Chapter 2: The Ship of Theseus: Change Over Time in Topics of Technical Communication Research Abstracts

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Abstract: Meta-research on technical communication's published research can contribute empirical evidence to debates about what technical communication is and what it does. In this article, I conduct a corpus analysis of 1,593 abstracts from five technical communication journals covering the years 2000-2017 to determine the topics of research article abstracts. I analyze changes over time in word usage, as measured by numbers of abstracts mentioning individual words. Increases and decreases in word frequency over time indicate three trends in the topics of technical communication research abstracts: technical communication is moving from print communication to digital communication, expanding its boundaries via the term technical and professional communication (TPC), and increasing research on core concerns of technical communicators. The digital work that featured prominently in research abstracts reflected diversified types of online work in technical communication, such as content management, user experience (UX), and social media. Words describing areas of social justice, entrepreneurship, and community-oriented work grew in usage, but these areas are still small in comparison to the number of abstracts reaffirming core concerns such as practitioners, practices, and value. Yet the rapid digital diversification of technical communication work ensures that we should always be updating what "core concerns" means in our field.

Keywords: disciplinarity, research topics, meta-research, technical communication, TPC

Debates about what technical communication is and what it does seem endless (St. Amant & Melonçon, 2016a). Are we not focused enough on practitioner issues, as some have suggested (Boettger & Friess, 2016; St. Amant & Melonçon, 2016b)? Has a fascination with the novel resulted in a decrease in work on core research questions of technical communication (Rude, 2009)? How do topics like social justice fit into the field of technical communication (Jones, 2017)? What topics are increasing or decreasing in prominence in technical communication? What do those increases or decreases in topic frequency say about the direction of the field?

One way that these questions of direction can be answered is through meta-research. "Research on research is needed," state Lisa Melonçon and Kirk St.Amant (2018), because "without a fuller understanding of what we have come to value, implicitly deduced by what has been published in the field's journals, it becomes difficult to train the next generation of students and more importantly, it becomes difficult to show what it is that we do that is unique to the field of TPC" (pp. 2, 4). Seeking what is unique to the field of technical communication is not the only reason to conduct meta-research. Researchers have conducted meta-research on published research in technical communication journals to a variety of ends. Some have investigated the type of research methods used (Boettger & Lam, 2013; Melonçon & St.Amant, 2018), the treatment of gender and feminism in technical communication (Smith & Thompson, 2002; Thompson, 1999; White et al., 2015), authorship characteristics (Lam, 2014), and citation analysis (Smith, 2000), among others. These efforts allow technical communication as a field to assess the body of work that the field has created around a certain topic and then assess the way forward to reach certain goals or initiatives related to the topic under consideration. This chapter contributes to the meta-research in technical communication by investigating the topics in technical communication journal article abstracts over time. The goal of this topical meta-research is to determine what topics are increasing and decreasing in usage, and what those changes mean for the direction of the field's research overall.

The work builds on previous meta-research on topics in technical communication. In a seminal article, Carolyn Rude (2009) conducted a content analysis of topics in technical communication books to determine the open research questions in technical communication. This oft-cited piece suggests that disciplinarity, pedagogy, practice, and social change are open questions which the field's research should continue to address. More recent articles look at the fit of research to the audiences that the research is purportedly intended for. Saul Carliner et al. (2011) analyzed the topics of five years of articles in five journals against a survey of readers' interests to find that "some alignment exists between the topics published in [*IEEE Transactions on Professional Communication*] and the preferences of participants in the survey," but that the alignment could be improved. Ryan Boettger and Erin Friess (2016) used a content analysis of topics from 1,048 articles in four technical and professional communication (TPC) journals and one practitioner magazine to determine that academic research and practitioner publications could use more alignment in topics to better help the stability of the field. Both Carliner et al. and Boettger and Friess posit that the field's research and the work of practitioners are going in different directions. All three of these articles draw conclusions and offer suggestions for the future of technical communication research based on analysis of topics.

This chapter will also focus on topics to make suggestions about the future of technical communication research, but with a chronological focus. I seek to discover what topics are increasing and decreasing over time in technical com-

munication research journals, then assess how these changes may affect the future of technical communication research. To do this, I analyze how research topics in five technical communication research journals have changed over the years 2000-2017 by gathering a comprehensive corpus of research article abstracts published in *IEEE Transactions on Professional Communication*, *Journal of Business and Technical Communication*, *Journal of Technical Writing and Communication*, *Technical Communication*, and *Technical Communication Quarterly*. After dividing the abstracts into three eras (2000-2005, 2006-2011, 2012-2017), I analyzed the frequency of specific words in each era. This allowed a comparison of words increasing and decreasing in usage across the corpus; these words were descriptive of or associated with topics.

This method of topical analysis resulted in three areas of results. Words mentioned in fewer articles over time included *paper*, *articles*, *writing*, *rhetoric*, *ethical*, *electronic*, *web*, *engineering*, *information*, *document*, *write*, *policy*, *scientific*, *computer*, and *ethics*. Words mentioned in more articles over time included *communication*, *social*, *content*, *experience*, *online*, *technical*, *professional*, *user*, *field*, *projects*, *media*, *practice*, *practices*, *value*, and *community*. Words that did not appear in abstracts from the years 2000-2005 but appeared prominently in 2012-2017 abstracts included *multimodal*, *TPC*, *justice*, *mediated*, *entrepreneurs*, *content-management*, and *UX*.

From these findings, I argue that these changes in word frequency over time indicate three ongoing trends in the topics of technical communication research. Technical communication is

- moving from print communication to digital communication,
- increasing research on core concerns of technical communicators, and
- expanding its boundaries via the term technical and professional communication (TPC).

These three trends connect with open questions about the nature of technical communication research. Topics regarding the shift to digital reflect changes in the practice of technical communication. Changes in the practice of technical communication lead to questions regarding what the core concerns of technical communication are and should be; there is space enough for work on print and digital at the moment, but print practices are fading while digital practices are rising. These questions of core practices connect to ongoing conversations about disciplinarity brought up by the expanding boundaries of the field: the emergence of the term *technical and professional communication* shows that some researchers prefer wider boundaries in defining their field, while the term *technical communication* is still used in much larger numbers. Emerging work on how technical communication can affect social change through social justice and community action also contributes to these conversations about the boundaries of the discipline. Each of these three shifts entails its own attendant shift in pedagogy for the field. Faculty must re-skill or multi-skill to offer courses that meet emergent needs while working with

practitioners to determine what the needed skills are in emerging topical areas of technical communication practice. Technical communication has not become entirely a set of emerging concepts, but emerging topical areas are growing in prominence and need to be addressed in research and pedagogy.

◼ Method

To guide my chronological meta-research on topics in the field, I developed three research questions:

1. What words are decreasing over time in technical communication research abstracts?
2. What words are increasing over time in technical communication research abstracts?
3. What do increased or decreased usage of words mean for the direction(s) of technical communication research?

◼ Approach

This chapter takes a meta-research approach to investigate the change over time in technical communication research topics by identifying words that reflect topics in technical communication research abstracts. Meta-research includes many approaches, including statistical meta-analysis (Graham & Perin, 2007), descriptive meta-analysis (Cardon, 2008), and content analysis (Boettger & Friess, 2016). Thomas Orr (2006) offered corpus analysis as a profitable method of professional communication research, but corpus analysis research has been used only sparingly for meta-analysis in technical communication (Carradini, 2020). I use corpus analysis for meta-research on abstracts in this chapter.

Originally called corpus linguistics due to the field commonly associated with the method, corpus analysis is a method of studying large amounts of texts in a variety of fields (Archer, 2009b; Orr, 2006). Corpus analysis can approach many types of questions; this analysis is a corpus analysis of topics in abstracts and is unconcerned with linguistics in a grammatical sense. While corpus analysis can be done qualitatively, it is primarily used to surface insights from large amounts of data that may not be easily approached via qualitative inquiry (De Groot et al., 2006; Kaufer & Ishizaki, 2006, p. 254). Researchers using corpus analysis apply quantitative approaches to investigate large numbers of texts and use the insights from these methods to further investigate and answer questions regarding the texts in the corpus. These insights can be at the level of the word or words, as in linguistics, or in larger patterns, as in this study. Multiple types of quantitative approaches can be used to discover information about the texts in the corpus, from raw frequency to statistical analysis to multi-methodological approaches (Brezina, 2018). The type of quantitative method used in each analysis corresponds to the type of question being asked about the texts in the corpus.

The results of corpus analysis should leave the purely quantitative level and point the researcher and the readers back to the texts of the corpus. The quantitative analysis (whether frequency, statistical analysis, or other methods) points out areas where the scholar should investigate the texts further (Archer et al., 2009, p. 157). Thus, the quantitative approach is a way of identifying large-scale themes that may have been difficult to identify qualitatively, and then researching those trends qualitatively. In writing studies, Derek Mueller (2017) uses the terms "distant reading" and "thin description" to describe the process of using data mining techniques to identify aspects of the discipline of rhetoric and composition that were not identifiable before, then engaging with the texts that reflect those aspects in a new way (p. 25). Mueller's study was of disciplinarity in rhetoric and composition studies, but his methods hold for other analyses of academic disciplinary data at scale. I intend to use corpus analysis to identify topics in technical communication abstracts quantitatively, assess the texts that reflect those trends qualitatively, and make arguments about the discipline at large.

