 (N=18) students responded to using social media for personal use. The most frequently cited social media tools in the 18 responses were Facebook, Twitter and LinkedIn, respectively.

Manager Perception of Collaborative Technologies in the Workplace

The data analyzed thus far has provided an initial picture from managers of what types of technological tools are being used by students and managers to collaborate. What has yet to be discussed, however, is how managers perceive and define the use of collaborative technologies by technical communicators in the workplace. To determine their overall perception, managers were asked to respond to the statement "collaborative technologies have improved the teamwork skills of the technical communicators that I have supervised/managed." Figure 10 illustrates their response to this statement. (M=4.12; SD=.69; N=17). With the majority of managers in agreement, it is possible to infer that managers believe collaborative technologies enhance, not hinder, the collaboration of technical communicators.

Figure 10

Managers Response to "Collaborative Technologies Have Improved the Teamwork Skills of the Technical Communicators that I Have Supervised/Managed"



Conclusions

The need to collaborate on multidisciplinary teams with a variety of different roles combined with the diversity of a global workplace and new tools and technologies define the current skillset needed for technical communicators in the workplace. While the managers and students in this study appear aligned in many of their responses, there were some differences apparent in the unstructured answers related to leadership, openness to opinion, and tactical collaboration skills. In addition, it appears that while Web 2.0 technologies such as wikis, instant messaging and online collaborative work tools do not hinder collaboration, and that technical communicators are not lacking in their skill using these tools, without the core attributes of teamwork skills, student use of collaborative technologies is secondary.

Chapter 4: Discussion

While the framework applied to this study provides the opportunity for both managers and students to contribute to a definition of collaboration that incorporates teamwork attributes and collaborative technologies, there is a third framework to consider; Cook's (2002) pedagogical framework. Cook's examination of how literacies interrelate from a pedagogical perspective provides an opportunity to extend this study's own framework.

Cook's (2002) framework is one that is firmly situated in technical communications pedagogy and the literacies associated with it. While she is aware of the possibility that some might be critical of her framework because it is so entrenched in pedagogy and not the workplace, she defends her framework in the following way:

> [I]f students possess a working literacy in these six areas [basic, rhetorical, social, technological, ethical, critical] they will possess and employ a variety of skills that will make them successful employees. Instruction in these six literacies infuses students with skills necessary for communicating in many fields. By focusing on these literacies rather than on specific workplace skills, technical communication instructors may better prepare students for many workplaces and prepare them for lifelong learning, not learning for a specific vocation. (p. 24)

While her framework (2002) appears to provide a more systematic way of defining the literacies in the technical communication curriculum, it is only by connecting those literacies to the workplace we may get a more complete picture of how technical communication programs

can ensure the relevance of what is taught in the classroom in the same way that puzzle pieces connect to one another to give a complete picture.

Cook's (2002) "layered literacies pedagogical frame identifies six literacies that span the breadth of current technical communication pedagogy" (p.23). For Cook, the six literacies, while layered, are not hierarchical in nature and do not appear to require mastery of one before moving to the next, and neither of the literacies appears to be more heavily weighted or dependent on another (pp.8-17). However, while an interdependence between the layers is not explicitly stated, Cook (2002) does mention an "interrelationship of literacies" (p.24) in her conclusion and borrows the terms "integrated and situated" from her review of the literature on "technical communication pedagogy and workplace literacy" (p.6).

In defining the literacies, it appears in some cases that a literacy needs to be situated in the presence of another to exist, or to be demonstrated. This is illustrated by Cook in her explanation of rhetorical literacy:

> Rhetorical literacy can also be identified when students demonstrate other literacies such as basic literacy, by choosing appropriate genres, organizational schemas and graphical displays". (p.10)

A similar situated requirement is also evident for Cook (2002) in her definition of critical literacy where critical literacy is "enmeshed in situations requiring other forms of literacy" (p.16). The suggestion that the existence of rhetorical literacy is dependent on it being interwoven with other literacies does suggest an interdependent nature of the layered framework, even though Cook (2002) appears to disagree:

> [T]hey [literacies] should be viewed as extremely fluid, complicating technical communication instructional activities and goals rather than

> simplifying them. At times, it may even be difficult to describe one without mentioning how it might be layered with another either in classroom or workplace practice. To some, this fluidity may be troublesome because distinctions between categories often will be blurred. (p.23)

According to Cook (2002), it is precisely the fluid nature of the literacies that is the "the frame's strengths because it allows instructors to create activities that promote multiple literacies and develop many skills simultaneously" (p.23). However, if some of the defined literacies are dependent on being situated or interrelated with othersto be defined or to exist, it is unclear how a framework with components that are dependent on each other can also be "extremely fluid (p.23).

