Rough Machine Translation in the Communication Process

University of Tampere
School of Modern Languages and Translation Studies
Translation Studies (English)
Licentiate Thesis
September 2005
Pertti Nuutila

TAMPEREEN YLIOPISTO
Kieli- ja käännöstieteen laitos

NUUTILA, Pertti:
Rough Machine Translation in the Communication Process

Lisensiaatintutkimus, 119 sivua, 2 liitesivua
Syyskuu 2005

Tutkimuksessa tarkastellaan kääntämistä viestintäprosessin osana ja pohditaan, missä määrin perinteisiä kääntämisen teorioita ja käännösprosessia voidaan soveltaa konekääntämisen yhteydessä. Jatkuvasti lisääntyvän käännöstarpeen vuoksi käännösprosessia on pyritty tehostamalla erilaisilla tietoteknisillä ratkaisuilla termipankeista ja käännösmuisteista aina konekäännösjärjestelmiin. Viestinnän kannalta käännöstarve voidaan jakaa kolmeen ryhmään: kääntäminen tiedon jakamista varten, kääntäminen tiedon hakemista varten ja kääntäminen interaktiota varten. Tämä jako on periaatteessa sama riippumatta siitä, tapahtuuko kääntäminen ihmisen vai koneen toimesta.

Ammattikääntäjien pääasiallisin työkenttä on kuitenkin julkaistavaksi tarkoitetun materiaalin kääntäminen, johon konekääntäminen ei välttämättä sovellu. Tällaisen materiaalin lisäksi esimerkiksi Internetissä on kuitenkin valtavasti informaatiota, jonka kääntämiseen ihmiskääntäjien voimavarat eivät riitä vaikka heillä olisi käytössään tietokoneavusteiset järjestelmät. Tästä syystä kääntämisen apuvälineitä on myös muiden kuin ammattikääntäjien käytössä. Heidän kannaltaan on tärkeää saada selville, mitä jokin teksti pitää sisällään edes pääpiirteissään.

Tämä tutkimus on myös tapaustutkimus, jolla pyritään selvittämään, kuinka hyödylliseksi käyttäjät kokevat Roughlate-konekäännöspalvelun ja miten palvelua voisi kehittää. Alun perin Roughlate-palvelun kohderyhmäksi oli ajateltu henkilöt, jotka eivät osaa suomea. Palvelun avulla he saavat itsenäisesti selville tekstin sisällön. Kyselyyn saadut vastaukset osoittivat, että jos Roughlate-palvelua ei olisi tarjolla, he joko pyytäisivät apua kollegoiltaan tai jättäisivät tekstin kääntämättä. Roughlate siis vähentää kollegoille osoitettuja käännöspyyntöjä. Tutkimuksessa ilmeni kuitenkin, että konekäännöstä käytetäänn myös tekstin tuottamiseen. Tällöin käyttäjät eivät ole kääntäjiä, vaan esimerkiksi suunnittelijoita, joiden pitää kirjoittaa teksti englanniksi. He käyttävät Roughlate-palvelua ensimmäisen englanninkielisen luonnoksen tuottamiseen. Heidän kannaltaan palvelu on hyödyllinen, koska se nopeuttaa kirjoittamista ja poimii sanastoista valmiiksi erikoistermit.

Tutkimus tukee näkemystä, että raaka konekäännös voi olla tärkeä osa viestintäketjua. Ihmiset ovat tyytyväisiä raakakäännökseen, jos he haluavat vain nopeasti tietää lähdetekstin sisällön pääpiirteissään. Tällöin kyseessä ovat yleensä lyhytaikaiset, kertaluonteiset tekstit, joita ei välttämättä edes tallenneta. Palvelun avulla käännetään myös tekstejä, joita ei muussa tapauksessa käännettäisi lainkaan. Koetaan myös, että onnistuneen viestinnän kannalta puutteellinenkin raaka konekäännös on parempi kuin ei käännöstä lainkaan.

Contents

PREFACE 6

1 INTRODUCTION 7

1.1 Translation Theory for Humans … and Machines? 8

1.2 Scope of this Study 10

2 MACHINE TRANSLATION 13

2.1 A Historical Overview 14

2.2 Approaches to Machine Translation 17

2.3 Evaluation 21

2.3.1 Evaluation of Translation 22

2.3.2 Evaluation of Machine Translation 23

2.4 Case: Roughlate Machine Translation Service 25

2.4.1 KMTech and TranSmart 25

2.4.2 Roughlate 28

3 VARYING COMMUNICATION NEEDS 32

3.1 Translation Directions 32

3.2 Translation as an Event of Communication 35

3.3 Challenges in Communication 40

3.3.1 Misunderstanding 41

3.3.2 Communicating across Cultures 42

3.4 Functions of Language and Translation 45

3.4.1 Functions of Language 45

3.4.2 Functions of Translation 47

4 COMPUTERS IN THE TRANSLATION PROCESS 50

4.1 Traditional Translation Process 51

4.1.1 Specification 53

4.1.2 Translation 54

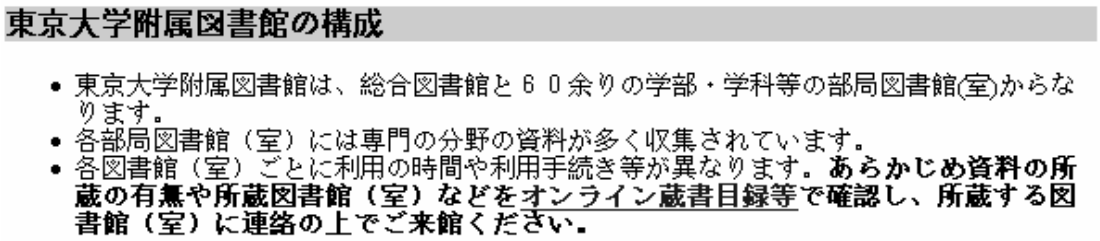
4.1.3 Revision 56

4.2 Automating the Translation Process 58
4.2.1 Machine Translation Tools 58
4.2.2 Terminology Managers 60
4.2.3 Translator Workbench Tools 61
4.3 Tools of the Trade 63
4.3.1 Translation Tools for Translators 64
4.3.2 Machine Translation for Translators 64
4.3.3 Machine Translation for Non-Translators 66
4.3.4 Translation Tools for Non-translators? 66
4.4 Translation Process with Computer Assistance 67
4.4.1 Source Preparation 70
4.4.2 Pre-translation 70
4.4.3 Translation 71
4.4.4 Post-translation and Delivery 72
4.5 Translation Stages in Assimilation 72
5 CARRYING OUT THE STUDY 75
5.1 Preliminary Assumptions 75
5.2 Evaluation of Roughlate 76
5.2.1 Evaluation During Development 76
5.2.2 Evaluation During Production Use 77
5.3 Research Material 77
5.3.1 Questionnaire 78
5.3.2 Online Voting and Log Information 79
5.4 Analysing the Material 81
5.4.1 Preparing for Analysis 81
5.4.2 What Was Analysed 82
6 RESULTS 83
6.1 Roughlate Users 83
6.1.1 Native Language of the Users 83
6.1.2 Educational Background and Tasks 84

6.2 Roughlate Use **85**
6.2.1 Frequency of Roughlate Use 85
6.2.2 Purpose of Roughlate Use 86
6.2.3 Types of Texts 87
6.3 Alternatives to Roughlate **88**
6.4 Usefulness and User satisfaction **89**
6.4.1 Quantitative Perspective 89
6.4.2 User Experience 91
6.4.3 How Good is Useful? 93
7 CONCLUSIONS AND DISCUSSION **95**
7.1 Findings and Future Development **95**
7.2 Aspects of Translation Theory for MT **100**
WORKS CITED **104**
GLOSSARY OF TERMS **115**
APPENDIX A. CASE: YOU AS A LAY PERSON **120**
APPENDIX B. SURVEY QUESTIONS **121**

Preface

Have you ever been in a situation where you did not understand the language around you? Picture yourself at a table in a Japanese restaurant in Tokyo. While waiting for the waiter, you grab the sheet of paper on the table. It reads[1]:



東京大学附属図書館の構成

- 東京大学附属図書館は、総合図書館と６０余りの学部・学科等の部局図書館(室)からなります。
- 各部局図書館（室）には専門の分野の資料が多く収集されています。
- 各図書館（室）ごとに利用の時間や利用手続き等が異なります。**あらかじめ資料の所蔵の有無や所蔵図書館（室）などをオンライン蔵書目録等で確認し、所蔵する図書館（室）に連絡の上でご来館ください。**

If you are not quite sure which course to choose, you may want to take a look at Appendix A. It provides you with a rough machine translation (MT), which may make the contents of this text more understandable. The purpose of this example is to give the professional translator a feeling of a situation where machine translation might be useful.

As you may have concluded from the previous paragraph, this study deals with machine translation and its usefulness. There is also some discussion on the applicability of various translation theories to machine translation. Chapter 1 will serve to introduce the scope of this study in more detail.

[1] This example assumes that you do not know the Japanese language. If you do, pretend you don't. This text can be found at http://www.lib.u-tokyo.ac.jp/koho/guide/gakugai.html#gakugai

1 Introduction

The main motivation for me to carry out the research discussed in this study was the fact that since setting up the first version of the Roughlate machine translation service in the mid 1990s (Nuutila 1996), it has been running smoothly and people have been using it actively. However, as for the real usefulness of the service, I could only say that "it must be fairly useful because a thousand or so users are willing to use it every month". Thus, the following questions were unanswered:

- What types of texts are translated, why, and by whom? The traditional text typology (Reiss 1989: 105) is viewed in the light of different communication needs, and in relation to machine translation for information retrieval purposes (Chapter 3).

- How useful are the translations? In this study, a fairly subjective method to measure usefulness is used. The users rate the usefulness of each translation in a particular situation (section 5.3.2).

