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Scholarship in international technical communication, 1950-1989: a historical study

Xiaoyan Huang

Department:

SCHOLARSHIP IN INTERNATIONAL TECHNICAL COMMUNICATION, 1950-1989: A HISTORICAL STUDY

by

XIAOYAN HUANG

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Approved by

Dr. Edward A. Malone, Advisor

Dr. David Wright

Elizabeth Marie Roberson

ABSTRACT

This thesis is a study of the published scholarship in international technical communication from 1950 to 1989. It provides insight into the four decades' worth of scholarship as well as a resource for the development of present and future scholarship in international technical communication. It attempts to answer the following research questions:

- What did scholars of international technical communication study in each decade?
- What are the similarities and differences among the four decades in terms of scholarship in international technical communication?
- What are the strengths and weaknesses of the relevant scholarship in the four decades?
- What can we learn from the scholarship in these four decades?

To answer these questions, I reviewed articles collected from the main journals and conference proceedings in technical communication published in the United States. I summarized and coded these articles according to their major subjects. Based on my review of this literature, I drew conclusions about the character and value of the published scholarship in international technical communication from 1950 to 1989.

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1. INTRODUCTION

1.1 PURPOSE OF THE RESEARCH

From 1992 to 2006, historical studies of technical communication "increased in quantity and quality" and "entered the mainstream of technical communication research" (Malone, 2007, p. 333). These studies focused on "practitioners, artifacts, genres, movements, techniques, events, and the profession" (Malone, 2007, p. 333). However, there have been relatively few studies about the history of scholarship in either technical communication or a specific field of technical communication, such as international technical communication. Some researchers have collected articles published in a certain journal during a certain period and arranged them into an annotated bibliography, such as Edlefsen (1979), Reese (1985), and Nakamura (1990). Some scholars have published annotated bibliographies of the published scholarship about some topics, such as ethics (Dombrowski, 2000), history (Tebeaux & Moran, 2011), and prognostication (Wright, Malone, Saraf, Long, Egodapitiya, & Roberson, 2011). Smith (2000) identified the most frequently cited texts between 1988 and 1997from the five peer-reviewed technical communication journals and analyzed them in terms of topics, authors, and forums. However, these article-length bibliographies are not deep studies of the published scholarship. This thesis is a relatively deep study of the published scholarship in international technical communication from 1950 to 1989. It tries to answer the following research questions:

- What did scholars of international technical communication study in each decade?

- What are the similarities and differences among the four decades in terms of scholarship in international technical communication?
- What are the strengths and weaknesses of the relevant scholarship in the four decades?
- What can we learn from the scholarship in these four decades?

This research not only fills a gap in historical studies of technical communication, but also serves as a record of the published scholarship in international technical communication during four formative decades in the professional of technical communication. Most importantly, it provides insight into four decades' worth of scholarship as well as a resource for the development of present and future scholarship in international technical communication.

1.2 SCOPE OF STUDY

In this thesis, I focus on the scholarship in international technical communication from 1950 to 1989 mainly for two reasons. First, this period (1950-1989) can be looked on as the first stage in the development of international technical communication as a conscious focus of academic scholarship. With the rapid technological developments in the wake of World War II, scholarly interest in technical communication, as well as international technical communication, began to grow and mature gradually. 1990 could be said to be a watershed. Around 1990, with the integration of countries like China and India into the global economy, economic globalization came into being (Cardon, 2008). Intercultural communication has become an important area of study since 1990 (Cardon, 2008). The important organization—the Society for Technical Communication—was becoming a truly international organization around 1990 with more geographically

dispersed membership around the world (O'Hara, 1989). Since 1990, the published scholarship in international technical communication has exploded in various media, including journals, books, academic conferences, and electronic publications.

Second, by limiting my focus to the 1950-1989 period, I was able to fit this project into the scope of a master's thesis. The narrower scope facilitated the completion of the project without reducing the project's value. Although this thesis only covers the pre-1990 scholarship in international technical communication, it still has considerable value. Through this research, we can observe academics' and practitioners' research interests in these four decades, make some comparisons among their studies, investigate the factors that caused changes in scholarship in the different decades, and most importantly, gain insight and possibly direction for the development of present and future scholarship in international technical communication. After reading this thesis, scholars working in the field of international technical communication may have a better historical sense of the evolution of their specialty area. A historical perspective can inform their own research and scholarship.

1.3 CLASSIFICATION SYSTEM

In this thesis, I divided scholarship in international technical communication from the 1950s to 1980s into the following categories:

- status of technical communication in other countries
- education
- writing issues
- graphics issues

- design issues
- management issues
- information systems
- localization
- international specifications/standards
- issues related to doing business
- professional organizations
- technical editor/editing
- translation
- distribution and usage of technical information
- instructions for international technical communication.

Some of these categories need to be explained:

- Status of technical communication in other countries: Means the state of technical communication's development in countries outside the United States.
- Education: Means educational practices in other countries or teaching technical communication to non-American students in the U.S.
- Writing issues: Refers to issues of language and writing skills for a certain purpose.
- Management issues: Refers to issues which aim at balancing "economy (business needs) with cultural understanding (user needs)" (Hoft, 1995, p. 33).
- Design issues: Mainly refers to page design, but also involves some aspects related to printing, such as make-up.

- Information systems: Refers to both hardware facilities and methods for storage, dissemination, and usage of technical information.
- Localization: Refers to "the process of adapting a product to suit the language, conventions, and market requirement of a locale other than the one for which the product was originally developed" (as cited in Hoft, 1995, p. 11).

I should make some additional clarifications about the term "status of technical communication in other countries." As a student who comes from China, "other countries" should refer to countries outside China. However, here it refers to countries outside the United States. I adopted the U.S. perspective for three reasons. First, I collected articles about international technical communication from the main journals of this field published in the U.S. Secondly, most authors of these articles are Americans. Thirdly, the study of international technical communication in the U.S. has been running ahead of other countries. Thus, it can be said that my research is based on the perspective of an American. However, this does not deny its value for other countries. Since the U.S. has taken the lead in international technical communication, a historical study of scholarship in international technical communication is not only meaningful for the U.S. itself, but it is also helpful for other countries whose international technical communication is less developed than the U.S.

Additionally, some articles could have been classified under two or more categories. For example, an article written about a specific aspect of technical communication in another country could have been classified under "status of technical communication in other countries" or (for example) "education." In such cases, I ascribed

the article to only one category. This is just because the division of categories is based on the main subject or emphasis of each article.

1.4 METHOD

The thesis is based on 88 articles from the main journals and conference proceedings in technical communication published in the United States. These journals and conference proceedings include

- *Technical Communication* (TC)
- *STWE Review*
- *STWP Review*
- *Journal of Technical Writing and Communication* (JTWC)
- *The Technical Writing Teacher* (TWT)
- *Industrial Editor* (a.k.a., *Technical Communications*)
- *Technical Writing Review* (TWR)
- *IRE Transactions on Engineering Writing and Speech*
- *IEEE Transactions on Engineering Writing and Speech*
- *IEEE Transactions on Professional Communication*
- *Conference Record of the IEEE International Professional Communication Conference*
- *STC International Technical Communication Conference Proceedings*
- *STWP Convention Proceedings.*

I searched for these articles by two means. One was checking the main journals published from 1950 to 1989. The other was looking through three important books,

Philler and Hersch's (1966) *An Annotated Bibliography on Technical Writing, Editing, Graphics, and Publishing, 1950-1965*, Carlson's (1983) *An Annotated Bibliography on Technical Writing, Editing, Graphics, and Publishing, 1966-1980*, and Balachandran's (1977) *Technical writing: A bibliography*, all of which identify publications in technical communication. Thus, the articles I collected and analyzed for my study constitute a relatively complete corpus of the published articles about international technical communication in the main technical communication journals and conference proceedings of these decades.

I reviewed and summarized these articles, determined their main subjects or emphases, and classified them according to commonly recognized categories. Based on my literature review for each decade, I answered my research questions about the four decades' worth of published scholarship.

1.5 ORGANIZATION

This thesis has six sections. Section 1 introduces some background information of the thesis, such as its value, the reasons why I studied the published scholarship from 1950 to 1989, and some terms used in the thesis. Sections 2 to 5 discuss the published scholarship in each decade. I not only summarize the published scholarship in each decade, but I also draw some conclusions based on my literature review. Section 6 is the conclusion, in which I provide a summative overview of the four decades' worth of published scholarship and answer the research questions I posed in Section 1.

2. SCHOLARSHIP IN INTERNATIONAL TECHNICAL COMMUNICATION IN THE 1950S

2.1 INTRODUCTION

The published scholarship in international technical communication, as in other areas of technical communication, does not seem very mature during the 1950s. Among the 88 articles I collected, only 6 were published in this decade. Moreover, the topics they covered were very limited. This feeble body of scholarship nevertheless provided some guidelines for developing international technical communication practices. Even at this early date, the practice of international technical communication was attracting scholars' and practitioners' attention.

2.2 LITERATURE REVIEW

The articles about international technical communication in this decade covered three topics: status of technical communication in other countries, design issues, and translation.

2.2.1 Status Of Technical Communication In Other Countries[1]**.** Bellmar (1958) described industrial communications in Russia for industrial editors in the U.S. The communications system in Russia was very smooth and could be described in terms of "discipline," "plan," and "socialist obligation" (Bellmar, 1958, p. 5). Information flowed in two ways. One way was to tell people information about the social plans, including technical developments, projects, and news. The other way was an upward flow of

[1] Patterson's (1957) article was not summarized but was included in the analysis in the thesis.

information. It could be “articles, or letters to the editor, or simply reports from people who are cooperative with authorities” (Bellmar, 1958, p. 6). The communications system was designed to check the masses’ willingness to take a step and prepare them for the step. Consequently, industrial editing and industrial editors acted in accordance with the system closely. The communication tools included papers, magazines, special industrial editors’ meetings, industrial news sheets, wall newspaper, signs and slogans, and agitators.

Allen (1959) discussed technical writing in Great Britain in order to illustrate the state of British technical writing. He had worked as a technical publications representative in British industry for one year, mainly worked with three British companies. Only one of them had a publications department which “could handle our work as a matter of routine” and “included fully competent writers, editors, artists, photographers, and multilith operators (who turned out beautiful three-color work)” (Allen, 1959, p. 12). Of the other two companies, one had a publications department of writers and illustrators, the other had a small writing group. The writers of the both companies worked only in designated areas and were not quite qualified for technical writing. Consequently, engineers were involved in doing the actual writing. According to Allen (1959), “British technical writing is presently just about where American technical writing was twenty years ago” (p. 12), “there is no technical writing company in Great Britain,” and “the technical writing field is thus only starting to get under way” (p. 13). He thought that the main reason for this situation was “the lack of demand for formal military instruction manuals from industry” (Allen, 1959, p. 12).

2.2.2 Design Issues. Grenard (1959) narrated his funny experience in a French print shop to give industrial editors and other technical communicators a rough understanding of the status of foreign printing. He and his partner, Jimmy Walding, were responsible for a special issue of the *Witch's Brew*— the crew's paper of the heavy cruiser USS Salem. They encountered some difficulties when having this special issue printed out, because neither of them knew French. Through hard oral communication and gestures, they finally got what they wanted. At the same time, the French printers learned English words. This article also showed some differences and similarities between French and American printing practices. For example, some copyreading symbols had different meanings in the two countries; some type sizes were common in France but rare in America; the cost of cuts was figured in millimeters in France; make-up and proofreading were coincident in both countries; etc.

Arnold (1959) described a house organ—IBM's *World Trade News*—in order to show the challenges of designing publications that deal with more than one language. This magazine had a large and varied readership—26,000 people in 84 countries (not including the United States). To accommodate these readers, the magazine had to be published in six languages. The different language versions came from the mother version, which was in English. They were translated and printed in six different places outside the United States. All the versions had the same layouts but different type. Translation posed many problems, such as text expansion of different languages and the accurate rendering of idioms, colloquialisms, and headlines. To these problems, editors and translators attached primary importance to readability and local conventions of language. In addition to text translation and layout, other praiseworthy aspects of this

multilingual magazine included its covers, photographs, nameplate, illustrations, masthead, table of contents, and type. Arnold (1959) noted that the magazine's editor deserved our "good show, tresbon, sehr gut and the rest of the lingual salutes" (p. 5).

2.2.3 Translation. Lewis (1958) provided some good ideas for technical translators. His article is still very enlightening and helpful, even though it was written more than 50 years ago. He pointed out seven deadly dangers in translating technical material and suggested five points to obviate these dangers. The seven deadly dangers in translation were:

1. Dictionary dipping
2. Agency aberrations
3. Nuance neglect
4. Geographical goofs
5. Erratic English
6. Ribald references
7. Subtle sayings and slogans

(Lewis, 1958, pp. 45-46)

When analyzing these dangers, he introduced a miraculous invention—the electrical data-processing machine, which could "translate up to 10,000 words of Russian into English" (Lewis, 1958, p. 46). But the machine could only translate word-for-word, which was at the first level of translation. It left most of the work to translators. He also referred to cultural differences between different countries. For example, the brand name of an American manufacturer turned into a vulgar word when it was translated into Iranian. Because of this problem with the brand name, the sales in Iran were greatly affected. To fix this problem, this company had to adopt another brand name and invested a lot in advertising and promotion activity.

To avoid these dangers in translation, Lewis (1958) suggested five solutions, including careful editing, careful semantics, care in selecting translators, close cooperation with translators, and complete retranslation. Among the five suggestions, he thought that complete retranslation by an independent translator was the most important, because he had "seen again and again translated material which, had it been retranslated, would have shown that it was not adequate for the purpose intended" (Lewis, 1958, p. 50).

2.3 CONCLUSION

In this decade, the published scholarly articles in international technical communication were relatively few in quantity and focused on the status of technical communication in other countries, design issues, and translation. This situation had a close relation with the state of the profession and academic discipline of technical communication at that time. Technical communication was in its infancy—both as a profession and in terms of its scholarship— in the 1950s. Journals and conferences in this field were being established. The first generation of professionals were busy plowing new ground in this field, especially close to home. They had not yet fully grasped the scope and potential of international technical communication. Also, they were preoccupied with profession-building activities at home.

The two countries under the topic of status of technical communication in other countries were Britain and Russia, two superpowers which were competitive to the U.S. The purpose of the authors who wrote these articles was obvious: they wanted to understand and learn something about the technical communication industry and practices of their foreign competitors.

Developments in computer technology during this period made it possible for people to use machines to facilitate translation. Machine translation did not get much attention in technical communication journals and conference proceedings mainly because it was new and relatively primitive. Other factors might be that machine translation was not yet frequently used and most practitioners had not realized its connection to the practice of technical communication. Cultural differences and text expansion of different languages were mentioned (Lewis, 1958).