I chose to use abstracts for this research because scholars in technical communication have previously employed abstract mining (White et al., 2015) and because abstracting practices including but not limited to writing journal abstracts can reveal elements of disciplinarity (Mueller, 2017, p. 62). Abstracts indicate what the article contains, previewing the language and concepts that will appear in the full article. Thus, I expect that the language in abstracts accurately represents terminology, concepts, and topics present in the full articles.

The language of the abstract is central to this effort, because I am using an approach that depends on frequency of words. High-frequency words are valuable because they have "aboutness"; they suggest what the overall textual object is about (Archer, 2009a, p. 4). The frequency of words is "a relatively objective means of uncovering lexical salience/(frequency) patterns that invite—and frequently repay—further qualitative investigation," as Dawn Archer (2009a, p. 15) states. Identifying what words often appear allows for further investigation of what the frequent appearances mean to the text. In this analysis, I chose to use the appearance of a word in an abstract as a marker that the abstract was, in some way, about that term.

While frequency of the word in the overall corpus would be the simplest way to approach frequency, I have approached frequency through the number of abstracts that contain the word, otherwise known as *range* (Bednarek, 2018, p. 98). Thus, frequency in this analysis is not relative to the length of abstracts (which showed a trend toward longer, more structured abstracts over time) or the number of words, but to whether a word appears in an abstract. Using range solved a potential methodological problem given my concern about the topics of the abstracts. I am concerned with aboutness of texts, instead of raw frequency of word usage. If a word appeared four times in a particular abstract, it could skew the number of times a word appeared in the corpus; a small number of abstracts including many repeated uses of a single word could make a topic associated with

that word look prominent in research. Instead of true word frequency, I count which abstracts include the word under discussion as frequency. This allows me to see how many abstracts included a word instead of how many uses of a word exist across the corpus.

Given my interest in the topics of the abstracts (as reflected by the words in the abstract) instead of direct comparison of the frequency of words, I did not conduct analysis of statistical significance on the findings. Instead, the quantitative analysis helped me identify which words were increasing and decreasing. This analysis marked the abstracts that included those words for greater study and ultimately discussion. Further statistical research on this topic would be warranted.

Data Collection

I gathered 1,593 abstracts of research articles in five journals that publish articles on technical communication. I excluded other types of published work in the field, because other types of articles such as book reviews often lacked abstracts. Carliner et al. (2011) also excluded these types of articles. The 1,593 abstracts comprehensively covered the years 2000-2017; by focusing on recent research, I hope to understand what the fields look like after years of development in the 20th century. I gathered the abstracts from five top-ranked journals in technical and business communication in North America as identified by Paul Benjamin Lowry et al. (2007): *IEEE Transactions on Professional Communication*, *Journal of Business and Technical Communication*, *Journal of Technical Writing and Communication*, *Technical Communication*, and *Technical Communication Quarterly (TCQ)*. To collect abstracts from these journals, I primarily downloaded information from SCOPUS, then augmented this database using an open-source scraper tool to gather abstracts from several years of *TCQ* not included in SCOPUS. I also gathered some abstracts from *Technical Communication* manually. Researchers can download this corpus for further research use at the author's website, StephenCarradini.com.

Data Analysis

To analyze this data, I used corpus analysis methods and tools. Because I sought to research abstracts at a large scale, I chose the method of corpus analysis. Orr (2006) argues for more frequent use of corpus approaches in professional communication, because corpus approaches offer a fine-grained level of analytical detail and the ability to analyze at a larger scale than qualitative efforts. Orr's ideas have proven true. Corpus approaches have been used in technical communication to study use of grammar in student writing (Boettger & Wulff, 2014) and social media use for technical communicators (McGuire & Kampf, 2015), among other efforts.

To pursue this corpus analysis approach, I formatted abstracts to remove content signals (e.g., *Purpose:*, *Research Problem:*) and copyright notices where

possible. I then loaded the 1,593 abstracts into the corpus analysis software Ant-Conc (Anthony, 2017; Laursen et al., 2014). I used the software to create a full list of words from the abstracts. I used a stoplist—a list of 153 common words that carry minimal topical content such as *I*, *to*, *as*, *were*, and *hadn't*—to eliminate common words and facilitate the discovery of meaningful words to analyze. My stoplist came from Ranks.NL, a company that makes a webpage analyzer tool for use in search engine optimization (Ranks.NL, n.d.). While not included in the official stoplist, I manually removed from analysis words related to the reporting of information in journal articles, such as *conducted*, *analysis*, and *results*. These reporting words did not contain content that I deemed to be a topic or associated with a topic. While the changing over time of words used to report data can reflect methodological shifts over time (Boettger & Lam, 2013), this article is focused on the topics of the abstracts instead of methodology or other aspects of the research (Lam, 2014).

I then split the abstracts into three chronological categories to facilitate an analysis of frequency change over time. Splitting the abstracts into three categories allowed for meaningful comparisons of topic frequency between the three groups. The small number of abstracts per year would not have allowed productive year-over-year analysis that showed trends as clearly as dividing the data into three eras. The abstracts covered the 18 years of 2000-2017, so I created three even chronological eras of six years each: 2000-2005, 2006-2011, and 2012-2017. The number of articles in each era is listed in Table 2.1.

Table 2.1. Number of Abstracts Per Era

Years	Number of Abstracts
2000–2005	551
2006–2011	552
2012–2017	490

The table presents three eras of journal articles with corresponding numbers of journal articles contained in that era. The first and second eras contained almost exactly the same number of articles, while the output of the third era decreased by roughly 11% in total number of articles.

After creating these three eras of abstracts, I created a Microsoft Excel formula to analyze the number of abstracts that each word from the full corpus appeared in (also known as range). I used this formula on each era of the abstracts, creating three lists representing the range frequency of words in each era of abstracts. I then looked for trends across these three lists, re-organizing the lists based on different variables (greatest to least in 2000-2005 usage, largest percentage decrease overall, largest percentage increase overall, etc.) to find meaningful results.

Given this range methodology, I found an average increase of slightly more than one abstract per word (+1.22) over the three-era span of the corpus. The median of overall difference and mode of overall difference both resulted in 1, as well. Some of this overall average increase can be explained by an overall increase in number of words in the abstracts of the three eras, as seen in Table 2.2: the 2012-2017 era represented an increase of more than 36,000 words over the 2000-2005 era. This overall number of words per era corresponded to an increasing average abstract length over the three periods, as the 2012-2017 era's average length of abstract (175 words) was almost double the average of the 2000-2005 era (89 words). If an abstract includes more words overall than a similar abstract of previous eras, it is more likely to have increased instances of individual words than in previous eras. Even with an adjustment from raw frequency to range as the frequency method, some of this bias toward the larger number of words in the later eras is inevitable.

Table 2.2. Words in Each Era of Abstract

Years	Total Number of Words in Abstracts	Average number of words per abstract
2000–2005	49021	89
2006–2011	62880	114
2012–2017	85918	175

The table shows three eras of journal articles with corresponding numbers of total words from all abstracts in that era and the average number of words per abstract in that era. Despite Table 2.1 noting that 2012-2017 included 11% fewer abstracts than previous eras, 2012-2017 abstracts included significantly more words overall and on average per abstract than in the previous two eras.

In the results, I italicize words found in the analysis to distinguish them from words I am using to describe the concept of the word or words. I also use the language of "era" in the results: 2000-2005 is the first era, 2006-2011 is the second era, and 2012-2017 is the third era.

▮ Results

I report the results of the study by addressing words declining in usage, words rising in usage, and words that have risen from no mentions to multiple mentions over the three eras.

▮ Terms Decreasing in Use

I found 15 words trending downward in usage, appearing in fewer articles from the first era to the third era: *articles*, *writing*, *rhetoric*, *ethical*, *electronic*, *web*, *engineering*, *information*, *documents*, *write*, *policy*, *scientific*, *computer*, *read*, and *ethics*.

(See Table 2.3.) It is necessary to note that these are not words that dropped to no mentions in the third era,[1] but those that had the largest declines in number of abstracts in which the word appeared. These words are still included in technical communication abstracts—and in some cases many abstracts—but their usage decreased over time.

Table 2.3. Terms Decreasing in Use

Keyword	2000–2005	2006–2011	2012–2017	Percent Change
read	15	7	5	-66.7
policy	13	13	5	-61.5
electronic	20	12	8	-60
ethics	12	16	5	-58.3
write	15	22	7	-53.3
ethical	23	14	11	-52.2
articles	29	21	14	-51.7
computer	15	10	8	-46.7
engineering	31	32	20	-35.5
rhetoric	38	33	26	-31.6
web	42	44	31	-26.2
document	37	22	28	-24.3
scientific	32	34	25	-21.9
writing	102	119	90	-11.8
information	112	115	102	-8.9

Table 2.3. shows the overall percent change across three eras for keywords used in abstracts. While writing and information lost a small percentage, they lost quite a bit overall in real numbers.