What appears to be missing from *Employability Skills 2000+*, in comparison to Cook's (2002) framework, is an identification of how the skills and attributes defined fit together and interrelate. While teamwork attributes are listed, there is no suggestion of a hierarchy or interdependence between the attributes or between the primary skills identified: Fundamental Skills, Personal Management Skills and Teamwork skills (The Conference Board of Canada, 2000). As discussed, while suggesting how some literacies may interrelate with others, Cook (2002) does not explicitly offer a proposed hierarchy or further elaboration on her references to a situated context and the existence of an interrelationship.

Application of Cook's (2002) Framework to this Study

Since the focus of this study is on collaborative skills and the use of collaborative technology by technical communications students and managers, not all of Cook's (2002) six literacies are represented in the data collected. By comparing the literacies to those skill

categories from The Conference Board of Canada as illustrated in Table 1, it is possible to create a base from which we may begin to examine how Cook's (2002) literacies differ from those skills identified by The Conference Board of Canada (2000).

As illustrated in Table 7, the qualitative responses of managers on the collaborative skills that were missing from new technical communicators indicated that while new technical communicators did not appear to be lacking in collaborative technology skills, they were lacking in the core teamwork attributes as defined by The Conference Board of Canada (2000) and the collaborative skills illustrated in the Rainey, Turner and Dayton (2005) study. When applying Cook's (2002) framework to this study, collaborative technology skills fall under technological literacy in the context of "promoting social interactions and collaboration" and the teamwork attributes appear to map to social literacy (Cook, 2002, p. 13). However, in terms of core workplace attributes, social literacy is not as concretely defined as it is in *Employability Skills 2000+*.

Apart from comparing the skills and collaborative literacies of both frameworks, what is more importantly demonstrated by the responses of the managers in Table 7 is that the social collaborative technology skill in new technical communicators appears to be developing independently, or in isolation, of teamwork skills. While the Conference Board of Canada (2000) framework does not provide guidance on why technology skills are developing independently of fundamental collaborative skills, Cook (2002), in her definition of social and technological literacies does begin to explore the relationship between the social and technological literacies and how they can be both assessed and demonstrated in the classroom; thus, providing a starting point to understanding the relationship of both skills in both workplace and classroom.

The responses from both student groups regarding the skills they had and were lacking also suggests that a framework that would map or define how skills connected together, which could be applied to new technical communicators, could be useful for understanding how literacies are demonstrated in both the classroom and the workplace. For example, the responses of students as shown in Table 6 suggest that students are focused on leadership skills. Next to leadership, the most wanted skill in the student responses to unstructured questions was the ability to be patient and tolerant with respect to the opinions and diversity of others. Managers, however, did not define leadership as a missing skill, but did appear to agree that openness and tolerance were missing in recent technical communication graduates.

Understanding the relationship between the identification of leadership in student definitions of have and want skills and in their definition of openness to opinions and diversity skills as lacking could be useful when designing a pedagogy that would more closely reflect the skills indicated as significant for the workplace. Without understanding how skills are situated and how each as an individual fits together, it is difficult to address and potentially resolve holes in the technical communications pedagogy. As illustrated in Table 8, when student and manager responses are mapped to Cook's (2002) literacies, the literacies don't appear to be representative of the specific collaborative attributes desired from a workplace perspective. If the literacies were expanded upon to take into account those weighted most heavily by the workplace, and defined individually and in terms of their interrelatedness, they would have the potential to be assessed and demonstrated in the classroom and the workplace.

Table 8

Six Layered Literacies Mapped to a Sample of Manager and Student (Cook, 2002)

Cook (2002) Literacy	Mapped to Student Responses	Mapped to Manager Responses
Basic	"good listening skills" (Group 1)	"…plain writing" "active listening"
Rhetorical	N/A	"audience analysis, customer insight…"
Social	"|I think it would be good to learn how to cope with differences in personalities and working styles within a group" (Group 2) "I'd like to improve my face to face groupwork skills, as well as my communication skills"	"Soft skills: - Interviewing subject matter experts (SMEs) – Building relationships with SMEs, especially those from different cultural backgrounds…." "Social networking. Not Twitter/Facebook, but the ability to interact well with others."
Technological	"I don't think I used any social media technologies during my co-op work term" (Group 2) "Facebook and LinkedIn to connect with students and instructors. Twitter for updates from professors"	"I think graduates are quite comfortable with the tools. The problem is, that they use the tools instead of face-to-face discussions." "Technical communicators are no different from other workers in their need to collaborate with others in the utility they find using collaboration tools"
Ethical	N/A	N/A
Critical	N/A	"Ability to purse a question, deep dive the content" "problem solving skills"

As demonstrated in this discussion, the application of each framework to this study has its benefits and limitations. By moving away from literacies in terms of layering and towards an analysis of their situated and interrelated nature that includes workplace attributes, a new framework emerges. Similar to pieces of a puzzle, this new framework would contain highly

interrelated components of knowledge and skills, which could contribute to the existing literature by connecting technical communication pedagogy, technical communication students, and the technical communication workplace.