- What do the users think about the quality, and how could the machine translation service be improved? It is clear that a machine translation service of today cannot produce publishing quality (cf. also Chapter 4 for discussion on what quality to expect from a machine translations system). Quality is also strongly linked to usefulness, and in this study, quality is viewed in relation to usefulness (section 6.4.3).

The assumption was that people are satisfied with a low quality translation if they just want to know what the unknown source text is about at a general level. Moreover, it was assumed that machine translation is used for translating texts which otherwise would not be translated at all. The focus of this study is, therefore, on how non-translators can apply machine translation (MT) in order to get at least some information out of a text that otherwise might not be translated at all. In most cases, we are dealing with short-lived translations that are not stored nor processed any further.

The key word is *communication* – as with all translation – but how can we fit rough machine translation in the general picture of translation? Has machine translation been

taken into consideration in the various translation theories? Have the various translation theories been taken into consideration by the developers of machine translation? What is the difference between traditional human translation and machine translation in the overall translation process? Thus, in addition to the empirical survey on the usefulness of rough machine translations, we will also spend some time in discussing the theoretical framework.

1.1 Translation Theory for Humans … and Machines?

For a long time, various theories of translation were mainly formulated for specific areas of translation. Little attempt was made to bridge the gap between literary and "other" types of translation. One of the first attempts was made by Snell-Hornby (1988: 31) with her stratificational model, where she integrated virtually all aspects of translation. In the model, the conventional areas of translation were placed in a spectrum with *literary translation* at one end and with *special language translation* at the other, *general language translation* residing somewhere in between. Theories such as these (which will be further discussed in section 3.4.1 below) seem to be able to cover quite a lot of the traditional fields of translation. However, automation in various degrees has entered the translation business, and translation is not so traditional any more. This has also been reflected in the formulation of translation theories. Chesterman (2000), for example, takes machine translation into consideration in his typology, where machine translation is referred to as a subtype of *Acceptability* in *Target-language variables*. However, the viewpoint here is still that of the professional translator.

If we take a look at the issue from a different angle, it may also be noted that developers of machine translation systems have made no or only a few explicit references to the translation theories available. Rather, developers of machine translation systems have often derived their theory from linguistics and computer science. Machine translation (MT) is the application of computational and linguistic methods and techniques to a practical task (cf. e.g. ten Haken 2001: 13). Thus, there remains a gap between the theories of machine translation and those related to traditional human translation (HT).

I will not go into a lengthy discussion as to whether translation in general and machine translation in particular is possible or not; rather, I am willing to accept Coseriu's viewpoint. He denies the possibility of an abstract ideal translation. Instead he accepts the view that there are optimal translations of specific texts for particular user groups, for particular purposes and for particular historical situations (Sager 1994: 131.) The theory should, therefore, also include a functional aspect, function in this connection being understood in the sense of e.g. Nord (1991). Accordingly, in this study I follow the main division made by Hutchins (1997), because it seems to work well with the functional aspect of translation. He divided the demand for translation into three main groups.

- *Translation for dissemination*: This is the traditional demand for translations of a publishable quality.

- *Translation for assimilation*: This is the answer to the demand for translations of short-lived documents for the purposes of information gathering and analysis, the translations made being here often provided in unedited forms. The need for translations done for this purpose increased remarkably by the information explosion of the twentieth century,

- *Translation for interaction*: The demand for on-the-spot translations, which was earlier the traditional role of the interpreter. Nowadays we need to tackle similar tasks in electronic telecommunications (see e.g. Hutchins 1997: 118).

The above division (which will be discussed in more detail in section 3.1) does not differentiate between human and machine translation. If the need arises to distinguish the translation work done by professional human translators from that carried out by computer software, we might refer to the latter as "roughlation". Thus, we might talk about roughlation for dissemination, roughlation for assimilation, and roughlation for interaction. Roughlation could also be seen to cover "translations" produced by people who are not translators and not fluent in the languages concerned but who know the languages in question to some extent. However, this study will still use the traditional

term *translation* when referring to translations produced either by professional translators or by lay users.

1.2 Scope of this Study

The information explosion of the past decades has brought about huge amounts of texts that cannot be translated by the traditional means, and computer-literate people are ready to use machine translation software to be able to cope with the tasks at hand. They have also increasingly started doing so. This observation is also supported e.g. by the fact that Managing Director Michael Anobile of the Localization Industry Standards Association[2] (LISA), the premier non-profit organisation for the language business community, has said that, "Today, more words are translated per year using Machine Translation (MT) than are translated by human translators" (Lisa 2004).

Motivated by the increasing importance of computers in the translation process, this study will concentrate on rough machine translations of texts which are needed for information retrieval purposes and which are not usually very long-lived. In this context, we will take a look at the main features of machine translation in general and a Finnish-to-English rough machine translation service (Roughlate) in particular.

Chapter 2 serves to give a general overview of different approaches to machine translation. It will also explain some of the basic functions of the Roughlate service. This study mostly concentrates on today and on how this particular system is used in practice, and how it could be developed further. The Roughlate machine translation service presented here runs on the TranSmart[3] Finnish-English machine translation engine developed by Kielikone[4], a Finnish software developer concentrating on language tools. When compared to the basic TranSmart, Roughlate incorporates an additional company-specific termbank, user interface, and intranet access.

---

[2] http://www.lisa.org

[3] TranSmart is a registered trademark of Kielikone Oy.

[4] http://www.kielikone.fi

Chapter 3 will discuss the question how a number of traditional human translation theories could be applied to machine translation. There will be elaboration on what happens if we try to fit the black box of an MT system in the place traditionally used for the black box of the human translator's mind. Can we consider the translation process in the same way for humans and machines? Even though translation theories range from the text linguistic level through cognitive issues to cultural level (see e.g. Catford (1965) or Halliday (1961) for early linguistic theories, de Beaugrande & Dressler (1981) for an introduction to text linguistics, and Snell-Hornby (1988) for translation as a cross-cultural event), they are not applicable to MT as such. I would suggest that the closer to the practical translator's work the theory is, the better it can also serve machine translation. Therefore, the theories discussed below do not deal with the cognitive processes. There are, however, elements from text linguistics and sociological aspects (notably from communication).

In addition to machine translation, computers are also used to support the work of the professional translator in many ways in the form of translation memories and termbanks. The three main computer applications in the field of translation are machine translation systems, translation memory systems, and terminology tools. The development of the Internet and electronic mail has also changed the demand for translations. Through the Internet, people are more exposed to foreign languages than ever before. They may follow links to interesting new web sites – only to find that they are written in a foreign language. In order to overcome the language barrier, people can turn to free on-line machine translation services (such as Babel Fish Translation[5]). Similarly, an e-mail message may be originally written in one language for a certain group of readers. However, it may be forwarded into a wider audience with also people who do not know the language used. These developments as well as the impact of computer tools on the translation process are further discussed in Chapter 4.

The main purpose of this study is then to find out how much a rough machine translation service is used, how useful the users find it in the internal communication of

[5] Babel Fish Translation can be found in http://world.altavista.com/.

an international company, and how it could be improved. The evaluation of the usefulness is based on the subjective rating of the users in particular situations. Chapters 5 and 6 describe the actual study and its findings in more detail, and Chapter 7 concludes the study with a few ideas of what could be improved in the current Roughlate service and where we might pursue further research.

2 Machine Translation

What is machine translation? Before going into any details about machine translation, let us consider how it has been defined over the years. The use of computers in the translation process has been studied for several decades (cf. e.g. Hutchins 1986 and Nirenburg 1987: 1), but the scope has changed together with the improvement of the hardware and software involved. The change in scope can also be seen in the very definition of machine translation. At the very beginning, the goal of research was machine translation, which was, still in the 1980s, defined as follows:

> Machine translation is the application of computers to the translation of texts from one natural language into another (Hutchins 1986: 15).

At that time, there were really no other paths to follow. However, as soon as other types of software tools for translators (i.e. translation technology products) began to become more common, they also needed a definition. The definition for them is quite similar to the former definition of machine translation.

> 'Translation technology' is the term used to describe computer applications which can help produce translations from one human language to another (Mason & Rinsche 1995).

Translation technology tools are further discussed in section 4.2 *Automating the Translation Process.* Meanwhile, machine translation has also got a new, and maybe a more appropriate, definition:

> Machine translation (MT) = any process in which there is an element of automatic analysis of a source language text, transformation of this text and production of a target language text in another language (Sager 1994: 326).

Next in this chapter, I will take a brief look at the history of machine translation, elaborate on the various approaches, and how to evaluate machine translation. Finally, I will describe the Roughlate machine translation service. The purpose of all this is to serve as the background information for the empirical study that will be discussed in Chapters 5 and 6.

2.1 A Historical Overview

Machine translation (MT) is a technique where computers are applied to the translation of texts from one natural language into another. There has been research on machine translation for several decades, ever since the first experiments in the 1940s. The improvements in computer hardware and programming systems have also made machine translation more useful, and heavy investments in hardware are not necessary any more. This study will not deal with the misadventures of the early years of machine translation. The notorious ALPAC report[6], for example, has been covered well in many publications (see e.g. Somers: 2003: 4). We might also bear in mind that time, technology and the understanding of the potential of computers have changed remarkably since the 1960s when the report was written.

The reasons for attempting machine translation range from practical and economic to ideological and scientific needs (Hutchins 1986: 15). Globalisation is also seen as an important booster for machine translation (Allen 2003: 299). According to John Hutchins, for example, the principal reason is often a practical one, as there are so many people who have to communicate in languages they do not know, and there are not enough translators to cope with the material to be translated. This seems to be closely related to the commercial and economic motives: in order to sell successful products, the documentation must be available in time. Machine translation is seen as a tool for making translation more efficient. In addition to these main reasons, Hutchins further notes that there are those with what one might call the idealistic belief that international co-operation and peace are promoted by the removal of language barriers. There are, however, also people who promote MT research in order to be able to find out what the 'enemy' knows. Naturally, there are also scientists who are interested in the 'pure research' aspect of the subject (Hutchins 1986: 15). In a commercial enterprise, the commercial and economic motives for the need to communicate are likely to come first.

