Technical Communication for International Audiences – an Assembly Manual for Automatic Stacking Cranes

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Tämä tutkielma tarkastelee englantia kansainvälisenä käyttökielenä teknisessä viestinnässä, erityisesti dokumentointiprojektin lopputuotteen laadun näkökulmasta. Tutkimuksen lähtökohtana on teollisuusyritykselle tuotettu dokumentointiprojekti, jonka tarkoitus oli tuottaa automaattisen konttinosturin (ASC) kokoamisohje englanniksi. Dokumentointiprojektin erityispiirteenä oli sen kansainvälisyys: ohjeen käyttäjäryhmää ei voinut määritellä lukijoiden kansallisuuden tai kielitaidon perusteella, minkä lisäksi kokoamisohjeen pääasiallisena tiedonlähteenä toimivat kokoamisprosessin käytännön asiantuntijat, joiden englannin kielen taito vaihteli suuresti.

Teoreettinen viitekehys rakentuu kahdesta osasta: ensimmäisessä tarkastellaan englannin kielen globalisoitumisen vaikutuksia siihen liitettyihin odotuksiin ja sen käyttöön kansainvälisessä viestinnässä. Toisessa osassa tarkastellaan teknisen viestinnän laatua erityisesti edellä mainitun kansainvälisen englannin näkökulmasta. Lisäksi kehitetään kansainvälisyyden näkökulman huomioonottava laatuheuristiikkalista, joka on tarkoitettu teknisen viestinnän lopputuotteiden laadun arviointiin.

Tutkimuksessa käytetään metodeina autoetnografiaa sekä heuristista arviointia teoreettisessa viitekehyksessä esitellyn mallin mukaisesti. Autoetnografinen tutkimusmetodi pohjautuu tutkijan omien kokemusten tuomaan kontekstiin, jossa tutkija itse tuottaa aineiston metodin kautta ja analysoi sitä kriittisesti ja itsereflektiivisesti. Tässä tutkimuksessa aineisto koostuu tutkijan tuottamista päiväkirjasta, haastatteluista ja havainnoista. Myös heuristinen arviointi yhdistyy tässä tutkimuksessa autoetnografiaan, sillä arvioitava kokoamisohje on tutkijan itsensä tuottama.

Tutkimuksessa käy ilmi, että käyttäjäryhmän analysointi oli tärkeässä roolissa dokumentointiprojektin onnistumisen kannalta. Dokumentointiprojektin kansainväliset erityispiirteet ja ASC:n terminologian hajanaisuus vaikuttivat kirjoitusprosessin etenemiseen, millä todetaan voivan olla negatiivisia vaikutuksia dokumentin laatuun. Teoriaosassa kehitetyn laatuheuristiikkalistan avulla kokoamisohjeen laatua voidaan kuitenkin arvioida tietyiltä osin. Jatkotutkimuksen aiheeksi nousevat tutkimuksessa esiteltyjen heuristiikkojen soveltaminen muihin projekteihin, luonnollisten ja ammatillisten kulttuurien vuorovaikutus teknisessä viestinnässä sekä autoetnografian hyödyntäminen laajemmin dokumentointiprosessin tutkimuksessa.

Avainsanat: tekninen viestintä, kansainvälinen englanti, heuristinen arviointi, autoetnografia

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1. Introduction

English has become a global language in the modern world, a fact perhaps nowhere as visible as in the world of business. Due to the global nature of modern-day companies, the communication of technical information, the topic of this study, is also increasingly done mainly in English. A majority of technical communication produced in Finland is already written directly in English instead of Finnish, which is why many technical writers in Finland have a background in languages (STVY 2014).

The international nature of technical communication has the possibility of creating challenges that are reflected in the quality of the technical documents. Even though professional technical writers might be language-experts, still a great deal of technical communication in companies is produced by technical experts, who might have vastly differing levels of competency in language and communication skills. Furthermore, the audience for technical communication written in English is as varied in terms of English language proficiency as the non-professional writers. In many companies, the pervasiveness of English as a global language has led to a situation where it is often assumed that just writing documents in English is enough of a global approach. However, if companies do not pay attention to the quality of their technical communication, it can lead to a situation where technical documents are created and distributed globally without good knowledge of effective communication strategies – or in some cases even proper English. The topic of this study is to discuss international technical documents written in English, and the possible effects that their international nature can have to their quality.

This study was sparked by a technical communication project with an interesting characteristic: the document, an assembly manual for a crane, was to be produced for an entirely

international audience, without knowledge of the nationality or language competency of the readers, and the document would never be translated to any other languages. Hietaniemi (2006, 117) rightly points out that technical documents are not separate from other information products in the sense that they hold culturally specific information and expectations. From this perspective, the prospect of creating a fully functional and high-quality technical document poses some challenges, mainly the question of making the document relatable to the intended audience, regardless of their cultural background and language proficiency. This question proved vital in the process of writing the technical document in question, and was the inspiration for the main issues discussed in this thesis.

1.1 Study framework

The primary research question of this study is: How does the international nature of technical communication projects affect the quality of the technical documents produced? Additionally, how can a technical writer achieve high quality when he or she is writing in English for a global audience? The theoretical discussion around these questions is divided into two sections: First, this study will discuss the effect of the global spread of English to how the English language is seen and used as language of communication, from the viewpoints of both spoken and written language. English – not any native variety of English, but English as an international language, a *lingua franca* – is probably the most common medium of communication for groups of people from a variety of backgrounds. The growing trend of Anglicisation of technical documentation creates a challenging atmosphere for technical writers, who must continue supplying effective documentation whilst taking into account the varying conditions in the readers' language and communication proficiency.

Second, the understanding of the international nature of English is used as a perspective in examining the principles of quality in technical communication. In the examination, the idea of heuristic evaluation is utilised for evaluation of quality, and a new list of quality heuristics for international English is created. In the analysis section, the new quality heuristics are used to examine the process and final product of the technical communication project mentioned previously.

Technical communication refers to designing and creating information for users, ideally by technical communication professionals, or technical writers, who have good writing skills and the ability to filter information and present it in a user-oriented way (STVY 2014). This study seeks to give technical writers tools to improve their work, and companies to improve their technical communication processes, but with a method that is slightly unconventional: instead of examining international technical communication processes as an outside observer, this study is an autoethnographical record that discusses a particular technical communication project from my personal perspective as its writer. A diary that was kept during the manual writing project, together with interviews and observations, represents the autoethnographical data in this study.

My personal observations and interpretations about the manual writing process recorded in the diary will be discussed and analysed reflexively. Furthermore, the reflexive autoethnographical analysis is combined with heuristic evaluation to examine the final product of the technical communication project – the ASC assembly manual, which is also part of the data in this study. These two aspects of the manual project, the process and the final product, are examined to see how an in-depth, qualitative and reflexive analysis from a technical writer's personal perspective can shed light on the issue of quality in international technical communication.

This study contributes to the discussions about globalisation in the field of technical communication and English as a medium of international communication. I will discuss the concepts of international English and English as a lingua franca, and how theoretical approaches in these matters can be applied to the evaluation of the overall quality of technical documents and to the work of the technical writer.

1.2 The company and the ASC assembly project

The inspiration and starting point for the questions raised in this thesis was a project for writing a technical manual for Cargotec, a Finland-based company with a global reach in the business of container terminals. As stated on their website (www.cargotec.com), Cargotec provides customised equipment, solutions and services to its clients around the world in more than 120 countries and more than 750 different locations. Cargotec has three brands, each operating in their own field: Macgregor, Hiab, and Kalmar, which offers cargo handling solutions to ports, terminals, distribution centres and heavy industry. In the summer of 2013, Kalmar was commissioned to provide a number of automatic stacking cranes (ASCs) in Australia. The crane parts are usually manufactured in Cargotec's factories and shipped to the final location where the final assembly takes place. This procedure is necessary since the ASC, once assembled, is over 26 meters high and 30 meters wide, and weighs approximately 220 metric tons (depending on customer specifications). During the assembly, I worked for Kalmar Equipment Australia for five months, and my main project was the assembly manual for the ASC, which, as mentioned, forms the basis and starting point for this thesis.

The Australian assembly project was an extensive international collaboration, including people from Finland, Australia, New Zealand, China, Poland, Germany, Hungary, United Arab Emirates, and Argentina. The language of communication in most instances was English. I was

the only employee, however, who was assigned to work with the ASC assembly manual, which was written mainly by observing works and interviewing the assembly personnel. The writing process of the ASC assembly manual is introduced in more detail in Chapter 5.

1.3 The structure of the study

In Chapter 2, this study will discuss concepts such as English as a lingua franca and international English, and the role of English in technical communication for international audiences. Chapter 3 examines quality principles for technical communication and establishes a list of quality heuristics that can be used to evaluate technical documents. Chapter 4 presents the methods and data used in this study. In Chapter 5, the ASC assembly manual project is introduced in more detail and the project's autoethnographical and heuristic analysis according to selected themes is included. Concluding remarks are presented in Chapter 6. More specifically, has the study been able to sufficiently answer the research questions presented? Have the quality heuristics been helpful in evaluating the outcome of the assembly manual project? I also hope to draw some conclusions about the suitability of autoethnography as a research method in this type of study.

2. International English

Some qualities of English as it is spoken and written around the world are examined in this chapter. The subject has been discussed quite extensively in literature, and there are many terms to describe the phenomenon of English used globally. Some of these terms are English as a lingua franca, international English, and English as an International Language. *English as a lingua franca* is English used in an international context, but mostly in oral communication. In this study, the term *international English* is used to denote English used in any context (and any format) where some form of internationally recognised and accepted variety of English is the goal, a concept which also has been called *English as an International Language* by Seidlhofer (2002, 8).This chapter discusses the use of these terms, the concepts associated with them, and their relevance to this study.

In this chapter, the focus of this study – technical communication in English for international audiences – is approached first by examining the role of English in international communication, both in general terms and in business contexts. Eventually, we will focus on international English in written communication and the field of technical communication. The purpose of this discussion is to shed light on how readers' individual positions as language users affect their expectations of technical documents, and how a technical writer can address the challenges of effective communication.

2.1 Introduction to English as a global language

The global spread of the English language has been a combination of political, economic, and cultural development ranging from the spread of the British Empire to the establishment of the United Nations (Crystal 2012, 153), and the visibility and appeal of American popular culture in

the global media (for a more thorough account on the historical reasons for the rise of English as a global language, see for example Crystal 2003). It is impossible to deny that English nowadays is a global phenomenon, possessing a special status as the language of choice in most international communication situations, more increasingly regardless of whether any of the participants speak it as their first language. How far English has spread in worldwide communication is nearly impossible to estimate, but those who nevertheless try it mostly agree that English is used in more than half, or maybe even in over 80 percent, of all written communication in the world (Peters 2004, 182). Measured in the number of speech occurrences (that is, number of discussions) worldwide, English is used more as a medium of communication between people from different cultural backgrounds than it is used among its native speakers (Seidlhofer 2002, 7).

In addition to having an official or semi-official status in more than 30 countries, English is also used as the official language in some specialised fields, such as air traffic control and marine communication. It is often used as a relay language in translation and interpreting. English has been accepted as the international language in tertiary education, science and technology, international law, media, financial institutions, and business. (Peters 2004, 182; Nickerson 2005.)

In the light of this information it is generally agreed upon that English has earned the title of a global language, and nowadays writing in English means writing for a highly heterogeneous audience spread across the world. This, however, does not necessarily mean that only one variety of English will prevail and drown all others. Quite the contrary: Peters (2004, 182) points out that wherever the English language has spread over the course of history, it has always produced a local variety that uniquely expresses the culture, background, environment and values of its

speakers, partly by incorporating elements from the previous language(s). It seems quite a challenge, therefore, to establish an international version of English for technical communication purposes, one which would be completely devoid of cultural connotations and national characteristics. There is reason to ask whether only one variety of English can represent all of its users and, furthermore, whether there really is a need for such an approach in technical communication for international audiences.

2.2 English as a lingua franca

English used in communication between different nationalities is often called *English as a lingua franca*. According to the Globalization and Localization Association's (GALA 2013) website, a lingua franca is a "language that is adopted as a common language between speakers whose native languages are different". English as a lingua franca (abbreviated as ELF), therefore, is English used as a medium of communication for speakers who come from different cultural and first-language backgrounds, and it is considered to be "the most wide spread contemporary use of English throughout the world" by the researchers of the Vienna-Oxford International Corpus of English (VOICE 2013), which is the first electronic corpus dedicated entirely to ELF interactions.

Although the definition of ELF presented above does not exclude written communication, as a distinct scientific concept English as a lingua franca, however, is usually discussed in the context of oral communication and teaching English as a foreign language. This study intends to focus on written (more precisely technical) information. Nevertheless, as we are focusing on technical information written for an international audience, it is important to include in the framework some discussion about the nature of the usage of English in an international context. This section examines how native and non-native speakers of English are viewed as the holders

of linguistic power and how their usage affects the language as it is used globally. These are questions that have to be addressed especially by a non-native speaker, like myself, who is required to write professionally in English.

A speaker's status as a user of language is traditionally divided into three concentric circles, according Kachru's (1992, 38) model. The inner circle represents native speakers, outer circle represents second-language speakers, and the expanding circle represents learners of the language. The three circles model is very much linked not only to linguistic factors, but also to the speaker's home country and historical and geopolitical issues. The circles also represent the landscape of English speakers and, whether or not it was Kachru's intention, his model has been often interpreted as mainly British and American English speakers being the core users in the inner circle, and other, less-prestigious varieties around them away from the "centre" (Jenkins 2009, 11–12).

