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Advantages and disadvantages with Simplified Technical English

- to be used in technical documentation by Swedish export companies

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Abstract

Understanding technical documentation is of vital importance, since instructions and descriptions are given about how technical products are used, maintained and repaired. Because of the increased economic globalization, more and more documentation is both written in English by non-native English writers, and delivered to non-native English readers. More and more documentation is also translated by means of computerized aids. In order to improve comprehension and translatability of technical documentation, controlled languages are created. Controlled languages are subsets of ordinary languages, but with restricted vocabularies and writing rules.

The aim of this report is to discuss the advantages and disadvantages for Swedish export companies to use Simplified Technical English (STE), which is a controlled language, for their technical documentation. In this work technical writers are asked about their opinions of STE. Additionally, technical texts written in traditional English are compared with versions written in STE, in order to find out whether texts written in a controlled language are easier to read or not. Within the comparison, the differences between the versions are discussed and a readability measurement is done. The measurement showed that readability in technical documentation is improved by using STE. The writers' opinions are illuminated in three areas, which are: higher documentation quality, reduced translation costs and reduced production costs.

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1 Introduction

Technical documentation (TD) is found everywhere in the society. Whenever you buy technical products, such as a computer program or a toaster, TD or for example installation manuals is bundled with the product. Understanding the TD is of vital importance, since instructions and descriptions are given about how technical products are used, maintained and repaired. Incorrect documentation may cause human injuries, as well as expansive material injuries (van der Eijk, 1998; Nyberg et al., 2003). Because of the increased economic globalization more and more documentation is both written in English by non-native English writers, and delivered to non-native English readers. More and more documentation is also translated by means of computerised aids. On the other hand, translations in some cases are not a possibility (van der Eijk, 1998). One option is to use controlled languages, which are restricted subsets of natural languages, with a limited vocabulary and writing rules. The use of a controlled language version of English increases the comprehensibility of documentation for people with poor English knowledge, as well as the translatability of documentation (Nyberg et al., 2003).

The most well known controlled language is Simplified Technical English (STE). STE was produced and developed with the purpose of improving the comprehensibility of aircraft maintenance documentation (Nyberg et al., 2003). Today STE is also used in other branches, such as medical equipment and telecommunication.

Sörman Information & Media (SI&M) are a Swedish market-leading provider of solutions in the area of after-sales information. They have been in the market since 1966 and enable customers to develop efficient information solutions in order to produce complex technical information. SI&M have four business areas; automotive, defence, industry and system. (SI&M, 2007) SI&M were interested in investigating how STE could benefit their customers, and how such benefits could be integrated into the services of SI&M.

1.1 Purpose

The purpose of this thesis is to investigate advantages and disadvantages for Swedish export companies to use STE as language for TD. Within this thesis the focus is on the user of STE and their views, consequently the results are from the technical writers' perspective.

1.2 Scope

In line with the purpose of this thesis, SI&M have identified three areas especially interesting for customers of SI&M, where language is an important factor. The scope of this thesis is to investigate the following three areas focusing on the effect of introducing STE.

- **Higher documentation quality.** The most frequent complaint about TD is that it is difficult to navigate and identify sought solutions, contains factual errors, is difficult to understand and is out of date or incomplete. Whether an introduction of STE would improve the documentation quality or not is investigated in this thesis.
- **Reduced translation costs.** Technical documents are delivered in different languages to different countries, accordingly translations may be necessary. Whether translation costs are reduced or not when using STE as the source language is investigated in this thesis. The concept of translation costs is considered a question of the time needed to translate documents, and the concept is also associated with variables such as: good generated translations and computer aids, such as machine translations and translation memories.

- **Reduced production costs.** The background material of TD generally is collected from different parts of a company, even though the text is produced by a single technical writer. Whether the TD production cost is reduced or not when introducing STE is investigated in this thesis. The cost aspect is associated with the time from the start of the production of a document until the document is approved according to the quality agreed on. Variables which effect the production time are for example the amount of reviews, the technical writers' learning time and the writers' writing speed. In the end the TD production costs are determined by the total time needed to produce the documentation.

1.3 Limitations

In addition to the areas described in section 1.2 SI&M have also identified another area which is reduced maintenance costs. This area includes for example updating according to construction changes or correcting discovered errors. According to SI&M this area has complex processes and great demands for resources, and STE is considered to have small cost influences compared to improved systems or process support. This area is therefore not investigated in this thesis.

1.4 Method

In this thesis a qualitative method with literature studies, interviews and questionnaires was used. The interviews and questionnaires were carried out in order to collect the opinions of the technical writers about STE. The interviews were done with technical writers working in a project at the company Saab Systems, where they just have started to use STE when the thesis work was commenced. The questionnaires were sent out to technical writers at SI&M who were familiar with STE, in order to collect material for comparison.

1.5 Document outline

The outline of the thesis is as follows:

Chapter 2: In this chapter the theoretical background including relevant concepts are presented. The concepts dealt with in this chapter are for example technical documentation, terminology, translation and controlled languages. These concepts are all necessary for understanding the following chapters and to be able to draw conclusions from the technical writers' point of view.

Chapter 3: In this chapter the methods used in order to collect the necessary data are described. The methods used in this thesis are interviews and questionnaires.

Chapter 4: In this chapter a presentation is given of the company Saab Systems and their documentation process. This is necessary in order to understand the technical writers' situation, and can also be used as means for comparison with documentation processes in other companies.

Chapter 5: In this chapter the technical writers' views of STE are presented. The structure of this chapter is in line with the purpose of the thesis, which means that the sub-headings are identical with the identified areas. Each sub-heading in its turn is divided depending on whether the writers are inexperienced or experienced users of STE.

Chapter 6: In this chapter example texts written in STE are compared with versions written in traditional English. The differences are discussed and readability measurements are presented.

Chapter 7: In this chapter a discussion about the technical writers' views is presented. The structure of the discussion is in line with the purpose of the thesis, such as in chapter five. The chapter concludes with a discussion about the used methods.

Chapter 8: In this chapter conclusions are presented. Finally, a list of future research recommendations is presented. The structure of the chapter is in line with the purpose of the thesis, such as in chapter five and seven.

2 Theoretical Background

In this chapter theoretical concepts relevant for this study are dealt with. The main concept in this thesis, as well as in the theoretical background is considered to be TD followed by STE. This chapter starts with a description of TD followed by descriptions of concepts such as terminology, translation and controlled languages. At the end of the chapter there is a detailed description of STE, followed by an introduction to controlled language tools.

2.1 Technical documentation

At procurement of most technology products today TD is included (Mårdsjö, 1992). All necessary information related to the product and its use is included in the TD (Krings in Muranko & Drechsler, 2006). The documentation is provided either on paper or electronically, and there is a distinction between internal and external documentation. Internal documentation includes information and instructions used by in-house staff, while external documentation represents product related information and instructions delivered to the customer together with the product (Muranko & Drechsler, 2006; Hicks & Valorie Sr, 1997). The TD relevant for this thesis is external documentation, which from now on is referred to as TD.

2.1.1 Different types

External TD serves as a tool for the user by teaching usages of the product. TD has three main purposes. These are to be instructive, to describe the technology and to motivate usage of the technology or the product. (Mårdsjö, 1992) The usefulness of a product is partially dependent on the quality of the documentation (Hicks & Valorie Sr, 1989; Mårdsjö, 1992). Two types of TD with different purposes are instructions and descriptions.

Instructions

The purpose of instructions is that after reading the text the reader should be able to correctly perform an action, such as installing a computer program. In other words, instructions are action oriented (Mårdsjö, 1992). A procedure is an action sequence, and in instructions a sequence of actions is presented to establish the overall goal of the instructions, consequently instructions are called procedures (Eisenberg, 1993). In installation manuals, for example, a sequence of actions is presented, and in the end this procedure results in a completed installation.

The communication between the manufacturer and the user of the product is realized through the TD. The intention of the manufacturer regarding the usage and maintenance should be transferred to the user through the documentation. A variety of instructions are needed for different users in dissimilar situations. An example is that service staff and a woman who uses a vacuum cleaner do not need the same instructions to be able to perform their desired actions. Accordingly, there are different types of instructive texts depending on the purpose of the instruction in a specific situation. Operating instructions, for example, are written with the intention of giving instructions for use, while service instructions are written for maintenance. (Hicks & Valorie Sr, 1989)

Descriptions

Sometimes an understanding of the procedure is necessary for the user to be able to perform actions correctly (Mårdsjö, 1992). The purpose of descriptions is to provide the comprehensive picture of the actions, and consequently the user is supplied with the necessary

understanding. In descriptive writing, which can be found in a description and operation topic, a general paragraph or a note in a procedure, the reader is provided with information and not with instructions (AECMA, 2004). Descriptions are function oriented, and the applications of the technology, as well as the possibilities and constructions of the technology are described within the descriptive publication (Mårdsjö, 1992).

2.1.2 User adaptation

Three important elements have to be taken into consideration by technical writers writing TD (White, 1997). These are the purpose, the target group of the documentation and the reading level of the reader. The purpose of the documentation is according to White (1997) whether the text is instructive or descriptive. The target group of the documentation is represented by the reader of the documentation, and among the readers the technical knowledge can vary a great deal. The reader of an installation manual for a computer program may for example be non-technical, whereas the reader of maintenance instructions describing change-procedures for a product may have a great technical knowledge. Mostly the individuals in the target group are not only different from the perspective of technical knowledge. User adaptation of technical documentation according to Mårdsjö (1992) is difficult because the motivation and the gender within the target group also vary. White (1997) meant that explanations of complicated technology have to be adapted to the reader's reading level. The reading level of the reader is represented by the degree of difficulty or technology complexity of the text, which the reader is able to understand (White, 1997).

2.1.3 Readability

Difficulties in reading written text can be seen as a combination of content, external characteristics and language (Platzack, 1989; Platzack, 1974). These concepts are according to Björnsson (1968) called reading value, legibility and readability. With other words, elements of contents are named reading value, external characteristics are named legibility and language qualities are named readability. According to Björnsson (1968) the difference within degree of difficulty is not considered to be dependent on the reading value or the legibility. Instead language qualities, as for example the choice of words, ways of expression or sentence constructions are according to Björnsson (1968) the determining factor if texts are easy to read or not. The length or frequencies of words, and length and complexity of sentences are examples of language qualities that affect the readability (Platzack, 1974; Björnsson, 1968). One aspect according to Platzack (1989) which makes a written text more difficult to read is by the use of the passive voice in written texts. Another aspect is the use of long sentences which are more difficult to read than shorter sentences, since more complex syntactic structures are used (Schleisinger, 1968 in Platzack, 1974). On the other hand, people are different and have different abilities to read. One text may be hard to read for one person, but for another the same text may be easy to read. Readability is a quality within a text but it is also important to adapt the text depending on the user (Björnsson, 1968). Björnsson (1968) meant that a simple language not necessarily results in a more readable text, because if qualified readers are included in the target group they are able to read more complex languages.

Readability formula

Readability formulas are mathematical equations with the purpose to predict how difficult a text would be for a reader (Redish & Selzer, 1985). Mostly, the formulas are used in order to explore if a text meets a predetermined value or to compare two versions of a text. There are hundreds existed formulas for different languages, and all of them predict the understanding of the text by counting one or two text features, usually sentence length and some aspect of

word frequency or word length. The fact that text difficulty is determined by language aspects has been criticized in some literature. Redish and Selzer (1985), for example, point to the fact that text comprehension is not necessarily improved by using short sentences and words. It is more important that the reader knows the used words or that the text is clear and concise. An alternative to readability formulas mentioned by Redish and Selzer (1985) was to test the text with a sample of readers. However, the most used, tested and reliable readability formula is Flesch's Reading Ease formula launched 1948 (DuBay, 2004). This formula is based on the average sentence length and the average number of syllables per word. The formula yields normally a value from 0 to 100, where a higher value indicates an easier text (Redish & Selzer, 1985).

Fleisch's Reading Ease formula are (DuBay, 2004):

Score = 206.835 – (1.015 * ASL) - (84.6 *ASW)

Where:

Score = position on a scale of 0 (difficult) to 100 (easy), with 30 = very difficult and 70 = suitable for adult audiences.

ASL = average sentence length (the number of words divided by the number of sentences).

ASW = average number of syllables per word (the number of syllables divided by the number of words).

2.1.4 Comprehensibility

The understanding of a text is not entirely dependent on text features. The process of reading is according to Gunnarsson (1989a) seen as a dialog between the text and the reader, where the comprehension or the understanding of the text is determined by the reader. In Gunnarsson (1989b) text understanding is seen as a constructive process, where mental representations of the text are created by the reader. Mental representations are abstract general pictures of the text. Text externally is composed by different components, such as words, sentences and passages. A comprehensive picture of the text is created from different content parts that are put together by the reader. The mental representation is created by the reader's mutual knowledge, which is the reader's preconceived ideas about text types and the knowledge about the surrounding world, as well as the knowledge of texts, which is knowledge about how words, sentences and paragraphs are connected to each other to create running texts. The more mutual knowledge a reader has to use to create the mental representation, the more difficult the text is to understand. (Gunnarsson, 1989b)

As has been mentioned in section 2.1.2, it is important when writing TD to bear in mind that readers within a target group are different individuals. These individuals have different mutual knowledge, as well as different text knowledge. According to White (1997) the task of TD is to give the reader additional knowledge to be able to understand the text, and in the end to be able to perform the desired action. Simplicity of language and an excellent interplay between text and picture is according to Mårdsjö (1992) necessary for an increased comprehensibility in TD. Comprehensible writing is obtained by using examples from the perspective of the reader, and not to use sentences with too much information (Melin, 2004).

To summarise comprehensibility and comprehension, comprehensibility is the quality of comprehensible language whereas comprehension is a quality within the reader. Comprehensibility is measured in understanding and time of reading, since more time is needed to understand complex sentences than simpler sentences (Melin, 2004).

2.1.5 Language style

The used language style in TD has to be effective because messages are conveyed by written texts (Mårdsjö, 1992). Effective language style according to Mårdsjö (1992) and White (1997) implies that the intention of the author effectively is transferred to the reader by the technical document. This also includes that the document is easy to read and understand. White (1997) meant that using appropriate words is an example of an effective style, as well as not using long word combinations. Texts that are experienced easy to read are on average composed of fewer words per sentence than more difficult texts (Björnsson, 1968). According to Björnsson (1968) a text is easier to read by shorter sentences, shorter expressions and shorter word constructions.

The language used in TD is influenced by the type of documentation. Instructions for example are action oriented, and actions are desired to be explained by words as precise as possible, consequently the text is probably written in chronological order, and the language used is concise (Mårdsjö, 1992). According to Hicks and Valorie Sr (1989) instructions should be written in imperative, and it is important to take the user into consideration during the word selection. On the other hand, Hicks and Valorie Sr (1989) meant that an oversimplification is not preferred. They believed authority is symbolized by advanced technical words. Consequently, some readers may have an interest in knowing such words. An oversimplification is not good if the reader has a great technical knowledge. In that case, the reader may not trust a simplified text to such an extent as he/she would trust a text written in a more complicated language. According to Hicks and Valorie Sr (1989) instructive texts should be written with legible declarative sentences of 20-25 words.

Descriptions on the other hand is function oriented (Mårdsjö, 1992). According to the AECMA (2004) the language used in the descriptive document is determined by the company policy, and the presence of the descriptive writing. This means whether the descriptive writing is found in description and operation topics or as a note in a procedure. The language can be adapted to the readers' objective with the document. Readers of a procedure are for example concentrated on doing an action whereas readers of descriptions only want information. (AECMA, 2004)

2.1.6 Quality

The language used in TD, as well as the quality of the documentation is crucial for comprehension. Quality in TD is associated with subjective elements (Rivera et al., 2004). In high qualitative TD correct and concise information without omissions is described with clarity. Ambiguous texts quickly result in a loss of comprehension. Insufficient understanding of the TD also results in costly losses, such as lower customer satisfaction, loyalty and increased support costs. Comprehension of TD is important, since documentation is trusted by technicians during an operation (van der Eijk, 1998). Material damages or human injuries may be caused by poorly written documentation, or the system may be out of order for an unnecessarily long time, which can be very expensive. The overall impression of the product is also improved by high qualitative documentation (Nyberg et al., 2003).

2.2 Technical writer

The working title of the person responsible for most of the text in TD varies in the literature, but the one used in this thesis is a technical writer. The topic of the text is predetermined, and a technical writer should therefore not be compared with a traditional author (Mårdsjö, 1992).

Mostly TD is produced in processes where more than one technical writer are involved. Within these production processes writers are responsible for different parts of the

documentation. Technical writers are according to Rolf (1986) in Mårdsjö (1992) working more effectively when they are working independently, and when they are involved early on in the developing process. For an early involvement, a good working co-operation between technical writers and technical developers is needed. In Mårdsjö (1992) two models of collaboration are described: the co-operation model, in which the technical writers continuously are present in the process of development, and the detective model, in which the technical writers have to find the relevant information themselves.

2.3 Terminology

A distinctive trait in technical texts is that concise information within a specific topic is conveyed (Ingo, 1990). "Terminology is the discipline concerned with the collection, processing, description and presentation of terms, which are lexical items belonging to specialized subject fields" (Bowker, 2003). Terminology is therefore one of the bases in TD. In Cabré (1999) three different ingredients are seen within terminology, and these are in line with the definition by Bowker (2003). These ingredients are terminology as a discipline, as a practice and as a product of the practices. Terminology as a discipline is symbolized by the principles and conceptual bases that govern the study of terms. Terminology as a practice is dealt with by guidelines for collecting terms, and the set of terms of a particular subject is meant by terminology as a product. To summarise these meanings terminology is considered to be an interdisciplinary field about naming concepts within specific domains, and realization of these concepts in linguistic or any other form (Cabré, 1999).

2.3.1 Terms

The basis of terminology is the new products or innovations in need of new names. The names are chosen according to distinctive traits of the products or innovations, and consequently terms are created. (Ingo, 1990)

Terms are words representing an object in the real world, occurring in a specific domain (Cabré, 1999). "A word is a unit described by a set of systematic linguistic features, having the property of referring to an element in reality. A term is a unit described by a similar set of linguistic features, this unit being used in a specialized domain. From this point of view, a word within a specialized domain would be a term." (Cabré, 1996)

2.3.2 Terminology standardization

Concepts in the reality are described by using terms. Accordingly, there would be difficulties in understanding the text if one concept is given two different terms. In order to have an efficient TD, where messages are conveyed without misunderstandings, there is a need of standardized terms within the domain (Cabré, 1999; Ingo, 1990). The text is less unambiguous and easier to understand by standardized terminology. Standardization of terms means that specialists who use terms do so in accordance with the agreements that they themselves have made - the agreement that they will use one and only one designation for a well delimited concept (Cabré, 1999).