---

[6] see ALPAC. *Languages and machines*: computers in translation and linguistics. A report by the Automatic Language Processing Advisory Committee, National Research Council. Washington, D.C.: National Academy of Sciences, 1966.

As was mentioned in the introduction, MT usage has been traditionally divided into translation for dissemination and translation for assimilation. Vasconcellos and Miller (1996) propose yet another category, conversation. The same division is also proposed by Hutchins (1997: 115) at a more general level, as will be discussed in 3.1 below. However, Hutchins uses the term *interaction*, which nevertheless seems to correspond to *conversation* as this term is used by Vasconcellos and Miller. Generally speaking, dissemination is the output of the sender, and refers to manuals and other publication-quality products translated by translation agencies, in-house translation services, or corporations for technical documentation. Assimilation, on the other hand, assumes the point of view of the receiver, and refers to rough translations, or slightly post-edited rough translations. These may be produced by the user by means of translation software, or provided by large institutions for individual users. Conversation or interaction, which combines the characteristics of dissemination and assimilation, makes use of fully automatic translation of written or even spoken dialogue.

It could be argued that machine translation was born out of the need to assimilate information. Warren Weaver wrote in 1947:

> Recognizing fully, even though necessarily vaguely, the semantic difficulties because of multiple meanings, etc., I have wondered if it were unthinkable to design a computer which would translate. Even if it would translate only scientific material (where the semantic difficulties are very notably less), and even if it did produce an inelegant (but intelligible) result, it would seem to me worth while (quoted in Hutchins 1986: 25.)

In due course, companies with the need to provide documentation in several languages also became more interested in MT; this was the period during which MT was mostly applied to disseminating information. It was, however, soon realised that the quality of the translations produced did not quite meet expectations of the professional translator. The role of MT was once again seen to be in the area of information retrieval for the lay user; Alan Melby, for example, wrote about "indicative" translation in 1987:

> Fully automatic machine translation has been and is used successfully but only where there is a steady flow of technical texts for which 'indicative' translations are needed. Indicative translation is a specification which means that the translation need not completely conform to the target language grammar and need not be of publication quality. It need only give a rough idea of what the

> source text is about. . . . Such translations are often used to decide whether or not to request a human translation of a given article (Melby 1987: 147).

During the early years of MT, in the first half of the 1950s, research was fairly modest in its aims. It was constrained by the limitations of hardware and by the unavailability of high-level programming languages for system developers. Syntax was a relatively neglected area of linguistic study, and semantics was virtually ignored. The early researchers were aware that whatever systems they could develop would produce poor quality results, and assumed major involvement of human translators both in the pre-editing of input texts and in the post-editing of the output (Hutchins 1997: 113).

This holds true even today, and commercial developers of MT systems nowadays point out that MT does not produce translations acceptable without revision (Hutchins 1997: 115). There has, however, been a change in expectations with regard to the type and quality of translated material, and it has become obvious that not all machine-translated texts require post-editing. Even though the current commercial and operational systems produce output which must be revised in order to reach a publishable quality, unrevised rough translations can be acceptable for information retrieval purposes. Accordingly, Allen (2003: 301-306) suggests different types of post-editing (or no post-editing) for translations for assimilation (inbound translations) and translations for dissemination (outbound translations).

The Roughlate rough machine translation service (see 2.4) was also developed on top of a system that was originally devised to produce text for translators to revise. It has been adapted to the assimilation task by developing a new user interface.

The quality of the rough translations (or roughlations) it produces is not suitable for publishing, but that is not even the purpose. They are meant to be used as such because the need for immediate rough machine translations, whose communicative objectives differ from those of high-quality human translations, is widespread. This is a point also noted by Sager (1994: 271):

> Readers will want to be able to by-pass the time-consuming and costly human translation circuit, and instead obtain instant translations produced by an MT

system. This is particularly relevant for the increasing amount of technical and scientific information which is becoming available in machine-readable form.

2.2 Approaches to Machine Translation

The fully automatic machine translation (FAMT) systems may be considered the most sophisticated translation technology products from the point of view of linguistic depth. They are based on advanced computational linguistic analysis, which allows them to produce a translation of a source document "from scratch". There are three "classical" strategies that have guided the design of MT systems since the 1960s. The so-called *direct* (or word-for word) translation method was historically the first, followed by the *transfer* and the *interlingua* methods as illustrated in Figure 1 below. (see e.g. Arnold 2003: 122).

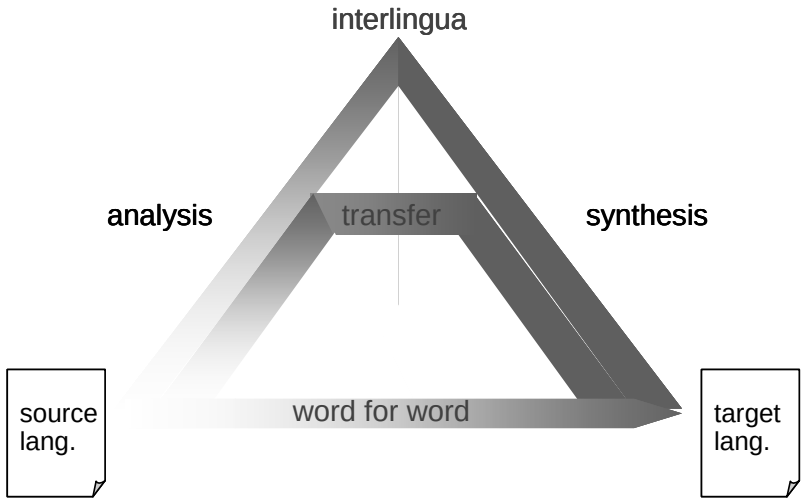


Figure 1. Machine translation approaches.

Tucker (1987: 22-26) describes the three approaches to machine translation as follows:

- The direct translation strategy passes each sentence of the text to be translated through a series of stages. No general linguistic theory or parsing principles are

necessarily present; instead these systems depend on well-developed dictionaries, morphological analysis, and text processing software.

- In the transfer strategy, a source language sentence is first parsed into an abstract internal representation (a tree structure, for example). Thereafter, a transfer is made from the source language to the target language at both the lexical and the structural levels. At the third stage, the translation is generated.

- An alternative to the transfer approach is to develop a universal, language-independent representation for text, known as *interlingua*. A genuine interlingua must be able to express the meaning of the text to be translated, and we can in principle dispense with bilinguality. An interlingua system resembles a transfer system but in an interlingua system the analysis goes even further so that the language-pair-specific transfer phase becomes virtually non-existent.

In addition to these, systems relying on artificial intelligence (AI) and neural networks have been studied. However, the operational MT systems of today tend to rely on the transfer method where the linguistic modules carry out the analysis of the source text, the transfer between two languages, and the synthesis (or generation) of the target text. The analysis produces a complete parsing of a source language sentence whereby all the words and lexical items in a sentence are reduced to their basic grammatical components. The output of the analysis stage is used to create the translation in the target language (for some further details, see Mason & Rinsche 1995: 23).

All this is carried out under the control of a set of specific rules. Translation by a computer is difficult because human language tends to be complex and ambiguous; many words and phrases can have different meanings depending on their context. Human beings also make essential use of what may be termed their *world of experience*: a human being typically attempts to solve a problem by attempting to relate it to some previous experience to see if there is sufficient similarity between the newly-encountered problem and an older experience to warrant an attempt at a solution by means of either copying or modifying a former course of action (Ungerer 1996). Computers, by contrast, do not have worlds of experience in this sense, and they

therefore cannot attempt to solve problems by resorting to common-sense reasoning – even if some of the modern machines do have what some people might wish to call a (rather primitive) ability to learn, that is, primitive in comparison to human beings (see e.g. Arnold 2003: 121).

Further, languages keep on changing (see e.g. Anderson (1973) for the study of the history of languages), which makes the maintenance of translation rules a continuous and tedious job. Advertising industry, for example, brings about new expressions constantly. They may modify idiomatic proverbs and expressions, and even if there is a special translation rule for the original proverb, a minor change in the proverb may render the existing translation rule useless for the new purpose. Let us consider the saying “maassa maan tavalla” ‘in a country obey the ways of the country’ which is often translated with the English expression “when in Rome do as the Romans do”. As soon as the space industry takes the tourists into the moon, an advertising agency may well coin a phrase “kuussa kuun tavalla” ‘in the moon obey the ways of the moon’ which would need completely new translation rule to produce, for example, “when in Luna do as the Lunars do”. Similar difficulties are caused by slang expressions and different dialects. Traditionally, advertisements are not translated by machine; however, it is quite possible that a lay user of a machine translation system wants to know what an unknown text is all about.

The challenges caused by the fact that languages do change were also realised by the MT developers in the earliest days of MT activity. Encoding of the expressions of a natural language into a limited number of rules in an MT system was considered to be a huge task. Accordingly, even before the idea of the hybrid use of the empirical and rule-based systems discussed above, proposals for simplifying the input texts for MT were made. Systems were proposed which could mark up source language texts so that analysis could be made easier (Hutchins 1986: 293). More recently, the idea has been implemented in organisations which, while using an MT system otherwise capable of accepting unedited input, limit the vocabulary and grammar of texts for translation in order to reduce problems of post-editing (see e.g. Hutchins 1986: 293). In other words, the organisations have started to use a controlled language. A controlled language refers to a system that limits language to a set number of core vocabulary words, and a set of

writing guidelines for grammar and style. The aim of these restrictions is to reduce ambiguities, colloquialisms, and synonyms (see e.g. Shubert et al. 1995: 348). Controlled language is used to improve the clarity of expression in the source text and to improve the quality of the MT analysis phase. It has become clear that the effort taken to develop a controlled input language for translation can certainly improve the quality of source and target text when the domain is suitable for a controlled language implementation (Mitamura & Nyberg 1995: 169).