3. SCHOLARSHIP IN INTERNATIONAL TECHNICAL COMMUNICATION IN THE 1960S

3.1 INTRODUCTION

Compared to that in the 1950s, the published scholarship in international technical communication in the 1960s made obvious progress, both in quantity and scope. More scholars and practitioners were turning their attention to this field. More topics related to international technical communication were being studied. The 12 articles in this decade covered such topics as status of technical communication in other countries, education, graphics issues, information systems, and translation (translation: general, translation software, and technical translator).

3.2 LITERATURE REVIEW

The quantity of articles about one topic did not differ much from that about another topic. But two focuses were obvious: status of technical communication in other countries and translation.

3.2.1 Status Of Technical Communication In Other Countries[2]**.** Based on his visit of England, Scotland, and ten European countries, Britton (1962) analyzed technical writing in Europe and provided an overview of technical writing in those countries. He deduced that technical writing in Europe should surpass that in the United States based on his assumption of the more superior education in Europe. However, he found his

[2] Gould's (1967) article was not summarized but was included in the analysis in the thesis.

deduction was wrong. The United States was “quantitatively ahead of Europe and even of England in technical writing activity” (Britton, 1962, p. 7).

Britton (1962) divided the fifty organizations he visited into three groups: educational institutions, industries, and publication and research establishments. Each group had the same complaints of poor technical writing. Whether in educational institutions or in industry, a common feedback was that the engineering students or engineers could not write and communicate. In addition, he asked the people he met in this field whether there was “any activity in the way of courses, training sessions, societies, or publications concerned with technical writing.” The answer usually was “There is nothing, as far as we know” (Britton, 1962, p. 5).

Furthermore, Britton (1962) analyzed the causes that resulted in such a situation in Europe. The first was the educational philosophy in Europe, that is, “education should be broad and basic rather than specialized” (Britton, 1962, p. 6). The second was cultural traits, such as Europeans are more tolerant and patient than Americans, their respect for the expert and the professor, and the indirect mind of Europeans (Britton, 1962).

Some efforts had been taken to change the underdeveloped situation, although the efforts were quite few. Holland had offered a number of courses in technical writing at universities and in industries. As Britton (1962) pointed out, England had founded technical writing societies such as PTI (The Presentation of Technical Information) and TPA (The Technical Publications Association).

To provide an overview of British technical publications, Root (1966) discussed technical publications in England in the mid-1960s. Based on his twelve-day stay in

England and his visit to fifteen organizations, he summarized some characteristics of British technical publications. Generally speaking, he was impressed "by the high quality of authorship and illustration, by the rather Spartan quality of many publications, and by the obvious pride in fine workmanship displayed by the people" (Root, 1966, p. 9). He was also impressed by the austerity of many British publications (Root, 1966).

Root (1966) surveyed several aspects of technical publications in England, including the British education system, certification of various grades of technical authors, finance exports, technical reports, technical manuals, equipment and procedures used by publications departments, and publications societies. He concluded as following:

> The British are substantially ahead of the United States in their definition of and agreement on what it takes educationally to be a technical author, technical writer, technical editor, or technical illustrator and in their implementation of this into specific courses and examinations. The technical and publication quality of both British reports and British manuals and the efficiency with which they are produced are roughly comparable to those in the United States. The British publications societies are exerting a beneficial influence on the growth of the technical publications profession in British but are not as unified organizationally as is STWP.
>
> (Root, 1966, p. 13)

There were two interesting points that were noteworthy in Root's article. One was related to the professional status of technical publication. Technical publication in England did not receive enough attention, which was evidenced by the fact that technical publications production received little allotment of funds and the salaries of technical publications personnel was low. Second, the City and Guilds of London Institute, the central school which set the standard of certification for the whole country, required that "the technical author not only must be a good engineer but also must have abilities that

most engineers lack, namely, a thorough knowledge of publications techniques and the ability to write effectively" (Root, 1966, p. 10).

Sampath and Murthy (1966) analyzed technical writing in India for the purpose of promoting the development of Indian technical writing. They listed five major factors that contributed to the underdevelopment of technical writing in India. The first one was the historical factors, such as emphasis on the "eloquence of silence" (Sampath & Murthy, 1966, p. 30), an earlier India's ignorance of industrialization, a nonindustrial economy during the period of British rule, a lack of research activity, and a disinterest in communication. Two, the pattern of education "had no industrial or vocational basis" and "did not stress the importance of a specific technical vocabulary for effective communication" (Sampath & Murthy, 1966, p. 31). Three, the language barrier—without a well-developed national language— was an impregnable handicap. Four, engineers and scientists were indifferent to technical communication. Five, a lack of recognition slowed down the development of technical writing.

Despite these adverse factors, technical writing was gaining attention and developing in India because of "the rapid industrialization of our country and accelerated original research activity" (Sampath & Murthy, 1966, p. 31). In addition, the authors suggested that the pattern of education in the United States should be followed. This pattern proposed that technical writing should be regarded as "an essential course of study for all branches of engineering education" (Sampath & Murthy, 1966, p. 32).

3.2.2 Education. In order to provide a useful source for American teachers of technical writing, Mitchell (1963) introduced the techniques for teaching technical

writing in Britain. His study was based on questionnaires, interviews, plant visits, and a search of the professional literature. He investigated a large number of samples, such as all English, Welsh, and North Irish universities, colleges of advanced technology, national colleges, technical colleges, ministries, utilities, management and training consultants, and public and private research laboratories. Thus, this study is very representative and of high credibility.

Mitchell (1963) analyzed the teaching of technical writing in different types of higher education institutions, including universities, colleges of advanced technology, technical colleges, schools of journalism, and correspondence schools. He also examined the professional societies and the on-the-job training in Britain. He came to the following conclusion:

> The British systems for training technical writers do not meet the quantitative demands of their own science and industry for skilled communicators…. However, within specific areas and for specific purposes, British training schemes are highly successful. In the United States, where the quantitative demand for writers is greater(and where the qualitative demand is perhaps less), the expense in terms of time and personnel makes imitation unrealistic.
>
> (Mitchell, 1963, p. 12).

The advantages of British techniques mainly lay in the “short” or “sandwich” courses (Mitchell, 1963, p. 11) offered by the technical colleges and the tutorial systems of the British universities and on-the-job training.

3.2.3 Graphics Issues. For the purpose of stressing the importance of symbols, Nasstrom (1968) explained how symbols were used in Europe. There were about 20 languages in Europe, which caused communication problems in many fields, such as

travelling and exporting products (Nasstrom, 1968). To help solve these problems, symbols were being used. These symbols included electrical wiring diagrams, road signs, and signs used on trains, in industry, and on washing appliances. He also introduced the symbolic information system for repair manuals in detail. This symbolic information system originated in AB Scania-Vabis, a Swedish truck factory where the author was employed. This factory exported its production to more than 50 countries. The symbols were used as a supplement for pictures in repair manuals. Although it had some disadvantages, this symbolic information system had many advantages besides its being easy to read and understand.

3.2.4 Information Systems. Green (1962) made a detailed comparison between information systems in Russia and the United States for the purpose of finding out the gap between the two countries. There were some similarities:

- Both Russia and the United States had great libraries.
- Both of the countries published scientific and technical publications widely.
- Both of the countries had special information centers, which concentrated on high-priority subjects.
- Seminars and meetings were popular in the two countries.
- Russia had VINITI (the All-Union Institute of Scientific and Technical Information) and the United States had a similar organization named the National Federation of Science Abstracting and Indexing Services.

One real difference, also a vital advantage over the United States, was that “the Soviets appear to have a greater appreciation of the impact of information on scientific progress” (Green, 1962, p. 98).

Besides introducing the information system in Russia, Green (1962) also briefly described the information systems in Poland and Denmark.

Day (1968) discussed the development of international scientific and technical information systems. International scientific and technical information systems were used to store, manage, and transfer scientific and technical information among the member countries who participated in the establishment of the systems. A strong scientific and technological base had “brought prosperity to many nations, bolstered their national stability, increased their influence, and strengthened their prestige” (Day, 1968, p. 1). However, there were many problems in organizing international information systems, such as the problems related to strong national systems, language, politics, telecommunications, organization and resources, duplication, the need for standards, and training and education. To circumvent these difficulties, international organizations spearheaded three major efforts: ICSU-UNESCO Feasibility Study of Worldwide Information Systems, OECD Feasibility Study on an International Network of Technical Information Systems, and IAEA plans for an International Nuclear Information System. These efforts greatly contributed to the development of international scientific and technical information systems.

3.2.5 Translation. In this decade, translation covered three aspects: general, translation software, and technical translator.

3.2.5.1 Translation: general. Lufkin (1969) believed that "translation, whether literary or technical, is a creative art, not a mechanical process" (p. 3). The assumption that "a translation must be literal in order to be exact" was wrong since a literal translation was not only "not more faithful than some other kind," it was also "not a translation at all" (Lufkin, 1969, p. 3). Translation was not a mechanical process, thus machine translation was impossible and might never be possible (Lufkin, 1969). Lufkin (1969) thought that "the steps in which an idea expressed in one language is first understood and then reexpressed in another are so subtle, so complex, and deeply hidden from observation that we may never be able to devise a machine program capable of imitating them" (p. 4). In the report issued by the National Academy of Sciences and the National Research Council, it was written,

> The contention that there has been no machine translation of general scientific text is supported by the fact that when, after eight years of work, the Georgetown University MT project tried to produce useful output in 1962, they had to resort to postediting. The postedited translation took slightly longer to do and was more expensive than conventional human translation.
>
> (as cited in Lufkin, 1969, p. 4)

According to Lufkin (1969), whether it is literary or technical translation, a translator "deals with ideas, for which the words are mere symbols; he is an intellectual, not a key-punch operator" (p. 5). He also discussed some other aspects of translation, such as the standards for evaluating translation quality, the translator's qualifications, and how to find a competent translator.

3.2.5.2 Translation software. Walker, Kuno, Smith, and Holt (1968) introduced a system used for "checking the usage of words and phrases in past translations of

mathematical texts" (p. 118) in order to supply a useful tool to do Chinese mathematical text analysis. Here, the translations referred to Chinese-English translations of mathematical texts. This system included two parts: the graphical input/output system for Chinese characters and various computer methods for analysis of Chinese mathematical texts. The uniqueness of the graphical input/output system introduced by the authors was that this system used "a display scope, a RAND tablet, or a plotting table with digitizing unit, for graphically inputting strings of nonstandard characters" (Walker, Kuno, Smith, & Holt, 1968, p. 128). The techniques for analysis of Chinese mathematical texts included the ones "for eliminating erroneously segmented entries from a concordance, for resolving ambiguities resulting from multiple meanings of characters through context analysis, and for locating such troublesome phrases by machine comparison of the Chinese original and the English translation of a text" (Walker et al., 1968, p. 118).

3.2.5.3 Technical translator. Van Acker (1964) explored the relationship between technical translating and technical writing for the purpose of establishing a correct understanding of technical translations. He thought that "the job a good technical translator has to perform is not at all primarily one of linguistics, but rather one of technical writing" (p. 1) and a good technical translator was in fact a technical writer who knew one or more languages. He gave technical translators a new name—foreign language technologists. According to him, the translation of a technical manual by a translator who just knew one or more foreign languages was worse than literal translation. However, the technical writers "who do not have knowledge in depth of one or several languages are none the less extremely well suited to act as Technical Editors in conjunction with translators who have produced a rough version" (Van Acker, 1964, p. 7).

To be a good technical translator, although he did not need to grasp all of the technical knowledge, he must have a solid grasp of the related technical subject matter. He should also have a scientific attitude and a suspicious nature.

Dietrichson (1966) compared technical translators with technical writers in order to provide a clear and comprehensive understanding of technical translators. Like Van Acker (1964), Dietrichson (1966) thought that "a translator must be not only a craftsman in his foreign language and technical specialty but also a competent technical writer" (p. 1). Because of the close relationship between technical translation and technical writing, he gave some advice that was applicable to both fields, such as having a good foundation in a technical specialty, mastering the English language, being familiar with the publishing business, mastering one foreign language, and being familiar with the actual work. He also discussed the wages of technical translators and the present and future market of technical translation, which showed that the profession of technical translation was very attractive and promising. Dietrichson (1966) pointed out that the problem with machine translation was not "in the hardware; it is in the fact that we do not understand any language well enough to program a machine to translate it" (Dietrichson, 1966, p. 7). Machine translation still needed postediting, which was a continuous workload for technical editors. Machine translation was not economically feasible at that time.

3.3 CONCLUSION

In this decade, scholars and practitioners were concerned about status of technical communication in other countries, education, graphics issues, information systems, and translation (translation: general, translation software, and technical translator). Scholars

and practitioners seem to have been especially interested in the development status of technical communication in England as well as its formal preparation of technical communicators, perhaps because Britain was a competitive country to the U.S. in the world and the two countries share the same language and heritage. Scholars and practitioners hoped to find out the gap between Britain and American technical communication. They also hoped to learn their advantages from Britain.

Technical writing in India was examined. In the 1960s, the industrialization policies and research activity in India stimulated the need for technical writing. Inevitably, problems in technical writing appeared. Thus, studies aiming at promoting the development of technical writing in India were needed.

Graphics issues and information systems were studied, too, although the quantity of published articles was small. A common purpose behind these studies was to facilitate the flow of scientific and technical information. For example, Nasstrom (1968) discussed the use of symbols to facilitate information flow among European countries. Day (1968) advocated the development of international scientific and technical information systems in order to smooth the transfer of information among different countries. These examples showed that international technical communication was becoming more common and important and some scholars and practitioners were concerned about the flow of scientific and technical information.

The scholarship about translation that was published in the various technical communication forums during this decade covered more aspects of translation, including the distinction between literary and technical translation, the effectiveness of machine

translation, the standards for evaluating translation quality, the process of hiring a competent translator, the qualifications of a good translator, and the use of translation software. The change was reasonable due to the development of technology and international technical communication practices.

We can find some opinions repeated by different scholars and practitioners. For example, both Van Acker (1964) and Dietrichson (1966) emphasized that a technical translator was a technical writer. Both Dietrichson (1966) and Lufkin (1969) had a negative attitude toward machine translation. The former thought that machine translation was not economically feasible and the latter straightforwardly denied the usefulness of machine translation.

In the scholarship of this decade, we still see the common assumption that technical communicators needed to be scientists and engineers. For example, the City and Guilds of London Institute, the central school that set the standard of certification for the whole country, required that the technical author must be not only a good engineer but also a writer. In their study, Sampath & Murthy (1966) just assumed that technical writers were scientists and engineers. Under this assumption, their ability of writing may be second to their understanding of science and technology. These assumptions reflected an older view of what a technical writer was. An emerging and competing view was that someone with strong writing skills was preferable to someone with a strong scientific or technological background—if needed both were not possible. In the 1950s, Joseph Chapline, the first computer documentation writer and manager of technical writers, had an advanced philosophy of hiring a technical writer. He came to believe that the ability of writing was more important than the mastery of technology, and he hired accordingly

(Brockmann, 1998). However, even in the 1960s, the idea that writing ability is more important than the mastery of technology itself was not widely accepted in the U.S., let alone Britain and India.