The common technical communication words *information* and *writing* displayed some of the largest drops in range frequency across the eras (see Figure 2.1). *Information* went from being mentioned in 112 abstracts to 115 abstracts and

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1. I did find words that dropped to zero uses in 2012-2017: *cross-functional*, *e-mail*, *ATTW*, *typeface*, *typography*, *mediate*, *memo*, *machine*, and *screens.* However, none of these words registered as a high-volume word in abstracts, and I discovered few clear content patterns in these usage-dropped-to-zero terms. *Cross-functional* featured in only six abstracts in the first era; *ATTW*, *e-mail*, *typeface*, and *typography* appeared in five abstracts; and *memo*, *machine*, *mediate*, and *screens* in four. In a minor way, these words reflect the shifts away from print (*memo*) and the expanding of the field (*cross-functional* teams may have been replaced by shifting networks of digital workers), but primarily they represent a change in how digital spaces are described and researched, which falls outside the scope of this article.

then down to 102 abstracts. While an overall loss of nine percent is not severe, the loss of ten abstracts overall places it at 12th in the list of words that lost the most abstracts in range frequency over the three eras. While *information* is still a core concept and a high-usage term, the number of abstracts that the word appears in decreased over the last two eras. The number of abstracts mentioning *writing* also decreased fairly dramatically. *Writing* increased from 102 abstracts to 119 abstracts before falling to 90 abstracts in 2012-2017. The overall loss of 12 abstracts represents only a 12 percent drop from beginning to end. However, uses of the word dropped precipitously from a 2006-2011 high of 119 to 90 in the subsequent era. This drop of 29 abstracts represented 24 percent of the 2006-2011 amount, or almost a quarter of *writing*'s highpoint lost in six years. *Write*, a corollary word to *writing*, also increased in number of abstracts before a precipitous drop, from 15 to 22 before falling to 7 abstracts in the last era. The words *rhetoric*, *articles*, *read*, *ethical*, *electronic*, and *computer* declined in usage consistently from the first era to the second era and the second era to the third era (see Figure 2.2). *Rhetoric* dropped from appearing in 38 abstracts to 33 to 26, a 31.5 percent overall drop. *Articles* dropped from 29 to 21 to 14, a 51 percent drop. *Read* dropped from 15 to 8 to 5, a 66.6 percent drop. Uses of *ethical* dropped from 23 to 14 to 11, a 52 percent drop. *Electronic* and *computer* both declined consistently over the last two eras as well.

Some words describing related fields rose or held steady in usage between the first and second eras before seeing a drop between the second and third eras (see Figure 2.3). *Engineering* saw an overall decrease of 35 percent (31 to 20) and *scientific* saw a decrease of 22 percent (32 to 25). *Policy* (13, 13, 5) held steady between eras one and two before falling. *Ethics* (12, 16, 5), a core concern of any discipline, appeared in more than ten abstracts in 2000-2006 but fell to fewer than 10 in 2012-2017.
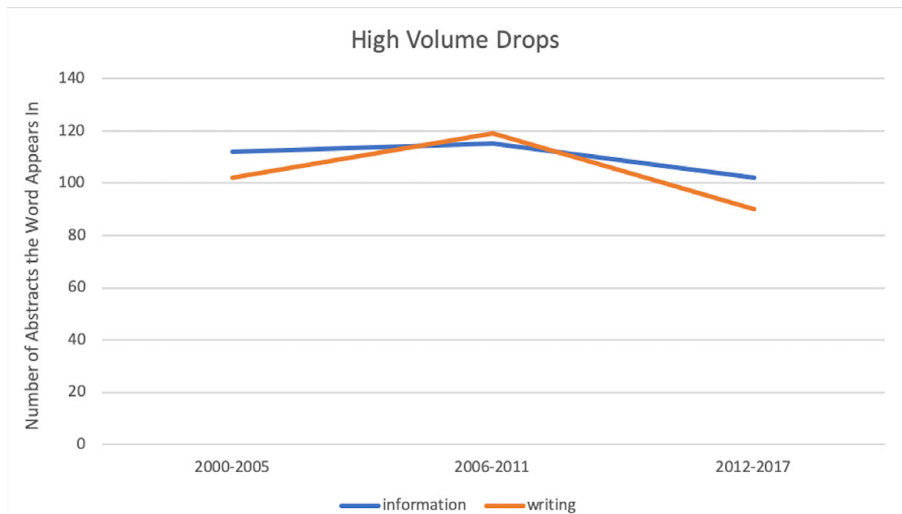

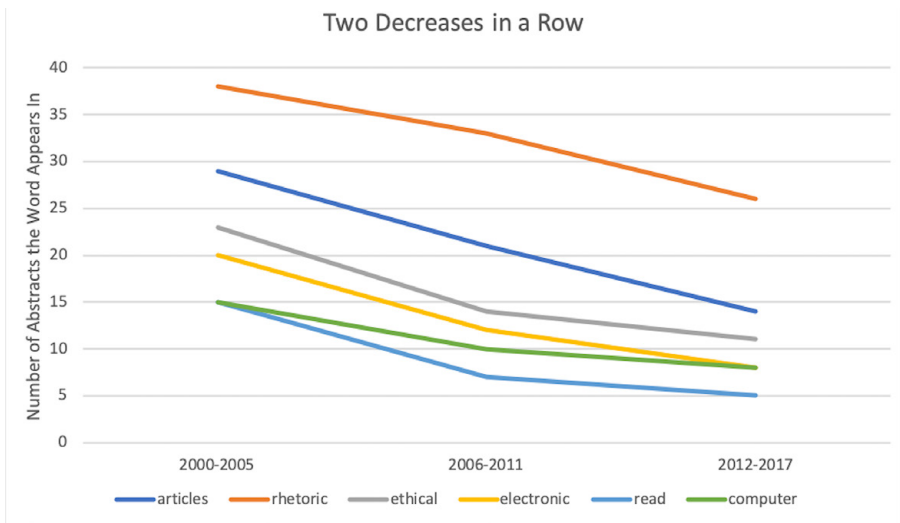*Figure 2.1. Information and writing decreased in usage overall.*

Two Decreases in a Row

Figure 2.2. Several prominent concepts in technical communication
showed two consecutive drops in number of abstracts.
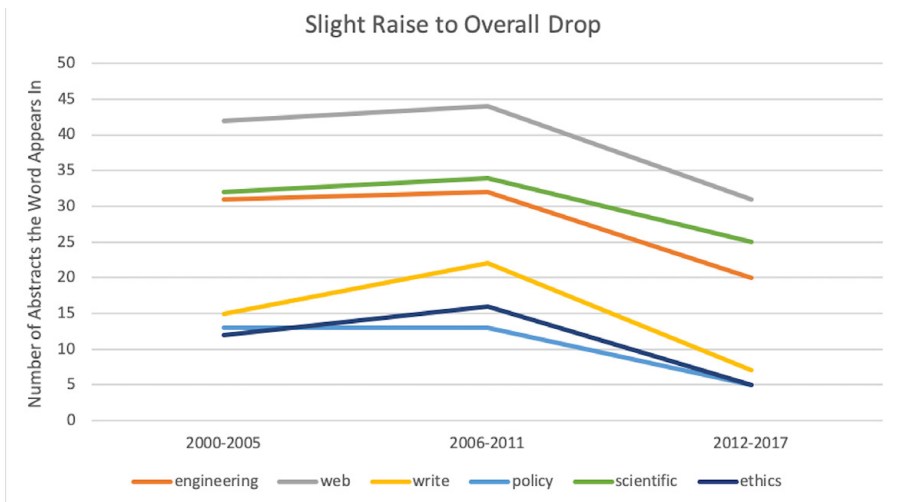
Slight Raise to Overall Drop

Figure 2.3. Some topics showed a rise in number of
abstracts before falling in the third era.

Documents stands out as an unusual outlier in this decreasing-use section. While *documents* declined from 37 abstracts in 2000-2005 to 22 in 2006-2011, the word saw a slight resurgence to 28 abstracts in 2012-2017. The overall decline of nine abstracts masks an unusual pattern of decline and rise that no other word in this analysis displays. Overall, some previously common words lost usage share between the three eras. Words such as *read*, *policy*, *electronic*, *ethics*, and *write* were already lower-frequency words that saw large declines percentage-wise and by range volume.

■ Terms Increasing in Use

Some words increased in use over the three eras: *communication*, *communicators*, *community*, *content*, *experience*, *field*, *language*, *media*, *online*, *practice*, *practices*, *professional*, *projects*, *social*, *technical*, *user*, and *value*. See Table 2.4 for the number of abstracts in which each word was included.

 Communication, *social*, and *technical* are high-volume words that increased over the three eras. (See Figure 2.4.) *Communication* increased from inclusion in 221 abstracts in 2000-2005 to 295 abstracts in 2012-2017, an increase of 74 abstracts (33.5% increase); *social* went from 41 to 88 (+47 inclusions, a 115% increase). *Technical* is used in 252 research abstracts. This number represents a 45-abstract increase over 2000-2005 (21.7% increase) despite the 2012-2017 era featuring a smaller number of articles (551 to 490). *Technical* came in second only to *communication* in the number of abstracts the word appeared in during the 2012-2017 era.

 Table 2.4 shows that many of the increasing terms increase dramatically, doubling, tripling, or even quadrupling the amount of uses over the three eras.