Controlled language may be applicable to high quality texts which are meant to be published, such as user manuals. However, controlled language cannot be considered to be an option for writing e-mail messages or something more informal – which is just the type of text that could be translated by MT systems nowadays. Fortunately, there are large amounts of machine-readable textual material available, which has brought about attempts to develop empirical, for example, example-based machine translation systems (see e.g. Arnold (1994), Carl et al. (2000)) which apply relatively low-level statistical or pattern matching techniques either directly to texts, or to texts that have been subject to only rather superficial analysis. The reasoning behind the term *empirical* is that the linguistic knowledge used by the system is derived empirically by examination of real texts, rather than being reasoned out by linguists (Arnold 1994: 186). Systems such as these are generally referred to as data-driven machine translation (Implementing 2004).

One approach in this line is the above-mentioned example-based machine translation (EBMT), which makes use of a bilingual corpus of translation pairs. Against this corpus, a best match algorithm is used to find the closest example to the source phrase. This gives a translation template, which can then be filled in by word-for-word translation (Arnold 1994: 188). A pure example-based approach would use no grammar rules at all. It has the drawback of requiring substantial amounts of pre-translated text. This has led to the idea of reducing the amount of example text required by providing a modest amount of linguistic information in order to permit generalisation of the examples. It would, for example, be possible to identify noun phrases in the source-language text and then substitute any other noun phrase wherever a noun phrase occurs (Brown 1999: 23). This would, of course, suggest that there is no radical difference between example-based and rule-based approaches – the real challenge lies in finding

the best combination of these. For example the traditional rule-based transfer could be used as a fall back which is used only if there is no complete example-based translation (Arnold 1994: 190).

Another data-driven approach to machine translation that diminishes the maintenance needs of grammatical rules is the statistical method, which does not involve linguistic analysis at all, or only to a lesser extent. Even though statistical machine translation is often presented as a separate approach, it has a lot in common with the direct translation strategy (discussed above), in particular the reliance on word correspondences. The main difference is that instead of translation rules, statistical machine translation uses probabilistic translation models to determine the best translation. (Ahrenberg & Holmqvist 2004: 1). It relies on the number-crunching power of the latest computers. In order to calculate the probability of a target sentence corresponding to a given source sentence, a large bilingually aligned corpus is needed. One defect of this approach is that, for example, morphologically related words (e.g. *see*, *sees* and *saw*) are treated as completely separate from each other. Therefore the statistical information calculated for *sees* does not include that of *see* and *saw*. This has led to the addition of low-level grammatical information to the system, moving in essence towards an analysis-transfer-synthesis model of statistically based translation (Arnold 1994: 193). Another solution would be to use lemmatisation and use the information provided by that process wherever needed.

Regardless of the architecture of the system, it is important that the users of a machine translation system understand that the translation is likely to be imperfect but that it can still provide the basic idea of the source text, which allows the user to then decide whether further translation by a professional human translator is needed.

2.3 Evaluation

The evaluation of MT systems is important for various parties involved: researchers want to know whether their theories make a difference, commercial developers want to impress customers and make money, and users have to be able to decide which system to select (Hovy et al. 2002: 43). However, the evaluation of a translation, whether it is

produced by a human translator or a machine, is a difficult task because there is no "ground truth" for a correct translation: there is no set of right answers that form a universally agreed-upon standard for comparison of evaluation results. (White 2003: 214). Let us next take a brief look at the evaluation of translation in general, and after that move to the evaluation of machine translation.

2.3.1 Evaluation of Translation

The difficulty of evaluation can be seen to lie in the fact that even if we accept that translation is essentially an operation in which the meaning of linguistic units is kept equivalent across languages, there can be seen different views to equivalence (House 2001: 243). Equivalence is also difficult to map between languages because different languages cut up reality in different ways. Therefore, functional pragmatic equivalence is seen to be the most appropriate for describing relations between original and translation (House 2001: 247). The functional-pragmatic model of translation evaluation states further that equivalence is the fundamental criterion of translation quality, or the quality of a translation is determined by the fact how well it adheres to the predetermined objectives (Pinto 2001: 297-298). Equivalence should, therefore, be seen as relative and not absolute (Ivir 1996: 155); it depends on the context and the purpose of the translation.

When measuring the quality of a translation, we often count errors, but the analysis can be time-consuming. If we consider a translation project where thousands of pages must be translated in a very short time, it is fairly difficult to implement a system for counting and analysing errors. There are, therefore, attempts to automate the measuring of equivalence between a source text and its translation(s). This would make it possible to compare them without resorting to subjective impressions and prescriptive practices. An example of this is Graphic Equivalence Method (GEM), a systematic measuring of the ST - TT(s) equivalence based on the use of statistics (Tarvi 2001).

Alternatively, we might use a much simpler method of evaluation as suggested by Sager (1994: 242), for example. This method of evaluation might be applied when economic considerations constitute the main reason for evaluation. The amount of time spent on

re-reading and revision is an indication both of the volume and of the gravity of errors. It would also be possible to collect correction data automatically by counting the words corrected in relation to the total number of words of a document. However, as noted by Sager (1994: 242), revisors have different perceptions of what they want to correct and they tend to over-correct when they know that their work is being measured.

The evaluation methods discussed above have dealt with the translation as a product. If, however, we consider the translation as a process, we must also ensure that the process is suitable and as efficient as possible for the task. In this respect, I am willing to agree with Pinto (2001: 297) who argues that the elements that can affect the quality of the translation product are the quality of the enterprise, of the translator, of the processes employed, of the translation itself, and even of the reader. She further suggests that the quality of the translation is a perception that depends on the degree of satisfaction reached by its readers (Pinto 2001: 297). This seems to be related to the *social judgement* as proposed by House (2001: 254). She calls for distinction between linguistic analysis and social judgement. Linguistic analysis compares linguistic features of the original text with the relevant linguistic features of the translation text. Social judgement, in turn, assesses how good a translation is. (House 2001: 254).

2.3.2 Evaluation of Machine Translation

There are different types of tools available for natural language processing, and they tend to call for different methods in the evaluation. The evaluation of spelling checkers, for example, is likely to be easier than that of an MT system. White (1999) mentions the following reasons for this: almost anyone can tell whether a word is correctly spelled, but the evaluation of translation requires special expertise. Moreover, there is no one right answer to whether a translation is correct or not, i.e., there is no standard against which to measure a machine translation. The difficulty of the task can also be seen in the fact that there have been no standards for metrics of Machine Translation Evaluation (MTE) ever since the beginning of MT technology. One reason for this is the fact that anything can be translated correctly in many different ways (Reeder et al. 2001: 55). This has led to various attempts on the evaluation front. It is even said that during the

past 50 years, more has been written about the evaluation of MT than about MT itself (Hovy et al. 2002: 43).

Hovy et al. (2002) give a brief overview of the tendencies and trends of past MT evaluation literature. Two aspects, fluency and fidelity, can be seen to stand out among MT researchers. They seem to feel that if a system produces lexically and syntactically well-formed sentences (high fluency), and the meaning of the input is not distorted (high fidelity), then the evaluation results are considered good enough. The simplest approach to evaluating either of these is to ask judges to rate each sentence as a whole on an n-point scale. Other measures, such as price, system extensibility, and coverage, are added by system developers and real-world users. In real life, these can even be seen to be more important than quality (Hovy et al. 2002: 45).

Human evaluations of machine translation are extensive but they can also be expensive and time-consuming. In order to speed up the evaluation of machine translation systems, Papineni et al. (2001: 1) propose a method of automatic machine translation evaluation. Their proposal suggests that the closer a machine translation is to a professional human translation the better it is. Thus, to judge the quality of a machine translation, its closeness to one or more reference human translations is measured by a numerical metric. The evaluation system would then require a numerical *translation closeness metric* and a *corpus* of good quality human reference translations. Their BLEU (BiLingual Evaluation Understudy) method is described in more detail in Papineni et al. (2001).

It has been noted that even though language engineering products have gained respectability, there are certain aspects in evaluation that need to be considered. Evaluations are still mostly kept confidential to avoid “helping” potential competitors. Evaluations are expensive because the whole process from the design phase, through collecting test material, to executing the evaluation requires special expertise and takes time. The results of different evaluations tend to be non-comparable because they are based on different design principles. All this has led to efforts to standardise the evaluation design procedures (Manzi et al. 1996). It may be possible to standardise the evaluation procedure itself but there is no use in setting absolute values for different

features inspected because the needs of the users may differ. In a sense the “best” system may not necessarily be the best for a particular purpose. Therefore, it is important to match the user needs with the performance and features of the system (Hovy 1999: 127). However, the evaluation of Roughlate as discussed in Chapter 5 does not rely on any standardised approaches. Rather, a functional and fairly practical method is chosen along the lines of Pinto (2001: 297) who argues that the functional standpoint sees quality of the translation as a perception that depends directly on how satisfied the readers are. Accordingly, in this study the quality is directly linked to user satisfaction.

2.4 Case: Roughlate Machine Translation Service

Above, we have discussed various aspects of machine translation in general. We will now take a closer look at the workings of a specific machine translation service, Roughlate, and the underlying translation engine, TranSmart. Roughlate is a company-internal service, and runs on top of the TranSmart Finnish-English MT system. TranSmart in turn relies on Kielikone Machine Translation Technology (KMTech) (Arnola et al. 1996: 3).

2.4.1 KMTech and TranSmart

Development of the Finnish-English machine translation system was started in the autumn of 1987 as a subproject of the Kielikone project, a project for the automatic interpretation of written Finnish (Honkela & Lehtola 1987: 7). The Kielikone project, the first phase of which was launched as early as June 1982, was supported by the SITRA Foundation (The Finnish National Fund for Research and Development). The main application-oriented aim of the project was to develop a portable interface system for making database queries in written Finnish (Jäppinen et al. 1987).