4. SCHOLARSHIP IN INTERNATIONAL TECHNICAL COMMUNICATION IN THE 1970S

4.1 INTRODUCTION

Published scholarship in international technical communication in the 1970s was richer both in quantity and scope than in the 1960s. I collected 34 articles from this period and these articles covered eight topics. The discussion about education and translation was much fiercer. Fifteen articles focused on education, involving several countries such as the U.S., Canada, Britain, Australia, and Japan. Nine articles focused on translation and they contained subtopics like computer-aided translation, machine translation, translation strategies, terminology tools, technical translator, and translation trends.

4.2 LITERATURE REVIEW

In addition to the topics of status of technical communication in other countries, education, and translation, the articles in this decade covered management issues, localization, international specifications/standards, technical editor, and instructions for international technical communication.

4.2.1 Status Of Technical Communication In Other Countries[3]**.** Mitchell (1971a) examined technical writing and applied communications in Australia. He analyzed the audience of technical information at first. Geographic isolation resulted in a significant isolation of audience. The background and training of audience differed

[3] Richardson's (1972) article was not summarized but was included in the analysis in the thesis.

greatly, especially between native-born Australians and "new" Australians (i.e., immigrants). Also, the intended audiences had different immediate needs. Following the analysis of audience, he summarized the characteristics of Australian technical communication. He wrote,

> The nature of the audience fosters a formal "scientific" prose style in Australian technical communication….it may be said that Australian technical writing is based upon the academic conditioning of Anglo-Australian university graduates. Opinions and personalities are welcomed and expected from a writer who is obviously "one of us."
>
> (Mitchell, 1971a, p. 7)

Finally, he made an optimistic prediction about the future of Australian technical writing based on the facts that industry was growing and vigorous efforts were being made by government, academic facilities, and professional societies. He also pointed out that salaries for technical writers were improving, which indicated the growth of technical communication in Australia.

4.2.2 Education[4]**.** Bratchell (1971) focused on the design of courses in spoken and written communication in Britain. In the early 1970s, British colleges of advanced technology had realized the importance of education in spoken and written communication for scientists and technologists. The study of communication received attention not only because of its relevance to commerce and industry, but also because of a technological revolution (Bratchell, 1971). With regard to the design of courses in communication, the colleges adopted sandwich courses which made "industrial and

[4] Seven articles (Bratchell, 1973a; Bratchell, 1973b; Collet, 1977; Colodner, 1970; Kirkman, 1978; Mitchell, 1971b; and Selinker & Trimble, 1974) were not summarized but were included in the analysis in the thesis.

academic training concurrent" in order to meet the needs of industry and commerce (Bratchell, 1971, p. 301). At the University of Wales Institute of Science and Technology, courses in spoken and written communication were "included in nearly all first-degree work," and "short courses at postgraduate and post-qualification level for industrial and commercial organizations" (Bratchell, 1971, p. 302) were also provided. The course in technical communication covered a wide variety topics, including psychology of communication, structure of modern English, style, organization of written material, graphic design and visual communication, modern communication theory, and legal aspects.

Baxter (1971) described a distinctive technical report writing course at the Swinburne College of Technology in Victoria, Australia, so that educators in the United States might learn something from it. The most outstanding feature of the course was that it was conducted by two lecturers: one was from the appropriate technical faculty and the other from the General Studies faculty. The lecturers had different responsibilities. Obviously, the technical lecturer was in charge of the technical aspects of the course, such as approving "the students' choice of topics," suggesting "methods of approach for those topics," and assessing "the technical quality and correctness of the reports" (Baxter, 1971, p. 224). The General Studies lecture was responsible for the aspect of communication, such as giving "advice on the quality and correctness of presentation, organization and expression, appropriateness of format, style, and conventions for particular kinds of report" (Baxter, 1971, pp. 224-225). Though neither of the two lecturers could be ignored, it was generally acknowledged that the General Studies lecturer was the key to the success of the course. One main reason was that the General

Studies lecturer should also be familiar with a wide range of technical and scientific subjects and played an important role among the three sides—students, his technical colleague, and himself.

The assessment of student grades was based on oral and written reports. The two lecturers assessed the two kinds of reports. The class joined in the assessment of oral reports. The General Studies lecturer held conferences with each student to discuss his/her written reports. The lecturer would point out the shortcomings of the report and suggest ways to improve the report to meet the desired criteria.

This type of course organization had been used for about ten years at the Swinburne College of Technology and turned out to be remarkably effective and successful, not only "in the quality of reports produced by the students," but "in breaking down the barriers between the staffs of the technical faculties and the humanities lecturers" (Baxter, 1971, p. 223).

To share their experience with other university-level teachers of technical writing, Pavelich (1973) introduced how she and her colleagues taught technical writing to foreign students at the University of British Columbia in Vancouver, Canada. Here, "foreign students" referred to "students who are recent immigrants, as yet unqualified for citizenship, whose native language was not English" (Pavelich, 1973, p. 103). Most of these students came from Hong Kong. A small number were from India, but that number was increasing. They did well in mathematics and science, but "orally they can be nearly incomprehensible and their written English is an entanglement of errors" (Pavelich, 1973, p. 103). Due to their cultural backgrounds and the education they received in their mother

country, they were totally ignorant of technical writing and reluctant to seek public help to improve their English.

The students started simply by filling in employment application forms. Application forms were important in getting a job. This was evidenced by the true story of a graduating student, who had average grades but received ten job offers because he could write forms, letters, and resumes, and was good at interviews. In addition, application forms led students to the study of sentence patterns and helped the instructors to understand students' backgrounds. Besides simple application forms, more complicated application forms were used, too. The complicated forms made students pay attention to the conventions of business correspondence and resume writing.

Another two kinds of training for these students were writing essays and linguistic exercises. The essay in the special class was "any longer composition that has a thesis in an introductory paragraph with a sequence of paragraphs developing it" (Pavelich, 1973, p. 107). It turned out that the students could write well-organized essays. The linguistic exercises helped students to correct errors caused by the differences between their native language and English.

Five years later, Pavelich (1978) published another similar article about the special technical writing class for foreign students to provide cruel but kind advice to technical writing teachers. Firstly, she asked, "Why didn't the foreign students learn properly in the freshman course or be failed by it?" (Pavelich, 1978, p. 55). Here, the freshman course referred to a technical writing course. One reason lay in the students. The analysis of the foreign students was similar to that in Pavelich's (1973) previous

article. For example, most foreign students came from Hong Kong and India; they had different cultural backgrounds; they seldom read, wrote, and talked English off campus; and Asian schools put more emphasis on mathematics and science. Another reason was related to the instructors. Both the English instructors and the technical instructors were "naïve in dealing with these students" (Pavelich, 1978, p. 56). They did not realize the importance of technical communication for students with majors in mathematics or science. In addition, there was little opportunity for the professional instructors to find out students' nonproficiency in English.

To improve foreign students' English skills, Pavelich (1978), with her colleagues, established special remedial classes for the students who failed the diagnostic essay. The special remedial classes turned out to be successful. The main reason was that the instructors had learned "the characteristics of our students thoroughly" and could "decide what to teach and how to teach it efficiently" (Pavelich, 1978, p. 57). By the evidence of the remedial students' essays, Pavelich (1978) and her colleagues also succeeded in making people realize the students' writing levels and the importance of technical writing. One example was that a normal technical writing course was offered and most professional faculties recommended their students to take it.

Mitchell (1974) examined the teaching of technical writing and business communications in Australia so that his readers might have a rough understanding of Australian approaches to applied communications. There was a need for business communications and technical writing because of the economic growth in Australia. Throughout the 19th century, Australia followed British educational schemes, and its 14 universities seemed unchanged in the author's eyes. However, the Second World War

taught the Australians that “an Agrarian economy and primary industries do not guarantee survival” and led them to “redesign their technical colleges and to create new, degree-granting colleges of advanced education and institutes of technology” (Mitchell, 1974, p. 10). Australians were “following U. S. rather than British models in training communicators” and Australian schools imported techniques and faculty, as well as education, from U. S. schools of business administration.

In Australia, the subject of applied communications was taught in the technical colleges, the colleges of advanced education, and the institutes of technology. The universities still followed British models and believed that “anything applied, practical, or in the craft/skill areas is not their responsibility” (Mitchell, 1974, p. 11). Applied communications courses in the technical colleges, the colleges of advanced education, and the institutes of technology, were “tied to content areas and function[ed] as service courses” (Mitchell, 1974, p. 14). One exception was the New South Wales Institute of Technology, in which an independent writing program was set up.

Mitchell (1974) summarized the teaching of technical writing and business communications in Australia as following:

> First, I think I have said that Australians are adopting U. S. techniques for communicating industrial, scientific, and technical information. Second, they are using pedagogical methods and texts similar to our own. Third, their economic and cultural zeitgeist indicates a long rise in applied education. Fourth, they are beginning to recognize writing as an autonomous area whose courses reinforce one another and are more than service courses for other discipline.
>
> (p. 15)

Pytlik (1978) described the special technical writing classes at Iowa State University to show that technical writing was an appropriate composition course for

foreign graduate students. Pytlik (1978) thought that such special classes might "help our English departments solve some of the problems created by increased foreign student enrollment" (p. 53). Two important reasons were that the standard content of the technical writing courses needed only minimal changes to serve this purpose and instructors of technical writing were more familiar with the kinds of writing these students would encounter during their graduate studies and in their future professions. The technical writing class consisted of students who came from different countries, had different majors, and were at different levels of English writing. This diverse background made it more difficult to teach such a class; however, the diverse background was also an advantage. For example, students in the special class had little opportunity to communicate in their mother languages, which made them realize the importance of mastering English. Due to the diversity in majors, the instructor could "concentrate on written communication problems" and "rely on the students' graduate-level knowledge of their subjects to provide the subject matter for their papers" (Pytlik, 1978, p. 53). One problem of these students, however, was that few of them were familiar with the inductive approach to writing. Pytlik (1978) also listed the required papers and some classroom procedures used in the course, such as a diagnostic paper, an abstract of an article, the inductive approach to organize a paper, and editing.

Mitchell (1978) studied the training of technical writing teachers in other countries to call attention to this training. The "other countries" in his article included Western Europe, the United Kingdom, Canada, Australia, Israel, Japan, South Africa, and Sweden. In Western Europe, little was done to train technical writers and teachers of technical writing. In the UK, the training of technical writing teachers was "dominated by

the City and Guilds Syllabuses (Sic!) 535 and 536" (Mitchell, 1978, p. 115) and the bulk of the training was relevant to the City and Guilds examination for certification. Canada seemed to have no training of technical writing teachers. It was doubtful that much progress would be made there until the Canadian Public Service formally created the job title and description of technical writer. Australia would follow the UK system and offer a course "external from a formal educational institution and leading to certification by an extension-like program" (Mitchell, 1978, p. 117). In Israel, Japan, South Africa, and Sweden, there were STC chapters, and the societal teaching programs took "the form of in-plant seminars concerned with upgrading personnel" (Mitchell, 1978, p. 117). As to the training programs in communications held in some international corporations, they were usually ESL programs focused on corporate needs. Altogether, Mitchell (1978) concluded that "the training of technical writing teachers abroad is not a real problem. Except in the U.K., it seems not to be done at all" (p. 114).

Hayata (1976) described the status of the studies and teaching of technical writing in Japan in order to improve the development of technical writing. English education was popular in Japan; however, the emphasis was on reading English or translating English into Japanese, and technical writing and communication courses were seldom provided (Hayata, 1976). But the motives for developing courses in technical writing in English were great, such as the increasing contacts with other countries in different fields. Only a limited number of Japanese professors specialized in teaching technical writing in English, such as Professor Y. Shinoda of Waseda University and the author at Doshisha University. A few journals published works related to technical English writing, such as *Jiji Eigo Kenkyu*, *Kogyo Eigo*, and *Kikan Hon'yaku*. Hayata (1976) thought that the most

important process in Japanese-English translation was "to translate a Japanese text into a translatable text in Japanese" (p. 27), i.e., to prepare it for translation. Furthermore, it was difficult "to find capable translators for scientific and technical papers and reports" (Hayata, 1976, p. 27). Hayata (1976) also pointed out the problems in scientific and technical writing in Japanese, such as vague expressions, socio-psychological and socio-anthropological aspects in the style and expression, and no singular/plural indications for quantity.

4.2.3 Management Issues[5]**.** Battrick (1979) shared the successful experience of the Publications Branch of the European Space Agency in writing, editing, and publishing for a worldwide audience. His purpose was to demonstrate that "if one is careful to trade off quality against speed of publication while still giving careful consideration to the needs and wants of the readership of a particular publication, it is possible to produce a high volume of scientific and technical publication successfully with only a small editorial team" (Battrick, 1979, p. M-24).

Among the various kinds of publications by ESA, Battrick (1979) mainly discussed *ESA Bulletin, ESA Journal, ESA Special Publications*, and *ESA Annual Reports*. The *ESA Bulletin* was a "reader-appeal" publication, that is, its major goal was wide dissemination. In fact, the *Bulletin* circulated within the ESA's eleven members and three observer states as well as in some 30 other countries. Editing and rewriting was an important procedure in producing the *Bulletin*. To reduce the cost, effective efforts were made, such as the adoption of a three-column layout. Due to the goal of wide

[5] Grom's (1975) article was not summarized but was included in the analysis in the thesis.

dissemination, the *Bulletin* depended on advertising as a source of revenue. The *Journal* had a wide readership in about 47 countries and its circulation was increasing at a rate of 40% every year. The *Journal* also needed editorial effort, but the motive was not "reader appeal," but the "shelf life of the information" (Battrick, 1979, p. M-25). Advertising was a source of revenue, and a subscription fee would be introduced in the near future. In producing the *Special Publications*, "speed of publication" was a major consideration and a camera-ready production was "the most effective method of transferring Conference-generated information" (Battrick, 1979, p. M-25). Production costs were subsidized by the Conference registration fee and the post-meeting sales. The *Annual Reports* were comparable to the *Bulletin* in terms of editorial and graphical effort. It was distributed without charge. As to other publications, they were "camera-ready productions wherever possible, supported as necessary with a minimum of editorial effort" (Battrick, 1979, p. M-26). They were sold in hard-copy form or microfiche. To promote dissemination, a computer-based bibliographic system was created.

4.2.4 Localization. Halling (1971), executive vice president of Planaprint International, Inc., Amsterdam, introduced a new concept (or system) of technical publications distributed abroad to help U. S. companies increase profitable foreign sales. This system had ten principles, including publication programs design, writing and graphic design, idiomatic translations, counsel on national customs, printing in countries of product use, and distribution planning. At that time, in the foreign sales field, technical publication was still "in its infancy as used—or abused by some American manufacturers" (Halling, 1971, p. 4). However, Planaprint International, Inc., had had great success. This was evidenced by the fact that "major European manufacturers of automobiles,

appliances, and electronic equipment use the service to produce and distribute English-language tech publications in the United States, as well as other countries" (Halling, 1971, p. 4). These principles in this system would still be very useful today, such as emphasis on graphics and counsel on national customs and taboos.