The approach to language learning has been for a long time that English learners should strive for native-like accuracy. English as a foreign language has been traditionally taught in schools, and how it is taught implies a strong presence of a standard variety, and superiority of native speakers. The learner is seen as a "linguistic tourist", an "outsider… who struggles to attain acceptance by the target community" (Graddol 2006, 82–83). Learning about the values and customs of the native community has been seen as an important part of learning the language.

However, in the face of ever-expanding use of English as a communication tool in the globalised world, Graddol (2006, 110) questions the traditional divide of English speakers into status groups and instead calls for the need to distinguish between different proficiencies in English. English as lingua franca (ELF) entails the idea that fewer and fewer occasions where

English is used actually involve a native speaker, which Graddol (2006, 87) considers "the most radical and controversial approach" to recently affect language learning. It shifts the focus from the authority of native speakers to intelligibility and effective communication strategies, allowing speakers to retain their national identity in terms of accent and other features. Seidlhofer (2002, 7) quotes the idea from Brumfit that linguistic power – that is, power to change and adapt – is precisely in the hands of the people who use the language. That would mean that maybe for the first time in history non-native speakers will determine how a language is used, maintained, and changed, and "who will shape the ideologies and beliefs associated with it" (Seidlhofer 2002, 7).

ELF is used as a medium of communication in a multicultural setting, therefore it does not have a fixed form (House 2010, 12). Instead, every speech situation with a new set of speakers is a unique incident. The participants, drawing from their own background and understanding of others, constantly negotiate their roles in the changing environment and the rules of communication to gain mutual understanding (ibid.). In practice, the participants need to assess their partners' as well as their own language proficiency and adapt to the situation by choosing words, grammar, and strategies that more easily convey the speaker's purpose. The success of the speech incident, therefore, is not measured by the correctness of the sentence, but how well it has been understood by the other party. Actually, native English speakers – who have been previously seen as holding the highest linguistic power – might be at a disadvantage in this sort of a situation if they do not have the skills to use English effectively for international communication. Instead, they might fail to accommodate to the speech environment linguistically or culturally, that is, fail to correctly assess the other participants' language proficiency, and speak too fast or use unfamiliar cultural expressions. (Hülmbauer et al. 2008, 27; Crystal 2011, 23.)

Indeed, globalisation and the increasing use of English as a global language has led to the situation where a technical writer who writes in English no longer necessarily writes for an audience with a native, or even fluent, proficiency. An English document is, in some sense, already regarded as a global one, with the expected capacity of passing information to a multitude of users with different levels of proficiency. In a multicultural speech situation, participants have the possibility to indicate that they have not understood a certain expression, but in a written medium that is not possible (and using a dictionary is not always possible). The variation in language skills among document users forces the writers to consider carefully what kind of language they want to use in their documents to effectively convey their message.

A technical writer who writes for a culturally diverse audience may struggle in coming to terms with the diversity of the readers and their expectations of the document. Nevertheless, the seemingly heterogeneous audience is sometimes brought together by its professional culture, as in the case of the ASC assembly project. A professional field, such as manufacturing, is seen as a discourse community, where the "writing practices conform to, and innovate within the boundaries of, the field's discourse" (Rozycki and Johnson 2013, 157).

Similarly, a manufacturing company, such as Cargotec, can be seen as a "community of practice" discussed by Hülmbauer et al. (2008, 28), in the sense that the company unites its employees in "mutual engagement in shared practices", "taking part in some jointly negotiated enterprise", and "making use of members' shared repertoire" (Wenger, paraphrased in Hülmbauer et al. 2008, 28). Even though the employees might belong to different linguistic and cultural groups, they form a community of practice within the company which is therefore likely to produce its own distinct form of language – that is, its own form of ELF (ibid.).

English as a lingua franca specifically in business contexts has been discussed in academia, using concepts such as English for Specific Business Purposes (ESBP), and Business English Lingua Franca (BELF) (see e.g. Nickerson 2005). In the discussion of business contexts, it has been established that people working in multinational companies need to be able to communicate effectively in more than one language, and with several people of different cultural backgrounds and different proficiencies in English (Nickerson 2005, 376–377). In their study on BELF in two company mergers, Louhiala-Salminen et al. (2005, 418) found that effective communication in business indeed focuses on intelligibility and information strategies, rather than language proficiency. A more in-depth discussion around ESBP and BELF, however, falls beyond the scope of this study, as we focus mainly on the specific field of professional technical communication.

As noted, the study of ELF has changed how non-native speakers are viewed as language users, and the shift in values relating to language learning and use emphasises the importance of communicative competency in multicultural contexts. Next, this study will go further and discuss the concept of international English as a medium of written communication and in the context of technical communication.

2.3 International English

This section focuses our discussion of an international language from ELF, which represents its oral communication form, to its written forms, more specifically in the context of technical communication. We will examine the concept of international English and how it is approached in the field of technical communication. This will help build an academic framework around technical documents about manufacturing products and processes – such as the ASC and its

assembly – which are written for audiences comprising of both native and non-native speakers of English.

When technical documentation is produced for an international audience with a varying background and proficiency in English, the writer will most likely try to find a form of language that is equally international. As mentioned above (in section 2.1), even established native varieties of English have many differences that separate them and, in a document, would reveal to the reader their origin. How would the writer succeed in creating a document that is accepted by all English speakers? The focus of mutual understanding in intercultural situations is especially highlighted in technical communication, which is used by readers to perform tasks (Mike Markel 2012, 3).

The term *international English* is used in this study to represent English that is used in multicultural contexts and strives to be recognised and accepted internationally. The concept is not clearly established in linguistic discourse. However, Peters (2004, 286) offers a definition of international English as English that has no regional characteristics and avoids colloquial expressions. She adds that this kind of idea is highly idealistic, even though more easily achieved in the written than spoken medium, or formal than informal style. Technical communication, for most parts, can be described as formal or semi-formal, but there are still many choices of expressions and forms between different varieties – even in formal, written language – which the writer needs to navigate and eventually choose a preference. Examples of these expressions would be words such as *centre*/*center*, *biscuit*/*cookie*, *familiarise*/*familiarize*, and so on. As no single set of grammatical rules can be applied everywhere in the world, how can we, then, produce a document in the English language that caters to all English users – native, second, and foreign language speakers alike?

In Peters' (2004, 286) opinion international English is best achieved by identifying the variants that have the widest distribution in overall usage. In searching for those variants Peters (ibid.) mentions one solution of the so-called "common English" words. They are variants which are found both in Britain and in the US, even though the most frequent choice might be different in British and American English. Peters gives an example of the word *catalog*/*catalogue*, with the first spelling used in the US and the second in Britain. However, the British spelling is also often used and seen in American contexts; in international English, it would therefore be appropriate to use the spelling *catalogue*, since it is understood more widely. Unfortunately, discussion about common English elements seems to be limited only to differences in American and British English. Peters's (ibid.) hopeful comment that "chances are" these words are understood in other regions would need some additional research.

The International Council for Technical Communication (INTECOM, 2003) has created guidelines for technical communication based partly on the same principle of common English that is advocated by Peters (2004, 286). The guidelines list nearly thirty pages of words and expressions that have "pose[d] problems" (INTECOM 2003, 2) for technical writers as they write for international audiences. The guidelines give a British spelling and an American spelling of the word, as well as an international spelling, which is formed either according to the common English principle, or some other principle based on the project group's research or "rationale". Native English-speaking countries are divided into two groups, where one should use British and one should use American spelling (ibid.).

Peters' and INTECOM's approach to the concept of international English is somewhat problematic. Coming to a general consensus on what varieties of English would be considered the models for an international variety is going to be extremely difficult. In the light of our

previous discussion (see section 2.2) about the change in linguistic power, and as discussed by Marnell (2004), favouring the American and British standard varieties over the dozens of others used around the world without regarding the individual context would today seem narrow-minded, even imperialistic. Using British English in a document intended mainly for Australian readers (as suggested by INTECOM 2003, 3) would truly make no sense, since the Australians have their own variety of native English towards which they, surely, have the highest regard.

If we would, then, discard the common English principle, the amount of research needed for establishing the variants with the highest usage rates would be enormous, even if a consensus was reached on the included varieties. Would the highest usage-rate be measured according to the number of speakers, number of states, or perhaps according to the geographical spread of the areas with the speakers of a certain variety? Consequentially, the high number of compromises and approximations would eventually create a variety of international English which would not represent any naturally occurring form of English. It would, therefore, be a kind of artificial language.

The approach to international English in this study more closely resembles that of Seidlhofer (2002, 8), who also refutes Peters' idea that international English should be considered a certain variety of English. Instead, she sees International English as a shorthand for "English as an international language" (EIL), which describes the status of English in cross-cultural communication. For Seidlhofer (2002, 8–9), international English includes speakers from every circle in Kachru's three circles model, not just learners of English, but native speakers and speakers of so-called New Englishes or World Englishes:

> Wherever English is chosen as the preferred option for cross-cultural communication, it can be referred to as EIL.

However, the term international English is preferred in this study over EIL because it is shorter and simple to grasp. Nevertheless, Seidlhofer's definition is vital in how international English is discussed in the context of this study: international English is not seen as a certain (artificial) variety of English, instead it is understood as all the varieties of English existing in the world and all the ways it is used in communication (written or oral) between people. Trying to establish a fixed variety of international English seems difficult, and even pointless, but we can think of international English as a variety which, although does not have a fixed form, strives for international recognition in the context which it is used. Consequentially, the term international English would then incorporate under its umbrella all of the concepts discussed in reference to the English language used in multicultural settings, such as Global English, English as a lingua franca, English for international audiences, etc.

While English is used around the world in all its variety, it is impossible to determine just one set of grammar and vocabulary that works for everyone. But if we cannot establish a fixed form of international English that can be used in technical communication, there must still be something we can do to help technical writers make informed decisions about the language they should use. Different kinds of artificial languages, such as Basic English (Flesch 1944), have been proposed as solutions for the problem posed by international audiences and effective communication. Also, in the aerospace industry, Simplified Technical English (abbreviated as STE) was developed to bring the official use of technical English under tight control with standards and guidelines. STE has later modelled for similar guidelines in other technical industries (ASD 2010, i). Even though no *one* standard can really represent all English used in every field of technical communication, many technical writers still promote some kind of "'controlled' form of English" (Huckin and Olsen 1991, 64, quotation marks in original), which

would reduce the use of overly long sentences, difficult verb forms and idiomatic, culture-related expressions often present in texts written for native audiences (ibid.).

The writers who were interviewed for the research for INTECOM's (2003, 2) guidelines, however, made it clear that although they needed help in making decisions about language, they did not need fixed standards, only guidelines. Marnell (2004, 2–3) also emphasises the writer's responsibility in the technical communication process, and sees a thorough audience analysis as the most effective method in determining what kind of language is best to use in a technical document. "Few technical writers ever need to write for a worldwide audience", he states, and concludes that more likely the audience is comprised of speakers from a limited number of English variants, which can be mapped and analysed (ibid.).

As mentioned in Chapter 1, however, what Marnell (2004, 2) describes as an "uncommon scenario" is exactly the scenario of the ASC assembly manual, whose audience could not be determined in terms of English variant or even their English proficiency. It is important that technical writers can make individual decisions, based on their professional expertise, but that is not enough. In the context of this study it has become evident that in technical communication some special attention must be paid to a culturally heterogeneous audience with speakers of several native languages. As there is not only one way to write formal, grammatically correct English, it is beneficial to establish some guidelines for international English in technical communication that would help writers produce a high-quality document, which is the topic of our next chapter.

3. Principles of high-quality technical communication

In trying to determine how to achieve high quality technical communication in English for international audiences, we have discussed the complexity of defining international English, and the significance of carefully considering the variety of English used by a technical writer. Next, the study will focus on the second half of the research question – the quality aspect. To be able to answer what good quality is in technical communication we need to define what we mean by "quality" and examine how it is viewed in the field.

This chapter will also examine a number of quality principles that contribute to the quality of technical documents written in international English. The quality principles are presented in a form of a heuristic list, a method originally developed within usability research and made well-known by Nielsen and Molich (1990). Establishing guidelines for the quality of technical communication in international English will support the reflexive, autoethnographical analysis of the data and the evaluation of the ASC assembly manual. The list of quality heuristics can also be used as a tool for evaluating the quality of other technical manuals written in English for international audiences.

3.1 Quality in technical communication

Technical communication is an integral part of any business and manufacturing field, since technical documents are seen as a crucial part of the product (ISO/IEC 1995, 1). However, not all companies have necessarily established such strategies and policies that would ensure consistent quality in company documentation.

To provide solutions to the varying quality in the field, the principles of good, clear and professional technical communication are dealt with in a number of guidebooks (see for example

Estrin and Elliot 1990, Kohl 2008, Markel 2012), which usually have a more practical rather than an academic approach, giving step-by-step advice for writing technical documents. But even though most of the guidebooks are very practically oriented, they still incorporate a vast number of researched information about quality in technical communication. They each have differing approaches, however, to the international aspect of technical communication in English. Many are either explicitly or implicitly meant for native speakers of English, and writing for non-native speakers is dealt with briefly in a chapter or two (see e.g. Markel 2012). Others, such as Kohl (2008), have an intentionally international approach, but still see international English more as an intermediate step to better translation quality, rather than the primary goal when writing for global audiences. This study hopes to contribute to the discussion of quality in technical communication especially from the perspective of international English, written for global audiences.