The basic processing module of KMTech is a generic (language independent) virtual machine, an abstract MT engine as illustrated in Figure 2. The abstract MT engine becomes a real virtual machine when rules are written for a given task. An MT system based on KMTech has a simple but flexible linear architecture where translation is a chain of MT engine applications. Each MT engine instance transforms linguistic trees according to the rules specified for a specific translation subtask (Arnola et al. 1996: 2). If, for example, we have a Finnish phrase “oli asunut” ‘had lived’, a specific rule might state that the representation of tense is changed from the auxiliary word “had” into an attribute of the verb “live”. Thus, the original tree is transformed in such a way that one branch was omitted. This is also illustrated at a general level in Figure 2.

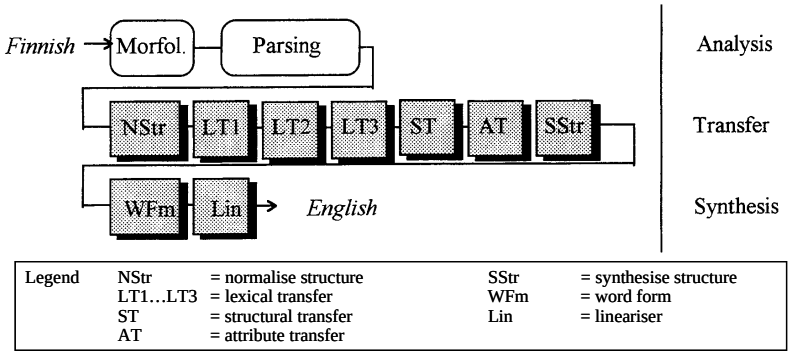


Figure 2. Architecture of the TranSmart Finnish-English system.

Even though KMTech does not presuppose any specific linguistic theory, the dependency theory of sentence structure was found to be particularly fitting for machine translation (for expositions of the main principles of the dependency theory, see Mel’cuk (1987) and Järvinen & Tapanainen (1998)). Accordingly, the MT engine is especially well suited for the transformation of dependency trees. KMTech applies the transfer approach (see also section 4.2), which means that a sentence is translated by analysing the sentence into its dependency structure and transforming it into a meaning-preserving target dependency tree. The target tree is then transformed into a linear string of word forms according to the grammar of the target language. Thus, the architecture of the TranSmart Finnish-English system can be described as a series of processes as illustrated in Figure 3. (Arnola et al. 1996: 3).

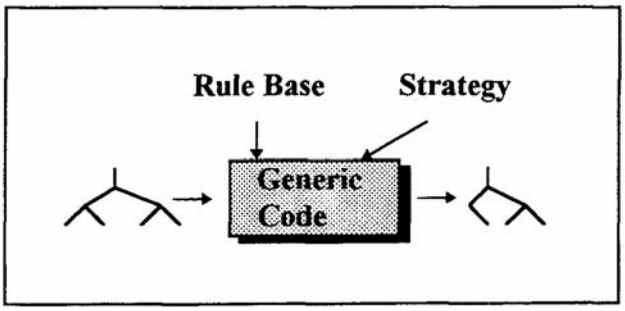


Figure 3. MT Engine.

After the text is cut into sentences, the process runs as follows:

- In the *Analysis phase*, the Finnish source sentence passes through two parts: first through morphological analysis (Morfol) for word forms, and then through parsing (Parsing) for dependency analysis of sentence structures.

- The *Transfer phase* consists of several consecutive transfer processes from normalising the source dependency tree into a more general format in (NStr), through lexical transfers (LT1-LT3), structural transfer (ST), and attribute transfer (AT) to the phase where the tree structure gets the target-language-specific structure (SStr).

- In the *Synthesis phase*, target word forms are generated (WFm) and the contents of the dependency tree are linearised (Lin) into the English sentence.

TranSmart includes an intelligent Finnish-English general language dictionary with some 70,000 entries. It is also possible to add company or domain-specific dictionaries, and the dictionaries can be prioritised according to the user needs (Carlson et al. 2001). Intelligent here refers to the fact that each entry is in fact a translation rule.

Initially, Kielikone designed an MT workstation version which runs on a Unix workstation. Unfortunately, in spite of the various attractive post-editing features, it did not fit into the workflow of the pilot companies. Therefore other solutions were also

inspected. Since MS Word[7] is the most popular word processing program in Finland, Kielikone decided to integrate the TranSmart system with MS Word (Hyvönen & Arnola 1998).

TranSmart was originally developed for translating Finnish into English but the KMTech MT engine was not restricted to this. Currently there is work going on to develop an English to Finnish machine translation system based on prefabricated components. The system relies on the language-independent TranSmart architecture, with an additional English dependency parser developed by Conexor[8] (Carlson et al. 2001).

2.4.2 Roughlate

Roughlate is a tool for preparing rough English translations of Finnish texts. It is a service provided to those who know very little Finnish, but need to get the basic idea of a Finnish text when no English translation is available. As the name implies, the result is a very rough translation and should never be used as such in documents to be published. The rough translation might have a broken sentence structure, which would not look good in a user manual – it might give you the idea that maybe the product itself is as bad as the language in the user manual. However, the ungrammatical sentence may well convey the information of the original text and as such thus serve its purpose in information retrieval.

Roughlate uses the Unix server architecture of TranSmart without the original workstation features. The basic architecture is illustrated in Figure 4.

---

[7] MS Word is a trademark of Microsoft Corporation.

[8] http://www.conexor.fi

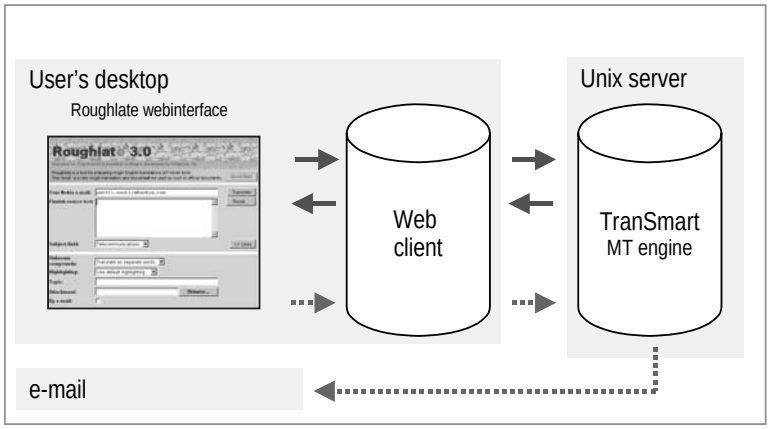


Figure 4. Basic architecture of Roughlate.

It can be used in two modes: on-screen mode and e-mail mode. In the *on-screen mode*, the translation appears as a new web page. This is ideal for short texts where the formatting does not play any role. In the *e-mail mode* (dotted line in Figure 4), the translation is delivered by e-mail. This is generally used for attachment files or longer texts. If an attachment file is selected, the translation is always returned by e-mail. Similarly, if the *By e-mail* box is checked, e-mail is used to return the translation. This may be useful if the text to be translated is long. A *topic* can be added in order to distinguish between separate translations. These, together with a number of other attributes the user can select when sending a text for translation, are illustrated in Figure 5.

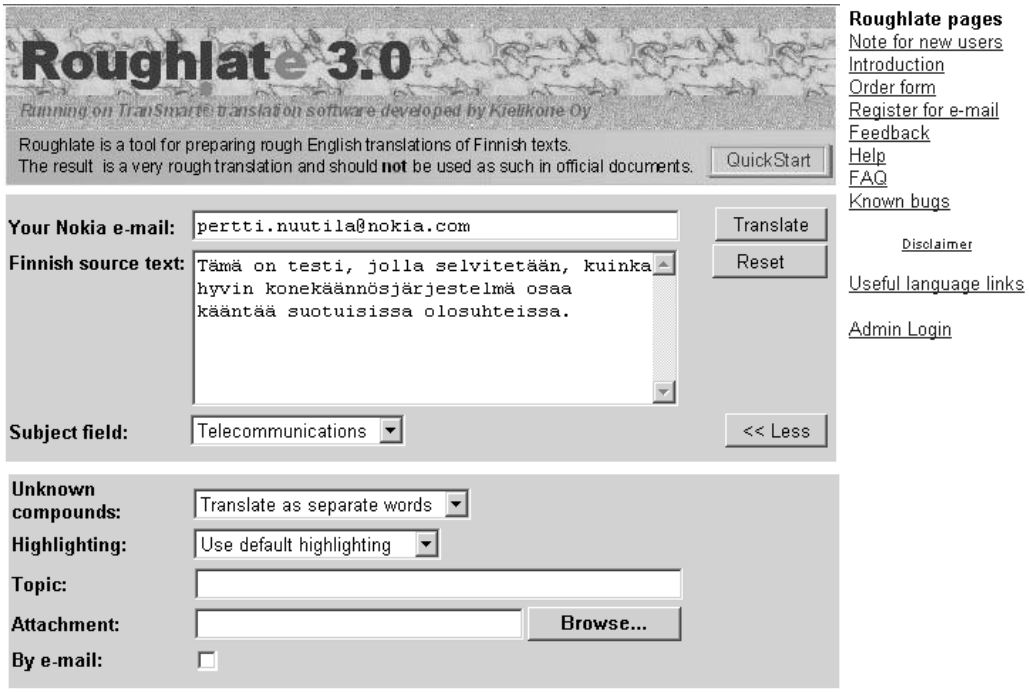


Figure 5. User interface of Roughlate.

After entering an *e-mail address* (which needs to be done only the first time) and entering the text to be translated in the *Finnish source text* field, the user only needs to press *Translate* and wait a while for the translation to appear. The “while” is a linear function of the number of words in the sentence being translated. For example, the translation of the sentence in Figure 5 appears on screen in less than 10 seconds. Most of this time is spent on transferring the data between the client and server, and therefore ten sentences like this translate in around 20 seconds. This includes the time to make the actual translation (which is dependent on the performance of the Unix system used), data transfer between the client and the Unix server, and preparation of the translation for display.