2.4 Translation

Definitions of translations are almost as numerous and varied as the number of persons who have discussed the subject. Translation is defined as a transfer of information, or semantic content from a source language (SL) to a target language (TL) by Ingo (1990). The translation though, is not only supposed to transfer the content, but also the form of the translated text should be the same as one used by a native reader of the TL (Cabré, 1999). In order to define a

good translation the response of the recipient has to be comprised, since the interpretation of the target text should be the same as the source text. A good translation is "one which fulfils the same purpose in the new language as the original did in the language in which it was written" (Forster, 1958 in Nida, 2000).

In technical texts a domain specific terminology is used, consequently a lot of the translator's work is to find equivalent terms (Bowker, 2003). To be able to do translations of technical texts there is a demand for an understanding of the SL, and in its turn also a terminological knowledge in both the SL and TL is implied (Cabré, 1999). Semantic accuracy is a requirement in translations of technical text, since the purpose of these texts is to convey certain kind of information (refer to section 2.1). Translations of technical texts are time-consuming and high responsibility demands are put on the translator, because of the great amount of terms and the demand for accuracy (Ingo, 1990). Incorrectly performed translations may have serious consequences. The translator has to know how general dictionaries, special handbooks and other textbooks are used, to be able to do technical translations. Seeking advice from specialists, understanding the actual work and getting to know the structure and the function of the product is also parts of the translation procedure (Ingo, 1990). To support the translator there has been a development of different computer-based aids. Two of them are described in the two following sections.

2.4.1 Translation memory

"A translation memory is a particular type of translation support tool that maintains a database of source and target language sentence pairs, and automatically retrieves the translation of those sentences in a new text which occur in the database" (Macklovitch & Russel, 2000). The translator is supported on three levels: terminology, sentence parts and sentence level by the translation memory (TM). These levels include active term recognizing, searching in the memory for similar sentences and finding identical or similar sentences by fuzzy-matching technology (Brockman, 1997). A translator working with a TM goes through a database, which contains earlier performed and saved translations, normally saved sentence-by-sentence, for anything similar enough of the current sentence to be translated. The retrieved sentence is a model for the current sentence to be translated. If an exact match is found the translator can use this without any changes, otherwise the model can be used as a suggestion for how the sentence should be translated. The tool highlights the differences between the model and the sentence to be translated, but it is up to the translator to decide which parts have to be changed. The key behind TM is an efficient saving of translated sentences, as well as an efficient matching. In most TM, the matching is based on character-string similarity and is counted by the measure string-edit distance, which counts the minimum insertions, deletions and substitutions needed to change a word into another. The way which generates the lowest value is selected. (Somers, 2003)

2.4.2 Machine translation

In contrast to translation memories, which support the translator, the translator is replaced by machine translation (MT). Computers are limited in their capacity to produce good translations, since they are incapable to perform vaguely specified tasks, learn things, perform common-sense reasoning and deal with some problems, where there are a large number of potential solutions. Computers are computational and the rules have to be precisely formulated (Arnold, 2003). Accordingly, and because of the great variations in languages, the computer programs are enormous (Ingo, 1990). Other examples of problems for computers are when there are more than one meaning of a word, or when two words are spelled identically but with different meanings (Ingo, 1990). Translations can not be performed only by

computers, because of their limited capacity. The text first has to be pre-edited into a suitable form for the computer. This is done by a translator. After this, the text can be inserted into the computer which performs the translation. Then the output from the computer is not the final usable translated text, but has to be post-edited by a professional translator (Ingo, 1990).

MT systems are constructed in three different ways. The direct approach, the transfer architecture or the interlingua architecture (Arnold, 2003). Translations in the direct approach are done on word-by-word bases, but in the transfer architecture the translation is divided into three steps. These steps are:

- Analyses, where the source text is analysed, and an abstract representation is produced.
- Transfer, where an abstract representation for the TL is created from the representation made in the first step.
- Synthesis, where a target text is created from the abstract presentation made in the previous step.

In the interlingua architecture an interlingua, which is a more or less language dependent representation scheme is used (Arnold, 2003). An example of an interlingua based MT system is KANT (Baker et al., 1994). An interlingua system is made up of a source language analyzer, where the interlingua representations for each sentence is produced (see Figure 1). These representations consist of language signs, and from these representations a target text is created. In this architecture the bases for translations is the interlingua no matter the language (Ingo, 1990). Ambiguity arises if more than one interlingua per sentence is produced. This may have a negative impact on translation quality (Baker et al., 1994).

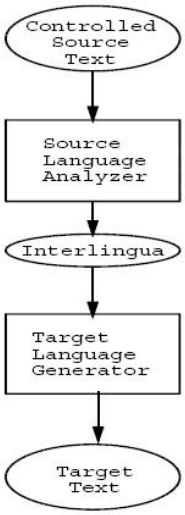

Figure 1: ***An interlingua based machine translation system.*** **Source: Baker et al. (1994).**

2.5 Controlled languages

A controlled language (CL) is a defined subset of an ordinary language with a range of rules that specifies the lexicon, grammar and writing style (Nyberg et al., 2003). According to van der Eijk (1998) controlled languages are constructed to be used in particular environments for precise purposes. Today controlled languages are used in different types of technical documentations, as for example in maintenance and operating instructions (Nyberg et al., 2003). Controlled languages can either exclusively be used as guidelines for writing or

together with a software, which controls the text to verify conformance. The language could also be integrated into a system for automatic MT of the technical text (Nyberg et al., 2003).

According to Nyberg et at. (2003) the purpose of using controlled languages is to reduce the ambiguity and complexity of written text, whether the text is read by a computer or by a human being. Texts not written in controlled languages may be difficult to understand and translate because of the ambiguity and complexity of ordinary languages. A general aim in controlled languages is to minimize the number of words and the complexity of sentences, but also an adherence to the principle of one-to-one association between word forms and concepts (Nyberg et al., 2003). This means that one concept can only be described by using one word. A CL lexicon contains both words that are permitted to be used in the writing, so called approved words, and unapproved words which are prohibited to be used (seeTable 1, page 14). Regarding the approved words, information such as the correct spelling, the syntactic category, a definition and one or more examples of their usage are included in the lexicon. Regarding the unapproved words, information such as the correct spelling, the syntactic category, a definition and one or more suggestions of approved words that may be used to express the same meaning are included in the lexicon (Nyberg et al., 2003). According to Nyberg et al. (2003) the usage of controlled languages and all the rules involved, results in improved quality of the TD.

Investments in controlled languages are done by licensing and customising an existing CL, or by developing and designing a new own CL. Despite of the additional costs by implementing a CL, the long-term benefits outweigh the costs for organizations that are producing a great amount of documentations per year and where homogeneity, reusability and translatability are important. (Nyberg et al., 2003) The interest of using controlled language in industries has steadily increased since the first CL was created. According to van der Eijk (1998), the growing interest has to do with economic globalization and increasing demands for high-quality technical documentation.

2.5.1 Different approaches

A CL is a restrictive language, but according to Reuther (2003) the definition depends on the intended use. In her article the intended use is seen to be either an improvement of text qualities, as readability and comprehensibility, or as an improvement of translatability in an automated translation processing environment. This is in line with the definition of controlled languages mentioned by Nyberg et al. (2003), where controlled languages are considered to be either human-oriented or machine-oriented. Human-oriented controlled languages are intended to improve the comprehensibility and readability of the text for humans, while machine-oriented controlled languages are aimed at improving text processing by machines (Nyberg et al., 2003). According to Nyberg et al. (2003) these two categories have much in common, but since humans and machines function differently the categories have somewhat different rules.

The CL lexicon described in section 2.5 is defined for human-oriented controlled languages. The information within a lexicon for a machine-oriented CL may include other information necessary for the computational processing (Nyberg et al., 2003). Besides, some writing rules are more useful in machine-oriented controlled languages, while others are more valuable in human-oriented languages. According to Nyberg et al. (2003) the requirements for more strict rules are for example greater within machine-oriented languages than in human-oriented controlled languages. A machine-oriented CL is for example in need of rules like “Do not use sentences of more than 20 words”. On the other hand, rules like “Make your instructions as specific as possible” are good enough for human-oriented controlled languages (Nyberg et al., 2003).

2.5.2 Advantages and disadvantages

In the literature, many advantages but also some disadvantages of writing the TD in controlled languages have been observed. One advantage of controlled languages is according to Nyberg et al. (2003) that the readability and comprehensibility is improved by the reduction of synonyms and the simplification of the lexicon together with the adherence of writing rules. As a logical consequence of improved readability and comprehensibility, tasks which involve documentation written in a CL can be more accurately and effectively executed. According to Nyberg et al. (2003) this is particularly relevant for complex texts and for non-native speakers. Another advantage is that texts written in a CL are easier to maintain and reuse because of the uniformity in word choices, use of terms, sentence structures and style (Nyberg et al., 2003). The effectiveness of MT is also improved by a consistent text (see section 2.6.3), and the overall costs of writing new documentation is reduced by a higher percentage of reused documents (Nyberg et al., 2003). Controlled languages used together with TM also increase the percentage of translations that can be reused, which in the end leads to reduced overall translation costs. To achieve the desired benefits of TM with a restricted source language the reference material has to be exclusively composed of texts written in a CL (Reuther, 2003). In Nyberg et al. (2003) they also mentioned the fact that using a CL not only improves the machine translations, but also speed up human translations. This results in faster available documentation in foreign languages, and possibly leads to an earlier selling of the product (Nyberg et al., 2003). Another advantage mentioned by Nyberg et al. (2003), was the reduced risks for misunderstandings, which may imply fewer injuries, by clear and distinct documentation.

From the writers' view the usage of controlled languages is characterised by the demand for more time to produce the documentation, since more rewriting may be necessary. At the same time less time for reviews is needed. It is claimed that it takes 20% more time to produce text in a CL (Goyvaerts, 1996 in Nyberg et al., 2003), but then the time needed for changes after the reviews is generally reduced (Nyberg et al., 2003). According to Lehrndorfer (1995) many writers admitted that one disadvantage of controlled languages is the expensive learning-time. The writers expected a greater difference in quality between the documents written in a CL and the ones not written in a CL, than was observed. Writing in a CL also had a restrictive influence on the writer's creativity (Nyberg et al., 2003; Lehrndorfer, 1995).

A study to show the usefulness of a controlled German language is seen in the article by Lehndorfer (1995). In the study 66 participants, with a mixture of technical writers, technical translators and engineers were told to use a controlled German with rules based on STE (further described in section 2.6.1) to write an instruction manual for a game. Afterwards, the text written in controlled German was compared with a version written in standard German, and the writers' opinions about the differences were collected. The study showed, as Lehrndorfer has expected, that the rules regarding the syntax were considered most difficult by the writers. The participants considered the words in the lexicon of the CL to be quite similar to the desired choice of words and consequently they did not feel controlled by the word restrictions. The study showed also that despite a similar content, the text written in standard German showed greater difference in word choices, level of abstraction and styles than the text written in the CL. The text written in standard German was produced faster than the text where the CL was used, but this text was half of the length of the standard text. The study showed that 60% of the participants thought a CL would be useful in their ordinary working area, whereas 26% thought a CL not would be useful. 14% did not know whether a CL was useful or not. Most of the people who thought a CL would be useful were engineers, senior executives of the documentation division and translators. Further analysis by Lehndorfer (1995) showed that a controlled German is most useful within texts that:

- Are action-oriented
- Contained safety- and warning functions
- Needed to be translated into more than one foreign language
- Involved more than one writer
- Were produced by designers or other persons without education in languages
- Had different target groups.

2.6 Simplified Technical English

In 1979, the European Association of Aerospace Industries (AECMA) investigated the readability of maintenance documentation in the civil aerospace industries (AECMA, 2004; Nyberg et al., 2003). The result of the survey was a restricted set of approved words and writing styles, the so called Simplified English (SE) guide which are described in section 2.6.1 (AECMA, 2004). Year 2004 AECMA merged with European Defense Industries Group (EDIG) and Association of the European Space Industry (EUROSPACE) to form Aerospace and Defense Industries Association of Europe (ASD). As a result, AECMA Simplified English was renamed to ASD Simplified Technical English, which in this thesis is written STE (Tedopres, 2007). Technical writers who produce documentation in STE are restricted by the use of the SE-guide and other specifications (AECMA, 2004).

According to Nyberg et al. (2003) STE is the most commonly used CL in industries today, and it is human-oriented (refer to section 2.5.1). The language is used at companies such as: Eurocopter in Germany (military and civil helicopters), Rolls-Royce in North America (aircraft, industrial and marine engines), Shikoku Kakoki in Japan (food and beverage packing machines) and at Tellabs in Denmark (telecommunications) (Tedopres, 2007). STE is a standardization of the English language used in technical documentations with the core concept of an easy, readable text (AECMA, 2004). According to Barthe (2005) the purpose with the simplification is to eliminate comprehension problems for non-native English speakers.

2.6.1 The AECMA Simplified English Guide

The purpose of the SE-guide is to explain the rules and features of STE (AECMA, 2004). The SE guide contains a vocabulary, where the approved words and their meaning are included. The guide is also a collection of a set of writing rules with both incorrect and correct examples. The guide was first published in 1986 and today it is used in aviation industries and other branches all over the world (for more detailed examples see section 2.6). (AECMA, 2004; Nyberg et al., 2003)

The approved words are sufficient to express any technical sentence and are chosen because of their simplicity and ease of recognition (AECMA, 2004). The principle behind the words is, like for other controlled languages, one word equals one meaning. An example is that “to fall” has the definition of “to move down by the force of gravity” and not “decrease” (AECMA, 2004; Nyberg et al., 2003). Likewise, there are restrictions concerning spelling, and where there are differences between American and British English the American version is advocated by the guide (AECMA, 2004).

The dictionary in the SE-guide consists of a limited number of approved words, their meanings along with an example of the correct use and parts of speech where the word can be used (see Table 1). In the dictionary there are also unapproved words, and for each of them a suggestion of an approved word is given by the dictionary, together with an example of the correct use. (Unwalla, 2004)

Table 1: ***A dictionary part from the SE-guide. Approved keywords and approved examples are in capitals, whereas unapproved words, unapproved examples and the assigned meaning are written in small letters.*** **Source: AECMA (2004).**

Keyword (part of speech)	Assigned Meaning/ USE	APPROVED EXAMPLE	Not Acceptable
AGAINST (prep)	In "contact" with.	PUT THE HOSE AGAINST THE FACE PIECE.	
advance (v)	FORWARD (adv), SET	MOVE THE LEVER FORWARD.	Advance the lever.
		SET THE THROTTLE TO MAXIMUM POWER.	Advance the throttle to maximum power.

In addition to the approved words in the dictionary, the writer is allowed to use words in a specific company dictionary. This dictionary is a collection of words that according to the SE-guide can be classified as technical names or technical verbs. The SE guide lists when words are allowed to be classified as technical names or technical verbs, and there are restrictions which tell the writer how to use these categories. Technical names are for example names of locations on the aircraft, such as: cabin, fuselage or wing. These words are only allowed to be used as nouns or adjectives. Technical verbs express a technical operation, for example manufacturing processes or computer processes, and are only allowed to be used as verbs. Drill and spray are examples of approved technical verbs which describe a manufacturing process, while enter and print are approved technical verbs describing computer processes. (AECMA, 2004)

In section 2.1.1 the differences between instructions and descriptions are presented. These two types of TD are also differentiated in STE, and are called procedures and descriptions. There are separate rules depending on the type of document. The main difference between these two types is that the purpose of descriptive writing is to give information about something, and not instructions as in procedural writing. (AECMA, 2004)

The writing rules within the SE-guide contain restrictions in nine different categories, as follows (see also appendix 5):

1. **Words:** In this category the writer is told to use approved words and their meanings, as well as to be specific and use consistent spelling (AECMA, 2004).
2. **Noun phrases:** In this category the writer is told not to use noun clusters of more than three words. Methods for clarifying noun clusters are also described by this category. Noun clusters are groups of nouns where they are used to describe another noun, for example "runway light connection" with "connection" as the main noun. Too long noun clusters are difficult to understand, since the main noun is harder to find than in shorter noun clusters. (AECMA, 2004)
3. **Verbs:** In this category the writer is told to use the approved verbs. The verb forms and their applications are described, as well as that verbs should be written in the active voice. Methods for changing from the passive to the active voice are presented in this category. (AECMA, 2004)
4. **Sentences:** In this category instructions for creating sentences are given. According to the core concept of STE (see 2.6) sentences should be as short as possible. In line with

that the writer is in this category told to write about one topic in each sentence, to use tabular layout for text containing a lot of information and to present information slowly in a logical order by using connecting words such as: thus, and, but, etc. At the same time, the writer is told in this category not to omit words in order to keep sentences short. (AECMA, 2004)

5. **Procedures:** In this category the writer is given rules for how to write procedures. The writer is for example told to use a maximum of 20 words per sentence, to write one instruction per sentence if not more than one action is done at the same time, and to use the imperative form. (AECMA, 2004)
6. **Descriptive writing:** In this category the writer is given instructions about how to write descriptions. The writer is for example told not to use more than 25 words per sentence, and to use paragraphs in a way that shows the logical order of the text. Besides, different rules for how paragraphs should be written are described in this category. (AECMA, 2004)
7. **Warnings, cautions and notes**: In this category rules concerning how to write warnings, cautions and notes are described. There are important differences between the three concepts which are determining factors for the rules. Technicians are from warnings and cautions told that parts of the procedure could be dangerous or cause damage. Consequently these parts should be written with clear and specific commands. Notes, on the other hand, are written in order to add more information, especially in a procedure, accordingly notes should not be written using commands. (AECMA, 2004)
8. **Punctuation and word counts:** In this category rules are given concerning how to use punctuations and how word counts are performed. (AECMA, 2004)
9. **Writing practices:** In this category instructions are given on how to rewrite sentences according to the other rules of STE together with general writing practices. (AECMA, 2004)

2.6.2 Text comprehension

One purpose with STE is to eliminate comprehension problems for non-native English speakers (mentioned in section 2.6). Shubert et al. (1995) investigated whether documents written in STE is easier to understand than texts not written in STE. In the study they used 121 students, 90 of them were native English speakers and 31 were non-native English speakers. The task was to read a procedural text either written in STE or not, followed by doing a comprehensible test. The procedural text contained two different procedures (A and B) and one STE and one non-STE version of both procedures. The comprehensible test was composed of two parts, one with multiple choice, short answered and true/false questions and one part where the participant were asked for each question to identify where in the document the answerers were found. The result from the study showed a significantly better performance for both native and non-native English speakers when reading the STE version. However, there was a greater difference between participants who read procedure A than the ones who read procedure B. In further analyses it was shown that procedure A was more complex than B. To summarise the findings, the study showed that STE significantly improves the comprehensibility and the identification of content location of more complex documents for both native and non-native English speakers.