Chapter 5: Conclusions

Collaboration and teamwork have been identified in classroom and workplace technical communication's literature as primary skills and competencies. Despite both contexts acknowledging the importance of collaboration and teamwork, there is still a lack of theoretical models that could be applied to help characterize the professional skills and knowledge. In addition, the frameworks that do exist are either narrow, focus only on one context, or fail to take into consideration the role that collaborative technologies play in collaboration. The study being reported here aimed to address the following research questions:

1. How do managers of technical communicators and technical communications students define collaboration?
2. What role, if any, do collaborative Web 2.0 technologies, such as wikis, instant messaging and Google Docs play a role in helping or hindering teamwork and collaboration in the workplace?

Limitations of the Study

It must be noted that since this study relies on data from managers that responded to the invitation to participate in the survey, it is unknown how representative they are of all managers who have technical communicator reporting to them. Also, the majority of the respondents were from the United States, so it is possible that their experience with technical communication graduates is different than what is experienced in Canada, but at the same time, the diversity in representation confirms the global nature of the field. Likewise, because of the small sample of one technical communications class, it is not known how representative their data is in comparison to the larger technical communications community. Despite the limitations of this

study, the data collected has provided the opportunity to examine how students and managers define the skills and competencies relative to teamwork and collaboration.

Defining Collaboration and Teamwork

The quantitative responses of both managers and students to statements related to team dynamics, openness to opinions, contributions, and leading and supporting were very similar. Managers indicated the importance of these skills in the workplace and students indicated they had these attributes. Where student and manager responses did diverge, however, was in their unstructured responses. From these responses, it appears there are key differences in how students and managers define collaboration relative to leadership and project management related tasks. In their responses to the teamwork and collaborative skills that they had, and wanted, students focused on leadership and project management related tasks.

These student responses are in sharp contrast to the responses of managers who did not include these attributes in their response to what skills were missing in newly graduated technical communications students. Students and managers, however, did appear to respond similarly by defining openness to opinions and diversity-related attributes (e.g., tolerance, patience for team members), thus, demonstrating their similar values. As demonstrated in their responses, managers and students appear to define collaboration similarly. For both samples, it is a critical skill required in the team-focused workplace, requiring openness to opinions and diversity as the primary skill, followed by, leadership, the ability to contribute, and an understanding of team dynamics. For the student sample, the ability to be proficient at project management-related tasks would also be included in the definition, as would an additional emphasis on leadership.

Role of Collaborative Technologies

Both managers and students appeared to agree that there is no lack of collaborative technology skills among new graduates and the majority of managers agreed that collaborative technologies have improved the teamwork skills of the technical communicators they managed. Where there is a slight departure between the two samples, is in the unstructured answers of managers. While manages acknowledge the existence of the technical skill for using collaborative technologies, they also highlight that new technical communicators are lacking in what they consider to be the core teamwork attributes as outlined in Conference Board of Canada (2000).

Student responses do not indicate that collaborative technologies have hindered student ability to collaborate and these responses demonstrate that students are comfortable using a wide variety of technologies even if they have not had the opportunity to use them during their work-term. The responses of the managers appear to suggest that the role of collaborative technologies has helped the teamwork skills of the technical communicators that they have managed, but at the same time, maintain that collaborative technology skills are not helpful if other key collaborative skills are missing.

Frameworks and Further Study

Finally, one of the most interesting consequences of this work was the combination of the Cook (2002) and Conference Board of Canada (2000) models to provide a valuable framework for this study. While Cook (2002) provided a dimensional analysis framework grounded in the literacies of technical communications pedagogy, the competencies and skills outlined by Conference Board of Canada (2000) provided another dimension grounded in the core skills and attributes necessary for the workplace. Since the domains of both models are restricted to either

the workplace or classroom, and because the presence of a strongly defined social-technological literacy or skill is lacking, they are incomplete. By using the analysis of survey responses from technical communication students and managers to contribute to a new framework, however, the possibility of a new model that includes classroom literacies, workplaces skills and a social-technological element emerges.

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Appendix A

Table A1

Employability Skills 2000+

*Table reproduced with permission from the Conference Board of Canada (2000).