The user can also select the *subject field* (which defines the order in which the dictionaries are searched), how to translate *unknown compounds* (either not at all or as separate words), and how to *highlight* the text (no highlight, character tags, or colours). The subject field and the translation of compound words can have an impact on the

translation result, whereas highlighting only serves to point out various issues in the translation. For example, if a compound is translated as separate words, the result is highlighted in order to indicate that it may not be correct.

In addition to the general translation rules provided by Kielikone, a company termbank and other internal vocabularies have been included in the Roughlate service. Furthermore, work has begun to add informal expressions to the translation rules. Usually, the informal expressions encountered in this context are new words that are just finding their Finnish appearance, such as “bootata” or “buutata”. However, they also include new expressions for an existing Finnish word, such as “maili” or “meili” for “sähköpostiviesti”. In most cases, a shorter or more convenient expression is used even if there is an existing one: “meilata” = “lähettää sähköpostiviesti”. At this stage, we are mainly dealing with nouns, verbs, and adjectives. Informal pronouns and other function words require more precise tuning from the system developers.

There seems to be a certain cycle of user-behaviour in connection with the introduction of a rough translation service. The first reaction is enthusiasm, which is followed by a phase when users complain about the quality. During the third phase users start to play around with the system and try to think of difficult challenges. In the fourth phase everyone settles down and the system is treated as yet another tool for communication (MT On-line 1996: 20). Our experience also seems to support this notion. At first, many people wanted to challenge the limits of the system by sending in texts with puns, proverbs, and so on, just to see how amusing the translations would be. A similar phenomenon is likely to occur every time we introduce the service to new user groups.

Now that we have a view of *how* machine translation is done, let us consider the *why*. We will next discuss the various directions of translation in the context of communicative purposes.

3 Varying Communication Needs

If we ask why texts are normally translated, a very likely answer will be: translation is a communication service, and the service will normally be directed at a target language receiver or receivers. Communication theory will thus be primarily concerned with establishing some basic systematic order in the translation of the versatile material that needs to be translated (Reiss 1989: 107).

In this chapter, I will make an attempt to bridge the gap between human translation and machine translation in certain aspects of translation theory. I will start with the translation directions and multilingual communication process where there does not seem to be fundamental differences between human and machine translation. After a few words of challenges and misunderstanding in communication, I will proceed to the typology of text types and functions of languages where some differences become apparent.

3.1 Translation Directions

We will next work on the idea that there can be different kinds of communicative purposes for translations. We might start by asking whether there is always a human translator in the multilingual communication process. In traditional translation there is. However, the development of computers and software has brought about machines that can also be used to carry out simple translation tasks. Naturally, the tasks differ considerably from those of a human translator; they serve different needs. As pointed out earlier, the demand for translation can be divided into three main groups: translation for dissemination, translation for assimilation, and translation for interaction (Hutchins 1997: 115).

Translation for dissemination is the answer to the traditional demand for translations of a publishable quality. The original (often implicit) ultimate goal of MT developers was to create a system that would “replace” the human translator (Hutchins 2001a: 1). However, in recent years translator workstations (with an integrated suite of tools to help the human translator) have offered a feasible and probably more attractive means

for professional translators than machine translation. Translations of quality can be produced at higher productivity levels while maintaining translators' traditional working methods (Hutchins 1997: 119).

If machine translation tools are used to prepare translations for dissemination, the key criteria are reliability of terminology and easy editing of the rough translation. This is often solved by adding machine translation as an additional tool in a translator workstation. The domain is narrow but deep, that is, the system is designed to be able to produce as reliable translations as possible in a given domain. It may have been tuned for the specific text structures of that domain. A well-known example of this is the TAUM-METEO system that translates meteorological reports from English to French has a restricted vocabulary and stereotyped syntax. (Hutchins 1986: 228). When the system was started in 1977, it translated 7,500 words a day. Two decades later, the new version of METEO incorporates two fully-automatic translation modules and two machine-assisted manual translation modules, and translates more than 30 million words a year (Meteo 1997).

Translation for assimilation is the answer to the demand for translations of short-lived documents for information gathering and analysis which can be provided in unedited form. The need for this has been emphasised by the information explosion of the twentieth century. This type of translation has not traditionally been undertaken by professional translators. Rather, the work has been done in organisations, often by secretaries or other employees with some knowledge of languages, as an occasional service and usually under time pressures. In this function MT has filled a gap ever since the first systems became available in the early 1960s. Rarely do professional translators see this output. There will continue to be a large and growing demand for this type of translation - which the translation profession as such has not been able to meet in the past (Hutchins 1997: 119). The translation is ephemeral, that is, it is used maybe once and deleted. The key criteria for translation for assimilation are speed, easy access, and ease of use. The domain is wide but shallow, meaning that the system should be able to give some kind of a translation of virtually anything. It may, for example, contain features that help in translating highly productive features of the source language that cannot be added to the translation lexicons. In Finnish, it might assist the translation of

compound words as sums of their parts. This is useful because it is not possible to enter all possible compound words in the translation rules; for example *kesäilta* would be translated as *kesä = summer* and *ilta = evening,* resulting in *summer evening*.

Translation for interaction covers the translation in face-to-face communication (dialogue or conversation) and correspondence (traditional mail or electronic mail). Translators have often been employed occasionally by their organisations in these areas, for example as interpreters for foreign visitors and as mediators in company correspondence, and this will continue. But for the real-time translation of electronic mail, it is not possible to see a role for the translator. For this, the only possibility is the use of fully automatic systems (Hutchins 1997: 119). The key criteria here are again ease of use and wide subject domain. In addition, the system must be able to translate in both directions. This is one thing that Roughlate cannot do at the moment.

Table 1 below illustrates the various translation directions and who might apply them.

Table 1. Translation directions.

User	Translator	Non-translator	
Type of translation	dissemination	assimilation	interaction
Knowledge of source language	active	none	passive
Knowledge of target language	active	passive	passive/none
Criteria	reliability of terminology, easy editing to get publishable quality	ease of use, easy access, speed of translation, wide domain (e.g. translation of productive words)	ease of use, two-way, wide subject domain, real-time translation (e.g. e-mail)

In this study, my interest is mainly focused on translation for assimilation, because this is what Roughlate is most suitable for. Translators would expect better editing features or integration into other translation tools. Those who use it for interaction would expect to have translations both ways. For assimilation purposes, users need not know the source language but they do need to have at least passive knowledge of the target language. Translation for interaction is meant for more casual exchange of ideas, and in most cases it is good that the sender of the message knows the source language. He may

not know the target language but a passive knowledge would be beneficial. Naturally, the translator may in some cases be regarded as a non-translator, for example if he is dealing with a language he does not know.

3.2 Translation as an Event of Communication

What is the basic function of translation? Why have people started to translate in the first place? I would claim that translation theory calls for a fairly practical view of translation along the lines of the communication theory as proposed by Sager (1994: 20):

> Translation theory [...] has a place in a theory of communication because the phenomenon of translation, i.e. the transformation of written documents (texts) from one natural language into another, only makes sense in terms of communicative objectives and can ultimately be measured only in terms of its communicative value.

Communication is a deliberate human activity as documents are produced for a variety of purposes. Let us consider the process of communication between a sender and receiver as illustrated in Figure 6.

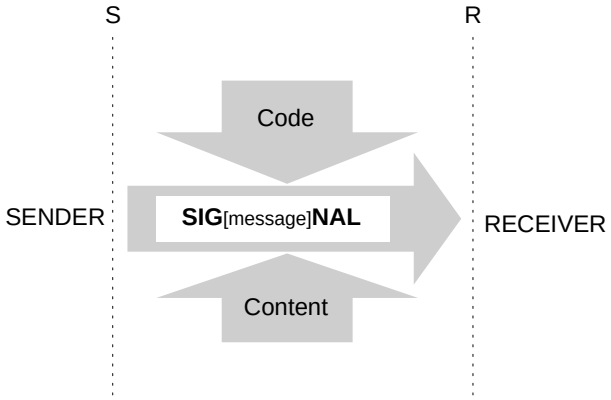


Figure 6. Monolingual communication.

Bell (1991: 18) describes the process of monolingual communication in terms of the following nine steps. First, the *sender* in the sender interface (S)[9]

(1) selects message and code,
(2) encodes message,
(3) selects channel,
(4) transmits signal containing message

After this, the *receiver* in the receiver interface (R)

(5) receives signal containing message,
(6) recognises code,
(7) decodes signal,
(8) retrieves message and
(9) comprehends message.

If we are dealing with written documents, the communication mainly takes place from the sender (or author of the document) to the receiver (or reader of the document). This does not, however, have to be a simple, unidirectional and linear process; several steps may be in progress at the same time, and there is co-operation between the sender and the receiver. In principle, their roles may change during the communication if they are communicating face to face.

The basic condition for communication to take place is that the participants share a common code. The common code is, obviously, the language used. If a common language is not available, translation is needed in order for the communication to succeed. Translation can be seen as a service with which a new readership is included in a communicative act which was originally restricted to the source language community. This is seen to hold even for texts which, in their source language form, were not

---

[9] Figures 6 and 7 are based on Bell's (1991) work. I have, however, added the interfaces S and R, with additional T_R and T_S in Figure 7, to be able to show the similarities and differences between monolingual and multilingual communication better.

thought to be truly communicative, such as diaries, personal memorandums, and notes (Reiss 1989: 107).

Production and reception of language constitute communicative acts, regardless of whether the speech act itself (as in translation) is physically or temporally split into separate parts (Sager 1994: 52). Figure 7 illustrates the difference between the processes of monolingual communication and multilingual communication, that is, translation.