4.2.5 International Specifications/Standards. Child (1972) suggested establishing international specifications for military technical manuals used by common language military allies. The MALLARD project was "a cooperative effort among the United States, United Kingdom, Canada, and Australia to develop a tactical communications system that would be common to all armed forces of the four nations" (Child, 1972, p. 191). The advantages of having such a common manual specification were self-evident. They would not only "enhance achievement of the objective of common operational capability," but also "represent a significant increase in production efficiency for manuals, plus a visible, attractive reduction in preparation and printing costs" (Child, 1972, p. 190).

The first draft by the MALLARD International Committee for Manuals and Support Documentation was "a completed specification for the content of technical manuals covering operation and maintenance of MALLARD equipments and systems" (Child, 1972, p. 193), not including a section for parts lists. During the process of creating the specification, many sticky problems occurred, one of which was the numbering of manuals. If the committee adopted the numbering of tri-service publications in member nations, it would result in twelve publication numbers. Finally, the solution to this problem was creating a common publications numbering system. Along with this numbering system, a common authentication was also developed.

Child (1972) also mentioned two areas significant to the future of technical communication, one was related to the SIMM (Symbolic Integrated Maintenance Manual) of the U.S. and the FIMS (Functional Integrated Maintenance Systems) of the U.K.; the other was microfilm/fiche techniques. The committee's attitude toward the two areas was very positive and suggested the adoption of the SIMM/FIMS concept and the microfiche techniques in the MALLARD system.

Foster (1972) attempted to arouse the American people's attention and attendance to the development of international standards. Foster (1972) thought that compatibility with international standards was very important because it was beneficial for exporting products. Lack of compatibility would lead to problems such as "misunderstanding, trade and product certification barriers, and costly loss of markets" (Foster, 1972, p. 91). The United States had begun to realize the importance of involvement in international standards development. For example, a bill named "International Voluntary Standards Cooperation Act of 1971" was introduced in the 92nd Congress; Americans did participate in some international standards activities. However, these efforts were not enough. The U.S. would lag far behind other countries if it just stopped here. It was predicted that 90 percent of the worldwide standards would be developed in the following decade. Foster (1972) suggested that the U.S. had better join in the development of international standards; otherwise, there would be no second chance.

4.2.6 Technical Editor. To illustrate the role of a technical editor in Australia, Williams (1975) discussed some elements and techniques of editing, duties of a technical editor, tasks of a technical editor in the production of an instruction manual, a technical editor's role in other areas of technical writing, and writing style. At that time in

Australia, a technical editor and a publication editor had some overlapping features. For example, they should be familiar with typography, design, layout, and printing techniques. One major duty of a technical editor was to establish a set of “house rules” (Williams, 1975, p. 170). Other duties referred to the communication decisions made by a technical editor, such as the purpose of communication, the intended readers and their needs, and the best channel of communication. Williams (1975) divided the technical editor’s work in the production of an instruction manual into three areas: information collection; text scheduling; editing, assembly, and verification. He suggested that in each area a technical editor should “be involved in the project from the earliest design stages for a number of reasons” (Williams, 1975, p. 174). Williams (1975) mentioned three other areas of technical writing in which the role of a technical editor was slightly different. These areas included the transfer of ideas among scientific disciplines, the transfer of ideas between scientist and non-specialist, and the bridging of communication gaps between technologists and management or government. No matter in which area, the author believed that “the technical editor will need to become more and more a specialist in the communicating of ideas, but a generalist otherwise” (Williams, 1975, p. 174). He also provided some helpful suggestions for technical editors.

As for writing style, Williams (1975) put more emphasis on correctness, completeness, understandability, and clarity. He also suggested more recognition of the importance of technical communicators in Australia, which meant increasing their salaries and more training opportunities, and the recognition and elevation of the profession of technical communication.

4.2.7 Instructions For International Technical Communication. Woods (1973) analyzed technical communication among a large multinational company and its affiliated companies. A central technical service group in the multinational company acted as liaison agent, like a pump "circulating data through multiway pipelines" (Woods, 1973, p. 145). Four kinds of technical publications were often transmitted among the multinational company and its affiliated companies: manuals, data sheets, product specification sheets, and bulletins. Inevitably, problems arose with the transfer of technical publications. They were the great differences among the affiliates in size and sophistication; the language barrier; the need to stimulate the flow of information in more than one direction; and the need for diplomacy (Woods, 1973). To break the language barrier, many strategies were adopted, such as editing for simplification, avoiding use of involuted and convoluted constructions, acronyms, slang and catch phrases, and some specialized standard technical terms. Woods (1973) called for the use of graphics because graphics assisted the written text and could help readers understand the text. She pointed out the importance of thinking international. As for crossflow of information, she argued that it was important to ensure technology and information to flow fluently among different areas. She also believed that "tact is a prime requisite in intercommunication" (Woods, 1973, p. 147).

Hildebrandt (1974) provided a detailed analysis of written technical reports from Germany for the purpose of finding out why people from different cultures had misunderstandings in written communication. His discussion was based on two main kinds of reports sent from German subsidiaries to their parent American companies:

operating reports and action reports. He summarized problems associated with these two kinds of reports:

> Operating reports are often cold and lifeless documents; they do not let foreign writers use creativity; are affected by nonparallel calendaring between countries; follow a complex channel between companies; and assume that readers put inestimable faith in figures. Prose statements are often lacking to amplify naked figures; feedback is negligible.
> Action reports and their interpretation are affected by the physical distance between subsidiary and parent company, misunderstood requests and interpretation of those requests, overlapping of effort in preparing reports, and sheer length.
>
> (Hildebrandt, 1974, p. 303)

He explained exterior forces that caused such problems, such as culture and language. German had different cultures from the U.S., such as German's perfectionism, formality, and authoritarianism. Lingual factors included "ethnocentrism and language, process of writing the report, translation, and connotation" (Hildebrandt, 1974, p. 299). In the end, he pointed out that cultural variances might be the main factor that affected written communication within a company that had two different nationalities.

4.2.8 Translation[6]**.** Translation was a hot topic in this decade. It covered computer-aided translation, machine translation, translation strategies, terminology tools, technical translator, and translation trends.

4.2.8.1 Computer-aided translation. Lippmann (1971) introduced an approach to computer-aided translation—the time-sharing system TSS/360—in order to provide a useful approach for human translators. With the expansion of overseas business of U.S. companies, the need for multilingual documentation was increasing. Human translators

[6] Lewert's (1971) article was not summarized but was included in the analysis in the thesis.

might have difficulties in completing their tasks on time for various reasons—e.g., some reference materials were not immediately available or human translation was not fast enough. The system served as "an extension of the capabilities of the user, who is able to call on the resources of the computer as needed in the process of translation and get an immediate response" (Lippmann, 1971, p. 10). The system had many functions for the user, such as looking up a word or phrase in a dictionary, consulting other users, duplicating an existing translation, editing, and printing. Human translators could finish their tasks more quickly by using this system.

4.2.8.2 Machine translation. Colegrove (1972) gave a comprehensive analysis of machine translation based on the translation practices in the foreign assistance program for the Republic of South Vietnam. Firstly, he introduced the language problem in the Vietnamization Program. More specifically, the intended Vietnam readership of the manuals for American equipments could not read technical manuals in English and the quantity of English technical manuals was very large. To solve this problem, Colegrove (1972) reasoned that the best way was to translate these English technical manuals into Vietnamese. Consequently, computer translation attracted people's attention because of its potential speed. The validity of machine translation from English to Vietnamese was evaluated. The result was encouraging—"a machine could speak reasonably good Vietnamese" (Colegrove, 1972, p. 204).

During the process of machine translation of English technical manuals into Vietnamese, technical communicators played an important role because machine translation needed pre-translation editing and post-editing, which was "both time-consuming and expensive, and obviously compromises the original intent of machine

translation" (Colegrove, 1972, p. 206). Thus, "the feasibility of machine translation is still being carefully weighed" (Colegrove, 1972, p. 206).

Although computers could produce good literal translations, there were some problems technical communicators must face. For example, in different countries, there were different modes of thinking and measurements, some explanations and individual words were dependent on cultural background, and illustrations might be understood in completely different ways (Colegrove, 1972).

Despite these drawbacks, Colegrove (1972) had a positive attitude toward machine translation. Machine translation had some advantages over human translation such as its fast speed and standardization of the translation (Colegrove, 1972). It would have a wide application in the future, including the application at all organizational levels and the application to the international exchange of scientific and technological information (Colegrove, 1972).

Smart (1979) discussed the SMART System, which was based on Caterpillar Fundamental English, a controlled language. This system was used to edit and translate technical manuals. The SMART Electronic Editor had controlled vocabulary for technical manuals and could read "the texts electronically to monitor for the vocabulary, syntax and grammar" (Smart, 1979, p. W-141). The SMART Translator had advantages of speed, accuracy, and consistency. It did not translate word for word. The word order was automatically converted according to the target language grammar. It could also correct poor English style and do other conversions, such as converting measurements with decimal points into commas and inverting adjectives. Just as the machine translation discussed by other scholars, the SMART Translator needed post-editing, too.

Smart (1979) made a comparison of cost and time between the SMART System and manual translation. The two figures showed that SMART System had a remarkable advantage over manual translation when translating a large number of technical military manuals.

4.2.8.3 Translation strategies. Crites (1975) sought to provide "solutions to some of the problems of translating an English technical document into a foreign language" (p. 9). He identified three approaches to translating:

1. Individual words are treated as units within themselves.

2. Sentences or phrases are considered thought units.

3. The work as a whole is treated as the basic unit. (Crites, 1975, p. 9)

Among the three approaches, the combination of approaches 2 and 3 was "the most forceful technique, and the one used in modern professional translation work" (Crites, 1975, p. 9). He also discussed the problems in translation, including syntactic and nonsyntactic problems. He pointed out that the existence of cultural differences was the biggest challenge for technical translators. He gave some suggestions for solving these problems, such as adding definitions to jargon or in-house nomenclature, using standard terminology, and pre-editing materials which was to be translated. In addition, some production pitfalls were discussed, such as spacing requirements and the reading orientation of different languages, and decimal signs and units of measure in different countries. Finally, he pointed out that it was important to spend necessary funds and time on translation and pay attention to consumer response. A three-pronged translating and editing approach was described to produce a smooth and effective translation.

Agnew (1979) shared his company's methods for handling large-scale translation projects. Just as the name implies, a large-scale translation project was a large project containing "many units of different types of data which must be converted to a target language within a specific period time" (Agnew, 1979, p. W-19). Many U. S. companies were not confident when faced with such a project; however, Agnew Tech-Tran (ATT) was an exception. This company had developed some distinctive and reliable methods, including the establishment of the translation requirements by the client companies, pricing and quotation, pre-production details, and production techniques. Some of these methods were applicable to other peer companies. For example, the "learning curve" (Agnew, 1979, p. W-20) must be considered when estimating the cost of a large-scale translation project. The "learning curve" meant that "translating technical data takes more time in the initial stages of the project, gradually decreases during the course of the project, and then reaches the optimal rate" (Agnew, 1979, p. W-20). The two-pronged approach was another bright spot of ATT's methods. This approach included two kinds of staff in the process of translation: a qualified translator whose native language was the target language and an editor whose native language was the source language but familiar with the target language. Besides these two methods, other methods, such as the methods for consistency maintenance, collection of useful information for subsequent use, and providing the necessary peripheral services, were all worthy of study.

4.2.8.4 Terminology tools. When translating technical materials from one language to another, the correct use of terminology is very important. It is also a problem that may perplex translators. Yuen (1979) introduced some tools used to solve this problem when translating technical materials from Chinese to English. These tools

included show-and-tell techniques, dictionaries and glossaries, reference texts and professional journals, self-study notes, and consultation with subject-matter specialists. Based on her two decades of translation experience, which mostly dealt with medicine and biological sciences, she explained how to use these tools in detail while pointing out their shortcomings and advantages.

One point is noteworthy in Yuen's (1979) article. She thought that the technical translator should not only be proficient in the languages involved, but he/she should also be familiar with the subject matter. This opinion echoes many scholars' thoughts, such as Van Acker (1964) and Dietrichson (1966).

4.2.8.5 Technical translator. Schuck-Kolben (1979) also echoed the idea of Van Acker (1964) and Dietrichson (1966), that is, a technical translator was a technical writer. A technical translator and a technical writer had the same objective and some problems in common. They both used words to express ideas and struggled with the semantics and mechanics of language. The basic requirement of a technical translator was that he must not only have a basic understanding of the subject matter, but he should also be familiar with the languages involved. The funds of translations were often limited in a company due to the ignorance of the importance of translation. Schuck-Kolben (1979) thought that funding translation was just as important as funding the writing of the original.

4.2.8.6 Translation trends. Klein (1979) presented an in-depth analysis of the trends in translation. Firstly, he pointed out that, with the development of technology and information explosion, conventional translation methods could not meet the realistic needs of information transmission among different countries. In the U.S, modern translation had come through various stages, from the freelancer to machine translation.

The trend toward electronic devices was inevitable. Klein (1979) thought that standardization of international terminology and creating one artificial language were both impossible dreams. As to style in technical translation, Klein (1979) put emphasis on clarity and accuracy. But style should be highly stressed when producing promotional materials in a foreign language. Klein (1979) was not a big fan of machine translation. He thought that the computer could not compete with human beings because it had no intelligence and complicated thinking. But he encouraged human translation assisted by machine. According to him, "Only the human expert is able to solve through teamwork the formidable problems of terminology, standardization, and style, to close the cultural gap, assisted by word processing and international data banks" (Klein, 1979, p. W-76).

4.3 CONCLUSION

In this decade, published scholarship in international technical communication covered various topics but it had two focuses: education and translation.

Relatively speaking, the status of technical communication in other countries did not attract much attention. Only Mitchell (1971a) studied technical writing and applied communications in Australia and Richardson (1972) examined technical publishing in France. By contrast, education–related topics generated considerable discussion. This discussion was about several countries, such as Britain, Canada, Australia, Japan, and the U.S. The focus was teaching technical writing. The discussion of education suggested that, with the development of technical communication as well as international technical communication, scholars and practitioners, both from the U.S. and other countries, became increasingly more interested in specific aspects of technical communication rather than the general status of technical communication in different countries.

Additionally, with the rise of education in technical communication, topics such as pedagogy and teacher training attracted more attention.

Among the discussions of education, two articles were interesting and also important. One was written by Baxter (1971), introducing a distinctive technical report writing course at the Swinburne College of Technology in Victoria, Australia. The most outstanding feature of the course was that it was conducted by two lecturers: one was from the appropriate technical faculty and the other from the General Studies faculty. The other article was Mitchell's (1978) article, which discussed the training of technical writing teachers in Western Europe, the United Kingdom, Canada, Australia, Israel, Japan, South Africa, and Sweden. Mitchell (1978) concluded that the training of technical writing teachers abroad was extremely insufficient. The distinctive technical report writing course provided a method for the design of technical writing course. The training of technical writing teachers has received less attention in the scholarship than other aspects of teaching technical writing or technical communication, such as teaching methods. The importance of training for technical writing teachers is obvious. Mitchell's (1978) putting forward this topic definitely had a direct relationship with the rise of education in technical communication at that time. Nowadays, education in technical communication is becoming more mature. However, similar issues, such as the qualifications of technical communication teachers, should not be ignored.