 Terms related to use of the internet grew. *Online* and *content* grew dramatically over the three eras, for an overall positive increase of 45 and 47 abstracts, respectively. The words *online* and *content* actually grew slightly faster between the first and second era than between the second and third era (see Figure 2.5). *User* and *experience* track closely together, rising modestly between the first two eras and then spiking between the second and third eras. *Media* is featured in Figure 2.6. *Media* started with a robust 31 mentions in the era of 2000-2005. It too increased slightly between eras one and two and then jumped in usage after era two.
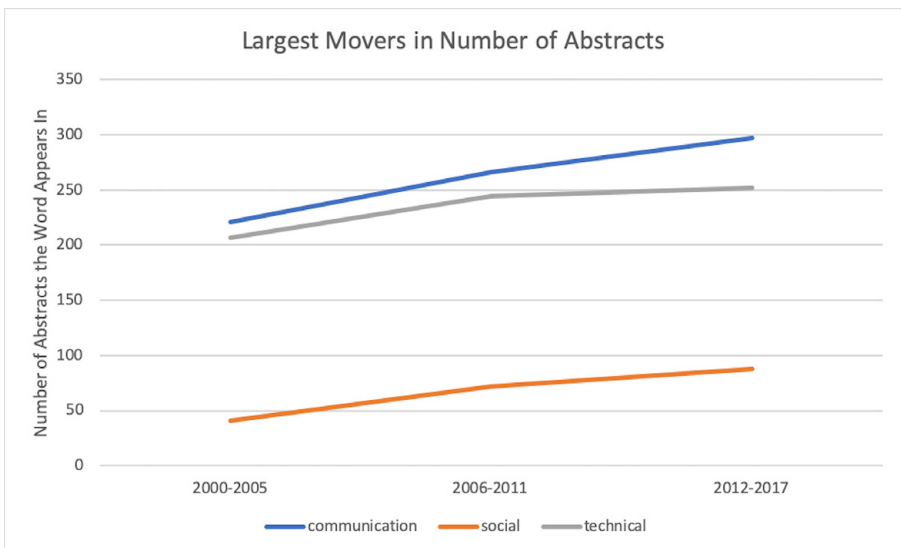

Figure 2.4. Communication, social, and technical were
included in large numbers of abstracts.

Table 2.4. Terms Increasing in Use

| Keywords	2000–2005	2006–2011	2012–2017	Percent Change
projects	9	17	44	388.9
experience	15	31	61	306.7
community	13	21	46	253.8
online	21	50	66	214.3
value	16	28	50	212.5
practice	23	47	70	204.4
user	20	28	58	190
media	20	31	55	175
content	27	52	74	174.1
social	35	72	88	151.4
language	24	37	55	129.2
field	36	34	71	97.2
practices	45	47	79	75.6
professional	65	103	109	67.7
communicators	61	78	92	50.8
communication	208	266	295	41.8
technical	207	244	252	21.7
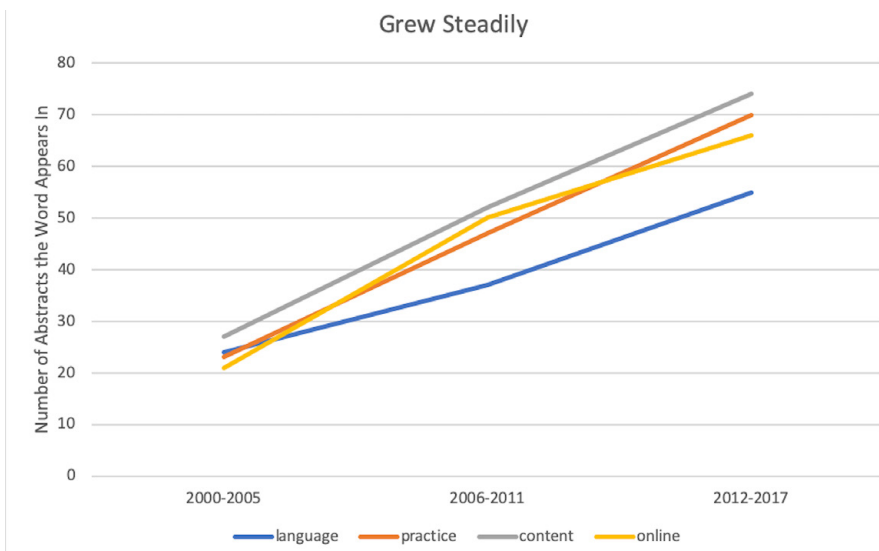
Figure 2.5. Four terms grew steadily; two reflected digital practices (online, content) while two reflect core ideas of technical communication (language, practice).
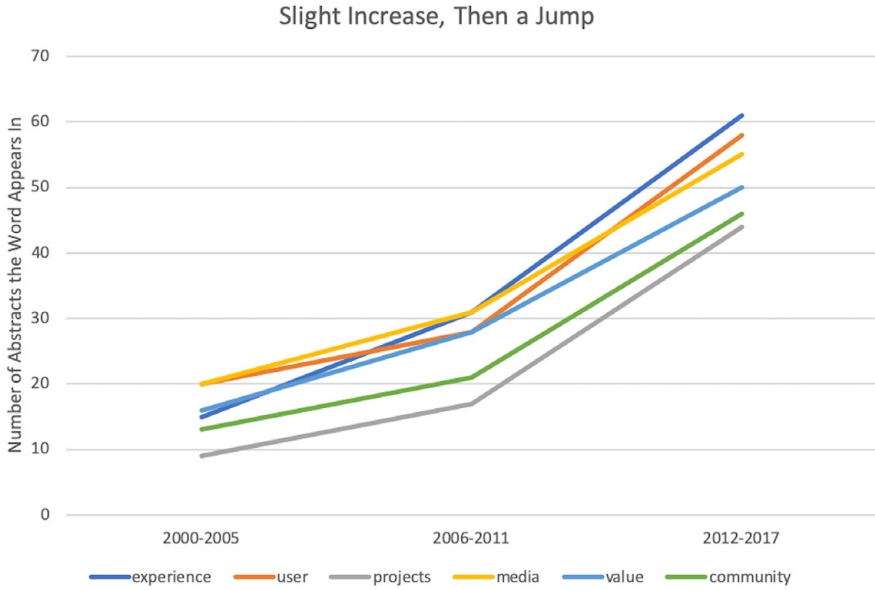
Slight Increase, Then a Jump

Figure 2.6. Several words experienced a slight bump between eras one and two and then a greater leap between eras two and three.
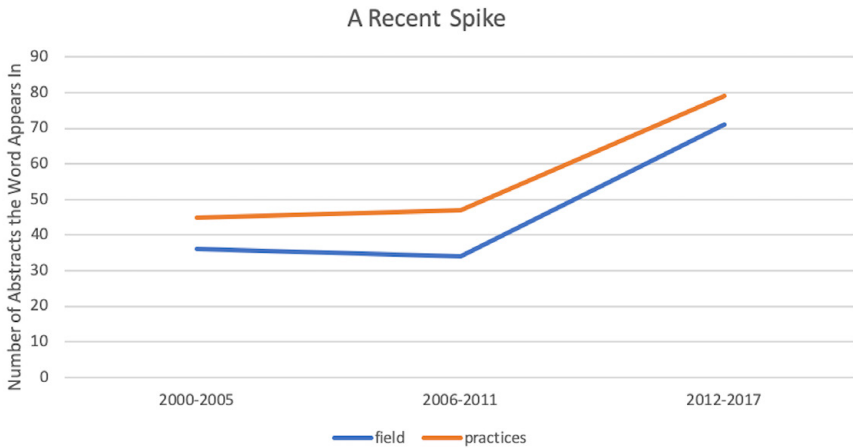
A Recent Spike

Figure 2.7. Field and practices did not increase much until between the second and third era.

Some words surrounding the traditional work of the technical communicator grew in use rapidly. Words such as *projects*, *community*, *value*, and *practice* experienced a dramatic leap in usage, with each of them more than tripling in use from the first era to the third. *Projects* almost quintupled in amount of usage. *Language* more than doubled, from 24 to 55. Use of the word *communicators* rose over the three periods, from 62 to 93 abstracts, with robust growth in use of the

term: usage of *communicators* grew slightly more between the first two eras (+17) than the second two eras (+13).

Three words did not sustain rapid growth through both eras. *Professional* experienced a sharp spike between eras one and two (+38) before tapering off its rise in the next era (+6). Conversely, *field* and *practices* decreased slightly between eras one and two before eclipsing totals from eras one and two in the third era. (see Figure 2.7).

Ultimately, many words grew dramatically, either in range frequency (*communication*, +87 abstracts) or percentage (*experience*, +388.9%).

■ Terms Rising from Nothing

Words that did not appear in abstracts from the years 2000-2005 but appeared prominently in 2012-2017 abstracts included *multimodal*, *TPC*, *justice*, *mediated*, *entrepreneurs*, *content-management*, and *UX*. See Table 2.5 for the increase amounts.

Table 2.5. Terms Rising from Nothing*

Keywords	2000-2005	2006-2011	2012-2017
multimodal	0	4	18
TPC	0	1	13
justice	0	1	12
mediated	0	7	11
entrepreneurs	0	0	11
content-management	0	0	10
UX	0	0	10

The table includes words that weren't used in the first era but were prominently used in the third. Because dividing by zero would create a percentage change of infinity, percent change was omitted.