The term quality in this study refers to the "standard of something as measured against other things of a similar kind; the degree of excellence of something" (Oxford Dictionaries 2014a). Quality as an outcome is quite subjective: Kastberg (2008, 2–3) points out that quality in technical communication, as in other fields, depends on interpretation. Quality is "a contingent concept" and there is never only one way for measuring it. According to Kastberg (ibid.), quality in technical communication has three different dimensions, which are presented below.

The *individual* dimension of quality depends on personal preferences of the people involved, but not necessarily only those of the writer. The personal tastes of the supervisors, the commissioner of the document or colleagues in the same project group might force the technical writers to make concessions, even though they might be the most professionally qualified people on giving judgement about the quality of the document. The individual dimension, therefore, is

dependent on the power relations of the parties involved and how those relations are enforced during the writing project. It extends to all aspects of technical communication, such as visual outcome and presentation of information, but only to the extent in which they are not controlled by company policy, industry standards, or the law.

The *situational* dimension contains the idea of "appropriateness" of the document and how it presents information to the intended audience. As indicated by its name, this dimension of quality is linked to the specific situation and surroundings of the document in question – that is, where it used and who uses it. For example, as Kastberg (2008, 3) explains it, using plain English when explaining legal matters to lay audiences might be considered good quality, but expert audiences are likely to perceive as "patronizing" (in Kastberg's words), or at least unprofessional. Including the situational dimension of quality in technical communication and making sure that the audience receives information in a way that is specifically designed for them, therefore, requires that the writer analyses the audience and the context where the document is used. To give another example befitting this study, the assembly personnel of the ASC would not be pleased with a 1,000-page, small-print stack of papers for an assembly manual, as they need instructions that can be used on the site in difficult outdoor conditions. That is why the length of a single task in the assembly manual was limited to no more than one page, since all of the information concerning one task needed to be visible at one look, without having to flip through pages.

The *functional* dimension of document quality is linked to the document's purpose and, in a broad sense, its usability. According to the Finnish Technical Communications Society (STVY 2014), the function of a technical document is "to provide users with information that supports the effective use of the product or service in question". Mike Markel (2012, 3) says that

technical documents "help people learn, carry out tasks, and make decisions". *Usability* refers to the ease of using a product or service to achieve one's goals, without hindrances or frustration (Rubin and Chisnell 2008, 4), in other words, usability in technical communication can be defined as the ease in which the document is used in its intended function. The functional dimension of quality, therefore, measures aspects of the document's usability.

3.2 Evaluating quality

The quality of technical documents can be evaluated in a number of ways. Huckin and Olsen (1991, 128) say that any kind of instructional text can, and should, be tested by actual users. This kind of testing is called usability testing, where the users can be observed in a realistic (although controlled) setting. However, the quality of a technical document can be evaluated by experts and professionals long before the document reaches its first (test) user. Even though they lack the valued element of user feedback, expert evaluations have the advantage of being fast, efficient, and easy because they require very little preliminary arrangements and can even be done in the course of one day (Korvenranta 2005, 111).

A very common and simple tool for expert evaluation is a list of usability principles, or *heuristics*. The most well-known set of heuristics was developed by Nielsen and Morlich (1990), who created a set of ten rules for evaluating the usability of computer interfaces, which Nielsen (1993) later modified and developed further. Many usability experts have used what is now called the "Nielsen's list" to create their own list of usability heuristics, either by adding and modifying, or creating a whole new list based on the original model (Korvenranta 2005, 116). Purho (2000) has developed Nielsen's list of usability heuristics to be applied to evaluating technical manuals. As Nielsen's list is used to evaluate mainly computer interfaces, Purho's list

is more suitable for non-interactive technical documents similar to the ASC assembly manual, but it still lacks the international perspective required for this study.

In this study, heuristic evaluation is used as an analytical tool for examining quality in technical communication in English for international audiences. I will use Nielsen's and Purho's usability principles as a starting point and integrate them into the quality issues discussed in technical communication literature. However, as these lists specifically focus on usability, the discussion is broadened to cover more generally the quality of technical documents. Also, writing specifically for an international audience is discussed in Nielsen's and Purho's heuristics to a very limited extent, whereas the purpose of this study is to bring the international aspect of technical communication in English to the focus. My purpose is to create a list of *quality heuristics* that is directly applicable to writing for international audiences and takes its unique aspects into consideration.

Heuristic evaluation has specific advantages for evaluating the quality of technical documents. First, if the document is modelled against an already existing heuristic checklist, the evaluation requires very little additional resources. Second, the list establishes a set of unifying standards to which all documentation within the company is able to aspire. Third, the writer can easily refer to the list in any stage of the document's life-cycle and adjust the document accordingly.

Heuristic evaluation is also suitable for the ASC assembly manual project, which is done for the company's internal use and therefore is not modelled against the same quality principles that have been established for the ASC user manuals and other documentation meant for external parties. Frankly, no such quality principles in the company's internal communication existed at the time of writing, at least to the extent that they would have been clearly visible to employees

and enforced by management. The heuristic principles established in this study could therefore be useful in creating some quality guidelines for the company's internal technical communication overall.

3.3 Quality heuristics for international English

By combining Nielsen's (1993) and Purho's (2000) heuristic checklists to the documentation guidelines in technical communication guidebooks from Estrin and Elliot (1990), Huckin and Olsen (1991), Kohl (2008), and Markel (2012), I have created a new list of heuristic principles for evaluating the quality of technical documents written in international English. Instead of painstakingly listing all of the sources' views on document quality individually, I will examine the source information from six different aspects in the following subsections. Each subsection contains the discussion of quality principles presented in the sources from that particular perspective. I believe that, when combined, the careful evaluation of all the aspects makes it possible to produce a high-quality technical document especially designed for an international audience.

The quality of technical documents for international audiences is examined from six different quality aspects: (1) presenting information, (2) task orientation, (3) terminology and language, (4) clarity of text, (5) error prevention and mitigation, and (6) professional appearance. The list of quality heuristics presented in this study repeats many of the core ideas of quality in technical communication and, therefore, can be used to evaluate any kind of technical document, but it differs from previous heuristics lists in that it has been especially designed for technical manuals written for international audiences. The "old" quality guidelines can be viewed from a new, international perspective, which discusses specifically how quality is seen in technical communication for international audiences.

The list can be used a guideline when the writing process is planned, but it can also be used as a list of heuristics examining the document that has already been written. In the following, I will introduce discussion related to each quality aspect separately and present my reasons why each particular aspect is included in the list of quality heuristics for international English.

3.3.1 Presenting information

The presentation of information is in a large role in Markel's "measures of excellence" (2012, 12–16) in technical communication. A technical document passes on valuable information to users, and helps them to perform tasks, so the treatment and representation of information must be done in a certain way to make sure the document performs its function. Markel (2012, 12) underlines the importance of a technical document's role in helping to perform a task in the safest and most efficient way possible. The technical writer, therefore, carries a responsibility that he or she does not contribute to errors by writing unclear, inaccurate text that causes people to make uninformed choices. *Honesty* and *accuracy* play an important role in the ethics of technical communication (see e.g. Allen and Voss 1997, 61). Without them, the writer or (more likely) the company which has commissioned the document may be held accountable for possible accidents whose consequences can be dangerous or expensive. Furthermore, for Huckin and Olsen (1991, 488) accuracy is also "a fair treatment in referring to groups of people", so it entails avoiding sexism and, by extension, avoiding the discrimination of groups such as racial or sexual minorities.

For many people it would seem rather obvious that information presented in a technical document should be truthful and accurate. However, problems may rise unexpectedly if the writer does not keep in mind the ultimate function of his or her document and, for example, lets

the outcome be dictated too much by other parties, such as the marketing department. Moreover, problems with accuracy may rise from having insufficient source information or inadequate use of it by the writer. Allen and Voss (1997, 71–79) point out that lack of honesty is not merely outward lying, but it can also be in the form of deliberate vagueness, false generalisations, statistics and graphics that are misleadingly interpreted, and so on.

In addition to ethical concerns, the information included in a technical document must be presented with consideration to the audience's needs. A technical writer works to create an interface between the user and the product, so all information enclosed in a technical manual must be there based on the writer's perception of what the audience wants or needs to know (Huckin and Olsen 1991, 56). First, the information needs to be *comprehensive*, which means that the reader is able to gain all of the required information in the document presented in sufficient detail. So, if a document's function is to instruct the reader in a certain task, the reader should be able to successfully perform the task using the documentation, without any additional sources. (Markel 2012, 13–14.)

Second, the information must be *significant* for the readers, which requires it to be edited to contain only that which is relevant to the audience. For example, a technical manual might be produced by the same engineers who developed the product to which it refers. Those engineers, who spent so many working hours honing their product, might feel inclined to present all of its various and interesting features, without really considering whether the user finds the information relevant or useful, which means that the reader will be burdened with information he or she does not need. (Estrin and Elliot 1990, 15–16.)

Third, the information must be *accessible*, which means that all of the necessary information must be easily found by the reader, preferably in a logical order (Purho 2000). Logic

implies certain *intuitiveness*, that is, content is presented in a way that is easily understandable to the reader, perhaps through earlier experiences (Huckin and Olsen 1991, 17). The concept of *sequential iconicity* is also important in this context, as it refers to how tasks are presented in the text in the exact order in which they should be performed (Marcus and Calude 2010, 24).

It is difficult to comprehensively determine such heavily value-laden concepts as "significant" or "logical", and the task becomes even more difficult when examined from an international perspective. Depending on their culture, people might have different expectations about what a technical document should entail and what is considered significant. As discussed by Suojanen et al. (2015), intuitiveness (and other similar concepts) stems from culturally familiar systems that determine what we think of as, on one hand, familiar and usable and, on the other hand, counterintuitive and therefore defective.

3.3.2 Task orientation

According to Purho (2000), task orientation is one of the important quality principles in instructional texts. The text must be focused on the user's task as *independent* from tools and processes as possible, since the tools and processes for performing a certain task may vary according to the user. The difference in how a task is performed is highlighted when we think of international audiences, since culturally different work environments are more likely to differ in work habits. To give an example, the cost of human labour has a huge impact on how tasks are structured in different countries. In China, the cost of labour is relatively cheap, whereas in Finland it is much higher and it is therefore quite understandable that many tasks which would be automated in Finland are done by hand in China.

Task orientation also makes the document more easily *adaptable* to changes in the actual product (Purho 2000). Design updates may change the physical appearance or location of certain

components, but not necessarily how they are used or installed. It should be noted, however, that the document may still help the user identify the preferred or required tools and processes to be used in performing the task. However, the focus of the manual should always be in the task itself.

3.3.3 Terminology and language

As discussed previously in Chapter 2 of this study, the choice of a language variety is an important question that must be addressed when writing in English for a global, heterogeneous audience. Whereas this study has argued against the use of any artificial "international variety of English", it is still important to choose *some* form or variety that the writer feels is close to the reader's previous experiences. Nielsen (1993, 20) mentions *intuitiveness*, a term already discussed in the context of presenting information (see section 3.3.1), also as a major component in the language used in technical communication. The terms and concepts used in the text must "speak the user's language" (Nielsen 1993, 20), which means that they must be as familiar as possible to the user's existing knowledge. Purho (2000) mentions the same principle, but calls it "a match between the document and the real world".

Markel (2010, 101) says that when one writes for readers from other cultures one should avoid jargon, idioms, and slang. Indeed, idiomatic expressions and slang can be very culture-specific, and in addition to being incomprehensible to some non-native speakers, their use might even alienate native speakers who are unfamiliar with the forms. Jargon, on the other hand, is linked to professional rather than natural culture, and in some cases jargon might even be seen as the "user's language" advocated by Nielsen. The issue of its use in a technical document in a specific professional environment might, therefore, be slightly more complicated.

According to Purho (2000), in addition to "the real world", the document must also "match the product", with consistency in terminology used both by the product developers and

the technical writers. Purho acknowledges the contradiction which can occur if the product already contains awkward terminology, and the technical writer is forced to balance between being faithful to the original developers' terminology ("the product") and, at the same time, writing more clearly from the user's perspective ("the real world"). For example, the audience of the ASC assembly manual consisted largely of assembly personnel whose knowledge and experience of assembling the cranes was "at the grassroots-level", that is, very practically oriented, and who also provided me with a great deal of terminology used in the manual. A contradiction rose when I discovered that several tools, procedures and assembly parts were known with one name in the everyday language of the site operations, and with another in the technical drawings written by product designers, which I also used as a source. As a technical writer, I found myself often torn between these two sources of information, the other representing the users' existing knowledge, and the other representing the company's official line of information.

In order to prevent such a contradiction from occurring, it is beneficial for a company to establish a unified terminology through a terminology project. An established and accepted terminology would reduce technical writers' workload and ensure the consistency of terminology within the company's technical communication (Perälä, 2014, 15).