Management issues, localization, international specifications/standards, technical editor, and instructions for international technical communication also attracted scholars' and practitioners' attention. These points came from the practices of international technical communication and provided good solutions to practical problems. Although

they were posed more than thirty years ago, most of them are very enlightening and helpful for today's international technical communication. For example, the principles of producing foreign technical publications introduced by Halling (1971), including idiomatic translations, counsel on national customs, and emphasis on graphics, are still useful in today's context. Woods' (1973) strategies to break language barrier for producing technical publications in foreign languages, as well as Hildebrandt's (1973) analysis of language barriers and cultural variances, is also valuable for today's international technical communication.

On the topic of translation, compared to that in the 1960s, there were more discussions. The intense discussion of translation had a lot to do with the technological and economic development and the political situation at that time. The further development of computer technology offered technological support for computer-aided translation and machine translation. The increasing internationalization of commerce and the change of political policies in some countries, such as the vietnamization policy of the Nixon government and the reform and opening policy of the Chinese government, resulted in a great need for technical translation. The huge practical need for technical translation, as well as the heated scholarly discussions, naturally aroused scholars' and practitioners' interest in the future of technical translation. Klein (1979) was a pioneer in this issue. His points were very meaningful then and now, such as his opinions about standardization of international terminology, style in technical translation, and machine translation.

5. SCHOLARSHIP IN INTERNATIONAL TECHNICAL COMMUNICATION IN THE 1980S

5.1 INTRODUCTION

Compared to in the previous decade, published scholarship in international technical communication in the 1980s did not change much in quantity, but it had different focuses and grew more mature in some aspects. Thirty-six articles were collected, and these articles covered ten topics. Obviously, translation was the biggest hotspot in this decade. Almost one half of the articles were about translation. The topic of translation covered the following subtopics: translation: general, translation: language, translation strategies, terminology tools, technical translator (in-house translator, freelance translator), and translation trends.

5.2 LITERATURE REVIEW

In addition to the topics of status of technical communication in other countries, education, translation, technical editing, instructions for international technical communication, and localization, the articles in this decade involved emerging topics such as writing issues, issues related to doing business, professional organizations, and distribution and usage of technical information.

5.2.1 Status Of Technical Communication In Other Countries[7]**.** Hass and Funk (1989) gave their observations about communication in Japanese technical settings. These observations came from two different job sites in two Japanese cities. They described the communication situations they observed as “shared information” because

[7] Griggs’ (1983) and Sides’ (1987) articles were not summarized but were included in the analysis in the thesis.

"information seemed not so much exchanged between individuals as shared among them" and "technical and procedural information was created by, sustained by, and belonged to the group as a whole, whether it was a small work team of three or four people or an entire division" (Hass & Funk, 1989, p. 364). The three characteristics of "shared information" were immediate, consensual, and spoken. The immediacy of communication was facilitated by the arrangement of the office and the easy accessibility of employees. Decision-making, creation of consensual information, and responsibility for maintaining, updating, and conveying this information were all group activities. A lot of information was conveyed via speech, such as technical matters, office procedure, and notices of social events. Of course, there was written communication in Japanese offices, such as documents prepared for audiences outside the department and analysis papers. Most of the people being observed wrote by hand, and there were no typewriters in the department.

In fact, the three qualities were also applicable to communication within the whole Japanese society. Such a cross-cultural observation was very helpful both to understand communication in other cultures and evaluate one's own communication practices.

5.2.2 Education[8]**.** Teachers of technical communication in the United States had some faulty assumptions about audience. Stevenson (1983) critiqued these assumptions to improve their recognition of their own audience of students and the audience of readers that those students would have in future. The first wrong assumption was that the

[8] Braun & Rosenhouse's (1987) and Baxter's (1980) articles were not summarized but were included in the analysis in the thesis.

nonnative students wrote technical English only when they were in the U.S. and would revert to their own languages when they returned to their own countries. The second one was that the nonnative students in technical communication courses did not need to write for diverse audiences and did not need to develop a repertoire of writing strategies. The third one was that teachers did not need to stress cultural differences of audiences for technical documents to both native and nonnative speakers of English in technical communication classes. By his abundant working experiences in Japan, Stevenson (1983) demonstrated that all three of these assumptions were wrong. He concluded that "in looking at both our students and at their audiences we must adopt an international perspective; in our research, in our texts, and in our classroom method we must learn to look at technical communication across cultures" (Stevenson, 1983, p. 330).

Willmot (1985) introduced his experience in teaching practical communicative English in China to provide a helpful example for those who were interested in teaching technical communication in China. He used the systems approach in his teaching. This approach used "the systems analysis techniques of engineering and industry in an interdisciplinary appreciation of selected literature, with tied-in exposure to various current media" (Willmot, 1985, p. 31). It was proved that the systems approach could "satisfy cultural and humanistic as well as vocational aspirations in a holistic way" (Willmot, 1985, p. 31). The first step of the systems approach was to analyze the objects—the Chinese postgrads and their professors of English. Willmot (1985) found that practical speaking and listening skills were not taught in their earlier schooling and writing skills were almost entirely neglected. The educational methods of learning English communications were very ineffective, such as hearing lectures on English

grammar and doing intensive reading of English literature. With the adoption of English as a second language by the Chinese government, there were more opportunities to access and learn English. Another important factor was that the Chinese Cultural Revolution deterred the development of scholarship and teaching in such subjects as English.

The texts Willmot (1985) used in his teaching were two free pocketbooks named *The Communication of Ideas* and *Overload*, respectively. The use of these two books turned out to be very successful. The Chinese students thought that the first pocketbook was "easy and even entertaining to read because it introduced them to many concepts about communication in a readable style useful to them in their day-to-day work and social dealings" and they learned "much about North American life and philosophy" (Willmot, 1985, p. 34). The second one, a book about the energy crisis, was an interesting and extremely readable book.

The lecturing style by Willmot (1985) was different from the Chinese traditional one. He asked the Chinese students to sit in a circle and discuss the readings. He assigned different exercises to students at different levels of English. He also offered optional evening sessions called "free talk" (Willmot, 1985, p. 35), in which they discussed any subject they were interested in.

The systems approach turned out to be very effective in teaching the Chinese students. Just as the Director of the Foreign Language Department wrote: "The systems approach aroused the students' interest in learning English, made them feel confident of learning English well, and get good results in their studies" (as cited in Willmot, 1985, p. 36).

5.2.3 Writing Issues. Downs (1980) provided thirteen guidelines to help writers write clear manuscripts for translation. Writers should be "re-educated to consider translation as part of the total job, not an afterthought, and to write for translation" (Downs, 1980, p. W-47). The thirteen guidelines included writing in clear English, keeping the terms consistent, using a multilingual format, converting weights and measurements to the measurements used in the target country, and communicating with translators. Downs (1980) believed that translation of manuscripts would not be such a big problem and the publication department could save time and money if these guidelines were followed.

Shinoda (1980) analyzed some fundamental problems in writing English for Science and Technology (EST) in order to make Japanese writers aware of these problems. The fundamental problems included improper use of articles, tenses, auxiliary verbs, subjunctive mood, and prepositions, and use of improper adjectives and unsuitable subject nouns and predicate verbs. Shinoda (1980) summed up these problems from his teaching of EST in Japan for over fifteen years. Most Japanese scientists, engineers, and students were faced with these problems in writing EST. Because of these problems, a scientific, technical English article written by Japanese writers usually lacked clarity and deviated from the original Japanese text. Therefore, it was very important to teach Japanese writers some aspects of English grammar that they often encountered in technical writing. Shinoda (1980) also pointed out that rhetorical competence was "an important but undeveloped subject for the Japanese EST practitioners to study" (Shinoda, 1980, pp. 107). They could not produce effective and clear EST discourses unless this area was studied.

Dennett (1988) discussed rhetorical structure in Japanese-English technical writing in order to help Japanese writers to improve their skills of technical writing. Japanese technologists, who wrote technical English, usually judged good writing by the criteria of clarity, beauty, surprise, and flow. They desired to "surprise, delight, or otherwise engage the emotions of the reader" (Dennett, 1988, p. 116). The typical model of skillful Japanese writing was kishotenketsu, which was described by a Japanese linguistics professor in this way: "First, you have the subject, *ki*, then you raise it, *sho*, next roll it, *ten*, and then, you end it beautifully, *ketsu*" (as cited in Dennett, 1988, p. 116). Dennett's (1988) study, based on a graduate-level seminar in technical writing at the University of Colorado, uncovered "the differing rhetorical expectations of kishotenketsu" (Dennett, 1988, p. 116). The study found that kishotenketsu had pervasive influence on the five Japanese participants, but most of them learned to avoid it in technical writing. For example, one student employed a structure of introduction-analysis-conclusion. Dennett (1988) suggested that ESL students and professionals should be taught English rhetorical structures, study the differences between English rhetoric and that of their native language, and understand the cultural expectations behind a rhetorical model.

5.2.4 Issues Related To Doing Business[9]**.** For the purpose of improving the relationships between clients and writers in Japan, Matsui (1989) analyzed some problems related to document design and suggested some solutions to improve writer-client relationships. The problems included time constraints, financial constraints, and different opinions toward document design held by clients and writers. Both time and

[9] Daniels, Shane, & Wall's (1983) article was not summarized but was included in the analysis in the thesis.

financial constraints would reduce the quality of documents. The different opinions between clients and writers could have an adverse impact on the process of producing documents. Matsui (1989) analyzed the historical roots for these problems, including the client's lack of knowledge of technical writing and document design, the client's difficulty in planning documents, and the client's difficulty in allocating financial resources for quality documentation. To solve these problems, both writers and clients needed knowledge of technical writing and document design. Writers should get familiar with each step of document design, including planning for producing documents, audience analysis, writing issues, visual elements, testing and evaluating documents, and communicating with experts and clients. Clients needed education in product planning which could "give them explicit ideas about how to manage the cycle of document production and evaluation" (Matsui, 1989, p. 342). Clients also needed to understand the importance and meaning of high-quality documentation and writers' involvement in the whole process of the product development. Matsui (1989) believed that a good writer-client relationship was beneficial to both the client's and the writer's company. Furthermore, it was helpful to produce a more satisfying document for the users.

5.2.5 Technical Editing. Ward (1988) presented the problems of editing in a bilingual, bicultural context for the purpose of arousing editors' attention to these problems. The bilingual, bicultural context discussed in his article mainly referred to English and Spanish, and American culture and Hispanic culture. Editing in a bilingual, bicultural context involved many problems that would also be encountered when editing in a monolingual environment, such as ego involvement, lack of linguistic discipline, and false assumptions about the audiences. These problems were often aggravated in editing

in a bilingual, bicultural environment. Furthermore, editing in a bilingual, bicultural context had some unique editorial problems, such as different types of interference, loans, and usage. Ward (1988) mainly discussed linguistic and intercultural interferences. For example, there were differences in syntax, usage, and sequence of tenses between English and Spanish. In Hispanic cultures, "criticism of what an individual produces—no matter how constructive the criticism—can be construed as belittling the person" (Ward, 1988, p. 225). Consequently, an editor was often considered unnecessary and undesirable. By these discussions, Ward (1988) asked editors in a bilingual, bicultural context to "be sensitive not only to a series of linguistic problems but also to what the authors expect of an editor" (p. 221).

5.2.6 Professional Organizations. By the metaphor of aboriginal songlines, Brockmann (1989) discussed the revival of a technical communication society in Australia. According to Maxwell Pleffer, the former president of the Technical Communication Association of Australia (TCAA), there was once a professional organization for technical communicators in Australia, but it had been disbanded. In 1987, when he arrived in Australia, Brockmann (1989) found the revival of the professional organization. It had a new name—the Australian Society for Technical Communication (ASTC).

Brockmann (1989) drew some similarities between the professional organizations of technical communicators in Australia and in the United States—that is, between the TCAA/ASTC and the STC—including the name change, writers' technological focus, geographical distribution, and sex ratio of the membership.

Some problems in the development of a national organization in Australia were pointed out, such as the lack of technical communication academia programs and professional journals and the cultural derivativeness of innovations in technical communication. Brockmann (1989) concluded that "the Australians have certainly rediscovered a fruitful songline, but it remains a fragmented songline" (p. 46). He deduced that until they developed a professional infrastructure as the U.S., the Australians would "have a tough time always finding their songline" (Brockmann, 1989, p. 45).

5.2.7 Instructions For International Technical Communication. Houghton-Alico (1988) explained working concepts for cross-cultural technical communication in order to provide a starting point for creating an effective methodology for this kind of communication. Working concepts for cross-cultural technical communication were developed by Technical Information Associates, Inc., whose president was the author. Prior to the development of a methodology for cross-cultural technical communication, working concepts were "created and applied so that the methodology [would be] developed from a practical, real-world foundation, rather than abstract theory" (Houghton-Alico, 1988, p. 99).

The main body of Houghton-Alico's (1988) article included four parts: communication types, definitions, foundation, and implications. She categorized communication into two types: verbal and written communication. The former included language and behavior, and the latter included language and the presentation of information. She defined some terms used in her paper, including culture, cross-cultural, intercultural, trans-cultural, verbal communication, and written communication. In the

"Foundation" part of her article, she discussed verbal and written communication, respectively. In verbal communication, three areas should be considered in the use of language and five areas should be considered in behavior. The three areas were the form of the language communication, the meaning of the words being used, and feedback in the communication. The five areas were kinesics, personal space, body contact, silence, and logistics. In written communication, two areas of consideration for language were the form of the communication and the meaning of the words being used. Six areas of consideration for presentation were page format, notational conventions, typefaces, integration of artwork and text, type of artwork, and writing style. In the "Implications" part of her article, she provided six basic steps in developing a strategy for successful communication. The six steps were defining the relevant cultures, identifying the communication formats and types, collecting relevant behavioral information for verbal communication, collecting relevant presentation information for written communication, designing an action plan, and screening the participants on attitudinal criteria.

5.2.8 Distribution And Usage Of Technical Information. Blum and Azencot (1989) examined small Moshav farmers' habits of reading agricultural extension publications in order to "explore how far family farmers in Israel fulfill the three conditions for effective, written communication of innovation through the extension system" (p. 389). The "three conditions" referred to having reading ability and reading habits; receiving written, agricultural information; and using the information. Their analysis was based on interviews with 171 representative farmers. The extension publications in the study included pamphlets, brochures, and periodicals. Their study found that the farmers had good reading habits and few reading problems and could make

full use of the publications. The main problems lay in the weak distribution system and authors' lack of consideration of the farmers' needs.