Several of these words describe digital or digital-related concepts: *multimodal*, *mediated*, *content-management*, and *UX* (see Figure 2.8). *Multimodal* shows the largest overall increase in this group of words, rising from appearing in no abstracts in 2000-2005 to four in 2006-2011 to 18 abstracts in 2012-2017. This quick rise from no mentions of *multimodal* to 18 abstracts over 18 years indicates a potentially significant shift in the type of communication researched by technical communication scholars. The average word is only included in 3.2 abstracts in 2012-2017; *multimodal* is the 430th most common word in an overall list of 11,919 words. *Mediated* jumped from no abstracts to seven between the first and second eras, then tapered off its rise to only 11 in the third era. Strangely, both *content-management* and *UX* scored no hits in abstracts during the first two eras, then both appeared in ten abstracts in the third era. Because *content-management* and *UX* both appeared in zero, zero, and ten abstracts over three eras, their two lines in Figure 2.8 are the same. *Content-management*'s line cannot be seen, but it is the same as *UX*'s.
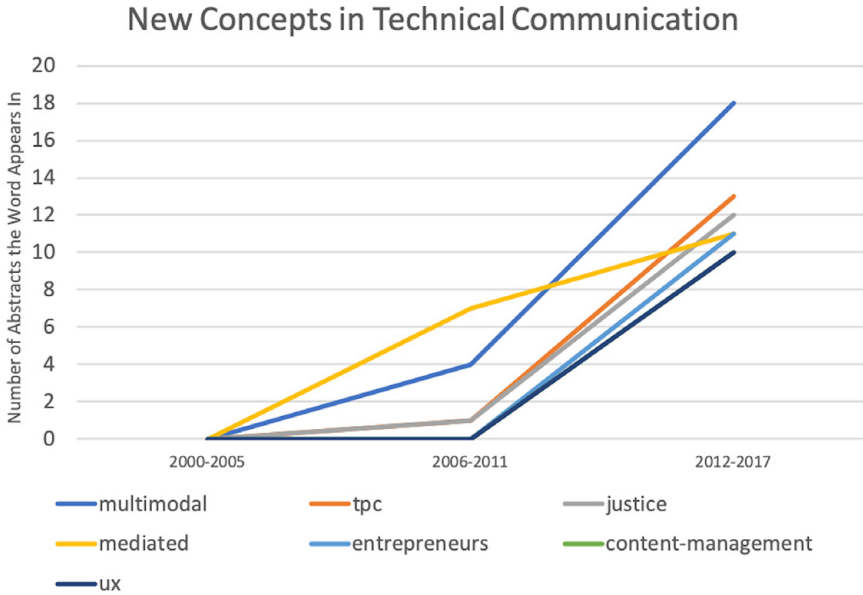
New Concepts in Technical Communication

Figure 2.8. Words that increased over time from no mentions in 2000–2005 show a shift to digital, a new way of talking about the field (TPC), a new research approach (justice), and a new subject group (entrepreneurs).

Three words describe concepts that are new to the field: *TPC* and *justice* featured in only one abstract each during the second era before jumping to 13 and 12, respectively, in the third era. *Entrepreneurs* scored no hits in the first two eras before appearing in 11 abstracts in the third era, making this topic a very rapidly growing topic of research. Collectively, these seven words display a dramatic rise in amount of research in a short amount of time. These seven words appear in 84 separate abstracts (one abstract uses *TPC* and *justice* together). This number accounts for 17.14 percent of all abstracts in the 2012-2017 era—an astonishing amount considering that none of these words appeared in research during 2000-2005.

▉ Analysis

I discovered three trends in word usage in abstracts from 2000-2017 as a result of this study. The first was that technical communication's research moved from a focus on print communication toward sharing that focus with digital communication. Technical communication abstracts used words describing *writing documents* and *rhetoric* less frequently over time, while using words describing *multimodal communication* and *user experience* more frequently over time. The second trend was an expansion of the field's boundaries via the term *technical and professional communication* (*TPC*). The third trend regarded increased research on core concerns of technical communicators, as reflected in the frequent and increasing use of the

words *technical, communicators, value,* and *practices.* This usage pattern shows a concern with what practitioners do on a day-to-day basis and how elements of their work (and the work overall) create value. This last trend seems to be in contrast with the first two, but they occurred at the same time—the field is large enough that different groups of scholars can be focused on unique initiatives at the same time. I further explain each of the three trends in word usage below.

▪ Digital

I found that technical communication research abstracts showed increased use of words reflecting *mediated*, *media*-rich *multimodal* communication. This move entails a shift toward *user experience* (*UX*) while delivering reconfigurable *content* in *online* spaces via *content-management* and *social media* while turning away from *rhetoric* as the grounding concept needed to deliver *information*. While many of these words related to use of the internet (*online*, *content*, *user*, *experience*, *media*) existed in research abstracts of the first era, they grew rapidly over the next two eras.

The words *multimodal* and *mediated* both reflect the emergence of digital communication in digital spaces. *Multimodal* reflects an emphasis on communication that takes place via multiple modes. In technical communication research, this word suggests an expansion of the research area from (technical) writing to communication in digital spaces; these digital spaces consider visual, multimedia, and written modes. *Mediated*, similarly, often relates to technology or computers (as part of the term *computer-mediated communication* or *digitally mediated communication*). These words point toward digital environments as places of technical communication research.

Content-management and *UX* describe new ways of working in digital environments and technical communicators' shifting relationship to the products that they work with in those digital environments.[2] *Content-management* describes a shift away from working with *documents* and toward pieces of *content* that can be refigured into multiple environments (documents, platforms, websites, and more). Digital content-management platforms make this management possible. *UX* stands for *user experience*; user experience expands on the concept of usability by including technical communicators earlier in the design process of digital spaces and content to make sure that users can actually use the work. Both of these concepts alter the role of the technical communicator from a person writing a document as a final deliverable to creating useful knowledge and experiences in multiple modes as a final deliverable. Both *content-management* and *UX* are digital adaptations and developments of technical communication that underscore an ongoing shift to the digital. This sudden spike in research activity surrounding these two concepts reflects the speed of changes in digital spaces; concepts

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2. User experience research can also be conducted in non-digital spaces, although it is more prominently associated with digital spaces.

emerge quickly, with research close behind. *Content-management* and *UX* join *multimodal* and *mediated* to depict shifts in technical communication research toward the study of digital communication and the study of how to work with digital communication.

The increased-usage words *online*, *content*, *user*, *experience*, *social*, and *media* further reflect the shift toward the digital. These words are often found in compound terms: *online content*, *user experience*, and *social media*. These phrases display new compound uses of words that have been included in all three eras, but reflect a digital turn with their new usage.

Even research on the internet is not immune to change; terminology about research on the internet seems to be changing as well. *Electronic*, *computer*, and *web* are words that all decreased in usage over the three eras. These words may have fallen out of use as newer words, such as digital and devices, come into play. These words may have been prominently used to describe digital spaces in Web 1.0 days. They occur less often in the Web 2.0 era that the last two eras cover (2006-2017).

▪ Changing Priorities

The change over time of words in the abstracts shows that words reflecting traditional priorities of research in the field (terms such as *writing*, *information*, and *documents*) are declining while words reflecting other areas of research are becoming priorities (terms such as *professional*, *field*, and *community*).

Any decrease in a word that is highly connected to the field's identity is important to note. For instance, the Society for Technical Communication's (2018) definition of technical communication places *information* in a central value-making role: "The value that technical communicators deliver is twofold: They make information more useable and accessible to those who need that information, and in doing so, they advance the goals of the companies or organizations that employ them." A decrease in research abstracts that mention the word *information*, then, challenges the overall paradigm that the value of technical communication lies in *information*. Potentially, that value can be created in other ways, such as developing a strong *user experience*; information is only a part of user experience. Accordingly, this decrease in use of the word *information* corresponds to an increase in *user experience*, *content-management,* and *content*. This shift could also be in response to the changing terminology of *content* instead of *information* to describe similar concepts. No matter the reason for the shift away from use of the word *information*, that shift is a prominent one.

Appearance of the word *writing* in abstracts decreased dramatically. The data show a large shift away from mentioning *writing* in technical communication research abstracts between 2006-2011 and 2012-2017. That *writing* lost share in abstracts (-29 abstracts) as *multimodal* communication and *user experience* gained steam in number of abstracts (+28, 18 for *multimodal* and 10 for *UX*) is a telling

correlation. Technical communication has expanded its definition of what is involved in the process of communication via *multimodal* and *UX*, among others; at the same time, research abstracts mentioning *writing* have decreased. While *writing* is still often mentioned in 2012-2017 (mentioned in the 22nd most abstracts), there has been a sharp decrease percentage-wise in the number of abstracts that mention *writing*. An expanded sense of what communication is and the types of work available to the technical communicator have shifted the focus of research abstracts over the past few years. A further notable correlation is that overall uses of the word *writing* decreased in abstracts, but uses of the word *communication* continue to increase. However, *documents* showed an increase in use between eras two and three, after a steep drop between eras one and two. Perhaps the shift in use from *writing* to *communication* is a terminology shift, as documents continue to persist in research despite a shift away from writing; perhaps we *communicate* via *documents* instead of *writing documents* in contemporary technical communication research.