Thrush (2001), on the other hand, wanted to investigate whether some linguistic features are more advantageous for some readers than others, dependent on the reader's native language.

In STE, as well as other controlled languages, the approved words are chosen because of their ease of recognition (see section 2.6.1). Thrush (2001) meant that the common words or the approved words within the dictionary mostly have Germanic origin while most of the unapproved words have Latin or French origin. Consequently, Thrush (2001) believed that texts written in STE may be more comprehensible for German readers than for French readers. She believed that the comprehension of the text is influenced by the reader's extraction. To investigate this, some words of either Germanic or Latin origin were removed from a passage of a text. The participants in the study, which were 44 German and French students, were supplied with a list of words to choose between in order to complete the blanks in the passages. The word list consisted of the correct term and a synonym which was the Germanic version if a Latinate word was removed and vice versa. The results of the study showed that both German and French speakers preferred the use of Latinate words. However, French speakers preferred Latinate words to a greater extent than German speakers.

Thrush (2001) investigated also if German students more easily understood texts where Germanic synonyms were used and vice versa. These results showed no significant difference. In the study Thrush (2001) has used a short text example which she believed may have affected the results. Accordingly, she recommended further investigations whether the reader's extraction influences the comprehension or not. However, the studies by Thrush (2001) have shown that some features within STE are less applicable when the audience are non-native speakers of English, and that some features affect some segments of the audience more than others. The most common words for a native English speaker are not necessarily easy to understand for a non-native speaker. Thrush (2001) investigated if phrasal verbs, which are two-word verbs consisting of one verb and one or two prepositions, are more difficult for non-native English speakers to understand than for native English speakers. The results showed that these verbs were more difficult for non-native English speakers than for native English speakers. According to Thrush (2001) the key behind successful technical writing is the audience and the purpose of the document.

2.6.3 Translation effects

According to Lehrndorfer and Mangold (1997) the cost of translations normally is based on the number of lines (50 keystrokes/line) and dependent on the SL and TL. A lot of time is needed to do translations between languages with great differences, but the translation is improved both in speed and accuracy by a source document with high quality. Irrespective of the translator, machine or human, the overall post-editing effort is reduced by high quality source documents (van der Eijk, 1998). In order to obtain an easy understandable source text both for the human and the machine, Lehrndorfer and Mangold (1997) in their article asserted that the text has to be written in a CL, and STE is given as an example. This is in accordance with the article by Baker et al. (1994), where it is shown that machine translations is easier and more correctly performed when the source document is written in a CL. The reason is that dramatically less syntactic structures are found when the source document is written in a CL. Consequently, the target sentence is probably translated with the correct intention. For more information about the system used in the article by Baker et al. (1994), refer to section 2.4.2. Controlled languages have a consistent syntax and terminology, consequently translation memories together with terminology databases are very effective (Brockman, 1997). The translation process is faster and the translation costs are reduced, because correct terms or suggestions for translations are quickly found by these tools (Brockman, 1997).

The quality and ease of translations from STE into other languages was investigated by Spyridakis et al. (1997). The aim of the study was to test the assumption that the translatability of technical documentation for native speakers of different languages is improved by using

STE. In the study a total of 39 students in the USA, 18 native speakers of Chinese, 15 native speakers of Spanish and six native speakers of Japanese, translated one of four documents. The material for translation was airline maintenance procedures, where two different procedures (A and B) were written in two versions with similar layout. One version was written in STE and one was not written in STE. The researchers believed an easy translatable document looks very similar to the original document when translated, and consequently the participants were told to preserve the meaning and the style of the original document as much as possible during the translation. The translations were rated by three other native speakers of every language. These were given a baseline translation for each document, which were designed to provide a standard of a good translation, and a rating key. The baseline translations were done by three Boeing employees, one native speaker for each language. The translated documents were assigned a grade according to the rating key, which included measures about the accuracy of the translation, style match with the original document, ease of comprehension, number of major and minor mistranslations, and number of major and minor omissions. The study showed the following results:

- No matter the native language of the participant, analyses of all data together showed that STE translations had a significantly higher style match with the original document and fewer omissions than the other translation. Even though no significance was shown, the means showed that translations of the STE version were of higher quality than the other translations, except from major mistranslation.
- Spanish translations of the STE version showed significantly higher on accuracy, style match and comprehension. These translations contained also significantly fewer mistranslations.
- Chinese translations showed no significant difference between the both translations.

Chinese is linguistically less similar to English than Spanish. That may be a reason why no differences between translations of documents written in STE or non-STE were found in Chinese translations (Spyridakis et al., 1997). According to Spyridakis et al. (1997) STE as source language is useful, especially for companies where translations from English into other Indo-European languages are done by non-professional translators.

2.7 Other controlled languages

Except for STE there are other known controlled languages that have been used in industries all over the world. In this section short descriptions of some of these controlled languages are presented.

2.7.1 Caterpillar Technical English

The heavy equipment manufacturing company Caterpillar Inc have together with Carnegie Mallon University's Centre for Machine Translation (CMT) and Carnegie Group Incorporated (CGI) developed Caterpillar Technical English (CTE), which was launched in 1991. Caterpillar Inc has a world wide market, selling products and parts that involve complex subparts, for example engines and hydraulic systems. For these systems a production of uniform, high qualitative and translatable technical documentation is necessary. (Kamprath and Adolphson, 1998; Nyberg et al., 2003)

The vocabulary of CTE was made up of around 70 000 terms. CTE was according to Nyberg et al. (2003) intended to improve translation quality and reduce manual translation costs, as well as standardized terminology and writing style for the author. CTE was not the first CL deployed at Caterpillar. In the 1970's Caterpillar developed and used Caterpillar Fundamental English (CFE), the first CL in use. The vocabulary of CFE had 850 terms. CFE was planned

to be used by non-English speakers. The intention of CFE was that non-English speakers after some basic training would be able to read the documents. (Kamprath and Adolphson, 1998; Nyberg et al., 2003) For several reasons Caterpillar abandoned CFE in 1982, but CFE inspired other controlled languages such as White's International Language of Service and Maintenance (ILSAM) and Perkins Approved Clear English (PACE). ILSAM in turn are according to Nyberg et al. (2003) considered the root of STE, which were described in section 2.6.

2.7.2 ScaniaSwedish

ScaniaSwedish is a CL developed by Scania CV AB in co-operation with the Department of Linguistics at Uppsala University (Almqvist & Sågvall, 1996). ScaniaSwedish is a standardization of the language used by Scania, in their truck maintenance documents. The documents are translated into seven different languages and its quality is an important competitive factor on the market. It is important that the language of the documentation is consistent, correct and easy to understand. A standardized source language is also a precondition to improve the translation process by using translation tools. The aim of the restrictions of ScaniaSwedish is to eliminate unnecessary linguistic variations, but still keep the expressive power that is required. (Almqvist & Sågvall, 1996)

2.7.3 Ericsson English

Ericsson English (EE) is a CL developed by Ericsson. EE was created for use in basic technical instructions and descriptions (Ericsson, 1983). The documents were supposed to be comprehensible for readers with poor knowledge of English by using EE. After EE was developed, Ericsson thought it would be useful to be able to produce higher-level documentation (such as instructions for computerised testing, technical descriptions and explanations of processes) in a similarly restricted way. The language required in these documents was an extended version of EE, since a wider range of English was needed. The title of the language permitted in basic instructions was level one and the extended version was called level two.

2.8 Controlled language tools

The growing interest in controlled languages gave rise to the need for CL authoring support (van der Eijk, 1998). The process of checking for compliance with a CL specification is considered tedious by the writers, consequently an automatic checking tool with few false alarms is probably appreciated (Nyberg et al., 2003). The texts are not automatically changed into the proposals given by the checker. Only the human being has the possibility to decide whether the sentence makes good sense or not (Boeing, 2007). CL checking tools are software applications, which verify that all words are approved and that the writing rules within a particular CL are obeyed (Nyberg et al., 2003). Technical writers are supported by the checker, in the way that possible errors and proposals for corrections are provided to the writer through text messages. The suggestions for corrections may be general proposals for making the text conform to the writing rules, specific proposals to choose between or provision of fully automatic corrections. (Nyberg et al., 2003) Figure 2 gives an example of the text message given to the writer by a checker, which has detected a used unapproved word within the text. The checker in this case is the HyperSTE checker, which is further described in section 2.8.2.

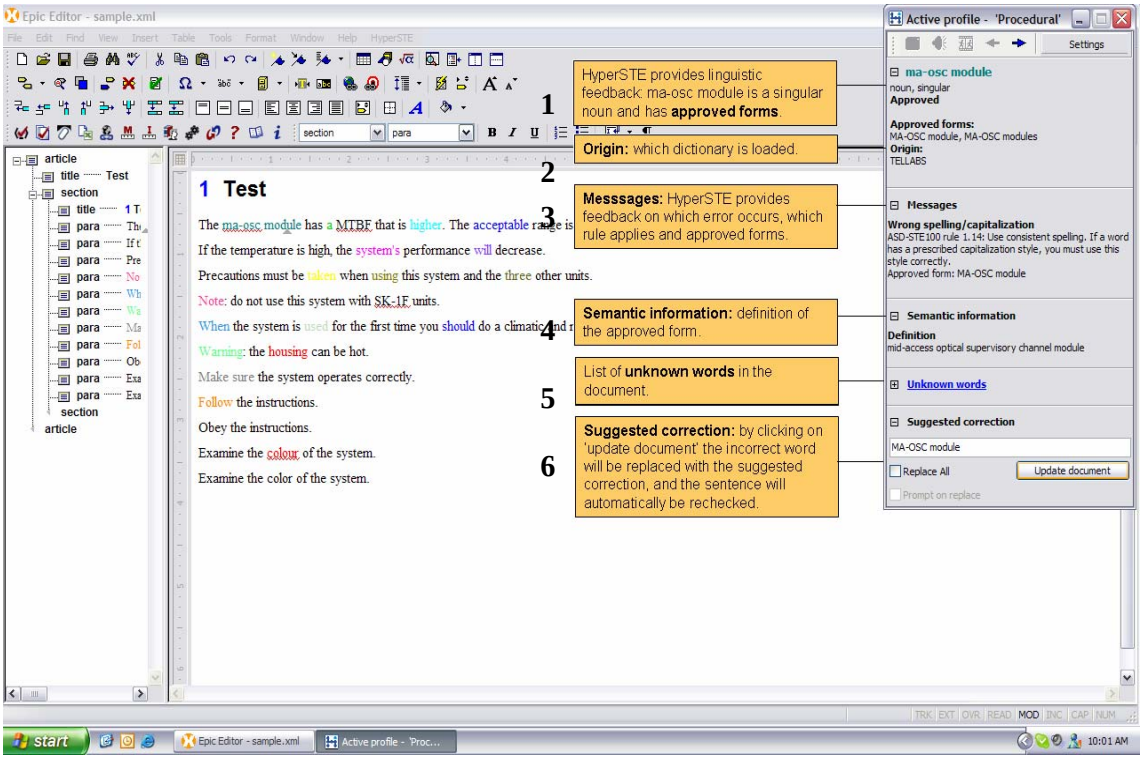

Figure 2: ***An unapproved word has been detected by the HyperSTE Checker. The following information is given to the writer: (1) linguistic feedback is provided: "ma-osc module is a singular noun and has the approved forms MA-OSC module or MA-OSC modules (2) origin: which dictionary is loaded (3) feedback on which error occurs, which rules applies and approved forms are provided by the HyperSTE Checker (4) semantic information: definition of the approved form (5) a list of unknown words in the document (6) suggested correction: by clicking on "update document" the incorrect word will be replaced with the suggested correction, and the sentence will automatically be rechecked.*** **Source: Braster (2007).**

The tool has to do different computational processes to check if a word is approved or not. According to Nyberg et al. (2003) some of the easiest processes for the tool are for example to decide the syntactic category within the context, morphological analysis and to look up the word within the dictionary. A useful CL checker has to be able to find out the meaning of the word within the used context, since words in STE are approved only in one meaning (Nyberg et al., 2003). Some rules within STE are based on human understanding which no current computing technology can duplicate and no CL checker could verify (Boeing, 2007). A top-quality checker is signified by high values of recall and precision. Recall is the percentage of possible error messages found by the tool, and precision is the percentage of correctly received error messages by the writer (Nyberg et al., 2003).

According to Nyberg et al. (2003) most checkers are developed to be used in-house, but there are some companies that have produced tools for commercial use. In the following sections a few checkers developed for STE are described.

2.8.1 Boeing Simplified English Checker

The Boeing Simplified English Checker (BSEC) has been used since 1990 and was developed by Boeing, for internal use only (Boeing, 2007; Nyberg et al., 2003). The checker helps writers comply with STE (see section 2.6) and is intended for use by writers who have been trained to write in STE (Boeing, 2007). The writers are told when unapproved words or incorrect grammatical constructions are used, and the writers are supplied with approved alternative expressions by the checker (Boeing, 2007).

Texts are analyzed for compliance with mechanical aspects of the standard by the checker. Some important rules within STE that are detected by the checker are the following (Boeing, 2007):

- Sentence length (20-25 words)
- Paragraph length (6 sentences)
- Noun cluster length (3 words maximum)
- Missing articles (based on count and mass distinctions)
- Unapproved verbal auxiliaries (passive, progressive, perfect, modals)
- Unapproved –ing participles
- Multiple commands in a single sentence
- Warning, Caution and Note errors
- Correct vocabulary and parts-of-speech usage

The checker detects also some grammatical and syntactic errors that are not explicitly expressed in the STE-guide, such as double word errors, misspelled words and punctuation problems (Boeing, 2007).

2.8.2 HyperSTE Checker

HyperSTE is a flexible checker tool aimed at facilitating the implementation of STE (Tedorpes, 2007). The tool is available from the company Tedopres. In addition to helping technical writers to check their texts for compliance with the rules of STE and standardized terminology, the checker also facilitates quality assurance by providing reports on the quality of the documentation checked (Tedopres, 2007).

HyperSTE is configurable for different documentation types, and has for example the following features (Tedopres, 2007):

- Fully STE compliant for aerospace and defence industries
- Customisable for STE in other industries
- Customisable and configurable to the technical documentation needs
- Allows rules to be added or disabled (e.g. check for correct use of terminology only)
- Profile management (apply different sets of rules to different parts or types of documents)

An example of the HyperSTE Checker plugged into the Epic Editor can be seen in Figure 2.

3 Method

The methods used in this thesis were interviews and questionnaires. Such designs, where interviews are combined with questionnaires, are called multi-method designs (Brewerton, 2001). In the first section of this chapter the procedure of the study is described followed by a description of the interviews and the questionnaires. Finally, the methods for analysing the material are presented.

3.1 Procedure

The process of collecting the needed information to be able to discuss the advantages and disadvantages of using STE is divided into two parts.

The first part was carried out at Saab Systems in Järfälla, and consisted of several interviews with employees. Firstly, an introductory interview was done, in order to amass information about the company and their publication process. After that, a few main interviews were carried out to collect the technical writers' opinions about STE.

The second part involved sending out questionnaires to technical writers at SI&M that have been writing TD in STE before. This material made up the basis for comparison.

3.2 Interviews

The purpose of the interviews was to amass as much information as possible about the company Saab Systems and the technical writers' views of STE.

3.2.1 Selection

In qualitative methods, it is important that the interviewee has knowledge of the subject (Holme & Solvang, 1997). The participants in the interviews were chosen by the manager of the department at Saab Systems, after the manager was given an introduction to the purpose of the investigation. Accordingly, the interviewees were considered to have enough knowledge of the subject to be able to participate in the interviews.

In the introductory interview, one person was interviewed who has been involved in the development of the documentation process at Saab Systems. The selected interviewees for the main interviews needed to be involved in the specific project where STE was going to be used, and consequently five people were available for the interview. All of these five writers were men with a more or less technical background. They were all engineers, but one of them had worked as a high school teacher, as well. Two of the five interviewees were permanently employed by Saab Systems, whereas three of them were consultants from SI&M. Three of the five interviewees had participated in a two day introductory course about STE.

3.2.2 Introductory interview

The purpose of the introductory interview was, as mentioned in section 3.1, to collect as much information as possible about the company Saab Systems and their publication process. To amass this information a one-on-one unstructured interview was done at the office of Saab Systems. One-on-one unstructured interview is a definition of a situation very similar to an ordinary conversation, where an interviewee and an interviewer interact with each other (O'Leary, 2004). In line with the purpose of the first visit at Saab Systems, an interview situation similar to an ordinary conversation, where the interviewee explained the publication process at the company, was considered the most appropriate method. During the visit, field notes were taken by the interviewer, as well as information from the intranet was collected. In

order to have knowledge of the company before the questions for the main interviews were done, the introductory interview was carried out and analyzed several weeks before the main interviews. Variations between data collection and analysis are very common in qualitative methods (Holme & Solvang, 1997).

3.2.3 Main interviews

The main interviews were five semi-structured interviews performed at the office of Saab Systems in Järfälla. The data from the interviews were collected by field notes, and recorded with an mp3-player, ZEN Creative. Before the interview, all participants were informed about ethical issues and that taking part was voluntary. The time for the interview was estimated to one hour, but qualitative interviews are adjusted after the information content, which means that the interview is finished when the received information has reached saturation point (Holme & Solvang, 1997). In the end, the time for the interviews differed between half an hour and one hour.