If the writer is in any doubt whether the reader might be unsure of the terms or abbreviations used in a technical manual, they always need to be defined in the document (Estrin and Elliot 1990, 15–16; Markel 2010, 101). One of the most important requirements mentioned time and again in the sources is *consistency*: the reader should not have to guess whether two words mean the same thing, so every noun and verb should only have one meaning. Same terms must be used throughout the text, even if it might cause some unnecessary repetition (Purho

2000). Huckin and Olsen (1991, 494) also remind the writer to use *familiar* vocabulary and avoid expressions that he or she has not used previously. If a writer uses an unfamiliar expression there is a chance it is not used correctly, and it also increases the risk of using a word that is equally unfamiliar to the audience.

The importance of good language and grammar are often emphasised in guidebooks for good technical communication. Furthermore, they also give plentiful and detailed guidance on how to pay attention to certain aspects of grammar. A professional writer should naturally be able to produce text that is grammatically correct, but also non-professionals who nevertheless write technical communication as part of their work should consider the implications of poor, perhaps hastily produced, language. Incorrect grammar may decrease understanding of the text, and mistakes make the document subject to interpretation. Furthermore, poorly written text might even reduce the reader's trust in the information presented, as well as in the writer's professionalism. (Markel 2010, 14.)

Writing in English for an international audience brings another dimension into writing with good grammar. If the writer really wants to make sure he or she is communicating effectively with the audience, he or she will have to consider the audience's proficiency in English and make sure that his or her understanding of the language use and mechanics are the same as the audience's. A common example of possible differences in understanding the mechanics of English is the use of the double negative, which usually is interpreted as a positive statement, since the two negatives cancel each other out (e.g. "not uncommon" would mean "common"). However, in some languages a double negative can instead mean a really strong, emphasised negative statement, an interpretation which also might be affect the reader's understanding of English, if he or she is unaware of the difference. (Oxford Dictionaries 2014b).

Huckin and Olsen (1990, 494) urge the writer to consider whether he or she has used the appropriate tone and word choice in order for the audience to better relate to the message. Basically, it means the writer needs to select an appropriate level of *formality*. The level of formality depends on the context, i.e. audience, subject, and purpose of the document in question, but usually technical communication requires a moderately formal or highly formal style (Markel 2012, 240). Even though the technical writer might write for his or her close colleagues, the informal style is usually not appropriate, and its lacks become more evident as it is examined from an international perspective. Informal English often includes colloquialisms, clichés, euphemisms and other culturally marked content, as exemplified in Markel (2012, 240):

> The Acorn 560 is a real screamer. With 3.8GHz of pure computing power, it slashes through even the thickest spreadsheets before you can say 2 + 2 = 4.

The above sentence is likely to make little sense to a reader who not only is unfamiliar with many of the colourful expressions used but also might lack the language proficiency or cultural knowledge to ever be able to decipher their meaning. The formality of language used in a technical document is closely linked to its situational dimension of quality, which was discussed in section 3.1.

For the sake of conciseness, Estrin and Elliot (1990, 23) advise writers to generally avoid excessive formality in the form of fancy words, which writers sometimes add in the hope of giving more authority to the text but in reality are just "stuffy and stilted bureaucratic jargon". They mention the suffix *–ion*, which "[adds] length to your words but [adds] nothing to the meaning of your ideas". Examples of *–ion*-words would be *altercation* (to be replaced by *dispute*), and *admonition* (replaced by *warning*) (ibid.). As a highly informal style is problematic for international audiences, a highly formal, flourished style also causes readers, even native English speakers, to struggle with making sense of the information presented.

3.3.4 Clarity of text

Clarity of text (also sometimes referred to as readability) has been discussed extensively in technical communication, especially in relation to the increasing need for communication in English for non-native speakers (for example, see Huckin and Olsen 1991, Kohl 2008). Huckin and Olsen (1991, 406) remind us that clarity is not only linked to the user's basic psychological mechanisms, but also to culturally dictated norms. With the increasing proportion of international audiences in technical communication it has become clear that the sentences in a technical document need not only to be grammatically correct, but also *simple* and *concise*. In order to achieve simplicity, books on technical communication provide plenty of instructions on which constructions are preferred and which ones should be avoided. For example, the *–ing*-construction is usually seen as a problematic form because it can fill many different grammatical roles and, therefore, be confusing to non-native and even native readers (Kohl 2008, 134). STE (ASD 2010, 1-3-2) recommends avoiding the *–ing*-form altogether.

Sentences should also be *brief* and well written for the benefit of the readers, who must be able to find the information they need and make use of it quickly and efficiently, or as Nielsen (1993, 20) formulates it, a writer should try to "minimize the user's memory load". Long, complex sentences make it more difficult for the readers to ascertain the main point of the sentence, and may force them to read the same part of text multiple times to understand what the writer has tried to say. Estrin and Elliot (1990, 15–16) assert that "[t]he more complex the information, the shorter [the] sentences should be".

When reading task instructions or other technical information, the user should not have to doubt who is intended to perform a task or who is responsible for the outcome, which can happen if the passive voice is used. For example, a sentence "the 'Start' switch should be turned on" can

have at least three meanings, depending on how the reader interprets it: (1) the user must now turn on the switch, (2) the user should have turned on the switch before the current task, or (3) performing the previous task correctly should have made the switch to turn to an 'on' position. To avoid creating these multiple meanings in instructional texts, the instructions should address the user directly (*direct address*), with *active voice* (Purho 2000). For example, the sentence "Turn on the 'Start' switch" addresses the user directly and makes it clear who should perform the task and when.

Estrin and Elliot (1990, 15–16) also mention *coherence* as a crucial part of clarity of text. In practice, coherence is best achieved by adverbial conjunctions and other elements that link the sentences together and make references between them. Some writers might feel tempted to eliminate parts of the text that are optional in some contexts – such as function words and punctuation marks – especially if there is limited space for the text. When writing international English, however, these optional "syntactic cues" should be left in the text to make it more readable (Kohl 2008, 13). For example, in the sentence "make sure that there are no visible marks in the cable", the word *that* is an optional element, and its elimination would not make the sentence ungrammatical. These syntactic cues nevertheless make the text more readable for people who may have limited knowledge of English.

3.3.5 Error prevention and mitigation

It is important to review a technical document from an error mitigation perspective. The writer or person who is evaluating the quality of a document needs to ask: "In this manual, how is the user prevented from making mistakes? If the user nevertheless makes mistakes, how can the consequences be mitigated?" When writing international English it is important to remember that

readers' language proficiency might prevent them from understanding parts of the text that have a direct consequence on their health and safety.

When an instructional, technical document deals with equipment such as heavy machinery or electric devices, it is clear that some of the most severe user errors might be dangerous, even fatal. The *risks* involved in these dangerous tasks need to be mapped, and the writer must make sure that any appropriate *warnings*, notifications and instructions are included in the document to alert the user. In the case of user errors, the reader should be provided with clear instructions on how to deal with the situation and where he or she might receive *additional information* (ISO/IEC 1995, 1). Usually the use of safety icons or labels with distinct colours is recommended for communicating about hazards (Ruohonen 2011, 40), but it is worth noting that not all icons are necessarily interpreted similarly everywhere, and not all colours have similar cultural connotations. For example according to my experience in China, the colour red is generally associated with good things and is commonly used in places like traffic lights and bathroom doors to denote "access" or "vacancy", which is the total opposite of how the colour is used in the Western world. It is therefore crucial that a writer is aware of these cultural differences and will take them into account in his or her document.

Luckily, to address this problem of cultural differences of interpretation, international standards have been established for warnings and notifications (see e.g. ISO 2004). Also, during my job at Kalmar Australia I gained much insight into the health and safety practices of one of the most tightly regulated countries in the world in terms of occupational safety issues. A high-quality document, therefore, is one that adheres to existing *international standards*, as well as *local laws*. It is, of course, hard to determine what is meant by "local" in the context of international audiences, but some sort of minimum requirements should be put in place that

represent the official company line. The writer is nevertheless required to possess some knowledge about the regulations in the country for which the documentation is officially produced.

Nielsen (1993, 20) also talks about error prevention in the context of computer interfaces, where it is important that the interface provides *feedback* and ways for the user to undo any mistakes that have already occurred. In a non-interactive document, the feedback is provided by including reports of what the user should be experiencing in certain stages of performing a task, and also by sufficient *metatext*, or as Estrin and Elliot (1990, 15–16) say, closure. Metatext is included to keep the reader informed about what he or she is reading. This includes stating the purpose of the document, and summarizing the main points. Purho (2000) discusses the same principle and calls it "help on using documentation".

3.3.6 Professional appearance

Markel (2010, 14) emphasises the importance of a technical document's professional appearance. Different writers, as well as different audiences, may have different aesthetical opinions – which give the document its individual dimension of quality – but it is nevertheless necessary to use a *unifying format* and *layout* with other documentation of the same company. The documentation needs also to *match the product* – not only in terminology, as discussed earlier, but also in appearance: this might include logos, colours, font, tone of words used in the text, and so on. (Purho 2000.)

Professional appearance is also linked to effective information design discussed in section 3.3.1. Ideally, the way in which information is visually presented in the document would enable the user to skim through the text and easily find the required information, as well as distinguish between different *information types* (Estrin and Elliot 1990, 69). This would be

achieved by headings and visual aids such as icons, fonts and formatting (Ruohonen 2011, 38), although, as discussed in section 3.3.5, using visual aids when writing for international audiences might be problematic due to cultural differences.

Purho (2000) discusses the importance of creating documentation that is purposeful – that is, the users' circumstances are considered to decide which format is the best for their needs. For example, a user who needs a step-by-step guide on how to install a large electrical component probably appreciates a laminated card more than a computer spreadsheet. This coincides with the idea of situational dimension of quality (Kastberg 2008, 2) discussed in section 3.1.

3.3.7 Summary of document quality

The different aspects regarding the quality of technical documents presented above can be used as a checklist for quality evaluation. Table 1 below summarises the quality aspects discussed in this chapter.

Table 1. Summary of quality heuristics.

Quality heuristic	**Keywords**
(1) presenting information	honesty, accuracy, comprehensiveness, significance, accessibility, iconicity
(2) task orientation	independence, adaptability
(3) terminology and language	consistency, intuitiveness, user-oriented, familiarity, formality, grammar
(4) clarity of text	simplicity, conciseness, coherence, brevity, direct address, active voice, single meaning
(5) error prevention and mitigation	warnings and notifications, risk-mapping, metatext, feedback, standards and laws
(6) professional appearance	layout, match with the product, information types, format

By itself, the list of heuristics on the left column is not particularly informative; for example, the contents of "presenting information" cannot merely be inferred from the title, unless one is aware

of the discussion around the concept. That is why the table lists keywords in relation to every quality heuristic, which makes it easier to recall the contents of the discussion.

As a summary, a high-quality technical document for international audiences is one where the information is presented truthfully and accurately, and where the instructions are task-oriented. It conforms to English grammar and syntax, but with special consideration for audiences that may not have the full command of English and its finer forms. The document takes into account the different standards and conventions in different cultures, and also recognises the importance (as well as the challenges) of visual presentation. The importance of analysing the audience and its needs is stressed in every aspect of its writing.

Having established a list of quality heuristics for international documents, this study will use it to evaluate the outcome of the ASC assembly manual and draw some conclusions about its quality.

4. Methods and data

This study uses two methods in the analysis of the data. Autoethnography is used as the primary method for the description of the ASC assembly manual project and evaluation of its success. Additionally, this study uses heuristic evaluation for examining the quality of the final product. The methods and data are presented in this chapter.

4.1 Autoethnography

Autoethnography is a qualitative method of research which draws from the researcher's personal experience and observation. It is a fairly recent method developed from traditional ethnography, a research method in social sciences where the researcher explores an "exotic" culture or group as an outsider, seeking to understand the culture and eventually gain acceptance and become the insider. Autoethnography studies a phenomenon in the researcher's own life, mainly his or her cultural sphere or lived experience, and therefore the researcher provides the main data. As in more traditional ethnography, the autoethnographer also observes and explores but does not need to gain acceptance because he or she already is an insider, "the context is his or her own". (Duncan 2004, 30.)

Autoethnographical accounts are often personal narratives about one's life, experiences and feelings in the researcher's own cultural sphere. Autoethnographical narratives are perhaps induced by changes or turmoil in those cultural spheres, leading the writers to question their identities and the cultures which have shaped their personae. For example, Hamdan's (2012) autoethnographical study about education is influenced by her moving from Saudi-Arabia to Canada and being able to compare and reflect upon differences in the educational systems in both countries. Sparkes (1996) uses the method for telling a personal story about his changing

body image after a debilitating sports injury to create a context for discussion in physical education pedagogy. By using their own experiences as starting points, the writers have created new angles for scientific discourse, emphasizing the subjective experiences and interpretations of the people who are part of micro-level phenomena.

As autoethnography emphasises personal voice, the most important practice in autoethnographical study is, therefore, participant observation (Duncan 2004, 31). However, an autoethnography goes further than merely using the researcher's personal context as data. Additionally, in order to truly be distinguished as an autoethnography, the study also needs to include the researcher's personal voice, self-observation and reflexive investigation (Anderson 2006, 378; Wall 2006, 148). Furthermore, according to Anderson (2006, 378) autoethnography must clearly place the researcher in relation with the object of study and provide a larger theoretical context.