The overall shift away from writing and print ideas continues in the words *rhetoric*, *articles*, and *read*. Rhetoric has been a foundational part of technical communication since the late 1970s, if not before; this decline in use of the word in abstracts over the past two eras suggests that research interest in the topic is flagging and/or that the concept has been replaced by different grounding concepts in the work of technical communicators. As *rhetoric* emerged from work on *writing* and oral communication, it is not surprising that a decrease in abstracts mentioning the word *writing* would correspond with a shift away from using the word *rhetoric*. While digital rhetoric and the rhetoric of health and medicine are places where *rhetoric* continues to develop, the word has been used less overall in the last two eras than in the first era. The decreases in *articles* and *read* reflected a decrease in textual analysis: studies on journal articles, newspaper articles, and other types of articles declined, as did studies on how people read texts. The declines continue to indicate that theories of, genres of, and responses to *writing* are all affected by a shifting set of ideas on what communication is and what technical communicators do.

The decline in use of the words *engineering* and *scientific* is surprising, due to the central role that both of these words have played in the field historically. Engineering holds a special place in the history of technical communication as one of the founding reasons for technical communication, while scientific communication has been associated with technical communication closely enough that the Council of Programs on Technical and Scientific Communication includes the term in its name. The decline of these words in abstracts points again toward an ongoing shift in focus for technical communication research. The rise of *entrepreneurs* in technical communication research abstracts underscores the decrease in use of *scientific* and *engineering* in research. The percentage-wise decline of these two words is similar to the declines in the words *writing* and *information*. All four words represent bellwethers in thinking about how the field is shifting

its attention away from previous topics and moving toward new topics—even as older words remain prominent in frequency of mentions.

The decrease in the use of the words *ethics* and *ethical* is surprising, because these seem like areas ripe for development. The number of abstracts including the words *ethics* and *ethical* decreased despite being a fundamental, grounding concept in technical communication research, pedagogy, and practice. It may be that discussions of ethics are being replaced by or subsumed by *social justice* in research—social justice mentions are increasing in technical communication research. More inquiry should investigate why the word *ethics* is declining in technical communication research abstracts; this is an unexpected and troubling finding if the concept of ethics is not being researched and foregrounded in technical communication work. Even the rise of other groundings for technical communication does not obviate the need for research on ethics. Similarly, more inquiry is needed on why the word *policy* is flagging as a research topic in technical communication abstracts; technical communication can say much about internal corporate policy as well as governmental policy. I see no clear reason from the data as to why the word *policy* is decreasing, other than (perhaps) policy's association with the also-decreasing *scientific* concerns.

These words displayed a shift away from some historically prominent words and concepts in technical communication, such as the *writing* of print *documents*. These downward trends correspond with the previously noted rise in multimodal communication in digital environments. While the digital is a rising trend, the digital is less a specific subject area than a place where subject areas happen. Other subject areas and actions are rising in prominence, particularly in ways that expand the boundaries of the field.

An expansion of technical communication's boundaries is reflected in *TPC*, *professional*, and *field*. The word *professional* is connected to the term *technical and professional communication* (*TPC*). *TPC* allows for technical communication research to include things outside the traditional scope of technical communication. This concern with expanding technical communication to include new topics and audiences is further reflected in the word *field*. Scholars in technical communication have increased their talk about the field as a whole and what can/should be included in the field. This strong interest in discussing and defining the field has grown from a constant to a phenomenon; the use of *field* held relatively steady in the first two eras, being used in 36 and 34 abstracts. However, use spiked to 71 abstracts in the third era, almost doubling its original amount from the first era. This new interest in describing/defining the *field* in the third era perhaps grew from the work of Rude (2009), as mentioned above.

The use of the words *justice* and *entrepreneurs*, another set of words that emerged in the latter two eras, shows how technical communication's research priorities continue to expand. *Justice* reflects social justice; each abstract that mentioned *justice* mentioned the word in the context of *social justice* except one abstract that mentioned it in the context of criminal justice. A social justice ap-

proach to technical communication research features different commitments and goals than other approaches to technical communication, expanding the types of research that are present in technical communication journals. One example of how new terminology and concepts are working their way into discussions of the field is shown in an abstract that offers *social justice* as an important approach for *TPC* to consider and implement (Jones, 2016).

Another expansion of the field is constituted by use of the word *community*, which spiked up 254 percent, from 13 mentions in the first era to 46 mentions in the third era. *Community* involves an expansion of the boundaries of technical communication by talking about technical and professional communication as something that is done in and for real communities, as opposed to being something in and for imagined, individualized end users. While not a new concept overall (*community* appeared in the first era), the term's use grew dramatically over the three eras. Technical communication research also recently expanded its terminological and conceptual boundaries to include *entrepreneurs* in the groups that technical communication researchers study. The word *entrepreneurs* does not appear in any abstracts for the first two eras, but appears in 11 abstracts in the third era. This professional group reflects a wider view from technical communication scholars as to who is involved in the work of technical communication. Especially as some in the field expand the name of the field to technical and professional communication, entrepreneurs represent one answer to the question of "What is professional about technical and professional communication?"

Technical communication research is expanding to include new audiences and concepts. The expansion of technical communication through the acronym *TPC* is alternately a subject of excitement and consternation, particularly in places where scholars and practitioners feel that the pursuit of the novel and interesting has crowded out other research on core issues concerning working technical communicators. Yet this research continues apace. *TPC* research pushes the boundaries to include new concepts and new constituencies into the work of the field. This work can be perceived as one outcome of the overall shift away from print toward digital. The digital space provides opportunities for many people who would not have been able to make careers on their own in the pre-digital era to make careers (Petersen, 2014, 2016). This change results in people who would otherwise work in organizations as technical communicators becoming entrepreneurs of technical communication (Lauren & Pigg, 2016a, 2016b). The acronym *TPC* suggests that professional communication of this type is something that technical communication researchers can address under the aegis of technical and professional communication.

▪ Reaffirmation of Core Identity

But as much as some things change, some things stay the same. Many research abstracts in the second and third era mentioned words common in the first era,

such as *technical*, *communication*, *communicators*, *practice*, *practices*, *projects*, *language*, and *value*.

The word *technical* shows that the *technical* aspects of technical communication are not going away. The use of *technical* in the names *technical communication* and *TPC* contributes to the number of uses of this word as well. While the group of people who are counted as technical communicators (or those who are eligible to be studied as technical communication research) grows, the field still uses the word *technical* in increasing amounts. Despite the expansion of the boundaries of technical communication, *technical* is still a core term.

As older words surrounding *writing* decline in use, the field has coalesced around the word *communication*. Researchers included *communication* in 208 abstracts in 2000-2005 and 295 in 2012-2017. This was an increase of 87 abstracts, but an even greater jump in percentage of abstracts: *communication* appeared in 208 of 551 abstracts (37.75%) in 2000-2005, while it appeared in 295 of 490 in 2012-2017 (60.2%). This large jump in percentage of abstracts mentioning *communication* shows that communication is becoming more central to the work described in technical communication research abstracts. Due to the previously noted rise in *user experience* and *content-management* in the field, this doubling down on the word *communication* might seem counter-intuitive. Still, this large percentage of abstracts using the word is hard to ignore as a common word that the researchers of the field can agree on.

Communicators is another particularly important word for technical communication, because one of the primary features of technical communication is the focus on a specific, definable group of people known as technical communicators. The continued use and growth of the word *communicators* indicates that research was conducted over these three periods that focused on the needs of the specific group of people that are at the core of technical communication. While the overall group of people who are counted as part of the field of technical and professional communication for research purposes is growing, the focus on the technical communicator continues to develop. *Communicators*, more than any other word, reflects that the core of technical communication research is strong and focused on practical efforts to help practitioners of technical communication, the technical communicators.

Technical, *communication*, and *communicators* are valuable words due to their connection to the name of the field, while *practice* and *practices* are valuable words due to the research focus that they show. The words *practice* and *practices* both increased dramatically in usage over the three eras. *Practice* more than tripled in use (23 to 70), while *practices* increased from 45 to 79 (a 75% increase). These words both point toward practical matters of work. Research on *practice* and *practices* focused on the way that technical communicators do their work. As the focus on how technical communicators do their work has been a concern of the field from the very beginning, it seems that changes in priority for the field have not significantly altered a focus on research regarding how the technical communicator's work is done.

Terms such as *projects*, *language*, and *value* are valuable to extend the idea of practices, both in what those practices are and what the goals of those practices are. *Projects* reflects two elements of technical communication research: research on pedagogy and workplace studies. The description of projects in a student context often, but not exclusively, related to service-learning projects in the community. The workplace studies usage focused on various aspects of professional projects that companies completed. *Language* also shows two aspects of technical communication: the use of language in international/intercultural contexts (both in the workplace and in English as a second language training) and *language* as a descriptor of the words used in communicating. Finally, *value* reflects technical communication's concern with developing value for employers and justifying the value that technical communicators bring to the table via communication, skills, and theories. These are areas of growth in numbers of abstracts, but also areas of field stability; technical communication research has shown a steadily growing interest in work of this type from 2000-2017.

This trend showing an increasing focus on the practical work of technical communicators seems at odds with the trend of new topics. However, these trends are both ongoing, and should be encouraged individually. The continued focus on the technical communicator allows for the core interests of the field to be continually developed and addressed.