The interviews were semi-structured, which is a flexible way of doing interviews in order to amass as much information as possible about the technical writers' opinions. The advantage of semi-structured interviews is that questions with fixed-choice responding are combined with the participant's possibility to explain their responses and to provide more in-depth information. Accordingly, semi-structured interviews were considered the best choice of method for the purpose of this study. (Brewerton, 2001) Semi-structured interviews are controlled by a questioning plan done by the interviewer (O'Leary, 2004). The plan or guideline for the interviews in this survey was made out of open questions regarding the concepts considered relevant, for example the available checkers, advantages and disadvantages with STE. Open questions are preferred in situations like these interviews, where the respondent's view of something is requested, since the respondent is free to express any opinion (O'Leary, 2004). However, it is important to remember the relevant concepts, which the interview is supposed to generate information about to obtain the required data. Consequently, it is necessary to use a guideline during the interview (Holme & Solvang, 1997). In this case, two different guidelines with minor differences (se appendix 1 and 2) were developed, since some of the interviewees were permanently employed at Saab Systems and some others were consultants.

3.3 Questionnaire

A questionnaire with both closed and opened questions was designed (see appendix 3). According to O'Leary (2004) closed questions are answered by choosing between predetermined alternatives, like in this questionnaire (see appendix 3) between easier to understand or easier to translate. The closed questions used in this study were mostly combined with opened questions which were replied to by motivating the choices of alternatives. In order to collect material for comparison the questionnaires were sent out by email to nine technical writers at SI&M that have been writing TD in STE before. The age distribution of the writers was between 27 and 62, and eight out of these nine writers were men. The mother tongue of all writers was Swedish, and most of them had a technical background.

Using a questionnaire has several advantages, for example answers from a large sample are gathered within a short period of time. The desired writers' were located at different places in Sweden and therefore a questionnaire was designed and sent out by email. In the design process of the questions, a pilot study was done with one person at the SI&M's office in Stockholm. This person has not been using STE as language for documentation but has knowledge of STE by working with other documentation standards.

3.4 Analysis

The analysis method used in this case is called content analysis (Brewerton, 2001). This method involves production of a running text by analyses of transcriptions or other data. According to Brewerton (2001) there are distinctions between qualitative, quantitative or structural content analyses. In this thesis the focus is on the meaning and not on quantifying the results, accordingly qualitative content analyses were carried out.

3.4.1 Analysis of main interviews

Firstly, all five interviews were transcribed. The transcriptions were made roughly by reproduction of the words stated by the writer. Tunes or intentions were left out, only the words were reproduced (see appendix 4). The analysis was supposed to be presented in line with the three areas; higher documentation quality, reduced translation costs and reduced production costs, and consequently appropriate quotations from the transcriptions were separated into these areas. Some quotations were considered facts rather than opinions, as for example quotations about the publications at Saab System. These quotations were summarized and included in chapter 4. In the other three areas, quite similar quotations were put together within different categories which were in line with the questions within the interview guide. In the area of higher documentation quality there were six different categories: STE as a disadvantage for the writing situation, STE as an advantage for the writing situation, STE as an advantage for the final document, STE as a disadvantage for the final document, general opinions about STE and opinions about the checker. In the area of reduced production costs there were three categories: learning time, speed of production process and writing speed. Finally, the quotations were collected and a running text, where the writers' opinions are presented, was produced.

3.4.2 Analysis of the questionnaires

Firstly, the questions were associated with different areas. Question 3,4,5,7 and 8 (see appendix 3) were related to the area of higher documentation quality whereas question 6 and 9 (see appendix 3) were connected with reduced production costs. Finally, the answerers were categorized into different categories which were in line with the questions. The area, higher documentation quality, was divided into four categories: improved quality, advantages of STE, disadvantages of STE and the checker. The area, reduced production costs, was divided into two categories: the production process and the writers' writing speed. The analysis resulted in a running text.

4 Production of Technical Documentation at Saab Systems

An introduction of the company Saab Systems is presented in the beginning of this chapter. Thereafter the TD produced at Saab Systems is described followed by a description of the publication process. The chapter is finished by a presentation of the current situation, where STE is implemented at Saab Systems. All information in this chapter is retrieved from the Saab Systems intranet, the company's homepage and from interviews with employees.

4.1 Saab Systems

Saab Systems is a supplier of customized decision support systems for defence and security solutions in air, land or naval environments (Saab Systems, 2007). These systems can be found in different platforms, such as aeroplanes, tanks and vessels. The decision support systems are made to be able to plan an execution from one computer in one of the platforms. This is done by using the collected information about the platform's enclosed environment, which is represented on the computer screens. (Fängström, 2007) The decision support systems are flexible and enable the customers to customize the system after their specific needs. Saab Systems have a capacity to follow up the full life cycle of a decision support system from design through support and training. (Saab Systems, 2007)

The customers of Saab Systems are not necessarily the actual end users of the decision support system. Saab Systems have for example sold a system, which is mounted in one vessel made by Kockums and Försvarets Materiel Verk (FMV). These two companies are the customer of Saab Systems. However, in this case the user is not FMV or Kockums, but rather the user of the vessel and the end user of the system is the Swedish Naval Forces. Most of the systems designed by Saab Systems are found world wide on the military market, but there are also projects on the civil market. (Fängström, 2007)

In Sweden there are about 670 employees at Saab Systems, and the headquarter is located in Järfälla near Stockholm. Saab Systems also has offices in other positions around Sweden, for example in Arboga, and in other countries like Australia and Finland. (Fängström, 2007)

4.1.1 Integrated Logisitc Support

Integrated Logistic Support (ILS) is the division at Saab Systems where the TD is produced. ILS is part of the Naval Systems and is divided into three functional groups with around 20 employees. (Fängström, 2007)

Logistic Engineering (LE), one of these three functional groups, deals with the capabilities of maintenance for the technical system. LE is divided into two main areas. The first one deals with analysing and influencing the design for the purpose of building the support requirements into the system. This is done by different analyses, such as maintenance task analysis, which analyses how the system should be maintained, and reliability analysis, which analyses when the system breaks down and what happens then. In the other area of LE spare part calculations is performed. (Fängström, 2007; ILS, 2007)

The functional group where the TD is produced is further described in section 4.2. TD at ILS is called technical publications. (Fängström, 2007; ILS, 2007)

Another functional group deals with training. The most common kind of training provided by ILS is, when either the customer visits the location of Saab Systems or when personnel from ILS visit the customer, to perform training regarding operative actions or maintenance. Other

kinds of training provided by ILS have a closer form, with focus on specific parts of the system or training where the customer joins the project for a long time. (Fängström, 2007)

ILS personnel are involved during the whole system development process and are able to influence the technical design, participate in technical examinations, sub-supplier meetings and to develop the strategy for the future support of the product (Fängström, 2007; ILS, 2007). According to ILS, a system is the product itself and every necessary function associated with the product, as for example technical publications and customer training. All technical publications for operational and maintenance purposes are produced by ILS. (ILS, 2007)

4.2 Technical Publications produced by ILS

Technical publications are delivered to the customers in digital forms or as paper copies (ILS, 2007). The source language of all the publications is English, and there are no translations done before delivery. Technical publications produced by ILS are divided into the following categories:

- System descriptions, which are general descriptions of the present system, with aspects on hardware and functionality, as well as interfaces to subsystems.
- Maintenance descriptions, which are descriptions on different levels of where in the organisation the maintenance is performed. There are for example descriptions about how the system is maintained as preventive and corrective measures. Safety instructions, which are about how the system is handled to avoid personal injuries and damages to the system, or built-in information, which contains instructions about procedures the user through pushing a button have access to, are also included in this category.
- Technical descriptions, which are more detailed technical descriptions than are found in the system description. Hardware information i.e. drawings and lists containing information about the hardware in the system, are for example included in this category.
- Operating instructions, which are instructions about how the system is operated.

The target group of the publications varies depending on the type of publication. The readers of operating instructions or other software publications are for example either computer technicians or operators, which could be officers. Maintenance descriptions or other hardware publications are for example written for engineers repairing the system.

4.3 Technical Publication process

During year 2006 the publication process at ILS changed a great deal. Today the process explicitly is an iterative process with the purpose of creating accessible technical publications for the customers (ILS, 2007). The development of technical publications has a functional focus, which means that the Functional Group Leader (FGL) is responsible for one function through all projects. Earlier the process had a project focus, which meant that one person was responsible for one part of a project, but on the other hand needed to control all the other subparts of the project. The reason behind these changes was reorganization at all divisions in Naval Systems. (Fängström, 2007)

An overview of the technical publication process today is described in Figure 3.

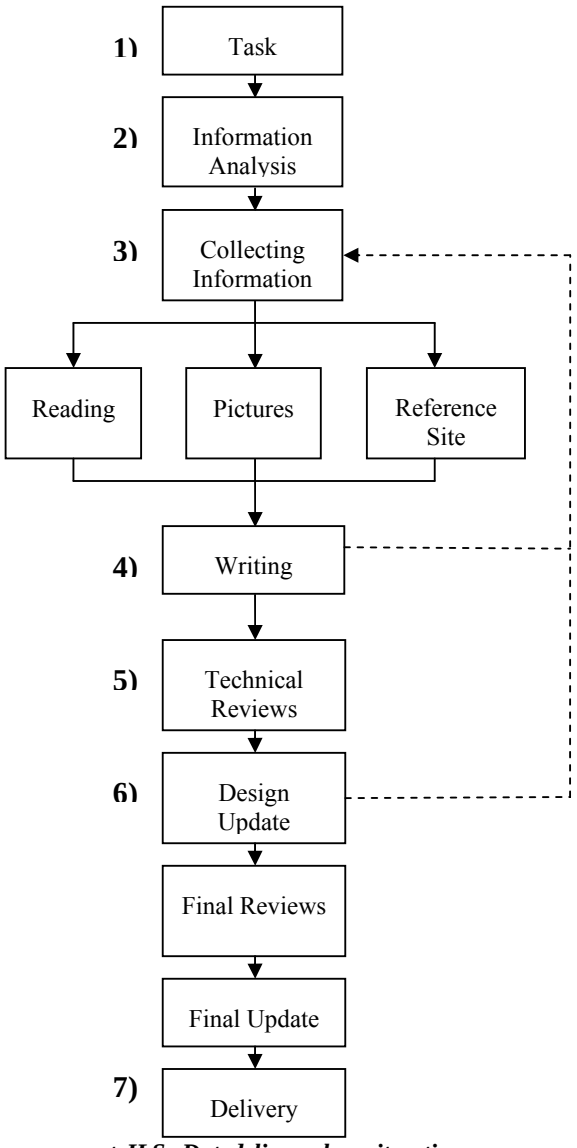

Figure 3: ***The publication process at ILS. Doted lines show iterative sequences where the author may be forced to go back in the process while the black lines show the process straight-forward.***

(1) The process is started by an initiation of a task according to system design, customer requirements and system information. A task is either to create new publications or to update current publications for external or internal customers. Internal customers are other parts of the Saab Systems organisation.

(2) After an initiation of a task is done, the following step is called information analysis. Each technical writer is given responsibility for a specific area of the system. To be able to write technical publications, knowledge of customer requirements is required. To be able to analyse the content and depth of the publications that are going to be produced, knowledge of previous and similar technical publications is required. Analysis is done by the FGL, System Engineer Manager (SEM) and Technical Author (TA), sometimes the customer is also involved. The information analysis is resulted in the structure of the technical publications, the content of each chapter and the level of information, the target group for each publication, time schedule, terminology, etc.

(3) After the information analyse is done, the writer has to collect a lot of information about the system. Information is collected by reading design and other specifications of the system, and by taking pictures of the hardware. The reference site, which is used to test and understand the system, is also important for the technical writer to acquire a deeper understanding of the system.

(4) When the information is collected the writer starts writing. When writing the publication the writer may find the collected information insufficient and may therefore have to go back and gather more information. This makes the writing process, an iterative process.

(5) When the writing is done and the technical publication is produced a technical review of the document is done by the Software Engineer (SWE), Hardware Engineer (HWE) and SEM. In technical reviews both the language and the technical content are examined.

(6) The system development process is going on during the technical publication process and consequently some design updates may have been implemented. Design updates may result in a need for the technical writer to collect new information. A final review of the document is performed if there are no design updates. The Review Manager (RM) is responsible for the final review where both the technical content and formalities are inspected. Formalities of the publications are for example date and the responsible division at Saab Systems, but also depth in the publications. Finally, the last updates in the publications are done by the writer.

(7) At the end of the process, the technical publications are delivered to the customer. (Fängström, 2007; ILS, 2007)

4.4 Implementation of STE at Saab Systems

To begin with only new projects at Saab Systems will be written in STE instead of traditional English. STE will primary be used in action oriented publications, but also in descriptions and other manuals. When the interviews were done some of the writers who wrote descriptive documents, did not strictly obey all the writing rules within the SE-guide, unlike the writers who wrote procedures. The text in the projects where STE is going to be used is written in the Arbortext editor integrated into a platform called UpTime created by SI&M. Before, the publications were written in Interleaf or FrameMaker. During the use of STE the writers will have two instruments for support, the SE-guide including a company approved dictionary together with the HyperSTE checker (described in section 2.8.2). When the interviews were done the checker did not work properly, which means that the writers have no experience of the tool except from an introduction course.

The changing phase, to use STE instead of traditional English, is gradually taking place in projects where the writer is told by the contract to use STE. The change in language use is one of three major changes for the writers' situation at Saab Systems. Another change is the use of the Arbortext editor integrated in UpTime. The third change at Saab Systems is the application of the international standard S1000D, which is an international standard for defence and aerospace documentation (Tedopres, 2007). Before these three changes the writers were more independent in the writing process. Normally, nothing about the structure or the layout of the publication was written in the contract. However, some of the writers tried even before to avoid using synonymous in order to keep the text easier to understand, but there were not any stricter rules telling the writer how to write the present publication. There seem to have been some unexpressed conventions regarding the structure of the publications, but nothing as strict as STE.

The reasons behind the major changes are to secure uniform, easy and correct publications, where misunderstandings are avoided. In the process of writing publications more than one

writer are involved, but that is not supposed to be visible in the final text. It is also a sales pitch for the company to be able to offer the publication process using STE, UpTime and S1000D.

5 Technical writers' views of Simplified Technical English

In this chapter the technical writers' views of STE are presented. The sub-headings are in line with the identified areas described in the section 1.2. The area reduced translation costs is, however, removed from this chapter, since the respondents were not working with translations. The chapter is finished by a summary, where the opinions from both the inexperienced and the experienced users are summarized.

The sub-headings in the first two sections are divided into two parts: results of the interviews with the inexperienced users and results of the questionnaires with the experienced users. The opinions from the interviews with technical writers at Saab Systems are presented in the first part, whereas the responses from the questionnaires are presented in the second part. Each part begins with a summary of the views followed by lists with the writers' expressed opinions. Quotations in this chapter are translated from Swedish into English. The quotations are edited in order to make sense as a running text, which means that some repetitions and pauses are left out.

5.1 Higher documentation quality

In this section opinions related to advantages and disadvantages by using STE, which has to do with the quality of the final document, are presented. The views presented in this section concerns for example the writing style, the outcome of the final documents and the utilization of controlled language tools.

5.1.1 Results of the interviews with the inexperienced writers

One important factor of STE stated by one writer is, that it is supposed to simplify for the reader and not for the technical writer. Because of the writing rules and the restricted vocabulary the final document is considered simplified and easier for readers to understand, especially for non-native English speakers.

STE is more suitable within procedural writing because of the information reiteration. The overall risk of misunderstandings within technical documents is reduced by the concise and concrete writing. The usage of restricted words results in a uniform publication irrespective of the number of writers involved in the production. In addition there is a risk of reduced accuracy in the writing by using the restricted words. The vocabulary may also be a source of irritation both for readers and writers. Two examples of that stated by one writer, are that a native reader believed the writer thought of him or her as a fool because of the simplification, or that a native reader did not trust the simplified text. When using STE the writers are not allowed to express themselves freely and a sensation of loss of creativity may occur. The restricted vocabulary may be experienced as an advantage and conducted to a simplified writing situation by writers not that good in English. The risk of spelling- or grammatical errors is considered to be reduced by the checker and the vocabulary. The checker tool is believed to improve the text quality by the fact that used unapproved words are noticed and suggestions for corrections are given.

In the interviews, the writers explicitly expressed the following opinions about STE:

- STE is preferred as long as it is used moderately. A few writers believed descriptive texts written according to the rules of STE would be difficult to read because of the restricted vocabulary. The lack of synonyms was considered a problem when writing descriptive texts. On the other hand, the restricted vocabulary was considered advantageous when writing maintenance instructions (procedures) since the actions

presented in these documents may recur in other instructions. Therefore texts from earlier documents can be reused.

- Because the writers are writing for customers in countries where the inhabitants have poor knowledge of the English language, they realized that there is an obvious risk of misunderstanding when using too long sentences or uncommon words. All writers agreed on that the overall risk of misunderstanding is reduced by using STE. One reason mentioned was the concise and concrete writing. One writer said:

  > *"When I have read the text I have written, I can see that the text is easier to understand."*

- Three writers thought of STE as an advantage, because irrespective of the number of writers involved in the production, the usage of restricted words results in a uniform publication. The writers, though, also thought of a few disadvantages of using STE and the vocabulary. One writer believed that there is a risk of reduced accuracy in the writing by using the restricted vocabulary. Most of the writers agreed on that the demand for only using the approved words was annoying, but they thought this feeling may change after a while. One writer thought the writers have lost most of their creativity by writing in STE, since they are not allowed to personally influence the text. Despite the loss of creativity the writer believed they have possibilities to be inventive in other areas within the documentation. An example mentioned was that the writers have the possibility to think of ingenious methods for the user to find and rectify faults or abnormalities in the system.
- Other opinions mentioned were that writers not as good in English as these writers considered they to be, may not see the restricted vocabulary as something annoying, and that a technical writer with a technical background may not experience the restrictions as frustrating as writers with a linguistic background. One writer said:

  > *"There is a distinction between being an author and a writer when working with technical documentation. When you are writing fiction it is different, you are free in your writing. In technical documentation it is defined what you are allowed to write, and especially in STE."*

5.1.2 Results of the questionnaires with the experienced users

Most of the writers agreed on that the readability and comprehensibility of technical documentation is improved by using STE. Texts written in STE are easier to understand because of the short sentence length and the limited vocabulary, and because the text looks uniform and standardized. A restricted vocabulary is considered to lead to fewer words to learn, but there may be a risk of reduced clearness within the documentation. The writers mentioned that it sometimes is hard to find suitable words and expressions, and circumlocutions have to be done, since they are not allowed to use synonyms.