5.2.9 Localization. Klein (1989b) studied localization of documentation to provide technical translators some guidelines when dealing with translation toward the European Community market. The EC market was a big and attractive market; however, there were great barriers when producing documentation for this market, such as different customs, culture, language, and some country-specific differences. Localization was required to overcome these barriers. Klein (1989b) divided localization of documentation into three phases: mandatory, electronic, and market-driven multilingual localization. Mandatory localization included "all the technicalities required to adapt product documentation to a specific country" (Klein, 1989b, p. 159), including conversions, warranties, and standards. Electronic localization aimed to "standardize the basic document structure, starting with the English version, and to reduce the actual translation effort to the minimum" (Klein, 1989b, p. 160). One result of electronic localization was that the English master document was formatted, except page numbering. This was due to the different text expansion of different languages. Market-driven multilingual localization emphasized the cultural differences in different countries. Translation must conform to local cultural habits. Klein (1989b) welcomed good graphics, but he thought graphics could complement, not replace word translation.

Klein (1989c) covered several topics in the third "International Technical Communication" column in 1989, including the newsletters of the Silicon Valley Chapter and Hewlett-Packard, technical communication in maquiladoras in Mexico, some contributors to the column, members of STC, and international students. Localization was

the major topic of both the October 1988 issue of the Silicon Valley newsletter and the December 1988 issue of the Hewlett-Packard newletter. Klein (1989c) explained that he imported the topic of maquiladoras in the column mainly because of two reasons. Firstly, technical communication was needed in maquiladoras. Secondly, he was interested in the use of different media which aimed to facilitate understanding between different cultures. He mentioned some contributors, such as Sandra Burleson, the president of International Business Communications in Columbia, South Carolina. He also pointed out that most of STC foreign members were from Canada, Japan, and Israel. STC had few members from other countries. Besides learning a foreign language, he suggested that international students should work abroad.

5.2.10 Translation[10]**.** The topic of translation included the following subtopics: computer-aided translation, machine translation, translation strategies, terminology tools, technical translator, and translation trends.

5.2.10.1 Translation: general. Larrue (1982) introduced technical translation in the federal Translation Bureau in Canada. His article included two parts: the object—the technical text—and the subject—the technical translator. A technical text was one that "deals with the design, manufacture, construction, use, maintenance, and repair of an object created by man, ranging from simple, everyday objects to complex systems" (Larrue, 1982, p. 15). It included a wide variety of forms, such as instructions for assembly, technical magazines, standards, manuals, and specifications. Larrue (1982) summarized five characteristics of a technical text. A technical translator had something

[10] Teague & Teague's (1982) article was not summarized but was included in the analysis in the thesis.

in common with all translators, that is, they both translated from one language to another. However, a technical translator had specialized qualifications, training, work areas, and working conditions. Larrue (1982) also mentioned that the professional status of technical translators had been improved.

King (1982) had a detailed description of the Linguistic Service Division at Teleglobe Canada to show that "translation at Teleglobe is an effective means of communicating ideas and technical concepts in a bilingual corporate environment" (p. 15). The Linguistic Service Division had three sections: English Translation, French Translation, and Terminology. The documents for translation included publications describing Teleglobe and its activities, technical documents, financial documents, job descriptions, memos, etc. Both the English Translation Section and the French Translation Section might encounter special problems. For example, because many French-speaking Quebeckers were not familiar with French technical terminology, they invented terms when they wrote in French. Thus, translators in the English Translation Section had difficulty in understanding these terms. Translators in the French Translation Section had difficulty in translating the jargon in highly condensed English texts. The Terminology Section served as a good assistant for the translators by providing terminology help. Besides the translation service, the Linguistic Service Division also offered other services, such as a call-in service, publishing a terminology bulletin, and an editorial assistance program. Despite the emphasis on bilingualism, other languages were also handled, such as Spanish.

To serve as concluding remarks for the special issue on technical translation today, Klein (1982b) offered "a different view of the large translation agency" and gave "a brief

survey of computer-aided translation before taking a quick look at the future of translation" (p. 27). He held a positive attitude toward translation agencies. According to him, agency teamwork could solve problems that a single freelancer could not solve. An agency could offer translators both challenges and opportunities and provide customers a high-quality service. Klein (1982b) thought that computer was playing an important role in translation; however, human translators would not be replaced by machines although their functions would change in the computerized translation process. He thought the major stages in CAT systems were to pre-edit, to glossarize, and to post-edit the product. Thus, a mulitilingual terminology bank became a key component. He pointed out that existing CAT systems provided only a word-for-word translation. It was arbitrary to say that CAT was cost-effective. There were two crucial factors which could affect the cost of CAT. One was "the ratio of repeating terms within the text," and the other was "the number of already translated terms stored in the CAT system glossary that might match some of the terms in the source text" (pp. 29-30). The approach of controlled English was effective for some fields, such as aviation, but might be unsuitable in other situations, such as high technology and complex new topics. CAT still needed post-editing, and extensive post-editing might be both time-consuming and expensive. As for the quality of CAT, Klein (1982b) said that CAT could offer a product with "bone-dry 'information transfer' quality" in a "fast, cost-efficient manner that is unmatched elsewhere" (p. 30). Klein (1982b) also talked about technical translation tomorrow:

> I see a definite need for independent experts, linguistic consultants who would be called upon in cases of disputes and doubts arising when the customer questions the quality or competence of the translator or agency.
> I see an unfilled need for more top-level technical translators.
> CAT is here to say, to change, to grow, but I predict that word processing will play an increasing role in translation.

> I see a pressing need for professionals to get together today…. I see a need for a CAT user group, including users of all CAT systems available today, to exchange information, experiences, and suggestions for the systems of tomorrow. (pp. 30-31)

One noteworthy point that he mentioned was the low professional status of technical translators. It was lower than the status of technical writers.

Hammond (1989) discussed the increasing needs for high-quality translations in the U.S. A. for the purpose of better solving this issue. One reason for the great needs was the rapid technological development around the world. Lots of important papers were written in different languages which needed to be translated. However, the traditional problem of lacking multilingual scientists and researchers was still existent. A second reason was "science and access to technology have become internationalized" (Hammond, 1989, p. 408). The computer revolution had intensified internationalization. For example, multilingual databases could be accessed online. Hammond (1989) showed two ways which met the needs for translation. One was the growth of the profession. High-quality technical translations were no longer translations by foreign language students. High-quality technical translations required both subject matter specialty and sophisticated translation skills. Hammond (1989) introduced some efforts by the American Translators Association (ATA) with the aim of training and improving technical translators, such as the accreditation exams and the annual conferences. The other way was the reopening of the National Translations Center. The NTC was "a national depository and referral center for helping the American scientific and industrial community locate unpublished English translations of foreign language literature in the natural, physical, medical, and social sciences" (Hammond, 1989, p. 409). The NTC served as "a translation clearinghouse," which was very helpful for high-quality

translation (Hammond, 1989, p. 409).

5.2.10.2 Translation: language. Rofe (1982) examined middle and far eastern languages to provide a useful resource for translators or interpreters who dealt with one or more of these languages. He was mainly concerned with Arabic, Chinese, Japanese, and Indonesian, which were important in the world market. Based on his 40 years' experience, he talked about several important aspects of these languages, including the nature of the languages, their study, available reference materials, and other noteworthy points. In conclusion, he pointed out "the subtleties and deliberative vagueness of much oriental expression" and emphasized that "proper translation of Eastern languages requires much familiarity with the cultures in which these languages developed" (Rofe, 1982, p. 20).

Strong (1983) introduced the Kodak International Service Language (KISL) to demonstrate an effective tactic in large-scale translation. KISL is "a limited-use language, based on English, designed strictly to communicate service information" (Strong, 1983, p. 20). The language had a vocabulary of fewer than 1,000 words and each word had only one meaning. The vocabulary contained two parts—"a core vocabulary of about 350 words that are common to all types of Kodak equipment, and seven special lists that relate to individual machines or groups of machines" (Strong, 1983, p. 20). Other features of KISL included simple English syntax and grammar rules, short sentences, and limited punctuation. In addition, the illustrations in KISL publications were supported by the text, which was different from traditional technical publications. This was due to the ideas held by the Customer Equipment Service Division at Eastman Kodak Company. They

believed that “visual communication is universally understood and is superior to verbal communication whenever there is a choice” (Strong, 1983, p. 21).

Adding words to KISL was strictly controlled. A vocabulary request form had to be submitted by those who requested to add a word. This form listed the word, its part of speech, its definition, and an example of its use. An international committee reviewed the request and decided whether to add the word. Non-English-speaking service people were trained to use KISL. Usually, it took only two to three months to get them familiar with KISL. The benefits of KISL were great, such as greater accuracy and brevity, faster access, better quality, and improved availability.

5.2.10.3 Translation strategies. To help his peer translators do a better job, Holden (1980) provided some tips for translating manuals for a target country. Firstly, he introduced the translation process which was universal both in large and small projects: coordination, selection, and implementation. Coordination was achieved by two different groups of people—a translation coordinator in the product planning organization and someone responsible for package, distribution, and records of documents in the publications group. Selection referred to the process of determining which manuals to be translated, and implementation was the schedule of translation in the target countries. Then he gave some dos and don’ts for writers and editors to reduce the translator’s burden, such as writing a glossary, using a limited vocabulary, being aware of idioms, not using examples unique to Americans, and not including people in photos. In the part of follow-on activities, Holden (1980) talked about technical and cosmetic changes. He thought that technical changes could not be avoided, but cosmetic changes could be avoided.

Eliezer (1981) pointed out some pitfalls in technical translation to help the novice avoid committing such mistakes. He compared the homonym to a mine and the synonym to a torpedo, two pitfalls that a translator might easily encountered. A good technical translator should not only grasp the grammar and vocabularies of a foreign language, but he/she should also understand the meaning and usage of the language under its specific context. Eliezer (1981) listed some examples of amusing but incorrect translations. He warned not to ignore these comic translation, because they might cause serious problems.

Rozov (1982) described a translation technique using both a dictating system and a word processor for the purpose of sharing an efficient technique with his peers. The process of this technique contained three steps: (1) dictate rough translation; (2) type on WP; and (3) proof, correct, edit, and correct. Compared to the traditional translation process, which had many more stages, the new translation technique was both time-saving and cost-effective.

In order to help writers prepare instruction manuals for non-English readers, Sanderlin (1988) talked about how to make it easier to produce such manuals. Firstly, writers should overcome barriers caused by different languages, cultures, and learning styles. For example, American technical writers were used to first-person singular pronouns while Chinese or Japanese writers were used to first-person plural pronouns. Japanese people had a more tentative learning style than American people. Secondly, writers could choose from three options for preparing such manuals. The three options included human translation, machine translation, and controlled English. All of the three options had both advantages and disadvantages. For example, human translators could produce “the most natural-sounding manuals because they can most easily understand the

differences in language, culture, and learning style" (Sanderlin, 1988, p. 97). Machine translation was very costly and needed checking by human translators. Sanderlin (1988) talked a lot about controlled English, such as restricted vocabulary, limited sentence structures, dictionaries of controlled English, and advantages and disadvantages of controlled English. Finally, she provided some simple guidelines related to content, prose, and visuals for writers when they first prepare manuals for non-English users. In fact, these guidelines were not only useful for producing manuals for non-English users, but they were also helpful for producing manuals for users whose native language was English.

5.2.10.4 Terminology tools. Brinkmann (1982) introduced the TEAM multilingual terminology bank to provide a useful resource of specialist vocabularies for technical translators. TEAM, developed by the Language Services Department of Siemens AG, collected specialist vocabularies which could be "swiftly processed in a large variety of ways and made accessible to all users" (Brinkmann, 1982, p. 6) in the terminology bank. It contained eight languages: German, English, French, Spanish, Russian, Italian, Portuguese, and Dutch. Arabic would be added in the near future. Most entries were bilingual. Brinkmann (1982) also discussed other aspects related to TEAM, such as three requirements for the development of TEAM, how to enter data in TEAM, how to utilize TEAM, the equipments for hard-copy output, and the relationship between terminology banks and machine translation. When discussing the relationship between terminology banks and machine translation, Brinkmann (1982) admitted that machine translation required "prohibitive expenditures for post-editing to produce good quality texts," but he believed that "improved machine translation systems are bound to come" (p.

7). Terminology banks would be logical suppliers of special vocabularies for machine translation systems.

5.2.10.5 Technical translator. Gingold (1982) examined the status of in-house translators in U.S industry. Firstly he pointed out that "in terms of its appreciation of foreign-language study in general and translation services in particular, the United States has always been considered to be among the world's most underdeveloped countries" (Gingold, 1982, p. 8). There were two reasons for this situation. One was that U.S industry had a huge domestic market with primarily English-speaking consumers and it seemed unnecessary to export products to other language areas. The other was that English was the predominant language in many areas of science and technology. However, Europe was completely different. The study of foreign languages was emphasized and well-developed in Europe. Additionally, European industry had realized the importance of producing promotional documents in foreign languages for overseas markets.

The material that should be translated included advertising and sales literature, product information, instruction and operating manuals, training courses, seminars, and books. When handling its translation requirements, a company would consider the following factors: the volume and nature of material to be translated, source language or languages, and subject matter. If the translation volume increased to a certain point, it would be cheaper to hire a full-time translator. The advantages to industry of an in-house translator included cost, quality, and speed. An in-house translator should be at least competitive with outside translation services in terms of cost and speed. As to quality, it was "risky to make categorical statements" (Gingold, 1982, p. 9); however, an in-house

translator would become more and more familiar with the company's products or services and had the advantage of consulting its technical experts. Besides the obvious advantages in a salaried position, the main advantage to an in-house translator was the improvement of the professional status. At that time, many employers did not "consider translators as full professionals" and "treat them on a level with scientists and engineers" (Gingold, 1982, p. 9). The position of in-house translator in a company helped to defeat this biased attitude. The disadvantages included the limited opportunities for advancement and a fixed salary. Gingold (1982) also provided some suggestions for translators, such as the positive attitude toward translation and proactive behaviors to affect how they were viewed by their colleagues and superiors.

Herrmann (1982) tried to make a case for the importance of the freelance translator. Many American companies failed in having their material translated overseas. The main reasons were that many European translators had trouble in dealing with American engineering slang and they lacked understanding of American mentality and language usage. When choosing a domestic translation agency, many companies would commit a common mistake—they would select an agency that was able to deal with all kinds of languages they required. In fact, such a translation agency was not realistic. Many translation agencies hired freelance translators, but they usually set translator and client apart, not allowing a translator to communicate with a client directly. However, the respectable agencies would "always acknowledge the fact that they (are forced to) use freelancers to a large degree" and were "not afraid of freelancers stealing their customers away" (Herrmann, 1982, p. 12). The insistence on the anonymity of its translators might indicate that the agency was in lack of qualified personnel. Herrmann (1982) also

provided some suggestions about how a company could make sure of the translation quality of their material. He also pointed out that the freelancer was the backbone of the translation industry.