The autoethnographical approach used in this study closely resembles the analytical autoethnography introduced by Anderson (2006), which seeks to combine the analytical approach of earlier ethnographers and reflexivity with using one's own context as data. The study can also be described as a *layered account*, a term described by Ellis et al. (2011, chapter 4.1, quotation marks in original):

> Layered accounts often focus on the author's experience alongside data, abstract analysis, and relevant literature. This form emphasizes the procedural nature of research. Similar to grounded theory, layered accounts illustrate how "data collection and analysis proceed simultaneously" … and frame existing research as a "source of questions and comparisons" rather than a "measure of truth" ... But unlike grounded theory, layered accounts use vignettes, reflexivity, multiple voices, and introspection … to "invoke" readers to enter into the "emergent experience" of doing and writing research..., conceive of identity as an "emergent process"…, and consider evocative, concrete texts to be as important as abstract analyses.

Ellis and Bochner (1996) are arguably the leading advocates for autoethnography, having published extensively on the subject and taught many years in the University of South Florida. Their approach is perhaps one of those that Kajakina-Lappalainen (2012, 19-20) calls experimental, in the sense that they have knowingly set out to test the boundaries between academic discourse and artistic expression. For Ellis and Bochner (2006, 439), the most important function of autoethnography is to evoke emotional responses in the reader, to make people want to "make a difference in the world". Ellis and Bochner define autoethnography in a way which challenges traditional virtues of qualitative research – such as objectivity, credibility, dependability, and trustworthiness of data – and proposes new ones: reflexivity, aesthetic merit, emotional or intellectual impact, ethical practice, expressing reality etc. (Holt 2003, 22; Ellis and Bochner 2006.) Unfortunately, their definition of autoethnography also seems to limit its use to social sciences (Ellis et al. 2011, chapter 4.1).

In the light of this information, it is probably not surprising that autoethnography as a research method is controversial and has received a great deal of criticism. As expressed by Holt (2003), some criticism of autoethnographical studies has focused mainly on the legitimacy of autoethnography as a method rather than improving the quality of the particular autoethnographical works in question. This is because the scientific community still does not agree on the legitimacy of using autoethnography as a method. Similarly to perhaps an ethnographer struggling to gain full acceptance of the community he or she tries to explore, autoethnography still seems to hover in the outskirts of the scientific community, hoping to be regarded as one of the legitimate methods despite its outward differences.

There are many academics, however, who recognise the potential in autoethnography and want to expand its use beyond social sciences. Autoethnography can also be brought closer to

other scientific methods, without emphasizing its artistic dimensions. Wall (2006, 156–157) considers an accomplished autoethnographical work something that finds a comfortable balance between academic tradition and personal expression. Wall places the increasing interest in autoethnography in the context of the rise of postmodernist philosophy, which questions the entire concept of objectivity in science. She echoes Neuman's claim that a "researcher can do no more than describe his or her personal experiences" (Neuman, quoted in Wall 2006, 147). According to a postmodernist view, even in the most careful, objectively quantitative study the researcher draws from his or her own experience and prejudice in producing an interpretation which is just one of many that can be used to describe the numerical findings (ibid.).

Subjectivity has also been discussed in the context of technical communication. Estrin and Elliot (1990, 11) say that early technical communication theorists have assumed that technical communication should always be objective. However, the subjectivity of the technical writer was later acknowledged as a natural part of the academic process: "The choice of a statistical method or the interpretation of its complex result, for instance, both involve the subjective judgment of the scientist" (ibid.). I agree with Estrin and Elliot in their conclusion that instead of letting one's biases to dictate the treatment of information, a technical writer must be aware of them and nevertheless present a balanced view.

The autoethnographical work in technical communication has already been initiated by Kajakina-Lappalainen (2012) in her Master's thesis, where she examines an individual instance of writing a technical manual and, I think, quite successfully balances academic and personal expression. Kajakina-Lappalainen (2012, 59–60) sees that the autoethnographical approach is well suited to her project, and she thinks that the way in which autoethnography as a method provides enough freedom for the researcher to draw from his or her personal experiences and

competencies is also a way to deeper understanding and improvement of practical work in technical communication.

Autoethnography has an excellent capacity to incorporate practical, micro-level phenomena into academic discourse. It gives to scientific discussion an important point of view that attaches vitality and reality to numbers. Autoethnography can be used as a successful method in technical communication to bring individual case studies into the sphere of scientific discourse. By case studies I mean personal accounts of unique projects which have the potential to benefit from being scrutinised in the academic context. In technical communication, I see a possibility for an entire body of autoethnographical studies which would give detailed descriptions of individual writing projects. By combining scientific theory and data to in-depth qualitative analysis of individual technical communication projects, produced by the writers themselves, autoethnography has the capacity to produce insight into technical communication processes, different aspects of writing projects, and the competence of technical writers.

This study discusses a particular technical communication project from my personal perspective as its writer. My personal voice is included in the form of a diary, which recounts my experiences of writing the manual. The data is examined and discussed reflexively but also referring to the theoretical framework established in the previous chapters. This study is not meant to be "evocative" in the sense that I expect people to feel compelled to change the world after reading it, but I hope, by sharing a personal experience, to discuss the changing field of technical communication in the face of the global economy, and to shed light on technical communication projects as complex processes that also depend on the subjective experiences of the people involved.

4.2 Heuristic evaluation

As discussed in section 3.3, heuristic evaluation is a form of expert evaluation, which can be used to examine the quality of technical documents. In this study, I have discussed the principles of quality in technical communication and formed a list of quality heuristics for technical documents written in international English, based on that discussion. In order to find out how the quality of technical documents is affected by the international nature of the writing project, this study uses the list of quality heuristics as a tool to evaluate the quality of the ASC assembly manual.

4.3 The data

The data examined in this study consists mainly of the diary which was kept during the project of writing the ASC assembly manual, as well as interviews and observations made during the process. The data has emerged from the researcher's context and presents my personal observations and thoughts of the writing process. The diary was kept from August 2013 to May 2014, during which time 6,284 words of text were produced in 24 different entries. The diary entries include highly varying contents from meeting minutes to detailed descriptions of the writing process and from the day's work agenda to musings over my competence as a technical writer.

The diary is a personal, reflexive record of the writing process and the problems, and successes, encountered during the period of writing. The diary, as well as observations and interviews provide first-hand information of how the manual project was realised. In addition, it brings to this study the personal voice of the researcher and a basis for reflexive analysis,

according to the autoethnographical method of research advocated by Anderson (2006) and discussed in section 4.1.

5. Analysis

In the theoretical framework, this study has discussed the issue of writing in international English. I have examined the effect of spoken international English, or English as a lingua franca, to written language and language used in the business contexts as well as in technical communication. I have also established six quality heuristics that can be used as a tool for evaluating technical documents written for international audiences. In this chapter, the discussion will focus on the writing process using the diary as data, and I will also evaluate the ASC assembly manual, using the quality heuristics as an evaluative tool. Figure 1 below presents the construction of the analysis:

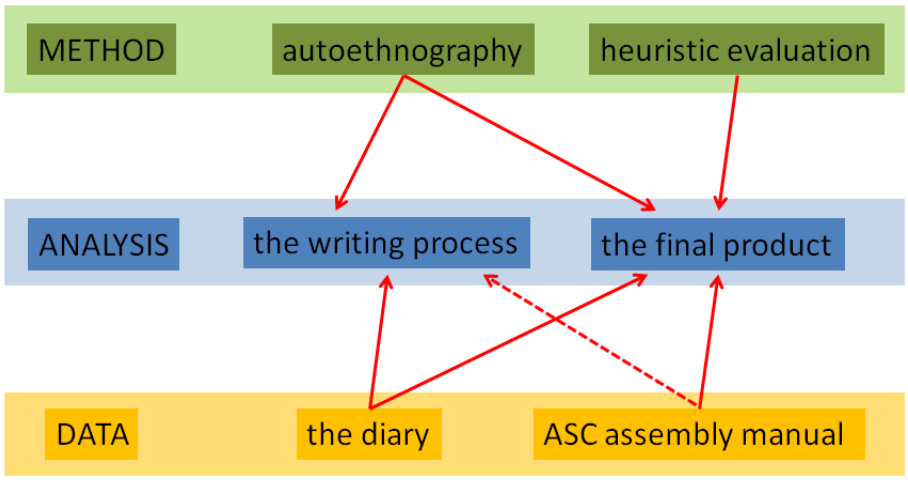

Figure 1. The relationships between method, analysis, and data in this study.

As seen in Figure 1, the study uses two methods for analysing the data: autoethnography and heuristic evaluation, which were discussed in Chapter 4 above. The data used in this study also consists of two parts: the diary that was kept during the ASC assembly manual writing project, as well as the outcome of the project, that is, the manual itself. Furthermore, the analysis is also divided into two parts. The writing process and the final product are analysed separately, using

the autoethnographical method. In the analysis of the writing process, the diary (which also contains records of observations and interviews) is the main source of analysed data. The quality heuristics established in Chapter 3 are used for analysing the final product, along with autoethnographical discussion about the diary data. The ASC assembly manual is in an important role when the analysis focuses on the final product, but its influence on the analysis of the writing process is only secondary, which is why, in Figure 1, their relationship is represented by a dotted line.

It would be interesting to analyse the linear process of writing the ASC assembly manual in a chronological order, focusing on each individual step in turn and, at the same time, show the maturation of the writing project as well as the technical writer along with it. While I think that an autoethnographical analysis – with its reflexive and qualitative approach – would be well suited for examining closely the process of writing a technical manual from start to finish, it is unfortunately beyond the scope of this study, which has a specific focus: the international nature of technical communication, and its effect on the quality of the manual.

As mentioned in section 4.3, the diary data was not particularly cohesive in terms of style and information value, and so it seemed appropriate to start the analysis by examining the contents of the diary and dividing it into important themes. Two particularly prominent themes concerning the manual writing process rose from the diary data: *audience analysis* and *gathering information*. These process-related themes are discussed to the extent in which they are linked to the issues raised by the research question: international English and quality in technical communication.

My initial intention was also to discuss all of the six quality heuristics and compare them to the assembly manual in this study, but the idea was eventually discarded for two reasons:

First, focusing on fewer aspects would allow me to perform a more in-depth qualitative examination of the chosen topic and to analyse it reflexively in more detail. Analysing the document thoroughly from six different angles would make the study unnecessarily long and would include too much work for the scope of one Master's thesis. Second, according to the autoethnographical method it was important that the diary data be included in the analysis, but not all of the topics were supported by diary data. The reflexive nature of autoethnographical research would no doubt give some leeway into discussing all of the quality heuristics, since the outcome was still visible and, as I had lived through the process, most of the issues were still vivid in my mind. However, the method requires autoethnographical data to support my analysis. Two of the most prominent quality-related themes that emerged from the diary excerpts are *terminology and language*, as well as *clarity of text*. They are chosen as the focus of quality analysis, partly because of their prominence in the data, and also because the issues around these topics in the data were closely linked to the issues connected with the international aspect of technical communication.

The discussion is divided, according to the themes, into four sections: (1) audience analysis, (2) gathering information, (3) language and terminology, and (4) clarity of text. Excerpts from the diary are scrutinised to give examples and examine the problems (and successes) relating to them. My editorial notes are sometimes included in the diary excerpts, usually either in an attempt to clarify the text or in order to protect the identity of people involved. The notes are distinguished from original diary entries by square brackets.

5.1 The writing process

I will start the analysis of the manual writing process by introducing it in terms of duration, specifications, and characteristics. The ASC assembly manual was commissioned as an assembly

guide for the assembly team, management, and other personnel who might need an overview of the assembly process. The writing process of the ASC assembly manual as it actually happened can be divided into three stages, all of which are marked by different phases of progress in the manual project and also by a change of my physical surroundings. First was the preliminary phase, when I was introduced to Kalmar Australia and commissioned to write the ASC manual. It included the preparatory work leading up to the start of the assembly process, such as receiving source documentation and familiarising myself with the ASC product.

The second stage was data collection and initial writing phase, which started at the same time as the ASC assembly on the worksite. The primary method of collecting data was observing the works and interviewing the assembly manager, supervisors, and crew. The source documentation that I had received was used only as a secondary and supportive source of information. On a daily basis I would personally go to the assembly site, take photographs and study the work phases in action, make notes and ask specifying questions from the assembly personnel. Afterwards, I would return to my desk at the site office and write the initial version of the work phase instructions using a page template that I had previously created. Next, I would show the initial version to the mechanical assembly supervisor. He would make corrections, which we discussed together and agreed on changes and additions for the second version. One work phase was written on one page, to fit the template, and could be reviewed and revised as a separate entity from the other pages.

The third phase commenced when my employment at Kalmar Australia ended, I relocated back to Finland and, after a brief pause, was employed by Kalmar's parent company Cargotec in the purpose of finishing the ASC assembly manual at the Cargotec main office. At this time, most of the pages had passed the initial writing phase. I no longer was able to observe

the assembly works and did not have direct face-to-face contact with the assembly personnel from whom I had received most of the expert information. The writing process of the third phase included finishing the mechanical assembly instructions and writing the initial and second version instructions for the ASC electrical connections, as well as additional descriptive chapters.

In this section, the writing process is viewed through two themes that rose from the diary data. First, we will discuss the issue of defining and analysing the audience for the ASC assembly manual. The second topic is the effect of ELF to the process of gathering source information for the manual.

5.1.1 Audience analysis

According to Callison and Lamb (2004, 34), audience is the collective recipients of written, spoken or audio-visual communication. Technical communication strives to be user-oriented, which means that technical documents are designed specifically with the audience in mind (STVY 2014), and they should be created to provide the audience with the sufficient information to use the product. *Audience analysis* is gathering and interpreting information about the audience. It involves identifying the recipients and their needs, interests, and expectations (Callison and Lamb, 2004, 34), and Huckin and Olsen (1991, 66) say it is the most important part of a technical communication process. This section discusses the ASC assembly manual project in terms of how the recipients were analysed and how difficulties in defining a specific audience for the assembly manual affected the writing process.