■ Discussion

The trends in this meta-research point directly toward what technical communication did as a field in 2000-2017. Trends show technical communication research increased its use of terms that focused on the practices of technical communicators in multimodal digital spaces such as user experience, online content, content management, and social media. Researchers decreased their use of words related to topics such as information, writing, rhetoric, scientific work, and engineering. Words describing areas of social justice, entrepreneurship, and community-oriented work grew in usage, but these areas are still small in comparison to the number of abstracts including words describing more traditional concerns such as communicators, practices, and value.

This description of topics in technical communication research abstracts shows that technical communication is conducting work on at least three of the four open questions that Rude (2009) noted: practice, disciplinarity, and social change. Words describing the topic of pedagogy are less represented in this analysis due to a methodological concern that I describe below. Technical communication research is interested in the overall practice and individual practices of work, according to words whose use is rapidly growing. This finding that research on practice and practices is growing could be in response to the work of Carliner et al. (2011) and Boettger and Friess (2016), who called for technical communication researchers to focus more on the practices of technical communicators. In

particular, Boettger and Friess' call for less research on rhetoric and more on practices is borne out in the research, as inclusions of the word *rhetoric* decreased from 38 to 26 abstracts over the course of the three eras, while inclusions of *practices* rose from 45 to 79 over the same span. More than three times as many abstracts mentioned *practices* than *rhetoric* in 2012-2017. This shift may be a response to the calls of both articles to align more closely with practitioner needs in research, but it may not be; the practices which researchers are conducting research on might not be the core concerns of practitioners, as stated by Boettger and Friess.

This question about "which practices?" is particularly relevant because the shift to digital changes the work that some-to-many technical communicators do. While not eliminating the need to work with documents and writing, technical communicators may be content-management professionals, user experience experts, or multimodal content creators (Brumberger & Lauer, 2015). All of these require working with language in some way, directly manipulating language, creating environments for language to be effective, or delivering language in multiple formats. So, the core concept of working with language in a technical space persists, but the actual ways of working in those spaces are shifting. Thus, the field is solidified but also shifting. Continued research efforts should be made to track how the digital affects the lives of all technical communicators, whether they are working in traditional roles with subject matter experts to create documentation and help materials for technical equipment/software or making user interfaces effective for the delivery of communication. As the type of work that technical communicators do shifts, the quest to articulate the value that technical communicators bring also must be continuously pursued (Petersen, 2017). This type of research on the practical work that technical communicators do, whether it be in traditional technical communication roles or in more far-flung digital fields, should be pursued vigorously. Research that assesses how work happens in digital spaces (Pigg, 2014) and how the digital affects traditional organizations (Spinuzzi, 2015) will require boots-on-the-ground research regarding how practitioners of technical communication do their work in a digitized and digitizing era. This sort of work takes an incredible amount of time, effort, and support from the technical communication practitioner community (Boettger & Friess, 2016). Practitioners have often given of their time and skills to research, and their sacrifices should be acknowledged as we researchers continue to ask them to be co-researchers and participants in ethnographic, interview, survey, and digital collection methods for the advancement of the shared field.

The end result of these practitioner-supported studies may be that the digital has so transformed and diversified the work of technical communication that there is no center to the field. It may be that the terms *technical communication* and *technical communicators* are the Ship of Theseus, the ship that had all its parts replaced and yet still bore the same name. The question of "Is it the same ship, even if it has had its parts interchanged?" is valid. The core concerns of technical communication (technical communicators, practices, projects, language, values, et al.) may be highly respondent to the new digital environs and thus change what it means to

be a technical communicator altogether. If this shift to digital that showed in the 18 years of abstracts continues apace, technical communication may require even more multi-skilling and re-skilling in emerging skillsets than it currently requires. Thus, the practices that technical communication requires of its technical communicators should continue to be researched. The discussion as to "which practices should be researched?" is an ongoing concern, and this chapter will not conclude the discussion. While words describing traditional research areas such as *writing* have decreased in research abstracts and words describing emerging topics such as *user experience* have increased in research abstracts, use of the word *writing* has not decreased to a point where the term *user experience* is more common in research abstracts than *writing*. The balance of core, historic concerns of technical communication and emerging topics in research (and attendant pedagogy) is an open one; at the moment, the historic concerns are still more common and should be more focused on in pedagogy than the emerging concerns. This focus is not to the neglect of new concerns, which should be the continued focus of new research. At some point, there may be more user experience research than research on writing, if user experience continues to be a concept that practitioners suggest for research and/or that catches the attention of the academic field. The concerns and needs of working practitioners should be carefully considered, but the expanded boundaries of the field suggest that even "practitioners of TPC" is a category open to definition. This tension may be resolved by using the term *technical communication* to correspond to traditional concerns such as the value that practitioners bring to organizations, while using the acronym *TPC* to describe the needs of groups emerging into our research, such as entrepreneurs and social media managers. This is but one way to strike a balance between the two foci of technical communication research; others could be developed.

Research on Rude's open question of how social change can be achieved through technical communication has increased over the three eras studied. The idea of social change was not new in 2009, but the interest in various ways of implementing efforts toward social change intensified over the next eight years. Increased use of the word *community* and emergent use of the term *social justice* point toward ongoing research questions regarding how social change can be made through technical communication (Jones, 2017). Implementing social justice practices in technical communication and doing work in and for the community are ways that technical communicators can hope to affect social change; thinking equitably and communally when communicating changes the potential outcomes of communication. These two ideas stand near to and yet contrast with the concepts of ethics and users. Aspiring to a particular code of ethics and applying it to work can be a top-down approach that reduces ethics to a set of checkboxes. Social justice is an expansive concept that resists easy lists of concepts in lieu of interacting with the histories, lived experiences, and in situ practices of audiences. This approach ties into the differences between community approaches and user-focused approaches; community approaches to communication within

a specific, named group of people are far different than writing for an imagined user or users. While not all communication can be done in and for specific communities, this arm of technical communication research posits a different way to make social change in the world than the traditional methods of technical communication. With use of the word *ethics* decreasing in research abstracts, one area of research is to continue to assess how technical communicators can create social change within organizations. Other ways of making social change can and should be developed in technical communication research that build on, extend, and co-exist with these ideas.

Rude's third question, regarding disciplinarity, is clearly being discussed as well. Research abstracts mentioned the words *field* and *TPC* in increased amounts, showing an interest not only in discussing the field of technical communication, but in defining it further as *technical and professional communication.* This discussion of what TPC is—and what it means to add *professional* to technical communication—is an ongoing story. The acronym *TPC*'s usage spikes from one in the first era to 13 in the last era, suggesting that it is a recent phenomenon. The emergence of the word *entrepreneurs* in the third era offers a clue as to what *TPC* might mean in practice: the expansion of the field to include other types of communicators and communication practices under the mantle of the expanded title TPC. Yet the words *technical* and *communication* have grown rapidly in use; *TPC* is still a very small percentage of the overall usage (13 uses) of the words *technical* (252 uses) and *communication* (295 uses). So while the discussion of disciplinarity has a new entrant in the acronym *TPC* and the development of the associated word *professional* (109 uses), the discussion of disciplinarity and the descriptor used for the field are both still largely focused around the term *technical communication*. While technical communication is a core identifying term, development of new topics and ideas under the mantle of technical and professional communication research should also proceed. Beyond the specific concerns of field and title, each of the changes discovered in this analysis (the shift to digital, the changing priorities, and the reaffirmation of core concerns) is related to disciplinary aspects of the field: they speak to who the research in technical communication thinks that we are.

While these findings have implications for pedagogy, Rude's fourth open question of pedagogy is less clearly covered in these findings. This is a methodological limitation. I chose to limit the analysis to words that were associated with topics in technical communication research and excluded words associated with methodology or pedagogy for purposes of scope and clarity of findings. While the specific areas of concern in technical communication pedagogy over the years 2000-2017 are not present here, the concerns of multi-skilling, re-skilling, and development of emerging skillsets to address the shift to digital and attendant shifts in technical communication priorities all fall under the realm of pedagogy. As these trends continue, research on these trends should continue to be adapted into the classes of technical communication teachers all over the world. While

these skills are critical to the further development of technical communication pedagogy, the core concerns of writing, information, and documents are not gone from technical communication research abstracts or practice. The research work that expands the boundaries of the field must be set in context of a much larger amount of work focused on the core concerns of the technical communicator. Even as the words *writing*, *information*, *documents*, and *rhetoric* appeared in fewer abstracts from era one to era three, these words appeared in large numbers of abstracts—much larger numbers of abstracts than any word describing an individual emerging topic at the moment. So, the enthusiasm for what is emerging must not override the large amount of work that represents traditional concepts in technical communication.

The abstracts of 2000-2017 in technical communication research point the field toward the future: a robust path of an expanded set of practitioners working with researchers to understand and analyze the work of an increasingly-but-not-entirely digital workplace so that knowledge can make its way back to the classroom for aspiring technical and professional communication practitioners. The shift to the digital and a changing set of priorities for technical communication live in tension with a commitment to core, historical principles of technical communication. While research should continue on core concerns and emerging concepts, the rapid rise of the digital ensures that we should always be updating what "core concerns" means and what the most important practices needed in pedagogy are. The Ship of Theseus has not yet had all its parts replaced, and we may never see that occur; but we should always be checking what is on the hull.