One writer believed it is important for both readers and writers to have knowledge of STE. Otherwise, a feeling of plainness may occur, especially for readers with very good knowledge in the English language. To produce a good STE written text in a simple way, the writer may have to rewrite the text by looking at the sequences and the order of actions. A correct written text in STE is considered difficult to misunderstand. According to one writer there are no reasons not to apply STE to TD, but it may be more difficult within descriptive documents. The writers should, however, keep the rules of STE in mind and endeavour to write "in the

spirit of STE". Almost all writers believed they easier have produced correct written text in STE by means of a checker tool.

In the questionnaires, the writers explicitly expressed the following opinions about STE:

- In seven answered questionnaires out of nine, STE was used in the present project to improve comprehensibility. Five writers thought that the text written in STE is easier to understand since no synonyms are allowed. The limited vocabulary is also an advantage since generally fewer words are involved, consequently the text is easier read and understood by readers not very good in English. Text written in STE is also easier to understand because of the reduced sentence length, and since it looks more uniform. Standardized documentation is to prefer due to that documentation written by different writers will be easier to read. On the other hand, the lack of synonyms and short sentences are considered to result in reduced clearness of the documentation. Sometimes it is also necessary to do considerable circumlocution because of the lack of suitable descriptive words.
- Three writers thought, plainness sometimes occurred in texts where STE was used. One writer stated that this especially concerns readers with very good knowledge in the English language. Due to the lack of synonyms this writer thought that such readers may have misunderstood texts written in STE to a greater extent. Another writer believed readers without knowledge about STE may look on the text as excessively directive and strange. One writer thought that in order to have produced a good text in STE in a simple way the writer has to rewrite the text by looking at the sequences and the order of actions. In that case, the writer was of the opinion that both the writing is easier, and the result is easier to read. This writer meant that a correct written text in STE is difficult to misunderstand. Because there are advantages for everyone, both the writers and the readers, another writer was of the opinion that there are no reasons not to apply STE to TD. This writer believed the text, especially procedures are easier to read, understand and write by using STE. The writer had also the opinion that since texts become easier to read, understand and write by STE, technical writers should endeavour to write "in the spirit of STE" even though it may be more difficult within descriptive documents.
- Most of the writers (four out of five) had been using a checker tool; an example given was the BSEC checker. These writers stated that the tool resulted in a better text since the tool highlighted the used words which were not approved in STE. One of the writers that had been using a checker experienced the tool as something useful when it came to corrections of specific sentences. However, this writer claimed that the tool has to take the terminology into consideration. Otherwise, some of the marked faults are actually not errors.

5.2 Reduced production costs

In this section opinions related to the introduction of STE's influence on the production costs of the publications are presented. The area reduced production costs is associated with the time of production processes, which includes the amount of reviews, the technical writers' learning time and the writers' writing speed (see section 1.2). Results presented in this section are opinions concerning these subjects.

5.2.1 Results of the interviews with the inexperienced writers

In the beginning of using STE most of the writers believed they needed more time to write the publications in STE than in ordinary English. However, the writers thought that when they

have been using STE for a while the time needed to write in STE is less than writing in ordinary English, because of the restricted language and the constant document layout. The learning time of STE is considered individual, but also a question of age. The most difficult within STE was considered to be the requirements of strictly following the rules.

The whole production process, including all the reviews, is considered faster by using STE. The process is quicker from a linguistic point of view because writers do not have to rewrite the text to such an extent as today, but it all depends on the writing speed. The situation for the reviewers is considered different when STE is used by the writers, since a simplified language is used. The reviewers may not have attended any instruction courses in STE and therefore they may have complaints about the simplified language which is used.

In the interviews, the writers explicitly expressed the following opinions about STE:

- Three writers explicitly expressed that they in the beginning of using STE needed more time to write the publications in STE than in ordinary English. However, they thought that when the writers have practiced and crossed the threshold the writing in STE may be performed faster than in ordinary English because of the restricted language and the constant layout. On the other hand, there may not be a difference since even though the language is not restricted, technical writers are not thinking of using beautiful and expressive sentences.
- Four writers admitted that the time needed for a writer to have a good grasp of writing in STE is individual. One writer believed the time needed is a question of age. This writer mentioned that the more a writer had been working without using STE, the harder it probably is to learn to use STE. This writer believed also that from a general point of view younger people learn new tasks more easily than older persons.
- To become familiar with the new way of thinking, the requirements of strictly following the rules was considered the most difficult within STE. Two writers expressed that they earlier had been thinking of writing simple, and not using too many synonyms, but they had not followed any rules. One writer said:

  > *"Personally I can say that I probably before, in other words several years ago, tried to write in line with STE, since there are advantages of uniform and concise writing. I think writing as simple as possible is something that you over the years have learned."*

- The whole production process, including all reviews, is done quicker by using STE, since from a linguistic point of view the writers do not have to rewrite the text to such an extent as today. The situation for the reviewers was considered different and one of the writers believed they frequently have to explain why the simplified expression is chosen due to that the reviewers have not attended any training course in STE. On the other hand, another writer thought the reviewers mostly have comments regarding the functional content and more rarely views about the language used in the publications. This writer considered the reviewers to be readers of the text, and therefore he believed the comprehension of the text, and consequently also the check of the text, would be done easier.

  > *"I would think that it would be easier even for them (the reviewers) to do the inspections, because they are also readers."*

5.2.2 Results of the questionnaires with the experienced users

The time needed to produce technical documentation in STE is individual. Some writers needed more time to write in STE than in traditional English, while others needed less time. A new technical text written in STE may be created quicker due to that one word has one meaning and the writer do not inherit complicated sentence structures from an already written text. In the beginning of using STE every word has to be checked, consequently the writer needed more time to produce the text. On the other hand, a correctly functioning checker which takes the terminology into consideration would accelerate the speed of the production process compared to the speed of the production process without a checker. The learning time is also individual and varied a great deal, between few weeks to one year.

Overall, more time according to the writers was needed for the production process by using STE. Most reasons were related to the writers' writing situation, in other words, the writer needed more time to write the document. Another reason stated was the circumstantial reviews, since the reviewer was not informed about STE and the consequences.

In the questionnaires, the writers explicitly expressed the following opinions about STE:

- Two of the writers who felt they had good command of writing in STE thought it took more time to write in STE than in traditional English. Two other writers were of the opinion that there was no time difference. One writer believed the usage of STE resulted in that new technical text was created quicker, since one word has one meaning and because the writer do not inherit complicated sentence structures from an already written text.
- Another opinion was that in the beginning of using STE every word had to be checked, and consequently the writer needed more time to produce the text. On the other hand, as the time went on technical texts were considered to be produced quicker by using STE, since the writer get to know the most common used words. Likewise, because one word has one meaning and the writer does not hesitate about which word to choose.
- One of the writers that had been using a checker claimed that the tool has to take the terminology into consideration. Otherwise, some of the marked faults are actually not errors. The writer has even in these cases to check whether the tool has given correct suggestions or not. Consequently, unnecessary more time is needed to produce the documentation. On the other hand, a correctly functioning checker is considered a useful tool in order to quickly show the writers which faults they have made.
- In the questionnaires it was shown that six writers considered themselves to have a good command of writing in STE. The time until the writers considered they have learned to write in STE varied a great deal, which are seen in Figure 4. The time varied between few weeks to one year. It is considered a very long time until a writer makes himself a master of STE, but as time goes on the person gradually learns the rules and does not need to look in the SE-guide as much as before.

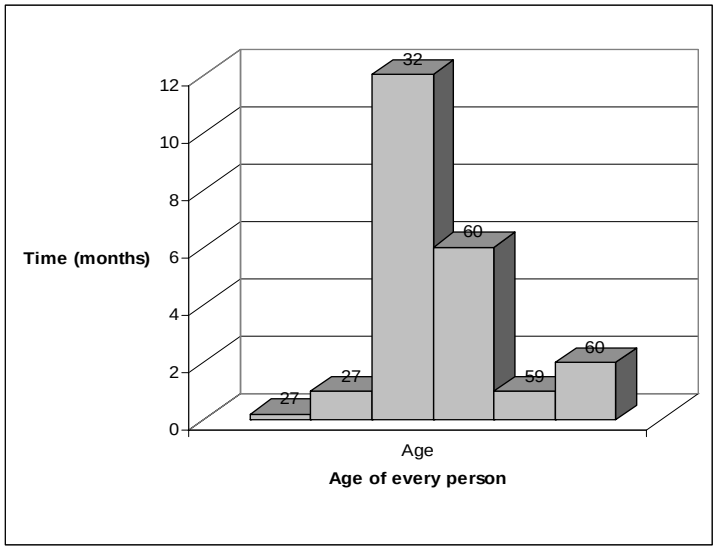

Figure 4: ***A chart over the time six different writers in different ages needed to learn to write in STE. The value above each stack shows the age of the person represented by the stack.***

- Six out of nine writers experienced that the production, from creating TD to delivery, of the documentation took more time when STE was used by the writers. Many reasons thought of had to do with the writer's situation. Someone for example believed more time was needed, since writing in STE not felt obvious and the writer had to choose the words, sentence structure and sentence length carefully.
- Production of descriptions in STE was generally considered to take more time than instructions, especially when the descriptive text contained long sentences and abstract passages. One writer was though of the opinion that there was no difference in the speed of the production when the writers started to use STE, but the writer noted that in the beginning it took more time because the writers had to defend the text in front of the reviewer. The reviewer had opinions about the words and that the language was too simple, but when the concept was explained for the reviewers and they knew that this concept was going to be used according to the contract the reviewer did not have any more complaints about the language.

5.3 Summary

In this section the opinions within the areas, higher documentation quality and reduced production costs are summarized. In the summary the opinions from the inexperienced and the experienced writers are compared and discussed together.

5.3.1 Higher documentation quality

Both inexperienced and experienced writers believed STE is most advantageous for procedures. They agreed that readability and comprehensibility in technical texts are improved by using STE. They also agreed that the documentation becomes more uniform when STE is used regardless of the number of writers involved in the project. One disadvantage with STE mentioned was the risk of loss of accuracy within the documentation. To attain the desired positive effects of using STE an important factor is seemed to be that both writers and readers have knowledge of STE. A reader without knowledge, especially native English speakers, may experience plainness within the language as well as a ridiculous directive language. A writer on the other hand, is in need of knowledge and support tools, as

for example checkers, in order to be able to smoothly write in STE. A checker is a valuable supporting tool for the writer, since they are told when unapproved words are used or when incorrect sentence structures are written. Time for practice is needed for a writer to obtain a good command of writing in STE.

5.3.2 Reduced production costs

The knowledge and the time have a decisive influence on the production process' efficiency. The reviewers, for example, have to know what STE is. Otherwise, both the inexperienced and the experienced writers believed that the production process (from writing to delivery of the documents) would take more time by using STE than traditional English, since the writers have to explain and motivate the used and simplified language. On the other hand, the writers believed the time needed for the reviews would be less if the reviewer has knowledge of STE, since the reviewers are human readers and the comprehensibility of documents is improved by the use of STE. The time needed for the reviews would also be less, because the use of checkers result in that the language used in the document already is complied with the rules in STE.

Another fact that influences the speed of the production process is the writer's writing speed. All the writers who have participated in this thesis believed that STE has individual effects on the writing speed. Whether the writer need less time to write in STE than in traditional English may have to do with the type of documentation. No one of the experienced writers who had been writing descriptive texts believed they wrote faster by using STE. On the other hand, one of the writers who had been writing procedures claimed that he was writing faster by using STE.

Not only the difference in the writing speed is individual, the learning time is also very different between the writers. Figure 4 shows that there is not really any relationship between age and time, as one of the inexperienced writers thought. There are probably other reasons why some learn more easily how to write in STE than others.

6 Empirical evidence

In this chapter two technical text examples are presented to show the advantages of the use of STE. The example within the first section of the chapter is a procedural text and the text presented in the second section is a descriptive text. To show the advantages of using STE, both sections consist of two versions of the same text. One version written in traditional English compared with a version written in STE. Additional examples of comparison can be seen in appendix 6 (Dekker & Wijma, 2004).

Finally, a summary from the comparisons are presented.

6.1 An example of a procedural text

In this section a procedure written in original English is compared with the same text but rewritten in STE. Firstly, the original version is presented followed by the STE-version. After the examples have been presented, the changes (from the original version into the STE-version) in the document are discussed. The discussion is presented in tabular form (see Table 2) where the first column shows the sentences within the original version and the second column the corresponding sentence written in STE. The changes are discussed and motivated in the row below each sentence. Finally, the readability within both versions is measured and compared in order to further analyse the advantageous of STE.

Example 1 – original version

Overspeed Governor

Removal/Installation

Removal of the Overspeed Governor.

1. Any leaking oil can be collected by placing the cleaning cloth under the overspeed governor (3).
2. Disconnect electrical connector (2) from electrical receptacle (1).
3. Note the position of bracket (6), it must be installed in the same position. Remove nut (4) and washer (5), which attaches bracket (6) and overspeed governor (3) to the gearbox. Nut (4) is to be discarded.
4. The bracket (6) is to be safetied to the aircraft structure with a temporary tie, away from work area.
5. Holding the overspeed governor (3), remove remaining three nuts (9) and three washers (8), which attach overspeed governor (3) to gearbox. Three nuts (9) are to be discarded.
6. Remove overspeed governor (3) from gearbox.
7. Protect electrical connector (2), electrical receptacle (1), and mounting pad of gearbox by installing an applicable blanking cap.
8. Remove packings (10 and 11) from overspeed governor (3). Packings (10 and 11) are to be discarded.
9. Remove, and safely discard cleaning cloth.

Example 1 – rewritten in STE

Overspeed Governor

Removal/Installation

1. Remove the Overspeed Governor.

   A. Put the cleaning cloth below the overspeed governor (3) to collect the oil leakage.

   B. Disconnect the electrical connector (2) from the electrical receptacle (1).

   C. Record the position of the bracket (6), you must subsequently install it in the same position.

   D. Remove the nut (4) and the washer (5) that attach the bracket (6) and the overspeed governor (3) to the gearbox.

   E. Discard the nut (4).

   F. Use a temporary tie to safety the bracket (6) to the aircraft structure, away from the work area.

   G. Hold the overspeed governor (3). Remove the remaining three nuts (9) and the three washers (8) that attach the overspeed governor (3) to the gearbox.

   H. Discard the three nuts (9).

   I. Remove the overspeed governor (3) from the gearbox.

   J. Install an applicable blanking cap to prevent damage to:
      - The electrical connector (2)
      - The electrical receptacle (1)
      - The mounting pad of the gearbox.

   K. Remove the packings (10 and 11) from the overspeed governor (3).

   L. Discard the packings (10 and 11).

   M. Remove, and safely discard the cleaning cloth.

Explanations about the changes

The material for comparison in this section was a procedure. Chapter five within the SE-guide (refer to appendix 5) deals with this type of documentation. In general, the most important rules to think of when writing a procedure in STE are: to keep the sentences short, to write only one instruction per sentence except from situations where more than one action is done at the same time, and to use the imperative form of the verbs (the active voice). Another general principle to bear in mind is that the basic philosophy of STE is to keep text as simple and readable as possible (AECMA, 2004).

In the example texts there are a lot of technical names, which are allowed to be used, consequently these names are not changed into the STE-version. Unapproved used words in the original version and the corresponding approved words in the STE-version are underlined. The alteration into approved words and sentence structures are discussed in the row below the sentences. The rules referring to within the table are found in the SE-guide (see appendix 5).

Table 2: ***A procedure written in traditional English in comparison with the version rewritten in STE.***

Original version	STE-version
Removal of the Overspeed Governor.	1. Remove the Overspeed Governor.

The line in the original version is written in the passive voice and has to be changed into the active voice (refer to rule 3.6).

Even though "removal" is an approved noun it is changed into the approved verb "remove", since when an action, as in this case, can be described by an approved verb that verb should be used (refer to rule 3.7).

1. Any leaking oil can be collected by placing the cleaning cloth under the overspeed governor (3).	A. Put the cleaning cloth below the overspeed governor (3) to collect the oil leakage.

The sentence in the original version, as well as in the first example sentence, is written in the passive voice and has to be changed into the active voice (refer to rule 3.6). "Leaking", "placing" and "under" are unapproved words. The word "leak" with the meaning of a verb is according to the SE-guide suggested to be changed into "leak" as a noun. In this case the meaning is better conveyed by the approved noun "leakage", which therefore was used. "Placing" is changed into the suggested and approved word "put" and "under" was according to the meaning replaced by the approved word "below".

2. Disconnect electrical connector (2) from electrical receptacle (1).	B. Disconnect the electrical connector (2) from the electrical receptacle (1).

In STE an article should be used before a noun (refer to rule 2.3), consequently an article is added before each noun in this sentence.

3. Note the position of bracket (6), it must be installed in the same position. Remove nut (4) and washer (5), which attaches bracket (6) and overspeed governor (3) to the gearbox. Nut (4) is to be discarded.	C. Record the position of the bracket (6), you must subsequently install it in the same position. D. Remove the nut (4) and the washer (5) that attaches the bracket (6) and the overspeed governor (3) to the gearbox. E. Discard the nut (4).

Only one instruction per sentence is given in procedures, except from situations where more than one action is done at the same time (refer to rules 5.2 & 5.3). To show a relation between two or more complex actions a tabular layout is recommended (refer to rule 4.3), consequently this part in the original text is divided into three parts in the STE-version.

Part C: In this part "Note" is an unapproved word and is changed into the approved word "record" suggested by the dictionary within the SE-guide. The last part of the sentence in the original version is written in the passive voice which has to be changed into the active voice, or the verb has to be written in the imperative form (refer to rule 5.4). In this part "it" is changed into "you" because in procedures the subject of verbs in imperative form is implied as "you" (rule 5.4). The word "subsequently" is added to distinctly indicate that this action is

done after the first part of the sentence.

Part D: In this part the actions within the sentence are done at the same time, accordingly they are written in one sentence. In STE an article should be used before a noun (refer to rule 2.3), consequently an article is added before each noun in this sentence. As the comma is eliminated in the STE-version the word “which” is changed into “that”. Punctuation in this case is controlled by a style manual chosen by the current documentation project, and has nothing to do with general STE-rules.

Part E: This part was written in the passive voice and has been changed into the active voice (refer to rule 3.6).

4. The bracket (6) is to be safetied to the aircraft structure with a temporary tie, away from work area.	F. Use a temporary tie to safety the bracket (6) to the aircraft structure, away from the work area.

This sentence is written in the passive voice and has to be changed into the active voice, which is done by using the imperative form of the word “use” (refer to rule 5.4).