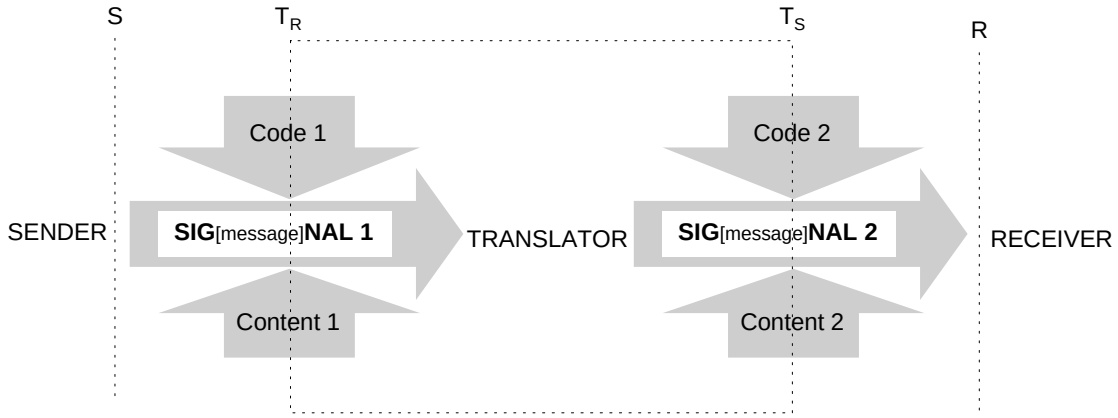


Figure 7. Multilingual communication.

In a communication process which includes translation, the sender interface (S) and receiver interface (R) are practically similar to those of a monolingual communication as presented in Figure 6. The additional translation phase could be described as consisting of the following nine steps.

First, the *translator* as a receiver in interface T_R

(1) receives signal 1 containing message,
(2) recognises code 1,
(3) decodes signal 1,
(4) retrieves message,
(5) comprehends message;

after this, the *translator* as a sender in interface T_S

(6) selects code 2,
(7) encodes message by means of code 2,
(8) selects channel, and
(9) transmits signal 2 containing message (Bell 1991: 19).

The translation process in the communication event seems to have a close resemblance with the transfer approach in machine translation. In the transfer approach, a source language sentence is first parsed into an abstract internal representation (a tree structure, for example). Thereafter, a transfer is made from the source language to the target language at both the lexical and structural levels. In the third stage, the translation is generated (cf. e.g. Tucker 1987: 23). If we add input and output to the process, we get the following steps:

- A sentence is input in the system. This could be seen to cover the *(1) receive signal 1 containing message* phase.

- The sentence is parsed (or analysed). This could be seen to include the *(2) recognise code* and *(3) decode signal* phases. At this stage, the morphological and syntactic (maybe also semantic) structures are recognised. Not all systems have the *recognise code* phase available; the user must usually define the source language and ensure that the text is in a suitable format.

- The sentence is transferred to the target language in *(4) retrieve* and *(5) comprehend message*. One might call this “comprehending” but one should bear in mind that the computers of today cannot really comprehend anything in the sense in which human beings comprehend something. At this stage, the sentence is an abstract representation. It might be a tree structure with each node containing all relevant information on the word it contains.

- The target sentence is generated. The appropriate *(6) code* (i.e. target language) *is selected* and the abstract structure is *(7) encoded* into the proper grammatical structure in the target language.

- The translated sentence is output. This can be seen to include the phases *(8) select channel* and (*9) transmit signal 2 containing message*. We have to admit that when dealing with machine translation, the signal may well be distorted. Even so, the message is likely to come through better than with no machine translation.

We can see that the process discussed above can be applied both to human translators and MT systems since they both serve the communicative function. Moreover, the different translation directions suggested by Hutchins (1997, see also 3.1) seem to work well irrespective of whether the translation itself is carried out by a professional translator or a machine. Accordingly, machine translation can be seen to have its place in the total translation process beside the expert translator, as illustrated in Figure 8.

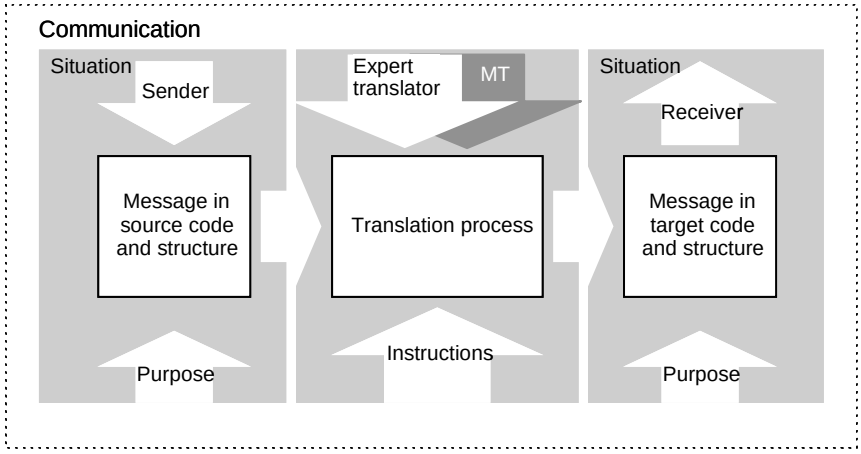


Figure 8. Theoretical framework of translation.

Note that the same internal translation process which is illustrated in Figure 8 is also represented by the area between T_R and T_S in Figure 7 *Multilingual communication*.

Naturally, if publishing quality translation is needed, the internal translation process needs to be carried out by an expert human translator. In many cases, however, the main purpose of an electronic mail message, memorandum, or the minutes of a meeting is to communicate information, and therefore we may wish to consider translation only in terms of its communication role. In cases where draft quality for information gathering is enough, the internal translation process may be carried out by an MT system. In these

cases the translation assignment is defined by the non-translator user of the machine translation system, and the purpose of the translation will probably differ from the original purpose of the source text. This is also in line with the *skopos* theory, which states that source and target texts may diverge from each other not only in the formulation and distribution of the content but also as regards the goals which are set for each, and in terms of which the arrangement of the content is determined (Vermeer 1989: 175; Nord 1991: 72).

3.3 Challenges in Communication

In Figure 6 above we saw a communication process that follows Shannon's (1948: 2) mathematical theory of communication in which communication is reduced to a process of transmitting information. A message is transmitted within a signal through a given channel. The signal is received and the message reaches the destination.

However, Shannon's model also includes a noise source that may distort the signal (Shannon (1948: 2). From the point of view of the sender and receiver, translation (whether by a human translator or machine translation software) can be regarded as a part of the communication channel through which the signal with the message passes. It is therefore also subject to noise. One important noise source in machine translation can be attributed to the vocabularies and translation rules. Imperfect translation rules can distort the signal (by producing erroneous grammar, giving wrong word choices, or leaving some of the words untranslated) and therefore the intended message may be difficult to interpret.

If the noise source could be eliminated, would we then have accomplished a 'perfect' communication process? If that were the case, it would be free of noise interfering with the signal, and people would be able to understand each other. Unfortunately, even if there were no external factors interfering with the signal, there might still be problems with decoding the message properly. This may be caused by a different situation of the sender and receiver or a changed purpose of the message. All in all, those communicating may misunderstand each other due to various reasons as will be discussed below.

3.3.1 Misunderstanding

People may say different things than the words they use might let us think. They may also use words and expressions unknown to us. These, among others, can cause misunderstanding which has been characterized as

> a communicative phenomenon typically belonging to reception, occurring at the semantic-pragmatic layers of communication, having to do with incorrectness rather than with non-ethical behaviour, and being involuntary. (Dascal 2003: 294).

According to Bazzanella et al. (1999) misunderstanding can arise at five levels: phonic, lexical, syntactic, semantic, and pragmatic (Bazzanella et al. 1999: 818). In addition to these five levels, they further identify four different causes or ‘triggers’ for misunderstanding and relate them to the basic components of the interaction, i.e. the structural components of communication, the role both of the speaker and the interlocutor, and the ongoing interaction itself.

- *Structural triggers* include disturbances along the communicative channel, use of a foreign language, and structural ambiguities.

- *Triggers related to the speaker* include ‘local' factors, such as the use of ambiguous forms, and 'global' factors concerning the structuring of information both on the pragmatic and on the syntactic level, e.g., politeness.

- *Triggers related to the interlocutor* (or conversational partner) include knowledge problems, lexical incompetence, and wrong inferences.

- *Triggers related to the interaction* between the participants include non-shared knowledge. (Bazzanella et al. 1999: 818). Cultural differences also belong to the last category. (Dascal 2003: 295).

If one or more of these factors appears in a communication situation, the process of understanding can become more difficult. It does not, however, necessarily result in misunderstanding. (Bazzanella et al. 1999: 818). For example, if the communication takes place interactively (face-to-face, on the phone, or even through a computer system), misunderstanding can be managed. The misunderstanding management

involves one or more ‘negotiation cycles’ through which ‘coming to an understanding is sought and achieved’. (Bazzanella et al. 1999: 823, Weigand 1999: 766). On the other hand, if the communication process is not interactive, as can be in the case of a letter or an email message, there may not be the possibility for negotiation cycles. The danger of misunderstanding is even greater when communicating across cultures.

3.3.2 Communicating across Cultures

Translation is needed in order to make communication happen in certain types of situations. However, communication, especially between different cultures, can pose problems. Sager (1994: 127) categorises the problem issues as follows:

- Individuals do not necessarily comprehend every part of a message and cannot therefore re-convey it. (Sager 1994: 127). In this case, the individuals could use the services of a human translator or interpreter, or even a machine translation system, to help overcome the language barrier.

- Some source language expressions may call for explanations or paraphrasing to convey concepts unfamiliar in the target culture. (Sager 1994: 127). In this case, we are dealing with special expressions, such as the Finnish word “vihta” ‘A thick bunch of birch twigs, approx. 40 cm in length. Used to slap on oneself to promote blood circulation and cleanse the skin.’(Cankar 2003). It could be possible to use the long explanation in a machine translation rule but it would be cumbersome if it were translated that way every time the word appeared. The machine translation system used, would preferably give just the closest equivalent (bunch of birch twigs) -- the explanation might be displayed as a cross-reference link from the translated word.

- Languages and techniques of communication can be more or less explicit. Therefore, information conveyed explicitly in one language may become implicit in another. This may mean turning concrete into abstract or vice versa, or replacing the specific with the general or vice versa. Translating from an implicit language into an explicit language requires the translator to interpret what is implicit. (Sager 1994:

127-128). This requires reasoning, and it is therefore is not within the scope of today's machine translation.