As discussed in Chapter 3, the ability of the technical writer to analyse specific needs and expectations of his or her audience is important in every aspect of the quality of technical documents, especially when the readers consist of a heterogeneous, multicultural audience. As a

process phase, then, audience analysis has crucial implications to the quality of technical communication, as was also seen in the process of writing the ASC assembly manual.

For the ASC assembly manual I had difficulties establishing the audience, not only at the beginning but for a number of months into the manual project, as the following diary passage shows:

> 21 Nov 13: [An HSE project manager] wrote an email asking about Final Assembly Site instructions. When I tried to explain my project to her in an email, I realised that the whole scope of my project is still unclear to me, and I still don't have a clear understanding of the manual's target audience.
>
> This is my problem: If the manual intended as a process description for managers and safety personnel, as they said, why am I then writing a step-by-step detailed assembly instructions? If the manual cannot be used instead of the mechanical drawings, then again why does it have to be so detailed?
>
> I asked [the assembly manager] who he thinks are the target audience. His answer: everyone. Project management, management of works, purchasing department, client, marketing, etc. Well that makes a nice scope. Still I think if it is defined as a process description it would steer towards something less detailed. I should discuss this with [document coordinator] tomorrow.
>
> 22 Nov 13: Meeting, Jenni Vesala and [document coordinator]. Issue: the target audience from the writer's viewpoint. Conclusion: Audience is mainly the assembly team, definitely not the client.

As demonstrated by the above passage, the difficulties in defining the audience were a direct consequence from the fact that different people related to project had different ideas about the contents, and therefore the audience, of the manual. Whenever I asked my sources about the audience and scope, they could not agree on the subject and I was left without a definitive answer:

> 4 Dec 13: A meeting with [the assembly manager] and [an electrical designer], about the contents of the manual. It turned into an hour-long argument about the target audience and contents between the two, and I didn't get any useful information about what I should include in the electrical connections part.

> Afterwards, [the assembly manager] discussed the problems of audience and scope with [the document coordinator] to clear things up and turned out the latter had entirely misunderstood the scope of the manual. Great. The manual is not intended to be specific to this project and highly detailed, as he had thought. Instead it has a more general view, but still gathers and provides useful information about the assembly.
>
> They said that the target audience is everyone, except maybe the customer. It's really not that super important, they said, who the target audience is. I should just write the damn thing.

In hindsight, Markel's (2010, 88) division of audience into three categories would have been of great help to me in determining the audience for the manual. Markel divides the audience of technical communication into primary, secondary, and tertiary audiences, all of which have different expectations for the same document and use it differently. In Figure 2 below, Markel's definition of primary, secondary, and tertiary audiences are included in the broader definition of audience, by which I mean all of the intended readers of the document in question.

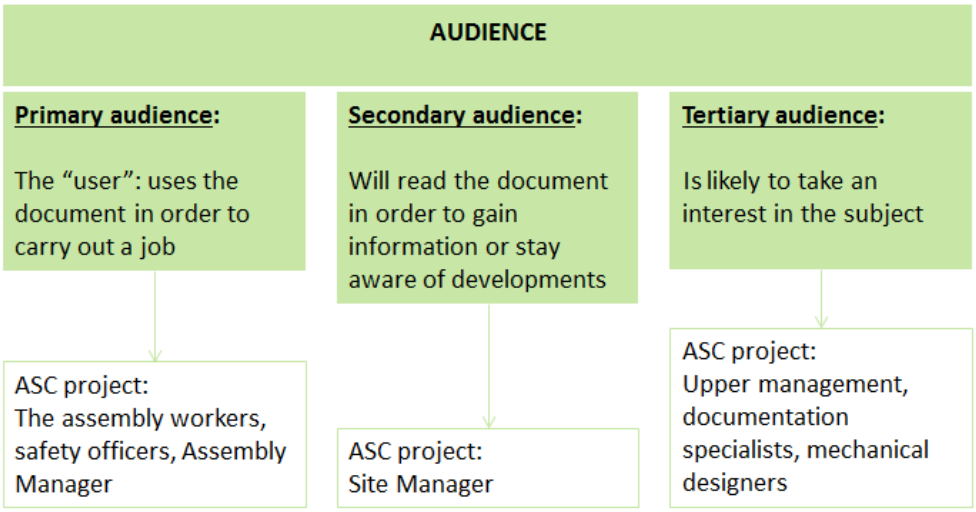

Figure 2. Division of audience into three categories, adapted from Markel (2010, 88).

Markel (ibid.) says that primary audience consists of people who use the document to carry out their job. By definition, then, the primary audience can be classified as the "user", and in the context of the ASC assembly manual the users are the assembly workers, safety officers,

and the assembly manager who use the information in the manual directly to carry out their jobs. The secondary and tertiary audiences do not represent the user, because members of those groups do not directly use the document to carry out tasks. However, the secondary audience will want to read the document to gain information that indirectly affects their work, and in the ASC assembly the secondary audience would be the site manager, who was my direct supervisor and also could gain practical information about the assembly process from the manual. Tertiary audience consists of people who are likely to take an interest in the subject, such as people in other departments of the company, document specialists, and supervisors to the site manager and the assembly manager.

It was pretty clear from the start that the "main audience" for the manual were the assembly workers and safety personnel, so it would have been beneficial to focus on what can now be determined as the primary audience, and not let my work be hindered by failing to establish the secondary and tertiary audiences. My mistake was to think that the writer of the manual should treat the target audience as one unified group, instead of recognising that the audience can consist of multiple groups with different agendas. When the target audience is regarded as a single unified group, then the slightest change inside that group is likely to change the focus of the text and confuse the writer, which is what happened to me. The diary excerpts above show that difficulties in defining the audience have an impact on the scope and contents of a technical document: if you do not know *to whom* you are writing, then how do you know *what* to write?

The diary excerpts above also demonstrate a key issue in audience analysis which was not entirely clear to me at the time: the ultimate responsibility for defining the audience and content of a document rests on the writer. As said by Goldsworthy et al. (2010, 497), audience

analysis is a "central component" in a technical communication project – it is, therefore, a key element in the professional expertise of the writer and should be left to no one else. As the previous diary excerpt shows, my colleagues (quite understandably) viewed the document from the perspective of a technical professional, that is, "this is information that needs to be put out there", whereas a technical writer's responsibility is to bring in the user's perspective: "this is a user, what information does he or she need to do this job?"

From the very beginning of the project, I had to accept the fact that in terms of nationality and language proficiency, the reader could be anyone. I was aware that the company collaborated with people all around the world and that the document should also be usable in possible future projects, of which I knew nothing about. This scenario of complete internationality was in stark contrast with how audience and its analysis were dealt with in technical communication literature. Many technical communication and writing guidebooks I consulted suggested that tackling the difficulties of an international audience would be solved by defining the audience's nationality and closely examining its language proficiency and cultural expectations (see for example Markel 2010, 85–94; Goldsworthy et al. 2010, 488), which in this project was impossible. The scenario was also the primary reason for the focus of this study, as I became intrigued by the concept of international English (see Chapter 2) and its implications to technical communication in international business, as how it was manifested in my project was not discussed in literature from the field.

Failing to definitively establish and analyse an audience for the ASC assembly manual created challenges for the writing process and, therefore, had at least the possibility of affecting the quality of the final product. I discovered that defining the audiences for a technical document is an important phase that needs to be done early on in the process. Furthermore, despite the

international aspect of the project, from a writer's perspective it was equally important to determine the audiences in terms of their professional needs as in terms of their English proficiency.

5.1.2 Gathering information

As mentioned, the primary method of collecting information for the manual was observing the works and interviewing the assembly personnel, which means that gathering information for the manual had a very practical orientation. It enabled me to receive information that was tried and tested in action, capturing the many challenges of crane assembly. However, the method of data collection in the assembly manual project had also its drawbacks. Observation as a method ensured that the manual would include information that was practical, but also unfortunately left room for gaps and irregularities due to the fact that I did not have experience of mechanical assembly or manufacturing. Interviews were conducted to mitigate this problem, but they did not reduce the possibility of human errors. The following diary passage is an example of the occasional random nature of the information gathering phase:

> 29 Aug 13: Today I was hanging around the site office during a break, listening in on people's work conversations, and it turned out there was a big misunderstanding with some of the terms I use in my manual. I would have never found that out without the issue turning up in casual conversation with [the assembly supervisor]. It is about two mechanical parts of the crane which look similar but aren't, and I just used one name for both of them.

As the diary excerpt shows, there is an element of uncertainty in collecting information through observation. However, due to being present at the assembly site I was able to make good use of the experience and working knowledge of a number of experts who worked on the assembly. They had extensive knowledge of the product, the assembly processes, individual working phases, safety issues, schedule, and scope – in short, all of the aspects of the cranes and their

assembly. Their role as a source of information was crucial in the successful completion of the assembly manual project. The assembly manager of the ASCs underlined many times the importance of having skilled, seasoned experts who had extensive experience of the ASC assembly that could be utilised in the project.

People cannot work together effectively, however, if they cannot communicate effectively, and problems in communication are likely to come up more often when people speak different first languages and have different expectations about communication and conduct (both very culturally specific phenomena, as discussed by Huckin and Olsen 1991, 405–406). During the writing process of the ASC assembly manual, I had trouble communicating with the Polish assembly crew, as well as the assembly supervisors, who were my main source of information:

> 21 Aug 13: I have problems knowing what is going on at the site. It is hard to ask the workers because they don't know much English, and their attitude towards me is slightly reserved. It takes a lot of time to create and maintain professional relationships with the workers because at first they don't take me seriously and if I ask them questions they just joke around. I have to determinately ask at least a couple of times before they realise that I'm serious. It's also difficult to ask [the Finnish assembly manager] anything because he is always so busy. I have started to rely more on [the Polish assembly supervisor] for help, but sometimes it is a bit hard to understand him because of his accent and talking speed.

Establishing a good working relationship with the assembly workers was important for the sake of the manual project; observing the workers was, after all, my primary method of collecting data. The above passage demonstrates the kinds of communication problems I encountered in the preliminary phase. First, establishing a good working relationship proved difficult because the workers did not seem to take my job seriously. It is hard to say what the reasons behind this were. Differences in Polish and Finnish cultures in expectations towards young or female employees, for example, might cause the Polish workers (who were all men of different ages) to distrust me. The more likely reason is perhaps linked to the fact that we had difficulties in

communication due to the lack of a common language, which hindered my ability to explain the nature of my work to my Polish colleagues. As far as they could see, there was an idle looking lady strutting around the worksite occasionally taking photographs and making notes as well as casual conversation. The suspicious behaviour expressed by some assembly workers indicated that some of them most likely thought I was spying on their work performance and reporting to managers about any laziness or misconduct.

The supervisor of the Polish assembly team had good English communication skills and an excellent working knowledge of the phases of the assembly, so he was an excellent source of information. As mentioned in the above diary passage, however, his fast staccato accent of English sometimes created problems in understanding. This problem decreased over time as I grew accustomed to his way of speaking.

Accent was not only a problem when communicating with second or foreign language speakers. Native speakers of English, as mentioned in section 2.1 of this study, speak a vast variety of dialects and accents. Only a few of them, such as the British RP and General American accents, have wide international recognition derived from their international status as representing prestigious varieties of English. Australian English is commonly accepted as a legitimate variety of English, but it is more rarely heard outside Australia.

The fact that the Australian variety is not widely familiar with foreign language speakers and that the accent phonetically differs significantly from those more commonly heard make it harder to understand for non-native speakers. In the course of my work in Australia, I had daily difficulties with the Australian accent, mostly due to my unfamiliarity with it and also partly because many of those Australians I conversed with did not tend to accommodate their speech to foreign language speakers. As mentioned previously in section 2.2 of this study, native English

speakers might easily assume that their native proficiency in the English language make them experts in communicating in English, when in fact they might be in a disadvantage if they fail to consider the foreign language speaker's differing needs in the communication situation, that is, they fail to adopt a lingua franca:

> 29 Aug 2013: I sat down with the [Australian] surveyor and he explained in great detail how the main beam rails are measured. … He explained stuff and I asked a lot of questions. Sometimes he used so much jargon in one sentence that, together with his accent, I became a little confused.

As the above excerpt shows, a technical expert might not always succeed in switching his or her point of view to match someone with different background (non-native speaker, non-expert). This underlines the importance of technical communication professionals, who can ask the right kind of questions and act as mediators between the technical expert and the audience (STVY 2014).

Both passages above give light to an interesting juxtaposition: natural cultures versus professional cultures. Can we really determine which affects people's behaviour and interpretations more in multicultural work environments? As already discussed in terms of audience analysis (in section 5.1.1), the professional context for the audience might determine its needs more decisively that the cultural context. Naturally, professional cultures have their own characteristics in every country, but nevertheless the international community of a certain professional group also creates a kind of unified culture in itself. We have already discussed in section 2.2 about "communities of practice" (Hülmbauer et al. 2008, 28), which are linked by their shared practices and knowledge, in the context of an individual company. However, in the global economy, the knowledge and practices of an entire industry can be seen to, although perhaps rather loosely, unite the people within their influence under a common denominator of a "professional culture". In that sense, an international audience for a technical document is not

entirely heterogeneous, and the writer can at least rely on the shared knowledge of the professional culture when passing on technical information.