5. Holding the overspeed governor (3), remove remaining three nuts (9) and three washers (8), which attach overspeed governor (3) to gearbox. Three nuts (9) are to be discarded.	G. Hold the overspeed governor (3). Remove the remaining three nuts (9) and the three washers (8) that attach the overspeed governor (3) to the gearbox. H. Discard the three nuts (9).

In procedures only one instruction per sentence should be given except from situations were two or more actions are done at the same time (refer to rules 5.2 & 5.3). In procedures it is also important to clearly show the sequence of the actions, which is easily done by using the tabular form (refer to rule 4.3). According to these rules this part in the original version is divided into two parts in the STE-version.

Part G: In STE only one instruction should be written per sentence, consequently the first part have to be written in two sentences (refer to rule 5.2). The original sentence is too long with 21 words and has to be shortened. “Holding is an incorrect form of the verb and is changed into the imperative form “hold” to show an active voice. The article “the” is added to the nouns since where it is appropriate in STE an article is used before a noun (refer to rule 2.3). As the comma is eliminated in the STE-version the word “which” is changed into “that”. Punctuation in this case is controlled by a style manual chosen by the current documentation project and has nothing to do with general STE-rules.

Part H: This part was written in the passive voice and has to be changed into the active voice (refer to rule 3.6). This is done by using the imperative form. In line with the rule 2.3, the article “the” is added in this sentence as well.

6. Remove overspeed governor (3) from gearbox.	I. Remove the overspeed governor (3) from the gearbox.

In STE an article should be used before a noun (refer to rule 2.3), consequently an article is added before each noun in this sentence.

7. Protect electrical connector (2), electrical receptacle (1), and mounting pad of gearbox by installing an applicable blanking cap.	J. Install an applicable blanking cap to prevent damage to: - The electrical connector (2) - The electrical receptacle (1) - The mounting pad of the gearbox.

The sentence is written in the passive voice and has to be changed into the active voice (refer to rule 3.6). "Protect" is an unapproved word and is changed into one of the suggestions within the SE-guide, "prevent". A tabular layout is chosen to clearly show the parts which are protected by the installation (refer to rule 4.3). As in this case, when the break-outs in the tabular layout are not complete sentences, only the last break-out is finished by a full stop. The colon is used to show that information follows (rule 8.1). An article is added to each noun since where it is appropriate in STE an article is used before a noun (refer to rule 2.3).

8. Remove packings (10 and 11) from overspeed governor (3). Packings (10 and 11) are to be discarded.	K. Remove the packings (10 and 11) from the overspeed governor (3). L. Discard the packings (10 and 11).

To clearly show the order of two or more complex sequences it is preferred to use a tabular layout (refer to rule 4.3), consequently these two sentences are separated into two paragraphs. The last sentence in the original version is written in the passive voice and has to be changed into the active voice (refer to rule 5.4). In STE an article should be used before a noun (refer to rule 2.3), consequently an article is added before each noun in this sentence.

9. Remove, and safely discard cleaning cloth.	M. Remove, and safely discard the cleaning cloth.

In the STE-version an article is added to the noun or the technical name "cleaning cloth", since where it is appropriate in STE an article is used before a noun (refer to rule 2.3).

Readability measure

To compare the readability between the two versions the Flesch's Reading Ease formula (described in section 2.1.3) was used. The words and the syllables within the text were counted by the WordCalc.com. To check the validity of the tool the words was also calculated by hand, and a few words were used where the syllables easily was counted by hand. A syllable in this case is considered to be an emphasised vowel. The word "remove", for example, is considered to have two syllables, "e" and "o". Likewise, the word "position" is considered to have three syllables, "o", "i" and "io". The counting gave the following results (for the meaning of the letters see section 2.1.3):

Example 1- original version

The number of words = 160.

The number of sentences = 14.

The number of syllables = 229.

ASL = 160/14=11.428, ASW = 229/160=1.431

Score = 206.835-(1.015*11.428)-(84.6*1.431) = 74.151≈74

Example 1 – STE version

The number of words = 172.

The number of sentences = 15.

The number of syllables = 217.

ASL = 172/15=11.467, ASW = 217/172=1.262

Score = 206.835-(1.015*11.467)-(84.6*1.262) = 88.462≈88

The STE text has a higher score (88) than the original version (74). According to the formula, the higher score, the easier is the text to read. In other words, the text written in STE is considered easier to read, than the original version. On the other hand, the measurement shows that the number of words and the number of sentences is greater within the STE-version than in the version written in traditional English.

6.2 An example of a descriptive text

In this section a descriptive text originally written in English is compared with a version rewritten in STE. Firstly, the original version is presented followed by the STE-version. After the examples have been presented, the changes (from the original version into the STE-version) in the document are discussed. The discussion is presented in tabular form (see Table 3) where the first column shows the sentences within the original version and the second column the corresponding sentence written in STE. The changes are discussed and motivated in the row below each sentence. Finally, the readability within both versions is measured and compared in order to further analyse the advantageous of STE.

Example 2 – original version

Nose Landing Gear

Description and Operation

1. Nose Landing Gear Shock Strut Assembly

The nose landing gear shock strut assembly is an oleo pneumatic tube. It compresses and extends to absorb landing loads when the aircraft lands. The main parts of the strut consist of the cylinder and piston.

The cylinder is a vertical tube which has attachment arms at the top end. The strut is attached to the aircraft by a trunnion bolt in each attachment arm. On the outside of the cylinder there are lugs and brackets. The lugs and brackets are for the lower drag brace, upper torque link, extension/retraction actuator, nose landing gear uplock roller, taxi light and nose wheel steering unit.

The cylinder has an internal liner in which the piston moves. At the bottom end of the cylinder there is a recoil stop tube and a gland. These are held in position by a ring nut and gland plate. There is a fluid charging screw and bleed screw near the top of the cylinder.

The piston moves inside the cylinder through the cylinder gland. On the bottom of the piston there is the axle housing which holds the wheel axle, a lug for the lower torque arm, and an inflation valve for nitrogen gas.

Example 2 – rewritten in STE

Nose Landing Gear

Description and Operation

1. The Shock Strut Assembly of the Nose Landing Gear

   A. The shock strut assembly (the assembly) of the nose landing gear (the NLG) is an oleo-pneumatic tube. It compresses and extends to absorb the loads during the aircraft landing.

   B. The primary parts of the assembly include:

      - The cylinder
      - The piston.

   C. The cylinder is a vertical tube which has attachment arms at the top end. There is a trunnion bolt in each attachment arm which attaches the assembly to the aircraft. The external side of the cylinder has lugs and brackets. These are for the attachment of:

      - The lower drag brace
      - The upper torque link
      - The extension/retraction actuator
      - The NLG uplock roller
      - The taxi light
      - The nose-wheel steering-unit.

   D. The cylinder has an internal liner in which the piston moves. At the bottom of the cylinder is the recoil stop tube and the gland. A ring nut and a gland plate hold these in position. Near the top of the cylinder is the fluid charging screw and the bleed screw.

   E. The piston moves through the gland of the cylinder into the cylinder. On the bottom of the piston there is:

      - The axle housing, which holds the wheel axle
      - A lug for the lower torque arm
      - An inflation valve for the nitrogen gas.

Explanations about the changes

The material for comparison in this section was a description. Chapter six within the SE-guide (refer to appendix 5) deals with descriptive writing. In general, the most important rules to bear in mind when writing a description in STE are: to keep the sentences short, keep the text interesting by varying the sentence length and constructions, to use paragraphs with only one topic to clearly show the logic and the relationship within the text, and to slowly present the complex information. Another general principle to bear in mind is that the basic philosophy of STE is to keep text as simple and readable as possible (AECMA, 2004).

In the example texts there are a lot of technical names, which are allowed to be used and accordingly these names are not changed into the STE-version. Unapproved used words in the original version and the corresponding approved words in the STE-version are underlined.

The alteration into approved words and sentence structures are discussed in the row below the sentences.

Table 3: ***A description written in traditional English in comparison with the version rewritten in STE.***

Original version	STE-version
1. Nose Landing Gear Shock Strut Assembly	1. The Shock Strut Assembly of the Nose Landing Gear

In the English language a noun may be modified or described by another noun. These groups are called noun clusters (see section 2.6.1). According to the rules within STE, noun clusters are only allowed to be made up of maximum three nouns (refer to rule 2.1). Therefore this sentence has to be rearranged.

The nose landing gear shock strut assembly is an oleo pneumatic tube. It compresses and extends to absorb landing loads when the aircraft lands. The main parts of the strut consist of the cylinder and piston.	A. The shock strut assembly (the assembly) of the nose landing gear (the NLG) is an oleo-pneumatic tube. It compresses and extends to absorb the loads during the aircraft landing. B. The primary parts of the assembly include: • The cylinder • The piston.

Paragraphs are used to show the reader how the text is built up. Each paragraph contains information about only one topic. The reader will get an idea about the topic within the paragraph by reading the first sentence, which is the most important sentence. (refer to rules 6.3-6.5) In this part of the original version more than two topics are dealt with and therefore the sentence has to be rearranged into two paragraphs in the STE-version.

Paragraph A: This part begins with a noun cluster of three words but this is a technical name and can not be rearranged into any other way. In order to simplify or shorten the name there are two methods to choose between (refer to rule 2.2). In this case one of these methods is chosen, and further on in the document long cluster are replaced by the name within the brackets, “the assembly” and “the NLG”. “Lands” is an unapproved word and is changed into the approved and by the dictionary suggested word “landing”.

Paragraph B: This part is divided into a tabular layout to clearly present the relations within the information (refer to rule 4.3). “Main” and “consist of” are unapproved words and have to be modified. “Main” is changed into the suggested and approved word “primary”. “Consist of” is changed into the approved word “include” which better corresponds to the present meaning, than the word “have”, suggested by the dictionary.

The cylinder is a vertical tube which has attachment arms at the top end. The strut is attached to the aircraft by a trunnion bolt in each attachment arm. On the outside of the cylinder there are lugs and brackets. The lugs and brackets are for the lower drag	C. The cylinder is a vertical tube which has attachment arms at the top end. There is a trunnion bolt in each attachment arm which attaches the assembly to the aircraft. The external side of the cylinder has lugs and brackets. These are for the attachment

brace, upper torque link, extension/retraction actuator, nose landing gear uplock roller, taxi light and nose wheel steering unit.	of: • The lower drag brace • The upper torque link • The extension/retraction actuator • The NLG uplock roller • The taxi light • The nose-wheel steering-unit.

The second sentence within the original version is written in the passive voice, but is changed into the active voice since that is preferred in descriptive writing (the passive voice is only allowed to be used when absolutely necessary). The second sentence is also rearranged to give more specific information.

In the third sentence, "outside" used as a noun is an unapproved word, and is changed into one of the suggested approved words "external", used as an adjective.

In order to clearly show the information relationships within the paragraph, the connection word within the fourth sentence is changed. A tabular form is used to clearly show how the information parts are related to each other (refer to rule 4.3). The second method to clarify the meaning of a long noun cluster is showed in the last break-out within the tabular form. In this method hyphens are used to show the relationship between the most closely related words (refer to rule 2.2). In STE an article should be used before a noun (refer to rule 2.3), consequently an article is added before each noun in this sentence.

The cylinder has an internal liner in which the piston moves. At the <u>bottom end</u> of the cylinder there is a recoil stop tube and a gland. These are held in position by a ring nut and gland plate. There is a fluid charging screw and bleed screw near the top of the cylinder.	D. The cylinder has an internal liner in which the piston moves. At the <u>bottom</u> of the cylinder is the recoil stop tube and the gland. A ring nut and a gland plate hold these in position. Near the top of the cylinder is the fluid charging screw and the bleed screw.

In STE "bottom" as a noun only has the meaning of the lowermost position and therefore "end" is excluded in the STE-version. The article within the second sentence is changed from "a" into "the". The sentence becomes less ambiguous by these changes.

The third sentence in the original version is written in the passive voice and has to be changed into the active voice (refer to rule 3.6). Throughout the whole sentence an article is used before every noun (refer to rule 2.2).

The fourth sentence is changed in order to make the information as specific as possible (refer to rule 1.13). In the original version articles are only used before some nouns whereas in the STE-version articles are used before every noun within the sentence (refer to rule 2.3).

The piston moves inside the cylinder through the cylinder gland. On the bottom of the piston there is the axle housing which holds the wheel axle, a lug for the lower torque arm, and an inflation valve for nitrogen gas.	E. The piston moves through the gland of the cylinder into the cylinder. On the bottom of the piston there is: • The axle housing, which holds the wheel axle • A lug for the lower torque arm • An inflation valve for the nitrogen gas.

"Inside" is an unapproved word and is changed into the suggested and approved word "into". Sometimes sentences have to be constructed in another way to be in accordance with the STE rules (refer to rule 9.1). This is done in the first sentence.

The second sentence is changed into a tabular form to clearly show how the information parts are related to each other within the sentence (refer to rule 4.3). The reader will easily understand how these break-outs are related to the rest of the information within the sentence by the use of a tabular layout.

Readability measure

To compare the readability of the examples the Flesch's Reading Ease formula (described in section 2.1.3) was used for these examples. The words and the syllables within the text were counted in the same way as for the procedural example (refer to section 6.1). The counting gave the following results (for the meanings of the letters see section 2.1.3):

Example 2 – original version

The number of words = 204.

The number of sentences = 13.

The number of syllables = 248.

ASL = 204/13=15.692, ASW = 248/204=1.216

Score = 206.835-(1.015*15.692)-(84.6*1.216) = 88.06≈88

Example 2 – STE version

The number of words = 210.

The number of sentences = 14.

The number of syllables = 245.

ASL = 210/14=15, ASW = 245/210=1.168

Score = 206.835-(1.015*15)-(84.6*1.168) = 92.909≈93

The STE text has a higher score (93) than the original version (88). According to the formula, the higher the score, the easier the text is to read. In other words, the text written in STE is considered easier to read, than the original version even in descriptive texts. On the other hand, the measurement shows that the number of words and the number of sentences is greater within the STE-version than in the version written in traditional English.

6.3 Summary

The theory that STE improves readability is supported by both of the examples in this chapter. The readability score is higher for the STE version than for the original version, in both procedural and descriptive writing. In the procedural writing, the difference is greater than in the descriptive, with a score of 88 for the STE version and a score of 74 for the original. The conclusion is that STE improves the readability of procedural writing more than the readability of descriptive writing.

Another interesting result from these measurements is that within both text examples, the number of words and the number of sentences in the STE-version is greater than in the version written in traditional English. In this case, that means that the text written in STE is longer than the original version.

7 Discussion

In this chapter the writers' opinions are discussed in relation to the theoretical background. The chapter is divided in line with the three areas identified by SI&M, and at the end of the chapter a discussion about the selected method is found.

7.1 Higher documentation quality

Two objectives of using STE and other controlled languages are to improve the readability and comprehensibility of the documentation (refer to section 2.5 and 2.6). Several studies have been published which show that controlled languages are designed in order to comply with these objectives. One of these studies is presented in section 2.6.2, where Shubert et al. (1995) show that the comprehensibility within complex procedures is improved, for both native and non-native English speakers, by using STE. Likewise, the writers who have participated in the interviews and questionnaires in this thesis agreed that documents written in STE are easier to understand. There are many reasons why texts written in STE are easier to understand, and one of these is the use of standardized terms (refer to section 2.3). Other reasons are for example that in STE, one word has only one meaning and that the length of a sentence is restricted (refer to section 2.6.1). In procedural writing, the sentences as well as the words are more repetitive than in descriptive writing, accordingly the inexperienced writers who were interviewed in this thesis considered STE to be more useful in procedures than in descriptions (refer to section 5.1.1).

In order to effectively assure that the written text comply with the rules within STE, a checker tool is very useful. There are different types of checkers (refer to section 2.8), but the overall function is to verify the written text for compliance with the STE rules. The writers are supported by these tools, and the text would be produced with a better quality. Most of the inexperienced writers, as well as most of the experienced writers, believed a correctly functioning tool improves the language quality of the documentation produced by the writers (refer to section 5.1.1& 5.1.2). On the other hand, these tools are experienced inconvenient when the terminology is not taken into consideration and when the tool has marked words for errors that actually are allowed to be used (refer to section 5.1.2).

Improved quality of the written document involves enhanced readability, as well as enhanced comprehensibility. TD is supposed to effectively convey messages, which is signified by the fact that a technical text has to be understandable (refer to section 2.1.5). The readability in texts is defined by language features (in section 2.1.3), but it is also about the content and the layout. One thing that generally improves readability of documentation is, for example, that the writer is told to use tabular layout by the rules within STE. This is for example shown in the first example in chapter 6 (see page 36). The text is designed in tabular form, and consequently the sequence of the procedure can easily be followed by the reader, with the result that the actions are performed in correct order. The advantage of using tabular layout is also shown in the second example in chapter 6 (see page 44), where the relation between different parts are clearly expressed. Readability of texts is about language features, but the understanding of the text is not entirely due to how readable the written text is. The comprehension of the text is considered to be a combination between readability and the reader's capacity to interpret written texts. The criticism concerning the readability formulas (presented in 2.1.3) may therefore be legitimate.

Except for improved comprehensibility, one of the reasons why Saab Systems has used STE was to achieve uniform documentation (refer to section 4.4). Likewise, the writers who participated in the interviews and the questionnaires believed TD becomes more uniform by

using STE. In many cases more than one writer has been involved in the same project (described in section 2.2), which is not supposed to be visible in the document, consequently a uniform documentation is important. The fact that the usage of a CL results in a uniform documentation is also supported by the German study presented in section 2.5.2. This study showed fewer variations in word choices, level of abstraction and style by using a CL. The conclusion was also drawn in this German study, that writers with a technical background thought controlled languages are more useful than writers with a linguistic background. Most of the participants in this thesis thought a CL was useful, and all of them had a technical background (see section 3.3). Some of the participants believed the restrictions within a CL impede the creativity which is also presented in the theoretical background (refer to section 2.5.2).