Schuck-Kolben (1982) provided some guidelines for locating and evaluating a technical translator. Firstly he mentioned the basic requirements for a good technical translator—a thorough knowledge of the original and the target languages and familiarity with the subject matter. The resources for locating a technical translator included the Yellow Pages of city telephone directories and professional organizations, such as the American Translators Association (ATA). The evaluation of a technical translator or a translation agency could be based on references and sample translations.

Teague (1982) talked about American technical translators and the ATA to help people have a better understanding of technical translators and its professional organization. He held the same opinion as many other scholars and practitioners did: a technical translator should not only be proficient in more than one languages, but he/she should also be familiar with the subject matter. Although the ATA contained members from all fields including literary, sci-tech, and commercial, the dominant one was scientific-technical translation. The workshop sessions at ATA meetings concerned most members' needs and had a tight connection to their practical work. To qualify its members, the ATA had a program named "ATA Certification," or ATACERT, which tested members "not only in their languages but also in the fields where they claim expertise" (Teague, 1982, p. 26). This program helped to rectify the public's misunderstanding toward technical translators—a technical translator was able to translate anything from the original language to the target language. Furthermore, it had

“a secondary public-relations goal: putting over the idea that translators are more than mechanics—they practice as difficult a craft as any other technical communicators and merit the same respect” (Teague, 1982, p. 26).

5.2.10.6 Translation trends. Klein (1989a) predicted the future of technical translation in a rhetorical effort to promote the development of technical translation. Firstly he pointed out the dangerous situation of the recent development of scholarship in international technical communication. For example, translation and related subjects, such as international documentation, were no longer conference topics. Concentrated discussion about international technical communication, such as a special issue on a certain topic, had been nonexistent in STC’s publications. The development of other countries in the world, such as China, the Soviet Union, and European countries, would affect the profession of technical communication and technical communicators. Internationalization and globalization was a trend in the future. Klein (1989a) posed some suggestions for the future, including software, style, grammar, beliefs and values, and professional quality standards.

5.3 CONCLUSION

Similar to the change in the 1970s, in this decade, scholars and practitioners continued to be interested in specific topics rather than the general status of international technical communication in different countries. This is a trend in the scholarship with the development of international technical communication. Thus, the topic of the status of technical communication in other countries contained only three article, which talked about Japan, Nigeria, and Israel. Articles about education were not as numerous as in the 1970s and had different focuses. In addition to the focus on methods of teaching technical

communication, articles about education emphasized audience analysis in the teaching of technical communication. Here, audience analysis referred to teachers' analysis of their own audience of students and the audience of readers that those students would have in future. This is an important point because teachers' audience analysis will directly affect their teaching method and results.

Klein (1989b) studied the localization of documentation toward the European Community market. His article was also about translation, but it paid more attention to the localization of documentation. Klein (1989c) seemed to cover several topics including localization. It is hard to ascribe it to a certain category. I temporarily put it in the localization category because this topic was the first topic it involved.

Technical editing and instructions for international technical communication were discussed, too. Ward's (1988) analysis of the problems of editing in a bilingual, bicultural context was a good instruction for technical editors, especially when technical communication in bilingual, bicultural environments was becoming more frequent in the late 1980s (Ward, 1988). Compared to the discussion in the 1970s, Houghton-Alico's (1988) article looks more comprehensive and systematic. This could not be separated from the development of international technical communication at that time.

There were four topics that were specially discussed in the 1980s. They were writing issues, issue related to doing business, distribution and usage of technical information, and professional organizations. Among the articles under the four topics, most came from other countries except two from the U.S. Two articles under writing issues and one under issues related to doing business were about Japan. Two articles under the other two topics came from Israel and Australia, respectively. The emerging

topics resulted from the practices of technical communication in these countries. Japan was one of the developed countries which had a huge need for technical communication. However, Japanese writers, who wrote technical English, were not capable enough to produce technical writing with high quality. One important reason was the differences between Japanese and English. Additionally, in Japan, many people did not have a good understanding of technical communication. The communication between clients and technical writers was difficult. Thus, how to improve technical writers' writing skills and how to harmonize the relationships between clients and technical writers became important and urgent issues. Similarly, the topic of distribution and usage of technical information in Israel was a result of "the personnel cutback in agricultural extension service" and "famers need to receive more agro-technical information than ever" (Blum & Azencot, 1989, p. 381). The topic of professional organizations had a direct relationship with the revival of the Australian Society for Technical Communication. It also showed that, with the development of technical communication and international technical communication, people paid attention to the construction and development of professional organizations. We can find other articles about organization, such as O'Hara's (1989) "Trends in STC" and Klein's (1989c) "International Technical Communication."

Translation was still a hot topic. About one half of the articles among those I collected for this decade were about translation. These articles covered the following subtopics: translation: general, translation: language, translation strategies, terminology tools, technical translator (in-house translator, freelance translator), and translation trends. The heated discussions about translation must have resulted from the increased

translation activity in industry. At the same time, it had a direct relationship with a platform—the special issue on technical translation in *Technical Communication*—and a person—Fred Klein. Including an introduction, eleven articles were published in this special issue. Fred Klein was the editor of this special issue and contributed two articles. He also published three articles in the column "International Technical Communication," which mainly dealt with translation.

In this decade, two articles were related to China. One was Rofe's (1982) article, mentioning that Chinese was one of the most important languages in the world commercial market. The other was written by Willmot (1985), introducing his experiences of teaching technical communication in China. The concern about China was a result of economic development and policy changes in that country. Since the implementation of the reform and opening policy, China has made great progress in various aspects and become an important player on the world stage. Thus, international technical communication in China, along with its scholarship, would continue to become increasingly common and important.

6. CONCLUSION

6.1 AN OVERVIEW OF SCHOLARSHIP IN INTERNATIONAL TECHNICAL COMMUNICATION FROM 1950 TO 1989

The orbit of the development of scholarship in international technical communication in the four decades is obvious. It can be drawn approximately as following:

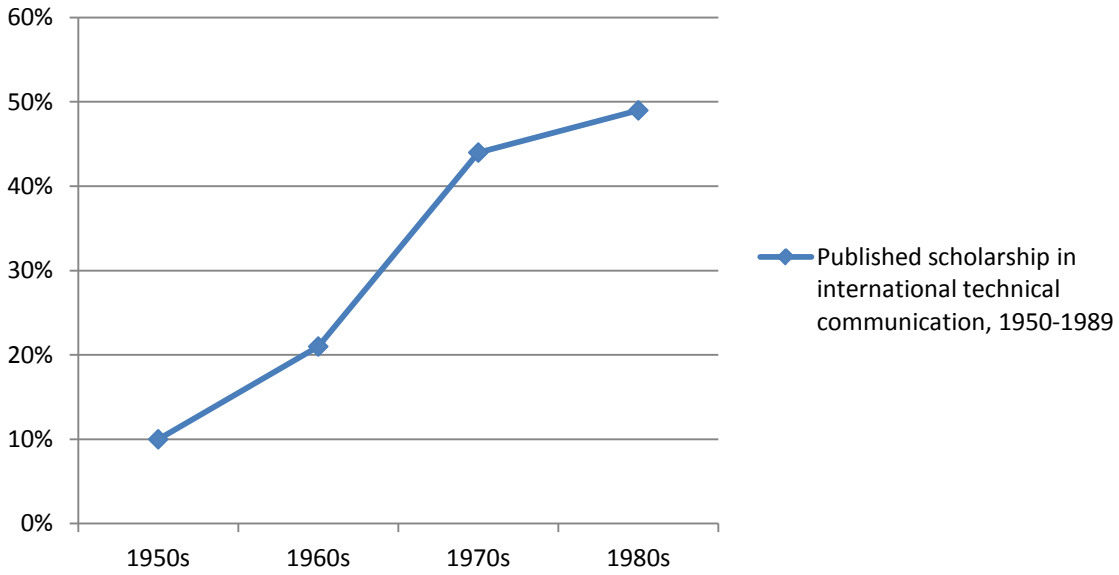

Figure 6.1: Growth of Scholarship in International Technical Communication, 1950-1989

This graph is based on both the quantity and scope of the scholarship in the four decades. In quantity, the numbers of articles I collected for 1950s, 1960s, 1970s, and 1980s are 6, 12, 34, and 36, respectively. In scope, the scholarship in the four decades covered a wide variety of topics, including status of technical communication in other countries, education, writing issues, management issues, design issues, graphics issues, localization,

information systems, international specifications, issues related to doing business, translation, technical editing, professional organizations, instructions for international technical communication, and distribution and usage of technical information. The numbers of topics covered in each decade are 3, 5, 8, and 10, respectively. We can see a sharp growth in the 1970s, both in quantity and scope.

Translation was the hottest topics among the various topics discussed in the four decades. Other hot topics included status of technical communication in other countries and education.

We can find one trend in the four decades' scholarship: from general to specific topics. In the 1950s, 3 out of 6 articles were about the status of technical communication in other countries. In the 1960s, 4 out of 12 articles were about this topic. In the 1970s and 1980s, the numbers were 2 and 3, respectively. This does not mean that scholars and practitioners had lost interest in the technical communication of other countries. They were still concerned with technical communication developments in other countries. But the focuses were different. Rather than discussing the general status of technical communication in Great Britain or Israel, for example, they focused on specific topics, such as education, writing issues, technical editing, and professional organizations.

6.2 SIMILARITIES AND DIFFERENCES OF THE SCHOLARSHIP IN THE FOUR DECADES

I have mentioned that the four decades could be looked on as the first stage in the development of international technical communication as a conscious focus of academic scholarship. Definitely, there were some similarities among the four decades' studies.

However, the scholarship was developing gradually in the four decades. Thus, differences also existed in the four decades.

6.2.1 Similarities. The most obvious similarity was the continuous discussion of some topics, such as status of technical communication in other countries, translation, and education. The first two topics appeared in each decade. The topic of education appeared in three decades, but not the 1950s. This shows that technical communication scholars and practitioners have long been concerned with the development of technical communication in other countries, from its general status to more specific topics. It also tells us that international technical communication cannot be separated from translation. Without translation, international technical communication could not proceed. The lack of discussion about education in the 1950s resulted from the underdeveloped status of education in technical communication at that time. With the development of education, more and more problems occurred. Naturally, scholars and practitioners became interested in this topic.

Another similarity was that different scholars and practitioners in different decades seemed to hold the same opinions about certain subjects. For example, Van Acker (1964), Dietrichson (1966), Yuen (1979), Schuck-Kolben (1979), Schuck-Kolben (1982), and Teague (1982) thought that a technical translator should not only be proficient in the languages involved, but also familiar with the subject matter. Van Acker (1964), Dietrichson (1966), and Schuck-Kolben (1979) emphasized that a technical translator was a technical writer. Both Downs (1980) and Sanderlin (1988) thought that technical writers, who wrote for translation, should keep in mind that translation was part of the total job and that they were writing for translation. As for the cost of translation,

both Crites (1975) and Schuck-Kolben (1979) suggested that the funding of translation was just as important as the funding of the original writing. The list goes on. All of these examples show that correct ideas would not change with the lapse of time.

One interesting phenomenon is that almost all of the scholarship in the four decades referred to developed countries, such as the U.S, the Great Britain, Japan, Canada, Australia, European countries, and Russia. Few articles were about developing countries and underdeveloped countries. Only one article talked about technical communication in India (Sampath & Murthy, 1966), one about Vietnam (Colegrove, 1972), and one about Nigeria (Griggs, 1983). Only four were about China (Willmot, 1985; Yuen, 1979; Walker, et al., 1968; Rofe,1982). Rofe's (1982) article discussed several languages including Chinese and Indonesia. One important reason for this phenomenon was that technical communication in a developed country, as well as international technical communication between developed countries, was more developed than that in a developing or underdeveloped country.

6.2.2 Differences. The differences in the scholarship of the four decades lie in both quantity and scope. From the 1950s to the 1980s, the quantity of scholarship increased in each decade. The number of topics covered in each decade increased, too. Compared to the previous decade, some emerging topics appeared, such as education, graphics issues, and information systems in the 1960s; management issues, localization, international specifications/standards, and technical editor in the 1970s; and writing issues, issues related to doing business, distribution and usage of technical information, and professional organizations in the 1980s. Additionally, the scholarship in each decade had different focuses. In the 1950s, the status of technical communication in other

countries was the focus. In the 1960s, the focuses were status of technical communication in other countries and translation. In the 1970s, education and translation were emphasized, and in the 1980s, translation was the biggest issue. The increase in the quantity and scope of scholarship resulted from the development of technical communication and international technical communication. As the practices were becoming more pervasive and complicated, more problems occurred and people had more opportunities to look abroad. Thus, scholarship in international technical communication became richer and richer.

We can also find differences among the four decades in terms of scholarship under the same topic. This point contains two aspects. One, scholars and practitioners in one decade had different research interests in the same topic than scholars and practitioners in some other decades. Two, the later discussions look more advanced than the earlier ones on the same topic. For the first aspect, education and technical translators are two good examples. Education in the 1960s and 1970s emphasized teaching technical writing. This emphasis was changed in the 1980s. In addition to the focus on methods of teaching technical communication, scholars and practitioners paid attention to audience analysis held by teachers of technical communication. The topic of technical translators was discussed more concretely in the 1980s than in the previous two decades. In the 1960s and 1970s, scholars and practitioners argued broadly that a technical translator was a technical writer. In the 1980s, the discussion was more specific, focusing on the use of in-house and freelance technical translators, how to locate and evaluate a technical translator, and professional organizations for technical translators.

The second aspect can be illustrated by discussions of terminology tools. Yuen's (1979) study of terminology tools was based on her two decades of translation experience. The tools included show-and-tell techniques, dictionaries and glossaries, reference texts and professional journals, self-study notes, and consultation with subject-matter specialists. By contrast, the terminology tool described by Brinkmann (1982) was the TEAM multilingual terminology bank, which was electronic and contained a large amount of specialist vocabulary. Here I do not intend to deny the value of Yuen's (1979) study. Her study was surely valuable, especially for individual translators and small projects. The electronic terminology bank was the product of advanced technology. With the development of science and technology, more advanced tools were used in technical translation and technical communication. These tools have powerful functions and can be easily used by users.

In addition, different scholars and practitioners in different times might hold different opinions toward the same subject. For example, Colegrove (1972) had a positive attitude toward machine translation. Smart (1979) thought that the SMART System had advantages over manual translation. Klein (1979), on the other hand, was not a big fan of machine translation. He advocated human translation assisted by machine. It is very normal that different scholars and practitioners have different opinions toward the same subject, whether in the past, at present, or in the future. Academia is an open domain which welcomes various reasonable and constructive ideas. The argument among different ideas is beneficial for the development of both scholarship and practice.

6.3 STRENGTHS AND WEAKNESSES OF THE SCHOLARSHIP IN THE FOUR DECADES

Although it was the first stage in the development of international technical communication as a conscious focus in academic scholarship, the scholarship in the four decades had some valuable strengths as well as weaknesses.