Fundamental Skills These skills needed as a base for further development	**Personal Management Skills** The personal skills, attitudes and behaviours that drive one's potential for growth.	**Teamwork Skills** The skills and attributes needed to contribute productively.
You will be better prepared to progress in the world of work when you can: **Communicate** • read and understand information presented in a variety of forms (e.g., words, graphs, charts, diagrams) • write and speak so others pay attention and understand • listen and ask questions to understand and appreciate the points of view of others • share information using a range of information and communications technologies (e.g., voice, e-mail, computers) • use relevant scientific, technological and mathematical knowledge and skills to explain or clarify ideas **Manage Information** • locate, gather and organize information using appropriate technology and information systems • access, analyze and apply knowledge and skills from various disciplines (e.g., the	*You will be able to offer yourself greater* *possibilities for achievement when you can:* **Demonstrate Positive Attitudes & Behaviours** • feel good about yourself and be confident • deal with people, problems and situations with honesty, integrity and personal ethics • recognize your own and other people's good efforts • take care of your personal health • show interest, initiative and effort Be Responsible • set goals and priorities balancing work and personal life • plan and manage time, money and other resources to achieve goals • assess, weigh and manage risk • be accountable for your actions and the actions of your group • be socially responsible and contribute to your community **Be Adaptable** • work independently or as a part of a team • carry out multiple tasks or projects	You will be better prepared to add value to the outcomes of a task, project or team when you can: **Work with Others** • understand and work within the dynamics of a group • ensure that a team's purpose and objectives are clear • be flexible: respect, be open to and supportive of the thoughts, opinions and contributions of others in a group • recognize and respect people's diversity, individual differences and perspectives • accept and provide feedback in a constructive and considerate manner • contribute to a team by sharing information and expertise • lead or support when appropriate, motivating a group for high performance • understand the role of conflict in a group to reach solutions • manage and resolve conflict when appropriate **Participate in Projects & Tasks** • plan, design or carry out a project or task from start to finish with well-defined objectives and outcomes • develop a plan, seek feedback, test, revise and implement • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project

arts, languages, science, technology, mathematics, social sciences, and the humanities) **Use Numbers** • decide what needs to be measured or calculated • observe and record data using appropriate methods, tools and technology • make estimates and verify calculations **Think & Solve Problems** • assess situations and identify problems • seek different points of view and evaluate them based on facts • recognize the human, interpersonal, technical, scientific and mathematical dimensions of a problem • identify the root cause of a problem • be creative and innovative in exploring possible solutions • readily use science, technology and mathematics as ways to think, gain and share knowledge, solve problems and make decisions • evaluate solutions to make recommendations or decisions • implement solutions • check to see if a solution works, and act on opportunities for improvement	• be innovative and resourceful: identify and suggest alternative ways to achieve goals and get the job done • be open and respond constructively to change • learn from your mistakes and accept feedback • cope with uncertainty **Learn Continuously** • be willing to continuously learn and grow • assess personal strengths and areas for development • set your own learning goals • identify and access learning sources and opportunities • plan for and achieve your learning goals **Work Safely** • be aware of personal and group health and safety practices and procedures, and act in accordance with these	• adapt to changing requirements and information • continuously monitor the success of a project or task and identify ways to improve

Table A2

Managers responses to "Who do technical communicators collaborate with at your company?"

Respondent	Response
1	Subject-matter experts, product marketing, other technical communicators, editors, and graphic artists
2	Project Managers, Engineers, Trainers, Multi-media Specialists, and other Technical Writers.
3	SMEs (e.g., Development, Marketing, QA, Tech Support); other writers
4	Developers, product managers
5	subject matter experts, documentation project lead, product/development manager
6	Other technical communicators, software developers, managers, sales people, customer support reps
7	Prototype validation technicians and design engineers.
8	product managers, system engineers, designers, developers, testers, customer support reps, customers
9	They communicate primarily with software developers and testers, as well as other technical communicators.
10	On a regular basis: Systems engineers, software developers, program and project managers, regulatory affairs personnel, legal, (pre- and post-release) marketing, patient services, technical services, clinical specialists, translators, editors, electronic publishers, and graphic artists.
11	software developers, product "owners", business subject matter experts, QA, production support, management, trainers
12	Practically everybody, but primarily business analysts, Web developers and mainframe programmers, accountants, managers, executives, admin staff
13	Subject matter experts, project managers, and program directors
14	Developers, project managers, engineers, management
15	Everyone.
16	Our SMEs and each other
17	Project Management, Product Management, Software Development, Testing, Service/Support, Other technical communicators