The participants in this thesis pointed to the fact that it is important to distinguish between a technical writer and an author, which as well is discussed by Mårdsjö (1992) in section 2.2. A person with a linguistic background may experience the restricted mode of expression in a CL more frustrating than a person with a technical background. This may be one reason why writers with a technical background in the German study (refer to section 2.5.2) thought controlled languages were more useful than writers with a linguistic background. One of the participants in this thesis stated that technical writers are already controlled by the topic, and that they are not trying to write varying and beautiful expressions. However, most of the inexperienced writers considered the restrictions to be a source of irritation. The German study (in section 2.5.2) showed, however, that because the approved words were similar to the words which otherwise have been chosen, the writers were not annoyed by the limited vocabulary. The reason why the inexperienced writers who participated in this thesis found the limited vocabulary annoying may be because they are not familiar with the words. Writing is considered a lengthy procedure, since every word has to be checked. The approved words within STE are chosen because they are common. However, the question is whether these words are that common for a Swedish writer or not? Thrush (2001) showed in her study (refer to section 2.6.2) that some words are preferred instead of others because of the extraction of the writer. Despite the fact that the approved words may not be common to some of the writers, they will come to know which words are approved and not.

7.2 Reduced translation costs

In TD, correct information has to be conveyed in an obvious and legible way in both the translated document and in the source document. In a translated version, the content within the source document is transferred to a document written in the TL. The translation process is time-consuming and great responsibilities are involved. Translators have to have knowledge in both the SL and the TL, as well as in the terminology for both languages (see section 2.4). The translatability of source documents is improved by using a CL. Among other things, because there is less ambiguity irrespective of whether the reader is a human being or a machine. Translations of documents ought to be more correct if the SL is a CL, since the comprehension of the text is improved by using controlled languages. The source document is more easily understood by the translator, and consequently the content will be more correctly rendered in the translated document. In the study performed by Spyridakis et al. (1997), described in section 2.6.3, it is shown that texts written in STE are more easily translated than documents written in traditional English. Likewise, the translations of the STE version are performed more correctly. It applies especially to native speakers of other Indo-European languages.

Translation costs are, according to Lehrndorfer and Mangold (1997) in section 2.6.3, based on the number of lines and dependent on the SL and TL. In the German study presented in

section 2.5.2 it is shown that a text version written in controlled German is half the length of the version not written in a CL. On the other hand, in the text examples in chapter 6 it is shown that the version written in STE has greater number of words and sentences than the version written in traditional English. Accordingly, whether or not source documents written in a CL ought to result in reduced translation costs depends on the language. It is also interesting to notice that the study carried out by Spyridakis et al. (1997), presented in section 2.6.3 does not show the same benefits of translating source documents from STE into non Indo-European languages.

According to Reuther (2003) in section 2.5.1, controlled languages are defined depending on whether the purpose is to improve comprehensibility or translatability. At the same time, one of these definitions is not excluded by the other one, since in both cases the reader may be a human being. STE is a human-oriented CL and defined to improve comprehensibility (see section 2.6). Simultaneously the translation process is also influenced by the usage of a CL. The translation process is quicker implemented by support from translation memories. Because of the similarities between different documents, for example the lack of synonyms and the sentence structures, texts written in controlled languages resulted in more reuse of sentences found by the TM. An already translated sentence, which is similar to the sentence that is going to be translated, is quickly found by the memory. Sometimes the sentence found is identical and can be used without changes, and sometimes a few minor changes have to be made before the sentence is usable. Anyhow, the translation process is faster than by means of a human translator (see section 2.6.3).

Standardised terminology, which is a concept in STE, results also in a faster translation process since the translator does not have to think about which concept the term refers to (see section 2.6.3). The translator also does not have to waste time searching for the correct translation of the term by means of term databases.

Source documents written in controlled languages are also translated faster by means of machine translations. Computers are computational machines in need of strictly formulated rules, which some of the rules in controlled languages are. Some of the rules within a CL are possible for computers to check, and therefore the pre-editing time is reduced (see section 2.4.2 and 2.5.1). The time is reduced because the translator does not have to change the form of the document to the computers capacity. The shorter period of time that is needed for the translations to be done, the sooner the product will be available on the world wide market, and the company starts to earn money. To summarise this section, translation costs are reduced by means of translation memories or MT. The use of machine supported translations is, however, an investment which of course has to be taken into consideration. On the other hand, according to the findings in chapter 6, the use of STE does not result in reduced translation costs by means of less number of words or less number of sentences.

7.3 Reduced production costs

Whether the production process and the writing speed is faster or not by using STE is unclear. The writers who participated in the thesis had very different opinions. Both the inexperienced and the experienced writers agreed that in the beginning the time taken to write documentation in STE was considered longer than the time for ordinary English. On the other hand, one of the experienced writers believed he wrote faster by using STE, when he knew the rules. At the same time other writers believed that there was no time difference at all (refer to section 5.2.2).

The reason why more time is needed may have to do with the limited vocabulary. Because one word has only one meaning, the writer has to be careful and think of the word's meaning

in the current situation. On the other hand, the expressions do not have to be varied which in the end should result in faster writing, but there are great differences between technical writers and authors which is expressed by Mårdsjö (1992) in section 2.2. Technical writers are not trying to write expressive and beautiful sentences in the way authors do. Instead the fact that one word has one meaning ought to improve the writing speed, since the writer does not have to hesitate about which word to use. This was also expressed by one of the experienced writers.

The sentence structures and the choice of words is consistent, consequently the writer eventually has learned more and more which sentence structures and words that are approved or not. This together with the standardisation of terms and the means of support such as: controlled language tools and term databases may in the end result in faster documentation production. The writing itself is maybe not influenced, but all processes around, like finding errors and choosing the correct terms are done faster. The whole production process will be faster, for example because errors are marked and suggestions for corrections are given by the checkers described in section 2.8. Consequently, the written text is complied with the STE rules and the reviewers have fewer complaints about the language used in the document. The writers who participated in this thesis believed the production process would be faster by using STE. The reason was that the reviewers have fewer complaints and the review process is faster. In the theoretical background (see section 2.5.2) it is said that writing in a CL compared to writing in a traditional language takes 20% more time. At the same time, the reviews are considered to be faster.

The whole production process is of course influenced by the writing speed, which in its turn is affected by the learning time. One disadvantage presented in the theoretical background (see section 2.5.2) is the extensive learning time to achieve a basic knowledge of writing in a CL or STE. On the other hand, how long time do native Swedish speakers need until they are able to write TD in traditional English? Swedish students study English for many years before they are able to write TD in the English language, and with comparison to STE the learning time needed to be able to write in STE is not extremely long. Actually, it is quite impressive to be able to write TD in STE after a few months. One of the inexperienced writers who participated in the thesis (refer to section 5.2.1) believed the learning time would be related to age. In Figure 4 (page 34) it is shown that there is no distinct relation between age and learning time. Instead, the more support and time the writers have to find their own ways of learning and writing in STE, the sooner the individual writer may have a good knowledgebase of using STE. The learning time is also influenced by attitudes. The writers will need more time to learn and write in STE if the language is considered a threat against the writers' creativity. The learning time and the writing speed are influenced by the project where the writer has been working. Accordingly, the writer's learning time and the writing speed is influenced by the support tools and the training courses the writers have attended.

7.4 Method discussion

The qualitative method was chosen, among other things, because of the limited number of available writers to interview and send questionnaires to. A greater number of participants had been necessary in order to find any statistical values if a quantitative method would have been chosen. The task of this thesis was to discuss the advantages and disadvantages with STE rather than to calculate statistics. This is also a reason why the qualitative method was chosen as most appropriate.

Within qualitative semi-structured interviews there is always a risk of loosing focus on the topic, but by using a guideline (see appendix 1 and 2) most of the participants answered the

same questions. Another risk with qualitative interviews is that interviewees respond in line with what they think the interviewer wants to know. However, the relation between the interviewer and the interviewees was considered to be reasonable good. The writers were considered to have responded with reliable answers, because the interviewee had no advantages of not being honest and since the responses were treated with anonymity. There is one disadvantage with the fact that only one interviewer was used, and that is depending on the interviewer's approach, there is a risk that more advantages are found within the responses or vice versa. The responses are analysed as objectively as possible, but of course since the responses are analysed in line with the identified areas within section 1.2 other answers have been left out. At the same time, the writers' opinions about these areas have been the focus throughout this thesis. Accordingly, no negative influences on the result are considered to arise if comments are excluded which have nothing to do with the identified areas. On the other hand, the interpretations of these areas are considered to have included a broad range of views. Some statements have more or less to do with the area than others, for example the writers' feelings about their writing situation were conceived to affect the quality of the final document.

Another aspect that may have influenced the opinions in this thesis is the fact that some of the writers, who were interviewed, have a fixed employment at Saab Systems whereas some are consultants from SI&M. The project may have made different impressions on the groups which in the end may have had an effect on the opinions about STE. On the other hand, the results from the employees and the consultants are not compared with each other. A greater problem with the study, however, is that both in the interviews and the questionnaires, the opinions about how good the participants are in using STE are given by the writers themselves. Consequently, subjective opinions are presented in this study. In order to have achieved more objective opinions it might have been better to ask the management of the projects about how well the writers use STE, but since Saab System recently started to use STE, the management had no opinions about the final outcome. Concerning the writers who answered the questionnaire, it was difficult to involve the management since all writers have participated in many different projects at different companies.

The writers who filled out the questionnaire have different experiences of STE, which may have influenced the writers' views. On the other hand, this is not considered to result in less reliable answers since opinions are presented and no statistics are calculated. When the answers from the questionnaires were analysed, one disadvantage with the questionnaire was found. This was the fact that the experience was measured by number of projects instead of time. It would have been interesting to be able to compare the responses in relation to how long time the writer had been using STE. The writers who responded to the questionnaire are, anyhow, believed to be experienced users, since they have been using STE more than the writers at Saab Systems.

In the discussions of the learning time it is difficult to know what the respondent meant by learning, but in this thesis the writers estimated the time needed before they had a good basic knowledge of writing in STE (see appendix 3). This is interpreted as the fact that the writers do not have to look in the SE-guide, or use other aids as much as in the beginning.

In chapter 6 readability measurements were used in order to compare the readability within a STE-version and a version written in traditional English. The understanding of a text, on the other hand, is not exclusively dependent on the readability. The comprehension of a text is rather a combination between readability and the reader's capacity to interpret written text. In order to find out how the reader understands a text, usability testing is therefore necessary. At the same time the comprehension is also influenced by language aspects. Therefore it was measured whether a text was more or less readable according to the readability formula (see

chapter 6). The text examples could also have been tested on the writers who were interviewed, but that was not the aim of the measurements within chapter 6. The purpose was to see whether the STE-version was more readable according to the formula than the version written in traditional English. The measurement showed this, but the conclusion that the text written in STE was more *comprehensible* than the original version could not be drawn by these measurements.

8 Conclusion

In this chapter conclusions from each identified area are drawn. Finally, a few suggestions for future research are presented.

8.1 Higher documentation quality

The comprehensibility and the readability, especially within complex procedures are improved by using STE. The restricted vocabulary and writing rules may be a source of irritation, both for readers and writers. However, the readability and comprehensibility of the document is improved when STE is used, both for native and non-native English speakers. To verify that the text is complied with the rules within STE a checker is a useful support tool for the writers. The usage of STE results in a more uniform documentation, irrespective of the number of writers involved in the project. STE is considered to be more useful by writers with a technical background, than by writers with a linguistic background. In other words, STE is useful for companies where technical writers who are non-native English speakers with a technical background are writing documentation primarily for non-native English speakers, and where the main goal with the documentation is comprehension of the original document.

8.2 Reduced translation costs

The translation process becomes easier and faster when using a CL for source documents. The reason for this is that both translation memories and machine translations can be utilized much more efficiently than when source documents are written in ordinary languages. The translation process is improved by standardized terminology. However, the TL has to be considered a major factor in order to fully acquire the benefits. It has been shown that translations into non Indo-European languages do not have the same benefits as translations from a STE document into an Indo-European language (see section 2.6.3). The length of the text is also an important factor in calculating the reduction of the translations costs. Shorter texts means cheaper translations, but the use of STE tends not to results in fewer words or sentences. In other words, STE is useful for companies where technical writers who are non-native English speakers with a technical background are writing documentation that is translated into many different Indo-European languages by means of translation memories or machine translations.

8.3 Reduced production cost

Whether the production costs are reduced by using STE or not is unclear. In theory it is considered to take 20% more time to write documents in controlled languages than in ordinary English. For some of the writers who participated in this study, the time taken to write documentation in STE was considered longer than the time for ordinary English. At the same time others believed that there was no time difference at all, and one considered STE being faster, since he experienced less hesitation when he was choosing the words to write. Even though writers need more time to write in STE, it is claimed (refer to section 2.5.2) that reviewers need less time to assure quality of documentation. One reason for this may be that the text is already verified by controlled language tools, and consequently the reviewers have fewer complaints about the language quality.

The time for the production process is also determined by the learning time, i.e., the time before the writer has acquired a good knowledge base of STE or another CL. Within this thesis it is shown that the learning time is individual. Some writers stated, they would need a few months to be able to use STE adequately, and one believed he would need a year. In other

words, STE is useful for companies who are producing a large amount of documentation, and where a lot of the documentation is relatively similar. Because of the similarities and the number of documents, reusability of already written documentation would be a great benefit for these companies.

8.4 Future research

Some of the studies presented in the theoretical background (see chapter 2), for example the study by Shubert et al. (1995), the study by Thrush (2001) and the study by Spyridakis et al. (1997), where it is claimed that comprehensibility, readability and translatability is improved when using STE, are carried out using university students. In the future it would be interesting to do comprehension and readability studies involving customers that in the past have been reading documentation written in ordinary English, but are currently reading documentation written in STE. To really find out if the reader of the documentation thinks the quality of the documentation is improved by the use of STE, it is necessary to interview people that have read documentation written in STE and the documentation not written in STE. In other words, an interesting topic for future studies would be to view the reader of the documentation as the user of STE rather than the writer.

Another interesting topic for future studies would be to investigate the possibility of implementing STE into software programs such as UpTime, and look into the effects on the documentation production costs. These intended systems have possibilities to automatically generate more or less complete documents. UpTime, for example, generates fault locations and suggestions of how to repair the errors. STE or other controlled languages implemented into these systems could perhaps without interference of a writer, generate completed high quality documents. Accordingly, the production costs of documentations would possibly be dramatically reduced.

9 Abbreviations

AECMA	= European Association of Aerospace Industries
ASD	= Aerospace and Defense Industries Association of Europe
ASL	= Average Sentence Lenght
ASW	= Average Number of Syllables per Word
BSEC	= Boeing Simplified English Checker
CFE	= Caterpillar Fundamental English
CGI	= Carnegie Group Incorporated
CL	= Controlled Language
CMT	= Carnegie Mallon University's Centre for Machine Translation
CTE	= Caterpillar Technical English
DMT	= Dictionary Maintenance Tool
EDIG	= European Defense Industries Group
EE	= Ericsson English
EUROSPACE	= Association of the European Space Industry
FGL	= Functional Group Leader
FMV	= Försvarets Materiel Verk
HWE	= Hardware Engineer
ILS	= Integrated Logisitc Support
ILSAM	= White's International Language of Service and Maintenance
LE	= Logistic Engineering
MT	= Machine Translation
PACE	= Perkins Approved Clear English
RM	= Review Manager
SE	= Simplified English
SEM	= System Engineer Manager
SI&M	= Sörman Information & Media
SL	= Source Language
STE	= Simplified Technical English
SWE	= Software Engineer
TA	= Technical Author
TD	= Technical Documentation
TL	= Target Language
TM	= Translation Memory

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Appendix 1

Skribenter fast anställda:

Bakgrund

- Hur länge har du jobbat på Saab Systems?
- Har du jobbat med tekniska publikationer hela tiden?
- Vad har du för utbildning?
- Vad är ditt modersmål?
- Vad är din roll i det kommande projektet?

Tekniska dokumentationen

- Vilka tekniska publikationer har Saab Systems? (är några instruktioner och andra beskrivningar)
- Vad är syftet i publikationerna? (förmedla en handling eller beskriva något)
- Vem läser de olika publikationerna?

Skrivsätt idag

- Vad styr ditt skrivande? Finns det normer inom företaget eller är det specifika skrivregler?
- Hur självständig anser du dig i ditt skrivande?
- Använder du någon formatmall idag?
- Vad kännetecknar den isåfall?
- Hur samarbetar du med utvecklaren? Får du en färdig produkt och sen själv samla material?
- Vem tar fram tekniska termer?
- Vad skriver du i för miljö?

STE

- Vad är de största problemen med publikationerna idag?
- Varför ska ni börja använda STE?
- På vilka publikationer ska STE användas?
- Börjar ni använda STE på alla publikationer samtidigt?
- Tror du man skulle kunna till en början använda STE på vissa delar i publikationen? (t.ex. börja med varningar för att sedan gå över till grammatik och sedan på all text)
- Vad skulle det isåfall få för konsekvenser?
- Vad har du fått för utbildning i STE?
- Vad kommer ni ha för stöd i skrivandet, verktyg, ordlistor eller någon expert?
- Vad tro du om verktyget?
- Tror du det kommer vara svårare, lättare eller ingen skillnad att skriva på STE jämfört med idag?
- Vad tror du kommer vara svårast eller enklast med STE?
- Tror du det kommer ta längre tid, gå snabbare eller ingen skillnad att skriva på STE jämfört med idag?
- Hur tror du att hela produktionskedjan för teknisk dokumentation kommer att påverkas av att använda STE?
- Vilka fördelar finns?
- Vilka nackdelar finns?
- Vilka utöver er och läsaren berörs av förändringen?

Appendix 2

Skribenter konsulter:

Bakgrund

- Har du jobbar i andra projekt där STE tillämpats?
- På vilken dokumentation skrevs STE då?
- Vilka stöd hade ni då?
- Vad har du för bakgrund?
- Vad är din roll i det kommande projektet?

Tekniska dokumentationen

- Vilka tekniska publikationer på Saab Systems skriver du?
- Vad är syftet med publikationen? (förmedla en handling eller beskriva något)
- Vem skriver du till?

Skrivsätt idag

- Vad styr ditt skrivande? Finns det normer inom företaget eller är det specifika skrivregler?
- Hur självständig anser du dig i ditt skrivande?
- Använder du någon formatmall idag?
- Vad kännetecknar den isåfall?
- Hur samarbetar du med utvecklaren? Får du en färdig produkt och sen själv samla material?
- Vem tar fram tekniska termer?
- Vad skriver du i för miljö?