■ References

Anthony, Laurence. (2017). *Antconc* (Version 3.5.0) [Computer software]. Waseda University. http://www.laurenceanthony.net/software

Archer, Dawn. (2009a). Does frequency really matter? In Dawn Archer (Ed.), *What's in a word-list? Investigating word frequency and keyword extraction*. Ashgate Publishing.

Archer, Dawn. (2009b). Promoting the wider use of word frequency and keyword extraction techniques. In Dawn Archer (Ed.), *What's in a word-list? Investigating word frequency and keyword extraction*. Ashgate Publishing.

Archer, Dawn, Culpeper, Jonathan, & Rayson, Paul. (2009). Love—'a familiar or a devil'? An exploration of key domains in Shakespeare's comedies and tragedies. In Dawn Archer (Ed.), *What's in a word-list? Investigating word frequency and keyword extraction*. Ashgate Publishing.

Bednarek, Monika. (2018). *Language and television series: A linguistic approach to TV dialogue*. Cambridge University Press.

Boettger, Ryan. K., & Friess, Erin. (2016). Academics are from Mars, practitioners are from Venus: Analyzing content alignment within technical communication forums. *Technical Communication*, *63*(4), 314-327.

Boettger, Ryan K., & Lam, Chris. (2013). An overview of experimental and quasi-experimental research in technical communication journals (1992-2011). *IEEE*

Transactions on Professional Communication, *56*(4), 272-293. https://doi.org/10.1109/Tpc.2013.2287570

Boettger, Ryan K., & Wulff, Stefanie. (2014). The naked truth about the naked *this*: Investigating grammatical prescriptivism in technical communication. *Technical Communication Quarterly*, *23*(2), 115-140. https://doi.org/10.1080/10572252.2013.803919

Brezina, Vaclav. (2018). *Statistics in corpus linguistics: A practical guide*. Cambridge University Press.

Brumberger, Eva, & Lauer, Claire (2015). An evolution of technical communication: An analysis of industry job postings. *Technical Communication*, *62*(4), 224-243.

Cardon, Peter W. (2008). A critique of Hall's contexting model: A meta-analysis of literature on intercultural business and technical communication. *Journal of Business and Technical Communication*, *22*(4), 399-428. http://doi.org/10.1177/1050651908320361

Carliner, Saul, Coppola, Nancy, Grady, Helen, & Hayhoe, George (2011). What does the Transactions publish? What do Transactions' readers want to read? *IEEE Transactions on Professional Communication*, *54*(4), 341-359. https://doi.org/10.1109/TPC.2011.2173228

Carradini, Stephen. (2020). A comparison of research topics associated with technical communication, business communication, and professional communication, 1963-2017. *IEEE Transactions on Professional Communication*, *63*(2), 118-138. https://doi.org/10.1109/TPC.2020.2988757

De Groot, Elizabeth B., Korzilius, Hubert, Nickerson, C., & Gerritsen, Marinel. (2006). A corpus analysis of text themes and photographic themes in managerial forewords of Dutch-English and British annual general reports. *IEEE Transactions on Professional Communication*, *49*(3), 217-235. https://doi.org/10.1109/TPC.2006.880755

Graham, Steve, & Perin, Dolores. (2007). A meta-analysis of writing instruction for adolescent students. *Journal of Educational Psychology*, *99*(3), 445-476. http://doi.org/10.1037/0022-0663.99.3.445

Jones, Natasha N. (2016). The technical communicator as advocate: Integrating a social justice approach in technical communication. *Journal of Technical Writing and Communication*, *46*(3), 342-361. https://doi.org/10.1177/0047281616639472

Jones, Natasha N. (2017). Modified immersive situated service learning: A social justice approach to professional communication pedagogy. *Business and Professional Communication Quarterly*, *80*(1), 6-28. https://doi.org/10.1177/2329490616680360

Kaufer, David, & Ishizaki, Suguru. (2006). A corpus study of canned letters: Mining the latent rhetorical proficiencies marketed to writers-in-a-hurry and non-writers. *IEEE Transactions on Professional Communication*, *49*(3), 254-266. https://doi.org/10.1109/TPC.2006.880743

Lam, Chris. (2014). Where did we come from and where are we going? Examining authorship characteristics in technical communication research. *IEEE Transactions on Professional Communication*, *57*(4), 266-285. https://doi.org/10.1109/TPC.2014.2363892

Lauren, Benjamin, & Pigg, Stacey. (2016a). Networking in a field of introverts: The egonets, networking practices, and networking technologies of technical communication entrepreneurs. *IEEE Transactions on Professional Communication*, *59*(4), 342-362. http://doi.org/10.1109/Tpc.2016.2614744

Lauren, Benjamin, & Pigg, Stacey. (2016b). Toward multidirectional knowledge flows: Lessons from research and publication practices of technical communication entrepreneurs. *Technical Communication*, *63*(4), 299-313.

Laursen, Anne Lise, Mousten, Birthe, Jensen, Vigdis, & Kampf, Constance. (2014). Using an ad-hoc corpus to write about emerging technologies for technical writing and translation: The case of search engine optimization. *IEEE Transactions on Professional Communication*, *57*(1), 56-74. https://doi.org/10.1109/TPC.2014.2307011

Lowry, Paul Benjamin, Humpherys, Sean LaMarc, Malwitz, Jason, & Nix, Joshua. (2007). A scientometric study of the perceived quality of business and technical communication journals. *IEEE Transactions on Professional Communication*, *50*(4), 352-378. https://doi.org/10.1109/Tpc.2007.908733

McGuire, Mark, & Kampf, Constance. (2015). *Using social media sentiment analysis to understand audiences: A new skill for technical communicators?* [Paper presentation]. 2015 IEEE International Professional Communication Conference, Limerick, Ireland. https://doi.org/10.1145/2775441.2775472

Melonçon, Lisa, & St.Amant, Kirk. (2018). Empirical research in technical and professional communication: A 5-year examination of research methods and a call for research sustainability. *Journal of Technical Writing and Communication*, *49*(2), 128-155. http://doi.org/10.1177/0047281618764611

Mueller, Derek N. (2017). *Network sense: Methods for visualizing a discipline*. The WAC Clearinghouse; University Press of Colorado. https://doi.org/10.37514/WRI-B.2017.0124

Orr, Thomas. (2006). Introduction to the special issue: Insights from corpus linguistics for professional communication. *IEEE Transactions on Professional Communication*, *49*(3), 213-216. https://doi.org/10.1109/tpc.2006.880750

Petersen, Emily January. (2014). Redefining the workplace: The professionalization of motherhood through blogging. *Journal of Technical Writing and Communication*, *44*(3), 277-296. https://doi.org/10.2190/TW.44.3.d

Petersen, Emily January. (2016, October 2-5). *Reterritorializing workspaces: Entrepreneurial podcasting as situated networking, connected mediation, and contextualized professionalism* [Paper presentation]. 2016 IEEE International Professional Communication Conference, Austin, TX, USA. https://doi.org/10.1109/IPCC.2016.7740516

Petersen, Emily January. (2017). Articulating value amid persistent misconceptions about technical and professional communication in the workplace. *Technical Communication*, *64*(3), 210-222.

Pigg, Stacey. (2014). Coordinating constant invention: Social media's role in distributed work. *Technical Communication Quarterly*, *23*(2), 69-87. https://doi.org/10.1080/10572252.2013.796545

Ranks.NL. (n.d.). *Stopword lists*. https://www.ranks.nl/stopwords

Rude, Carolyn D. (2009). Mapping the research questions in technical communication. *Journal of Business and Technical Communication*, *23*(2), 174-215. https://doi.org/10.1177/1050651908329562

Smith, Elizabeth Overman. (2000). Strength in the technical communication journals and diversity in the serials cited. *Journal of Business and Technical Communication*, *14*(2), 131-184. https://doi.org/10.1177/105065190001400201

Smith, Elizazbeth Overman, & Thompson, Isabelle. (2002). Feminist theory in technical communication: Making knowledge claims visible. *Journal of Business and Technical Communication*, *16*(4), 441-477. https://doi.org/10.1177/105065102236526

Society for Technical Communication. (2018). *Defining technical communication*. https://www.stc.org/about-stc/defining-technical-communication/

Spinuzzi, Clay. (2015). *All edge: Inside the new workplace networks*. University of Chicago Press.

St.Amant, Kirk, & Melonçon, Lisa. (2016a). Addressing the incommensurable: A research-based perspective for considering issues of power and legitimacy in the field. *Journal of Technical Writing and Communication*, *46*(3), 267-283. https://doi.org/10.1177/0047281616639476

St.Amant, Kirk, & Melonçon, Lisa. (2016b). Reflections on research: Examining practitioner perspectives on the state of research in technical communication. *Technical Communication*, *63*(4), 346-364.

Thompson, Isabelle. (1999). Women and feminism in technical communication: A qualitative content analysis of journal articles published in 1989 through 1997. *Journal of Business and Technical Communication*, *13*, 154-178. https://doi.org/10.1177/1050651999013002002

White, Kate, Rumsey, Suzanne Kesler, & Amidon, Stevens. (2015). Are we "there" yet? The treatment of gender and feminism in technical, business, and workplace writing studies. *Journal of Technical Writing and Communication*, *46*(1), 27-58. https://doi.org/10.1177/0047281615600637