6.3.1 Strengths. The ultimate purpose of scholarship is to solve practical problems and prompt the development of practice in a certain field. The scholarship in international technical communication in the four decades was no exception. It served as a good guideline for the practice of international technical communication in its own day. Among the articles I collected for this thesis, some directly supplied instructions related to a certain aspect, such as localization (Halling, 1971), writing issues (Downs, 1980), and technical translator (Schuch-Kolben, 1982); some discussed a problem and found out the causes as well as solutions for the problem (such as Hildebrandt, 1974; Shinoda, 1980; Matsui, 1989; and Hammond, 1989); and some introduced a certain topic in order to find out what advantages and/or disadvantages it had and what we could learn from it (such as Green, 1962; Root,1966; and Baxter, 1971). From the history of international technical communication, we can see that practice has been developing in the same direction as scholarship. This is because practice and scholarship always interact with each other and prompt each other.

The scholarship in international technical communication in the four decades under examination was an early attempt in this field. It provided a solid base for later research. Just like other processes, the development process of scholarship goes from immaturity to maturity. It is a gradual progress, and the later stage is based on the

previous ones. The development orbit in Figure 6.1 shows the increasing trend in the scholarship in the four decades. If we do more research and add the scholarship from 1990 to the present, the increasing trend would not be changed, and in fact there would certainly be a sharp rise at some point in the recent two decades. The current scholarship is based on the previous scholarship. Without the previous scholarship, the current scholarship could not be what it is now. Scholars and practitioners need to refer to the previous scholarship when they are doing research. Some of the current studies directly employed the existing research findings. For example, Mitchell (1978) referred to the previous studies such as Mitchell's (1974) and Mitchell's (1963) works. Collet (1977) referred to Selinker & Trimber's (1974) article. Sanderlin (1988) referred to articles written by authors such as Gingold (1982), Brinkmann (1982), Strong (1983), and Downs (1980).

Another strength is reflected by the penetrating and time-tested ideas in the scholarship. Although they were proposed several decades ago, these ideas are still correct and feasible at present, even in the future. For example, the thought that a technical translator should not only be proficient in the languages involved, but also be familiar with the technical subject matter, was stressed in three decades (Van Acker, 1964; Dietrichson, 1966); Yuen, 1979; Schuck-Kolben, 1979; Schuck-Kolben, 1982; Teague, 1982). This thought is true in today's context. It will still be true in the future. Another example is cultural differences in international technical communication (Lewis, 1958; Halling, 1971; Hildebrandt, 1974; Houghton-Alico, 1988). This topic has garnered a lot of attention since the 1990s and will continue to be discussed.

6.3.2 Weaknesses. One weakness lies in some misunderstandings reflected by or existing in the scholarship. An example is the incorrect view of technical writers held by the City and Guilds of London Institute in the 1960s and Sampath & Murthy (1966) (this has been discussed in Section 3). Usually, these misunderstandings resulted from the limitations in a certain era. The misunderstandings of technical writers were closely related to the immature understanding of technical writing in the 1960s, especially in countries outside the U.S.

Another weakness is the limited research scope of scholarship during the four decades under examination. The numbers of topics covered in each decade are 3, 5, 8, and 10, respectively. Compared to the rich scope of today's international technical communication scholarship, these numbers seem feeble, especially the numbers for the two earliest decades. Additionally, some topics were not covered in the four decades: multilingual website design, cultural theories, international legal issues, cross-cultural visuals, etc. Undoubtedly, this situation had a lot to do with the development status of international technical communication and science and technology at that time. When technology was not advanced enough to supply necessary hardware facilities, such as global networks, and the practice of international technical communication was not very complicated, some topics, such as multilingual website design, did not exist in practice. Thus, scholars and practitioners could hardly notice these topics, let alone study them. Another important factor was the underdeveloped profession of technical communication. For a long time, the profession of technical communication was not widely recognized, which certainly prevented many talented people from joining this profession and contributing to the development of the profession as well as its scholarship.

6.4 AN IMPORTANT PERSON AND AN IMPORTANT JOURNAL

Among the scholars and practitioners who contributed to the development of international technical communication in the four decades under examination, Fred Klein was an important person who should not be ignored. He served as a guest editor for the special issue on technical translation published in the fourth quarter of *Technical Communication* in 1982 (Klein, 1982a). He started a forum named "International Technical Communication" in *Technical Communication* in February 1989. This forum appeared in the four issues of the journal in 1989 and continued into the 1990s. Fred Klein himself, published three articles in three issues in 1989. He discussed some topics related to international technical communication, including the future for technical communicators, localization, images and icons, and organization (Klein, 1989a; Klein, 1989b; Klein, 1989c). His contribution to the scholarship in international technical communication, especially translation, was inseparable from his rich working experiences. He had worked "as a freelancer, as the owner of a translation business abroad, as a regular employee, and as head of the German department and Chief Lexicographer of a large agency, obviously always as technical translator, editor, and project leader" (Klein, 1982a, p. 5).

Among the 88 articles I collected for the thesis, 27 came from *Technical Communication* and 13 from the *STC Proceedings* (see Table 6.1). Articles from these two publications occupied about one half of the total number. Note that both of the publications belonged to the Society for Technical Communication. Taking the long history of STC (see Table 6.2) into account, there were 49 articles coming from STC's journals and its proceedings. Also note that in 1958 and 1959, the content of *Industrial*

Editor and *Technical Communications* were the same except for the cover and newsletter insert (Edward A. Malone, personal communication, 3 November 2011). Thus, 52 articles were from STC's journals and its proceedings. The *Journal of Technical Writing and Communication* and the *IEEE Transactions* had 25 and 7 articles, respectively. In 1982, *Technical Communication* had a special issue on technical translation, which presented eleven articles about technical translation. In following years, *Technical Communication* continued to be one of the important journals providing resources for the study of international technical communication. Klein (1989a) praised it as "the best medium, the best platform" (p. 80).

Table 6.1 Distribution of Articles in Different Publications

Publication	TC	STC Proc	STWE Review	STWP Review (including STWP Proc)	JTWC	TWT	IEEE	Industrial Editor	TWR
Number	27	13	2	6	25	4	7	3	1

Note: Mitchell's (1978) article was published both in *STC Proceedings* and *JTWC*. Lewis' (1958) article was published in *The Proceedings of the 1958 Institute in Technical and Industrial Communications*.

Table 6.2 History of STC and Its Journal

Title	Organization	Year(s)
Technical Writing Review	Society of Technical Writers (STW)	1954-1957
TWE Journal	Association of Technical Writers and Editors (TWE)	1955-1957
Technical Communications (published simultaneously as *Industrial Editor* in 1958 and 1959)	Technical Publishing Society (TPS)	1957-1959
The Technical Writer	STW & TWE	1957

Table 6.2 History of STC and Its Journal (cont.)

STWE Review	Society of Technical Writers and Editors (STWE)	1958-1960
STWP Review	Society of Technical Writers and Publishers (STWP)	1960-1966
Technical Communications	STWP	1967-1971
Technical Communication	Society for Technical Communication (STC)	1971-Present

(Source: Malone, 2008)

Technical Communication ranked first in the publication of international technical communication, which was decided by the nature and characteristics of the Society for Technical Communication. STC has been "the world's largest and oldest professional association dedicated to the advancement of the field of technical communication" (About STC, n.d.). It was and would continue to be a global organization. In the four decades, STC worked diligently to recruit members from outside the United States. Especially in the 1980s, its membership increased dramatically and was more geographically dispersed (O'Hara, 1989). Now, STC has members "in almost 50 countries and is continuing to grow rapidly outside of North America and Europe"(About STC, n.d.). Because STC has always been a large and global organization, its publications have been concerned with technical communication around the world.

6.5 WHAT CAN WE LEARN FROM THE FOUR DECADES' SCHOLARSHIP

I have made a literature review of the scholarship in international technical communication over four decades and discussed the similarities, differences, strengths, and weaknesses of it. All of these efforts aim at a final and most important purpose: what can we learn from these publications? In this part, I will sum up some important points.

6.5.1 The Impact Of Technology And Politics On International Technical Communication.

Undoubtedly, technological and political factors have always played a crucial role in the development of international technical communication. The gradually ascending curve of the scholarship in international technical communication testifies to a truth: technological development is the momentum. For example, developments in translation technologies led to more articles about translation in technical communication journals and conference proceedings. The lack of advanced technologies in developing countries has retarded the development of technical communication in those countries. As we have also seen with China, a hospitable political environment, as well as wise policies, is a necessary external condition for the development of international technical communication and related scholarship.

As a student coming from China, I am especially concerned with the development of technical communication in China. As we can see, three of the four articles referring to China (Walker, et al, 1968; Yuen, 1979; Rofe, 1982; and Willmot, 1985) appeared in 1979, 1982, and 1985, respectively, which was after the Cultural Revolution and the implementation of reform and opening policy. Since 1990, more and more articles have been concerned with technical communication in China or related to China (such as Honold, 1999; Hayhoe, 2003; Wiles, 2003; Barnum & Li, 2006; and Yu, 2011). However, the development of technical communication and international technical communication in China is still far behind developed countries. One important reason lies in the lack of competitive advanced technologies in China.

The point related to technology and politics is an important one for all countries. It is especially important for developing and undeveloped countries because

technological and political factors are a prerequisite for international technical communication, even for technical communication within a country. Without technology, there would be no technical communication. Without advanced technology, there would be no international technical communication.

6.5.2 Focusing On Major Topics While Keeping Discussion On Various Topics.

The four decades' scholarship, although restricted by some objective factors, still continued to cover as many topics as it could. From the three topics in the 1950s to the ten in the 1980s, the scholarship in the four decades has shown us its efforts and progresses. Nowadays, with the development of international technical communication and technology, as well as the hospitable external political environment, we should be concerned with and study various problems that appeared in practices. Furthermore, to facilitate the development of international technical communication, we also need some reasonable predictions about international technical communication and one or more of its specific aspects.

In addition to the discussion of various topics, we should focus on some major topics. In the four decades, status of international technical communication in other countries, translation, and education were three focuses. Focuses come from what is most needed and urgent at a certain time. The solutions of the major problems would greatly contribute to the development of the entirety. For example, problems related to multilingual Website design and cultural differences in international technical communication have often occurred in practice and are not easy to deal with. These topics can be looked on as focuses for current scholarship. The academic research in

these areas will help to solve practical problems as well as prompt the development of international technical communication.

6.5.3 Learning From Others. Just as a famous saying from *The Art of War* goes: "If you know your enemies and know yourself, you can win a hundred battles without a single loss" (The art of war, n.d.). In the context of this thesis, there are surely no enemies, at most competitive opponents. However, whether in a peaceful environment or a battlefield, knowing others or your opponents is as important as knowing your enemies. Not only should we know our opponents, but we should also learn their strengths. The purpose of learning from others is to find out one's own shortcomings and improve oneself. In the four decades, scholars and practitioners did not stop learning from other countries, from the earliest studies of the general status of technical communication in other countries to the later studies of specific aspects of technical communication in these countries. The common motivation was to find out the gap and fill in the gap.

Learning from others is especially important for countries whose technical communication and international technical communication are underdeveloped. At a relatively early date, countries such as Great Britain, France, Sweden, and Israel as well as the U.S. began to develop technical communication industries. The experiences of the developed countries during their earlier periods could help the underdeveloped countries save time and find solutions for some tough problems. Wise use of other countries' experiences could help underdeveloped countries get twofold results with only half the effort.

6.5.4 Leaders And Platforms For The Development Of Scholarship. We need leaders in the development of international technical communication. Here "leaders" refers to persons who contribute greatly to or have a great impact on the development of international technical communication. At least one "leader" appeared in the four decades of my study: Fred Klein. Nancy Hoft can be regarded as a leader, too, in a later decade. She published an important book *International technical communication: How to export information about high technology* in 1995. This book has been widely used by scholars, students, and practitioners. It provided a good overview of international technical communication at the time. Kirk St. Amant is one of the current leaders. He serves on the editorial board for the *Technical Communication* and is also the associate editor for globalization and outsourcing for the *IEEE Transactions on Professional Communication*. He has published many works about international and intercultural communication (such as Ulijn & St. Amant, 2000; St. Amant, 2001; St. Amant, 2006; Zhu & St. Amant, 2007; and St. Amant & Sapienza, 2011). These "leaders" made significant contributions to the development of the study of international technical communication. Without their outstanding work, international technical communication, whether in scholarship or practice, would definitely lag far behind the current position.

We also need platforms for discussion and propagation. From 1950 to 1989, *Technical Communication*, as well as STWP/STC's international technical communication conference, served as very important platforms. Nowadays, with the rapid development of science and technology, the Internet has become an important platform. People have become used to receiving information online and communicating online. In fact, many journals have made their publications available online, and some

journals or magazines are published online. For example, we can access articles published in *Journal of Technical Writing and Communication* from both the traditional print version and the online version of the journal. *Intercom*, the magazine of the Society for Technical Communication, has an online version. Another very young online journal is *Journal of Rhetoric, Professional Communication and Globalization* (JRPCG), which was established in Fall 2009 and concentrates on cross-cultural communication with particular attention to professional/technical communication.

The Internet's becoming an important platform results from popularization of computers and networking, easy access to and wide coverage of the Internet, frequent international technical communication activities and academic exchange, and the increasing pace of life. Hunsinger (2011) described the Internet as "a central vehicle of globalization" (p. 17). Similarly, the Internet is a crucial medium for international technical communication as well as related scholarship.

Besides platforms like journals and magazines, we also need other kinds of platforms, such as conferences. There were some conferences in the four decades, such as the STWP Convention, the International Technical Communication Conference of STC, and the International Professional Communication Conference (IPCC) of the IEEE Professional Communication Society, which provided platforms for the discussion of international technical communication. The tradition of annual conferences is still retained, such as the Technical Communication Summit of the STC. Scholars and practitioners can share their ideas and experiences and discuss face to face. These conferences are also an important platform for the development of international technical communication.

Furthermore, as international technical communication becomes more pervasive and complicated, conferences should reflect these changes. For example, some topics are gaining particular attention from scholars and practitioners, and problems related to these topics often occur in practice, such as multilingual Website design and cultural differences in international technical communication. Thus, it is necessary to focus on these topics in conferences. Additionally, with the integration of developing countries such as China and India into the global economy, it might be beneficial to hold conferences in these countries. On the one hand, these conferences will help developing countries to have a better understanding of technical communication and learn something valuable from developed countries. On the other hand, developed countries can also have a better understanding of technical communication in developing countries, which will facilitate international technical communication with these countries. Conferences held in developing countries would also provide opportunities for the professional organizations in those countries to absorb more foreign members.

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VITA

Xiaoyan Huang obtained her B.S. in Management from Zhongnan University of Finance and Law and M.S. in Economics from Shanghai University of Finance and Economics. She received her M.S. in Technical Communication from the Missouri University of Science and Technology in December 2011. She worked as a research assistant and an assistant online course developer during her study at Missouri S&T.