STE

- Vad är de största problemen med publikationerna idag?
- Varför ska ni börja använda STE?
- På vilka publikationer ska STE användas?
- Börjar ni använda STE på alla publikationer samtidigt?
- Tror du man skulle kunna till en början använda STE på vissa delar i publikationen? (t.ex. börja med varningar för att sedan gå över till grammatik och sedan på all text)
- Vad skulle det isåfall få för konsekvenser?
- Vad har du fått för utbildning i STE?
- Vad kommer ni ha för stöd i skrivandet, verktyg, ordlistor eller någon expert?
- Vad tro du om verktyget?
- Tror du det kommer vara svårare, lättare eller ingen skillnad att skriva på STE jämfört med idag?
- Vad tror du kommer vara svårast eller enklast med STE?
- Tror du det kommer ta längre tid, gå snabbare eller ingen skillnad att skriva på STE jämfört med idag?
- Hur tror du att hela produktionskedjan för teknisk dokumentation kommer att påverkas av att använda STE?
- Vilka fördelar finns?
- Vilka nackdelar finns?
- Vilka utöver er och läsaren berörs av förändringen?
- När tror du ni kommer börja skriva STE?

Appendix 3 - Questionnaire/Enkät

Kön:

Ålder:

Modersmål:

1. I hur många projekt har du skrivit på Simplified English (SE)?

2. Vilken typ av dokumentation utgör de flesta fall där du skrivit på SE? (Skriv ett X i rutan som du väljer)

Instruktioner	Beskrivningar	Annan	Vet ej

3. Varför valde man att använda SE på dokumentationen? (Skriv ett X i rutan som du väljer)

Underlätta begriplighet	Underlätta översättning	Vet ej

4. Användes någon/några SE-checkers i projektet/projekten? (Ja/Nej)

a) Om ja, upplevde du att verktyget bidrog till en bättre text? (Ja/Nej motivera svaret)

b) Om ja, upplevde du verktyget som störande i skrivprocessen? (Ja/Nej motivera svaret)

5. Uppfattade du att SE bidrog till att höja kvaliteten på dokumentationen? (Ja/Nej motivera svaret)

6. Hur påverkades hela produktionskedjan från framtagning av material till färdig dokumentation av att ni skribenter skrev på SE? (Skriv ett X i rutan som du väljer)

Långsammare	Snabbare	Ingen förändring	Vet ej

Motivera svaret:

7. Vad anser du är fördelar med SE? (Motivera dina val)

8. Vad anser du är nackdelar med SE? (Motivera dina val)

9. Kände du någonsin att du lärde dig att behärska att skriva på SE? (Ja/Nej)

a) Om ja, hur lång tid tog det?

b) Om ja, hur påverkades din skrivhastighet av att skriva på SE jämfört med traditionell engelska? (Skriv ett X i rutan som du väljer)

Långsammare	Snabbare	Ingen förändring	Vet ej

c) Övriga synpunkter kring SE:

Tack för din medverkan!

Appendix 4 – An example of the main interviews' transcriptions

J: Har du börjat skriva STE?
I: Ja jag har börjat skriva. Jag har hållt på med det här projektet sen september men i början var det rätt oklart om det skulle va STE eller inte så att skrivit på STE kanske vi har gjort sen årsskiftet ungefär.
J: Fick du gå kursen?
I: Ja
J: Är det här första projektet du använder dig av STE?
I: Jo det är det nog. Jo. Jag har hört talas om det förrut. Man kan ju försöka skriva lite enklare ibland men vi har inte använt STE.
J: Hur tänkte du innan när du skrev dokumentation?
I: Det kunde väl vara såna grejer som att försöka använda samma ord för samma sak och inte hålla på och måla så himla mycket utan verkligen försöka skriva det man vill få fram. Använda samma ord hela tiden.
J: Var det som du tänkte eller var det någon som sa att du skulle skriva så?
I: Det kan nog varit en kombination, men ingen som uttalat sa att vi skulle använda oss av STE men sen har det ju uttrycks önskemål om att det ska stå enkelt och krångla inte till saker utan det är viktigt att man förstår vad det står.
J: Vad har du för bakgrund?
I: Jag är KTH:are, högskoleingenjör elektroteknik sen har jag jobbat på Ericsson, 4 år blir det nog ungefär. Och jobbade som product manager men då höll vi på och skrev lite olika såna här dokument som skulle va då enkla så att man inte skulle missförstå. Det fanns inget uttalt att det skulle vara något speciellt språk utan internspråket var american english så vi skrev american english men det skulle ändå vara lätt och förstå, inte krångla till det i onödan. Det var ungefär dem riktlinjer man hade.
J: Hur var det på Saab innan?
I: Jag var nog rätt så fri men jag försöker väl ändå göra precis som jag sa nu som jag gjort förut. Det är väl någonting som jag ofta har försökt att göra när man skriver just tekniska dokument. Och användarmanualer i synnerhet, att man inte ska kunna missförstå dem eller undra vad betyder det där ordet. Det ska vara enkelt.
J: Vem är målgruppen för den dokumentation som du skriver nu?
I: Det vi håller på med just nu är en användarmanual för dem som kommer anvädna ledningssystemet vi håller på med. Och det är ett ledningssystem för en ubåt så det är väl officerare och i viss mån värnpliktiga som kommer använda systemet.
J: Hur känns det att skriva på STE?
I: Det känns inte så annorlunda, jag tror det beror mycket på vad man skriver. Tobias t.ex. håller på mer med procedures det vi har skrivit hittills är mest förklarande text om funktioner och hur systemet fungerar. Vi skriver descriptive och då är inte det att följa S1000D slaviskt. Det är inte nummer ett. Utan då försöker man skriva så enkelt som möjligt men man kanske inte är så jättestrikt med att man bara ska ha ord som finns i en ordbok och såna grejer. Vi är lite friare. När vi kommer skriva dokument om underhåll och sådant t.ex. hur man byter hårddisk då är det ju ännu viktigare att man inte missförstår någonting.
J: Hur känns det att tillämpa STE på descritives?
I: Inte jobbigare för att som det är i descriptive är det ganska fritt ändå upplever jag det som iallafall. Det känns inte som det är speciellt annorlunda än det jag gjorde innan. Att försöka hålla det kort och enkelt. Så jag kan inte säga att det har påverkat jobbet.

Appendix 5 – The SE guide

List of Writing Rules

Section 1 - Words

RULE: 1.1 Choose the words from:
- Approved words in the Dictionary (Part 2)
- Words that qualify as Technical Names (Refer to Rule 1.5)
- Words that qualify as Technical Verbs (Refer to Rule 1.10).

RULE: 1.2 Use approved words from the Dictionary only as the part of speech given

RULE: 1.3 Keep to the approved meaning of a word in the Dictionary. Do not use the word with any other meaning.

RULE: 1.4 Only use those forms of verbs and adjectives shown in the Dictionary.

RULE: 1.5 You can use words that are Technical Names.

RULE: 1.6 Use a Technical Name only as a noun or an adjective, not as a verb.

RULE: 1.6A Some unapproved words are used to complete Technical Names. Do not use these unapproved words unless they are part of a Technical Name.

RULE: 1.7 Use the official name (shortened if necessary).

RULE: 1.8 Do not use different Technical Names for the same thing.

RULE: 1.9 If you have a choice, use the shortest and simplest name.

RULE: 1.10 You can use words that are Technical Verbs.

RULE: 1.11 Use Technical Verbs only as verbs, not as nouns (unless the noun form qualifies as a Technical Name). You can use the past participle of the verb as an adjective (refer to Section 3).

RULE: 1.12 Once you choose the words to describe something, continue to use these same words (particularly Technical Names).

RULE: 1.13 Make your instructions as specific as possible.

Section 2 - Noun Phrases

RULE: 2.1 Do not make noun clusters of more than three nouns.

RULE: 2.2 Clarify noun clusters that are Technical Names with one of these two methods:
- Use hyphens to show the relationship between the most closely related words
- Explain the noun cluster. Then, if possible, use a shorter name after the initial explanation.

RULE: 2.3 When appropriate, use an article (the, a, an) or a demonstrative adjective (this, these) before a noun.

Section 3 - Verbs

RULE: 3.1 Use only those forms of the verb that are listed in the Dictionary (Part 2).

RULE: 3.2 Use the approved forms of the verb to make only:
- The infinitive
- The imperative
- The simple present tense
- The simple past tense

- The future tense.

RULE: 3.3 Use the past participle only as an adjective, either with a noun or after the verbs TO BE, TO BECOME.

RULE: 3.4 Do not use the past participle with a form of the verb HAVE to make an unapproved tense.

RULE: 3.5 Do not use the past participle of a verb with a helping verb to make a complex verb.

RULE: 3.6 Use the active voice. Use only the active voice in procedural writing, and as much as possible in descriptive writing.

RULE: 3.7 If there is an approved verb to describe an action, use the verb (not a noun or other part of speech).

Section 4 – Sentences

RULE: 4.1 Keep to one topic per sentence.

RULE: 4.2 Do not omit words to make your sentences shorter.

RULE: 4.3 Use a tabular layout (vertical layout) for complex texts.

RULE: 4.4 Use connecting words to join consecutive sentences that contain related thoughts.

Section 5 – Procedures

RULE: 5.1 Keep procedural sentences as short as possible (20 words maximum).

RULE: 5.2 Write only one instruction per sentence.

RULE: 5.3 Write more than one instruction per sentence only when more than one action is done at the same time.

RULE: 5.4 In an instruction, write the verb in the imperative ("commanding") form.

RULE: 5.5 If you start an instruction with a descriptive statement (dependent phrase or clause), you must separate that statement from the rest of the instruction with a comma.

Section 6 - Descriptive Writing

RULE: 6.1 Keep sentences in descriptive writing as short as possible (25 words maximum).

RULE: 6.2 Try to vary sentence lengths and constructions to keep the text interesting.

RULE: 6.3 Use paragraphs to show your reader the logic of the text.

RULE: 6.4 Each paragraph must have only one topic.

RULE: 6.5 Always start the paragraph with the topic sentence.

RULE: 6.6 Use keywords to make the relationship between sentences and paragraphs clear.

RULE: 6.7 The maximum length of a paragraph is 6 sentences. Do not use one-sentence paragraphs more than once in every 10 paragraphs.

RULE: 6.8 Present new and complex information slowly.

Section 7 - Warnings, Cautions, and Notes

RULE: 7.1 Start a warning or a caution with a simple and clear command.

RULE: 7.2 Be specific in a warning or caution.

RULE: 7.3 If necessary, add a brief explanation to a warning or a caution to give a clear idea of the possible risk.

RULE: 7.4 Identify your command correctly as a warning or caution.

RULE: 7.5 If a condition is necessary before the technician continues, put the condition first in the warning or caution.

RULE: 7.6 Write notes so that you give information, not commands.

Section 8 - Punctuation and Word Counts

RULE: 8.1 Use colons (:) and dashes (-) to make tabular layouts.

RULE: 8.2 When you count words for sentence length, the colon or the dash has the effect of a full stop (period).

RULE: 8.3 Use the hyphen (-) as a joining signal

RULE: 8.4 When you count words for sentence length, each word in a hyphenated group counts as a separate word unless it is a prefix.

RULE: 8.5 Use parentheses:

- To make cross-references to illustrations and/or text
- To quote letters or numbers that identify items on an illustration or in text
- To mark text for which separation by commas is not sufficient
- To set off text that is not part of the main statement, but is important enough to be indicated
- To indicate the correct breakdown level of procedural substeps.

RULE: 8.6 When you count words for sentence length, text in parentheses counts as a new sentence.

RULE: 8.7 When you count words for sentence length, a number counts as one word.

RULE: 8.8 When you count words for sentence length, an alphanumeric identifier counts as one word.

RULE: 8.9 When you count words for sentence length, an abbreviation or an acronym counts as one word.

RULE: 8.10 When you count words for sentence length, titles, placards and quoted text count as one word.

Section 9 - Writing Practices

RULE: 9.1 Use a Different Construction to rewrite sentences in Simplified English when a word-for-word replacement is not sufficient.

RULE: 9.2 When you combine words to make a phrase, make sure that the words continue to obey the meanings given to them in the Dictionary (Part 2).

RULE: 9.3 Use the Dictionary (Part 2) correctly to get the correct words, meanings, and parts of speech.

Appendix 6 – Examples of comparison between traditional English and STE

Example 1 - original version
OPERATING TECHNIQUES

WARNING

Before operating the lift truck, FASTEN YOUR SEAT BELT. There are a number of operations, if not performed carefully, that can cause the lift truck to tip. If you have not read the WARNING page in the front of this Operating Manual, do so NOW. As you study the following information about how to properly operate a lift truck, remember the WARNINGS.

Basic Operating Procedures

Many people make the mistake of thinking that operating a lift truck is the same as driving an automobile. This is not true. It is true that some lift truck operating procedures are as simple and obvious as driving the family automobile (e.g. Look where you are going, start and stop smoothly, etc.).

A lift truck is a special machine designed to do a much different job than an automobile. Because of the close areas in which a lift truck operates and its other operating characteristics (like rear wheel steering and tail swing), every operator must receive additional training, even if they have a license to drive an automobile. The following discussion lists basic procedures applicable to lift truck operation.

Rewritten in STE
HOW TO OPERATE THE LIFT TRUCK

WARNING

Before you operate the lift truck, fasten your seat belt. If you are not careful, some operations can cause the lift truck to fall over. Read the warning page in the front of this manual now. While you read the procedures below, remember the warnings.

Basic operating procedures

Only approved personnel can operate a lift truck. You must get special training, also if you have a driving license. A lift truck and a car operate differently. The text below gives you basic procedures to operate a lift truck.

Example 2 - original version

The firewall is the world's first key-upgradeable integrated security appliance. Its Intelligent Layered Security architecture delivers multiple layers of protection that work together to detect and block threats from attacking your network. Stateful firewall, VPN, intrusion prevention, application filtering, spam blocking, and content filtering are all integrated into single appliance and managed through a common interface.

The firewall X is a superior security device designed with the future in mind. This platform has a streamlined 1 U form factor, increased processing power, higher memory and port count compared to existing firewall devices. There is an LCD display and front panel controls that allow access to status information without going to the management station. The firewall X even has an external hard drive bay for storage expandability in future applications.

As your security requirements grow, the firewall X platform is fully upgradeable to a higher performing model by simply entering a license key. Additionally, you can purchase a license key to activate additional network ports and high availability functionality to support your network and reliability requirements. As new security services become available for the firewall X to combat against future threats, a simple download and license key is all that is needed to enable your firewall X to provide added layers of defense.

The firewall X is a rack-mountable device that is easily installed into your network. For information on installing the firewall X, see the firewall QuickStart Guide or the "Getting Started" chapter in the User Guide.

Rewritten in STE

The firewall is the first security device that can use upgrades by a license key. The device has different layers of protection that find and prevent damage to your network.

The firewall has theses components:

- A stateful firewall
- A VPN
- A protection against instrusion
- A software program filter
- A spam filter
- A content filter.

You can control all the components from the same interface. With the front panel controls you can find the status information from an LCD display. The firewall X also has an external hard-drive bay to get upgrades.

You can upgrade the performance of the firewall X with a new license key and new software.

- You can enable:
- A new network port
- The high availability software
- A new security layer.

You can install the firewall X in a rack. The firewall X is easy to install on the network. For more data on the installation of the firewall X, refer to the firewall QuickStart Guide or the "Getting Started" chapter in the User Guide.

Example 3 - original version
Cabling the Firewall

Use the following procedure to cable your firewall:

1. Shut down your computer.
2. If you connect to the Internet through a DSL modem or cable modem, disconnect the power supply to this device.
3. Disconnect from your computer the Ethernet cable that connects your DSL modem, cable modem, or other Internet connection to your computer. Connect this cable to the WAN port (labelled WAN 1) on the firewall.
4. Connect one end of the straight-through Ethernet cable supplied with your firewall to one of the seven numbered Ethernet ports (labelled 0-6) on the firewall. Connect the other end to the Ethernet port of your computer.
5. If you connect to the Internet through a DSL modem or cable modem, reconnect the power supply to this device. The indicator lights flash and then stop. The modem is ready for use.
6. Attach the AC adapter to the firewall. Connect the AC adapter to a power source. The power light on the firewall goes on and the WAN1 indicator lights flash and then stop. The firewall is ready for use.
7. Restart the computer.
   During restart, your computer will communicate with the firewall. One pair of the Ethernet port indicator lights flash and then stop. Your computer is now connected to the firewall.

If you circled HP Enabled = Yes in the TCP/IP Settings table on page 19, your firewall is now fully installed. You should be able to test this by opening your Web browser and browsing to your favourite Internet site. However, if you circled HP Enabled = No, please continue to enable HP on your computer and configure the firewall for a static IP or PPPoE address.

Rewritten in STE
Connecting the Firewall

Use this procedure to connect your firewall, Ethernet and power cables:

1. Shut down your computer.
2. If you use a DSL or cable modem to connect to the Internet, disconnect its power supply.
3. Find the Ethernet cable between the modem and your computer. Disconnect this cable from your computer and connect it to the firebox external interface (WAN 1).
4. Find the Ethernet cable supplied with your firebox. Connect this cable to a trusted interface (0-6) on the firewall. Connect the other end of this cable to the Ethernet interface of your computer.
5. If you use a DSL or cable modem, connect its power supply.
6. Find the AC adapter supplied with your firewall. Connect the AC adapter to the firewall and to a power source.
   The firewall power indicator light comes on and the external interface indicator

lights flash and then come on. The firewall is ready.
WARNING: Only use the AC adapter supplied with the firewall.

7. When the firewall is ready, start your computer.

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Advantages and disadvantages with Simplified Technical English – to be used in technical documentation by Swedish export companies

Författare

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Sammanfattning

Abstract

Understanding technical documentation is of vital importance, since instructions and descriptions are given about how technical products are used, maintained and repaired. Because of the increased economic globalization, more and more documentation is both written in English by non-native English writers, and delivered to non-native English readers. More and more documentation is also translated by means of computerized aids. In order to improve comprehension and translatability of technical documentation, controlled languages are created. Controlled languages are subsets of ordinary languages, but with restricted vocabularies and writing rules.

The aim of this report is to discuss the advantages and disadvantages for Swedish export companies to use Simplified Technical English (STE), which is a controlled language, for their technical documentation. In this work technical writers are asked about their opinions of STE. Additionally, technical texts written in traditional English are compared with versions written in STE, in order to find out whether texts written in a controlled language are easier to read or not. Within the comparison, the differences between the versions are discussed and a readability measurement is done. The measurement showed that readability in technical documentation is improved by using STE. The writers' opinions are illuminated in three areas, which are: higher documentation quality, reduced translation costs and reduced production costs.

Nyckelord

Simplified Technical English, Controlled languages, Technical Documentation, Readability, Comprehensibility, Translatability