5.2 The final product

The two quality-related themes raised for discussion are (1) terminology and language, and (2) clarity of text. These themes have been discussed respectively in sections 3.3.3 and 3.3.4 as two of the six quality heuristics that can be used to evaluate the quality of international technical documents. They have been chosen as the focus of the ASC assembly manual's analysis because they emerged from the diary data as prominent examples of how the international nature of a technical communication project affects the overall quality of the final product.

5.2.1 Terminology and language

As discussed in section 2.2, every international speech incident has its own form of lingua franca which is affected by the participants' language proficiency and their expectations of the other parties' understanding of it. International English and ELF as it was used on the worksite turned out to be one of the key issues of determining the terminology and language used in the manual. This is mostly because of the method of data collection, since observation and interviews take note of language mostly as it is spoken.

The vocabulary used in communication during the assembly was mainly based on two kinds of dominating, but still distinctly different, varieties of English: Australian (or in some cases New Zealand) English, and English as a foreign language spoken by Finnish people. These two varieties were different, but not entirely separate: the Australian English used by the assembly workers and management affected the English spoken by the Finns, who seemed to view the Australian variety as having a higher status because it was spoken as a local native

variety. The effect was most visible in common everyday vocabulary and the terminology of processes that differed from the company's previous projects in other countries, such as processes related to safety, environmental issues, and infrastructure.

As the crane assembly took place in Australia and received a large amount of input from Australian and New Zealand experts, it is quite natural that the language used at the site and in the assembly manual received a great deal of influence from Australian English. But the non-native Finnish variety used at the site also affected the local landscape of international English, and therefore had an effect on the manual as well. The reason for this somewhat unlikely occurrence is that the Finnish workers were directly employed by the company and had extensive previous experience of similar projects; therefore they were experts on the product and the assembly.

The effect of the Finnish employees on the language used at the site was mostly visible in the established terminology about the product and the assembly process. An example of a "Finnish-English" term would be the term *erection*, used to denote the process of lifting and securing the main structural components of the ASC to form its load-bearing frame. The term induced some giggles among the site personnel, and comments were made about its awkwardness. Perhaps an Australian technical writer would choose some other word. I, however, did not see a reason to change the term, since it was both short and descriptive, had the appropriate tone, and furthermore lacked a synonym of equal suitability.

The issue of the language used in the company documentation was much more complicated in practice than in principle. Although the language of the company documentation was officially British English, the principle was not consistently followed by employees or enforced by the company, at least in the company's internal technical communication. For

example, the English-language secondary source information I received (e.g. mechanical drawings and other internal technical documents) exhibited many instances of influence from their Finnish writers, such as loan translations, Americanisms (since they were more familiar with American English), and awkward sentence constructions. The problems with the source documentation are also present in the following diary excerpt:

> 12 Nov 13: Many times I encountered things that were called with at least two different names. For example, designers who wrote the technical drawings were only using terms that were previously familiar to them, or perhaps used terms that they translated directly from Finnish to English themselves, which means that the use of terms among the designers was not coordinated. Also, component manufacturers sometimes in their assembly instructions used names that were different from what the designers were using.

In addition to the fact that the source documents did not give a consistent image of the company documentation, the varying terminology in the sources made me suspicious about using them as a definitive source, in terms of language. Furthermore, the company had not established an official terminology database for the ASC. The terminology used in the assembly manual was therefore a collection of words gathered from the assembly personnel, terms used in the source documents, and names that I personally made up or revised. The following diary excerpt indicates some problems that I had concerning the assembly manual terminology:

> 12 Nov 13: Some problems with terminology [looking back to the early phases of writing]:
>
> Ignorance over terms: The terminology on the project was very specialised. Many tools, processes, etc. were such that I had never heard about them before, and there were so many new words to learn. I learned a lot just when the project went along.
>
> Australian English: When receiving information from Australian/ New Zealand colleagues, I sometimes had problems establishing whether a term I had learned was Australian English or a common word/suitable for an international context.
>
> While talking with Finnish assembly experts, a word would occasionally come up for which I couldn't find a suitable translation. The expert himself either didn't

> know any English name for that term, or he used something that was not suitable for the manual because it was either already in use for something else, misleading, or colloquial.

A good example of a use of colloquialisms, mentioned in the above excerpt, was the name for a set of supports or "feet" made of rubber that were installed under a large component to protect it from vibration during crane operation. The parts were normally called *tits* – an expression which was not considered suitable for the language of the manual (for rather obvious reasons). However, the expression was so popularly used that the expert was not able to provide an alternative term. In the mechanical drawings, the parts were called with a generic name of *supports*, which I could not use, since the component to which they were to be connected was already called a *support*. In the manual, I ended up using the expression *rubber feet*, because I felt that the term was expressive and intuitive, according to Purho's (2000) demand of matching the language of the document with the real world also discussed in section 3.3.3 of this thesis. I was aware of the fact that the term was still somewhat too colloquial, but considered it a good compromise for the term being more easily understood by the audience. Even if the reader would be someone from a different cultural background, he or she would be able to understand the rather universal concept of "feet".

The informality of the language used at the site and also the influence of Australian English is also present in the following diary passage:

> 29 Aug 13: *Manlift* is a confusing term, because I don't know if it's only used colloquially, only in Australia, or globally. After some web-searching I decided to use the term *elevated work platform* (*EWP*), because it sounds more un-colloquial, and the concept at least includes the kind of manlift that is used on the site.

The above excerpt demonstrates a single instance of many where I had sourced a term from the assembly personnel but needed to check its suitability for the language and tone of the manual.

Manlifts were a commonly used piece of equipment at the site but, as I was reflecting on the appropriate tone for my document, the name seemed too informal to be used in the manual. Informality of the term was not the only reason the term *manlift* was eventually discarded. Technically, other types of elevated work platforms could be used in most of the work phases that were described in the manual, even though in this assembly project this was not the case. By changing the source term *manlift* to *EWP* I also adhered to the quality principle of task orientation that was introduced by Purho (2000) and discussed in section 3.3.2, as I focused on the process rather than specific tools.

The appropriate tone and formality discussed in section 3.3.3 in this study was not only compromised by the use of colloquial expressions. Sometimes the problem was excessive formality, as in the following passage:

> 16 Jan 14: I changed the word *egress* to *exit*, because I think it's more universally understood. *Access* and *egress* are kind of a word pair, as well as *entry* and *exit*, but I decided on *access* and *exit* in the manual, because *access* is more suitable for my needs (in most cases when the manual mentions access to the worksite I want to describe not only a place of entering, but also the opportunity/right of entering) and *exit* is more understandable for foreign language speakers. At least I had not heard the term *egress* before I heard it from [a New Zealand safety officer]. It seems really formal.

This passage shows that the problem with native English influence was sometimes also excessive formality of Australian technical communication, which seemed somewhat out of place in the work culture of the Finnish people on the site, including me. Some of my Australian colleagues insisted quite frankly that technical communication should be written in a formal, elevated style in order to sound more professional. This seemed like a common practice in the local work environment, but the formal style sometimes seemed to require the use of uncommon words and needless structural flourish. I disagreed with my colleagues' view and, instead, tried to avoid what Estrin and Elliot (1990, 23) called "stuffy and stilted bureaucratic jargon" discussed in

section 3.3.3. The above excerpt shows that the reason I hesitated using what I perceived as overly formal language was my consideration for the non-native speakers of English in the assembly manual's audience. I also asked the Finnish assembly manager if he had heard the term before, and, although he knew it, he said that he had learned it from his Australian colleague at the site. Even though I was no longer able to ask them directly, I concluded that the assembly workers, who mostly were expected to have lower proficiency in English compared to the assembly manager, were less likely to know the term, and therefore I left it out of the assembly manual.

As the company had not, at that time, established a terminology project for the ASC that would have created a unified terminology database for every sector to use, people working in different company departments and countries had different ideas about some of the words used in documentation. The issue of the missing (official) terminology database rose again during the third phase of the writing process in Finland, when the manual reached the consciousness of a larger group of colleagues. At this point, I came into contact with people from the business and sales departments, who looked at the assembly manual from their own perspective:

> 28 Nov 13: Today I heard that [a business manager] had some opinions about the TOC in my manual. He was interested in the manual for the part that coincided with his own work relating to the scope of works in the assembly.
>
> [The business manager] said that some of the terms need to be 'looked at' (meaning changed). I definitely agreed, but noted that it would require a whole project of its own. Terms used for the ASC should be unified (for technical writers, designers, assembly personnel, etc.) and brought to everyone's attention, and this kind of work is not something that can be done in a heartbeat. He did not seem convinced. Of course he would want that decisions are made quickly to move things forward, but I would appreciate more if things are done right the first time around. If the terms used for the ASC are modified in the business line to fit the scope of works used in sales and marketing, that information would not necessarily reach, for example, the designers, and it would not fit their needs (because they have not been consulted).

As discussed by Suonuuti (2013, 6), a professional terminology database improves, most of all, the readability and consistency of technical documentation, which means that the two quality themes discussed in this analysis section, terminology and clarity, cannot be completely separated from each other.

We have already established in section 3.3.3 of this thesis that consistency of terminology is an important quality component. However, the initial cost of starting a terminology project is relatively high, and measuring the cost-benefit results is rather difficult (Perälä 2014, 15), which is perhaps why such a project had not yet been done for the ASC, a new product in the company repertoire. Without an actual terminology project done by professional terminologists, however, there is always going to be differing opinions about what words one should use in a technical document, as demonstrated by the diary passage below:

> 29 Nov 13: [The business line in Finland] had also discussed the term *glue*, and proposed *seal* in its place. After some web-searching and checking the dictionary I decided on (*adhesive*) *sealant*, because *seal* is used more as a verb and to denote a concrete object, instead of a substance. *Bonding glue*, a term which I had received from an Australian colleague, came up in searches mainly related to hair extensions.

In the above example, I trusted my expertise as a language professional and technical writer, but in other instances I was forced to make concessions in the favour of differing opinions inside the company, which exemplifies the effect of power relations to the individual dimension of document quality (Kastberg 2008, 2) discussed in section 3.1, as in the following diary passage:

> 29 Nov 13: [The business manager] dropped by today to let me know that the terms had been discussed and it was decided that *side wall* is too colloquial, and instead *side structure* should be used. This had been decided in the business/sales department, because the scope should incorporate appropriate and unified language. I expressed my reservation, because I feel that *side structure* as a term is not clear and short enough, and it can be mixed with *side frame*, which is a different thing altogether. [The assembly manager] agrees with me, he feels that *side structure* is too vague as a term to be used in the assembly. However, I was told that *side wall* was a term made up by [the assembly manager] and it was

> never used in other projects before ours. Well, that just shows how different points of view different people have. The term was so widely used on site (and so expressive) that I never thought to question it.
>
> I received an updated picture of the ASC main components. There is no mention of walkways or platforms. All of them are grouped as *stairs*. This is problematic for the assembly, because those parts sometimes need to be defined separately. Also, using terms like *stairs 1* and *stairs 2* in running text is problematic, because the reader's eye might not catch the number. I received some useful insight from the business line colleagues to incorporate in the assembly manual. However, in my view, the terminology work done in a single department does not have a good basis if other units are not consulted and their needs addressed.

It is clear from the above excerpt that different company professionals have different needs and expectations for the terminology used in relation to the product. The sales team requires general terms that use the tone and language appropriate for the customer, whereas the assembly team requires specific terms that are both short and accurate. In the absence of a terminology database, it is perhaps no wonder that the terms are, then, occasionally changed and modified to fit the different uses inside the company. Words like *tit* or *wall* might not accurately describe a mechanical part or fit the level of appropriateness needed for an official technical document, but for their shortness, distinctiveness and the ease with which they provide mental associations they might be most suitable for assembly work. The differences, however, create a great deal of problems for the technical writer, who must balance between terms that use the appropriate tone on one hand, and expressive language on the other. As mentioned in section 3.3.3, Purho's (2000) principles that require the document to be matched both with the product and the real world can sometimes contradict, and the ASC assembly manual project exemplifies this contradiction quite well. The problem, once again, highlights the importance of audience analysis in technical communication. If the document is not written for the customer or other external parties, it is fair to ask whether it is reasonable to accommodate an outsider's needs in the document. The document would, therefore, fail to be audience-oriented.

5.2.2 Clarity of text

As discussed in the previous section, consistent and expressive terminology and vocabulary bring the document a long way in terms of clarity. This section, however, discusses clarity at the level of sentence construction. Starting the ASC assembly manual project, my expertise in technical communication was based on my expertise as a language professional. I had acquired a theoretical understanding of the mechanics of the English language and technical communication in my studies, but I possessed very little technical knowledge and professional experience from the field (which, fortunately, accumulated as the manual project progressed). Furthermore, the international aspect of technical documentation was something that I had not particularly considered before. As the manual writing project progressed, I soon felt the need to gain more information about how to write simple, clear text for international audiences, who were likely to have very different levels of competency in English.

In my quest for clarity, I studied technical communication for international audiences and found that the rules were very much the same as generally writing good documentation: one sentence should discuss only one topic, sentence structures must be clear, and use of terms must be consistent. Eventually I turned to ASD (2010) for the more detailed Simplified Technical English (STE) guidelines, which were very useful in many aspects, giving information on how to achieve clarity in writing technical information to international audiences. I recorded in the diary some of the actual changes I made in the text, based on the rules of STE (ibid.):

> 17 Mar 14: Avoiding the *–ing*-construction:
> Each attachment point is marked with a serial number, *matching* a bracket on the column → Each attachment point is marked with a serial number, *which matches* a bracket on the column
> *before painting → before you paint*
> *using your finger → with your finger*
>
> Elimination of synonyms:

fitting, mounting, installing, attaching → *installing*,
connect, terminate (cable) → *terminate*

Avoiding idioms and phrasal verbs:
thought out → *planned*
in place → *installed*

As discussed in section 3.3.4, Kohl (2008, 134) says that the *–ing*-construction is ambiguous and should be avoided in texts written in international English. As the excerpt demonstrates, the avoidance of the *–ing*-form forced me to rely on addressing the reader as "you", which I had had previously avoided for the fear of sounding too informal. However, as also discussed in section 3.3.4, direct address makes it clear for the reader who is supposed to perform the action, and it therefore increases the clarity of the text.

I have already discussed in section 3.3.4 that the writer should avoid creating multiple meanings with the construction of the text (as in the sentence "the 'Start' switch should be turned on"). The above excerpt demonstrates that I came across this issue mainly on the level of single words, as with the verb *to install*, which I encountered in many forms during the manual project. At some point of writing, the manual was practically littered with synonyms for the verb *install*. However, only after gaining some technical knowledge about the mechanical processes involved in the assembly did I realise that the verbs I had gathered from different sources actually denoted the same action, and was able to change them.

It is quite easy to rely on simple phrasal constructions when writing in English. Finding suitable alternatives was not always easy, but, as seen in the above passage and as discussed in section 3.3.4, the phrasal constructions are indeed more informal. Changing the phrasal constructions created a more suitable tone for the manual and had the additional advantage of being shorter, with just one word instead of two.

Finding shorter expressions was beneficial, since one of the problems I encountered during the initial writing phase had to do with how much space my instruction template allocated for the text:

> 21 Aug 13: Today ran into difficulties with my template: there was too much text to fit into the allocated space. Should I change the template or try to cut down the amount of text? I decided it will do good to try to reduce the amount of text first, because the manual should be as concise as possible anyway. If there is too much text it is possible that not all of it is relevant or useful, or I have not managed to explain the issue in the simplest way. If that does not solve the problem I should then design the template to be more flexible somehow.

As I was having trouble fitting in all of the written information, I decided to leave out articles and other small grammatical elements, so that the "more important words" would have enough space. My reasoning was that an article is not necessary for the sake of meaning in the text. Admittedly, my decision might have been influenced by my perspective as a Finn, since the Finnish language does not have articles. I thought that the reader would be able to infer the place of the article in the text, as the noun was still visible. However, I discovered that the article serves to help the reader to determine the grammatical category of the word, so my aim to be "as concise as possible" actually hindered the coherence, and therefore clarity, of the text. The rules 2.3[1] and 4.2[2] from STE contain the same idea that was already discussed in section 3.3.4 of this study: words should not be left out merely for the sake of length. Articles and demonstrative adjectives are those "syntactic cues" mentioned by Kohl (2008, 13), which can be eliminated from a text without making it ungrammatical, but should *not* be eliminated, in order for the text to remain clear especially for non-native speakers. Eventually, I re-added the articles and sought other ways of making the text brief and concise, mainly by trying to further simplify sentence structures.

[1] "When appropriate, use an article… or a demonstrative adjective… before a noun." (ASD 2010, 1-2-3.)
[2] "Do not omit words to make your sentences shorter." (ASD 2010, 1-4-2.)

Another difficulty I faced during writing was the appearance of long noun clusters, which were addressed in ASD (2010, 1-2-1) thus: "**RULE: 2.1** Do not make noun clusters of more than three nouns." In the course of writing the ASC assembly manual, this problem arose specifically in the context of naming the unique parts designed to be used in the assembly. I came across many mechanical parts and tools that were difficult to define in less than three nouns, and as they did not have terms beyond the generic name of "support" used in the mechanical drawings, I had to come up with more descriptive names myself. As the writing process went on, these terms were also often changed, as recorded in the following brief diary excerpt:

> 21 Nov 14: Terms that have been changed during the writing process:
> *Wall erection support beam* → *Erection support stand*

I was worried that especially non-native English speakers would have trouble understanding the sentences, as they simply would not realise the string of four words is actually just one concept. I tried to come up with shorter terms, but my lack of technical knowledge made the task ever so much harder, and usually succeeded in shortening the string only by no more than one word (as in the above example). ASD (2010, 1-2-2) encourages to use hyphens to tie noun clusters together when they are a part of a technical term (as in "erection-support-stand"), but that solution seemed to me almost ungrammatical. Eventually, to improve clarity in the text, I decided to occasionally use *cursive* to make the technical term stand out from the text. The following excerpt that exemplifies the use of cursive is taken directly from the ASC assembly manual:

> INFO: *Side frame stands* support the side frame upright on the rail, but are no longer needed after main girder installation.

I did not, however, use cursive every time the term was used in the text, or did not use cursive for every term in the manual. My goal was to introduce the focal mechanical part of the task in a

short descriptive sentence, where I would use cursive to make the term stand out. In my opinion, the solution was at least a step in the right direction for enhancing the clarity of the text, since the term is discernible from the text with just one look.

However, I did not think that the STE (ASD 2010) guidelines were always totally applicable. The reasoning for the guidelines seemed to sometimes go to such lengths that it did not help the clarity of text. I pondered the issue with the following words in the diary:

> 17 Mar 14: Some of the approved STE-sentences do not seem simpler despite the effort. For example, I have problems with this: 'aligned with the point to which it is attached' [ASD 2010, 1-2-2]. First of all, PAST PARTICIPLE MADNESS, although past participle is technically approved after *to be*. Second, "point to which" does not sound a simple construction to me. However, it is difficult to determine what foreign speakers might find difficult, because people who speak Latin languages and people who speak Asian languages might have totally different starting points, not to mention individuals in different stages of learning English.

To use "the point to which it is attached" instead of "attachment point" did not seem to enhance the clarity of the text in the sense of being simple, as discussed in section 3.3.4. The above excerpt shows that I was particularly thinking in terms of international and non-native speakers of English when I questioned the constructions suggested by STE and finally discarded some of them. Again, this demonstrates that technical communication cannot be "automated" by establishing prescriptive rules that are expected to work in every situation. In the light of the ASC assembly manual project, the writers need to have their freedom to make choices that affect the quality of the document, which means that a technical document will always have its individual dimension of quality. The overall situational and functional quality, however, can be improved by establishing heuristics lists for evaluating the quality of the final product, as I have done in this thesis.

In terms of clarity of text, I feel that most of the quality components (coherence, simplicity, direct address, etc.) determined by the fourth quality heuristic were addressed at some point of the writing process. Given to the size of the manual and the eventual time constraints, however, I was not able to make sure that every single *–ing*-construction and unwanted synonym was eliminated. The largest benefit, therefore, would have been accomplished if the quality heuristics (or other similar quality guidelines) had been established before the actual writing process began and they would have acted as a model to which my writing could be measured throughout the process.

6. Conclusions

This study was based on a specific technical communication project, the intention of which was to produce an assembly manual of automatic stacking cranes (ASCs) in English for international audiences. The assembly manual project was done on the Kalmar assembly site in Australia, observing works and taking notes of the assembly process as it occurred. Due to both the international audience of the manual as well as the differing backgrounds of the assembly experts used as sources, the concept of internationality became a central theme for this study. I wanted to determine how the international nature of a technical communication project affects the quality of the final product written in English. Furthermore, I was interested in how the best possible quality for my document, the ASC assembly manual, could be achieved.

In this study, we have looked at the effect of globalisation and English as a lingua franca on how English is viewed as the language of international and technical communication. An international variety of English totally devoid of cultural connotations is, in practice, basically impossible to reach. However, a technical writer can still strive towards writing English that targets people from different backgrounds and English proficiencies, and some types of guidelines have often been suggested to ensure the quality of the documents produced in this way. Guidelines that take into account the special international characteristics of technical communication projects offer the possibility of observing and testing the quality of a technical document written in English for international audiences.

Based on theoretical sources, this study has proposed the following quality guidelines, or heuristics, in order to define a high-quality international technical document:

- information is presented truthfully, being both comprehensive and significant, and logically constructed, bearing in mind that significance and logic may mean different things to people from different cultures
- instructions are task-oriented, which makes them adaptable and independent from the tools and processes used in different working environments
- terminology and language used in the document are consistent, intuitive, and user-oriented, with correct grammar and an appropriate level of formality, which in the case of international audiences should be neither excessively formal or informal
- the text is constructed to have the best possible clarity to cater for different proficiencies of English, aiming for brief, concise, and coherent text which addresses the user directly with active voice to avoid multiple interpretations
- the document provides the user with feedback and metatext, and helps the user to avoid and mitigate errors, as well as adheres to international standards, national laws, and company guidelines
- the document has a professional appearance and an appropriate format for its purpose, with the needs of the audience taken into consideration

Unfortunately, this study was not able to analyse or test every heuristic in the above list, and therefore a more thorough practical application of the quality heuristics is left for future studies in technical communication.

Nevertheless, this study has analysed the writing process of the ASC assembly manual through two themes that showcase the international characteristics specific to the project: audience analysis and gathering information. In addition, the study examined the quality of the final product of the ASC assembly manual project through the themes of terminology and language, and clarity of text. Using the autoethnographical method, the themes were analysed

using the diary data that I created to reflect on the assembly manual project. Additionally, the ASC assembly manual was analysed using heuristic evaluation.

Through analysis of the writing process and the final product, it can be concluded that the effects of the assembly manual project's international characteristics to the quality of the final product created challenges specifically for the terminology and language used in the manual. The technical writer's responsibility of mediating and filtering the information was present in this project specifically in the sense that I constantly needed to be aware of the informants' background as a language user. Also, the analysis of the final product shows that I made deliberate effort towards improving the quality of the ASC assembly manual in terms of textual clarity for international audiences.

The terminology used on the assembly site was colloquial and affected by different native and non-native varieties of English and the ELF that was formed as a mix of those varieties. On the other hand, the terminology that was imposed on the manual from other company departments had a more appropriate formal tone which more closely represented the company line. However, it lacked the detail required for practical assembly work. I conclude that the company would greatly benefit from a professional terminology project that would consider all the needs of the different departments. Establishing a terminology database for the company's products and processes would improve the quality and effectiveness of technical communication within the company.

This study found that the difficulties in defining the target audience for the assembly manual affected the writing process in a negative way. My sources had different ideas about the contents and target audience of the manual, which made the scope of the work unclear. This, in turn, slowed down the writing process, as I was confused about what to write. However, the

difficulties in defining the audience in the ASC assembly manual project were not directly related to its international characteristics. Instead, the problems in audience analysis were connected to different professional groups, in which sense this study failed to shed light on the specific problems of audience in *international* technical communication projects. The difficulties were still an important reminder of the fact that defining the audience and scope of a technical communication project are important phases in the process, for which the technical writer is ultimately responsible.

The manual's detailed description of the assembly was intended to add to the information found in the mechanical drawings. That is why the most important method of collecting information was observing the assembly on location, and not the mechanical drawings themselves. The information gathered from individuals, however, is by nature limited and subjective, perhaps obstructed by difficulties in communication, as was shown in the ASC assembly manual project. At the early stages of the manual writing project I was highly concerned about the preciseness and completeness of the information presented and therefore the large, unclearly defined scope and audience created complications for the progression of the writing project. But only later I realised that the subjective information of individuals was precisely the know-how which the company wanted to document in this project. The ASC assembly manual was necessary in the company because there was important information relating to the assembly that was not enclosed in the mechanical drawings, but was only a part of a few seasoned experts' existing knowledge and expertise.

It can be said the ASC assembly manual project parallels an autoethnographic research in the sense that both seek to use and bring to larger audiences the experience-based subjective knowledge of individuals in order to improve the work of others. The purpose of the

autoethnographical approach, where the method itself gives birth to the data, was to give a subjective and qualitative, but at the same time analytical, perspective of a technical writer's work in this study. Autoethnography has the potential to discuss the work of technical writers in an academic context, yet with a personal touch, which I think this study has succeeded in doing.

However, due to its subjective approach, this study cannot provide a reliable enough basis for generalisations in the discussed topics, as perhaps a quantitative study would be able to do. As mentioned before, I see this study potentially as a part of a larger body of works that has the possibility to shed light on technical communication processes with a very in-depth, qualitative focus. Together with quantitative and theoretical analyses, autoethnographical research introduces a new level of subjective knowledge that can be used to improve technical communication in theory and in practice.

Nevertheless, this study has been able to pinpoint some suggestions for improvement in technical communication processes for the case company. The study has been able to prove the existence of the effect of English as a global lingua franca to technical communication, as well as discuss its underlying reasons and implications. In this particular case, the effects of the international nature of the ASC assembly manual project were, as noted, the difficulties in determining the right terminology, and the challenges in gathering source information due to linguistic and cultural differences.

Interesting topics for future research include applying the quality heuristics introduced in this thesis to other technical documentation projects, the effect of natural and professional cultures to international technical communication projects, and further use of autoethnography for examining technical communication processes.

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