Even if the message is grammatically correct and the words used are familiar, the receiver may still be unable to comprehend it. This may be due to the fact that the relationship between the surface form of an utterance and its underlying purpose is not always straightforward (Asher et al. 2001, 183). Let us, for example, consider phenomena such as irony and indirect speech acts.

- *Irony* involves saying something which is completely opposite to the intended meaning. (Dascal 2003: 616). For example, saying *You are a pretty sight!* to a child whose face is covered with dirt is a typical case of irony. There is usually some sort of discrepancy between appearance and reality. However, the speaker expects that hearers will recognize that the speaker does not believe in the statement. (Mann et al. 2004: 65).

- *Indirect speech act* (ISA) is an utterance in which one speech act is performed indirectly by performing another. For example, the sentence *Can you pass the salt?* expresses a question. Usually, the speaker would expect an answer to a question (*yes* or *no*). However, in this case the question can be seen to have a different purpose: it is a request, and the speaker expects the hearer to pass the salt. Thus, the speaker utters a sentence, means what he says, but he also means something more. (Searle 1975: 59).

How about applying machine translation in translating sentences containing irony or indirect speech acts? I would argue that as far as irony, for example, is concerned, a machine translation system does not need to understand that there is irony involved. It is enough that the surface of the message is translated; the hidden meaning is left for the human reader to infer. It is not so much the machine translation but the cultural differences that pose problems in these cases. A typical way in an English speaking country when asking someone to open the window might be to make a remark how hot it is. A person from another culture might not be familiar with this and might just reply

politely to the remark by saying “Yes it is, isn’t it.” In this case we might say that the code was decoded successfully but the message was not understood properly.

However, Sager (1994: 124) suggests that culturally conditioned problems of translation are of limited importance in industrially oriented work because in the field of science, technology, and commerce, the cultural perspective is considered to be unimportant (Sager 1994: 129). Similarly, when using rough machine translation just to find out the contents of a message, the cultural aspect does not necessarily play any major role. For example, if proper translation rules have been written, a rough machine translation system will be able to translate “tappaa kaksi kärpästä yhdellä iskulla” as “to kill two birds with one stone”. However, even if the system did not contain a rule to produce such an idiomatic translation, the translation “to kill two flies with one hit” would probably serve to convey the message between the two cultures.

All in all, the most crucial difference between human translation and machine translation in the context of communication is the fact that the machines of today cannot really comprehend the message. Even though some semantic knowledge has been built into the systems, the current systems basically rely on syntactic rules, and their world knowledge is rather limited. Let us consider the sentence Bar-Hillel (1960) used as a proof that high quality MT was not possible.

> The box was in the pen.

If the system has only the translation rule for “pen” as a writing instrument, then the system would easily render a translation where the box (container) was inserted in the pen (writing instrument) even if the text was describing farming and the “pen” was the place where the pigs were kept. The human translator would probably have taken some action to resolve the question, even if he were not familiar with the second meaning of the word “pen”.

Similarly, if there were a typographic error in a word (e.g. “asinto” instead of “asunto” 'apartment, dwelling'), the human translator would probably notice the mistake and translate the text correctly (“an apartment”) whereas the machine translation system would just mark it as unknown. Thus, even though translators do not necessarily know

the technical details of the product whose documentation they are translating, they may be able to compensate for unclear writing and unusual topics (Implementing 2004).

3.4 Functions of Language and Translation

Let us now consider the translation directions from the point of view of some aspects of traditional translation theory. How do text types, function of language, and translation methods relate to the translation directions? How does machine translation differ from traditional human translation in this respect?

3.4.1 Functions of Language

As pointed out above, Snell-Hornby (1988: 31) places the conventional areas of translation in a spectrum with *literary translation* at one end, *special language translation* at the other, and *general language translation* in between. Other divisions of major translation activities have been presented by Sager (1994: 160, 164), who divides the same field into *literary translation*, *bible translation*, and *industrial translation*, and Newmark (1988: 44, 151), who divides the field into *literary translation* and *specialised translation* (which is further divided into *institutional translation* and *scientific translation)* as illustrated in Figure 9.

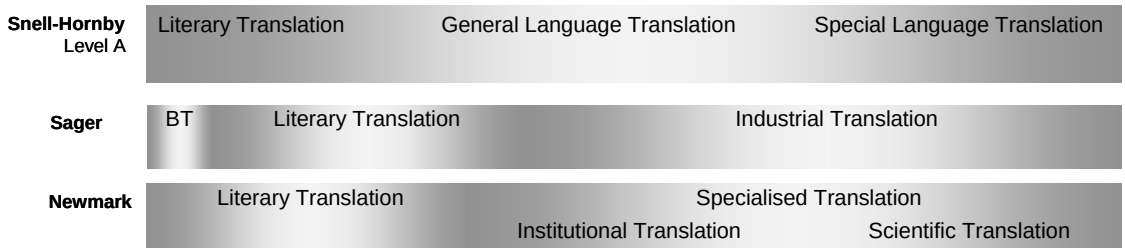


Figure 9. Areas of translation. (Snell-Hornby 1988: 31, Sager 1994: 160, Newmark 1988: 44).

Divisions like these seem to cover quite well texts that are translated for dissemination. These are texts that a professional translator is likely to encounter. Since we cannot see a direct reference to translation for assimilation in this spectrum, we might look at the matter from another angle. Let us consider the functional viewpoint.

Because writing is a motivated human activity, the writer always has a more or less specific pragmatic situation in mind. In the relevant literature, there are many different categorisations of functions of language. In most categorisations, texts have been divided into three major classes: expressive, operative, and informative (the names of these classes may, however, vary). Reiss (1989: 105) further distinguishes certain text types from poems and biographies, through satire, lecture, and operating instructions, to sermon and advertisement, as exemplified in Figure 10.

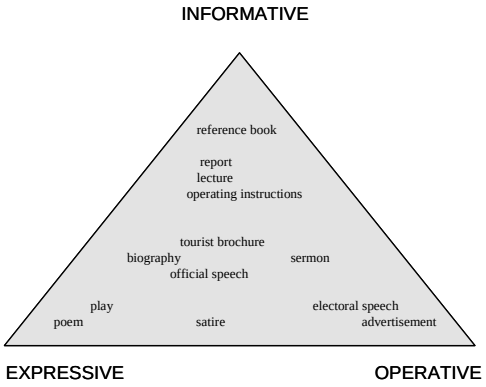


Figure 10. Main functions of language and text types. (Reiss 1989: 105).

More or less “pure” examples of the three main classes are as follows:

- informative text: instruction,
- expressive text: poem, and
- operative text: propaganda (Reiss & Vermeer 1986: 116).

In addition to these three main classes, other classes, such as poetic, phatic, and metalingual, have been proposed. All text types have their own characteristic mixture of functions, and, as argued by Sager (1994: 23), every use of language has an emotive aspect, because human beings cannot separate themselves from their emotions, though they can try to minimise the impact of the emotions.

Typologies like these can suffer from shortcomings as argued by Hatim (1997: 35). Different categories can be too broad to yield a useful classification because there is no coherent description of context. He therefore proposes a view of context that accommodates communicative aspects, pragmatic notions, and semiotic categories. (Hatim 1997: 36). However, from the point of view of current machine translation, a 'simple' typology is sufficient because the translation software (of today) cannot handle intention or context properly; especially those that work in a sentence-by-sentence manner. Naturally, the sentence-internal theme and rheme sequences can be used in improving the translation result, e.g., when deciding whether definite or indefinite article should be used.

3.4.2 Functions of Translation

Another view of functional types of translation is presented by Gouadec (1990: 334). The following division allows various degrees of flexibility in what is translated of the source text.

- *Keyword translation* refers to the extraction of keywords, indicating the basic concepts of the text, from the SL document and their translation into the TL. This is used for determining whether additional translation is needed.

- *Selective translation* disregards all irrelevant information. Limiting the translation to one aspect of the topic of the document speeds up access to information.

- *Abstract translation* provides a condensed translation of all the information contained in a document.

- *Diagrammatic translation* transfers the SL document content in the form of a diagram.

- *Translation with reconstructions* refers to complete translation of content without regard to form. This serves to communicate the content in the most direct way possible.

- .*Absolute translation* is a complete transfer which respects both the quantitative criteria of information and qualitative criteria of communication, which is to say that the information content and communication method correspond to those of the original.

- *Sight translation* provides a running commentary in order to give information urgently (Sager 1994: 184).

For machine translation for assimilation we might add yet another category, that is, *gist translation* (Vasconcellos & Miller 1996), where a translation system is used simply to obtain a rough draft so as to be able to get the general idea of a text. It can be seen to have aspects of keyword translation and sight translation. In fact, there were also experiments with keyword translation with Roughlate from Finnish into languages other than English. After adding lexical translation rules from Finnish to German, for example, it was possible to produce a "translation" that consisted of an English base text with German terminology. This text was not, however, used as such; rather, the system allowed me to generate a list of terms and their equivalents in the target language that were found in the in-house lexicon. This list was in effect a list of translated keywords.

This chapter has shown that machine translation and human translation do have something in common – foremost it is the fact that they are needed in the multilingual communication process. Their purposes otherwise are likely to be at least somewhat different: where human translation usually strives for complete rendering of the original text (content, style, and purpose), machine translation may have fulfilled its purpose just by giving a general idea of the contents.

The text types and functions of language discussed above seem to comply with the expectations of translation for dissemination, that is, the area where professional translators' work is well covered. However, in MT and translation for assimilation, we might modify the figure somewhat. Translation for assimilation can be seen to cover all types of texts to some extent, but the emphasis is on the informative text type(s). Moreover, we could think that the translation for assimilation tasks are something extra

– something that normally would not be translated at all if machine translation systems were not available. Therefore, these can be thought of as a “snow top” on the “text type mountain” as illustrated in Figure 11.

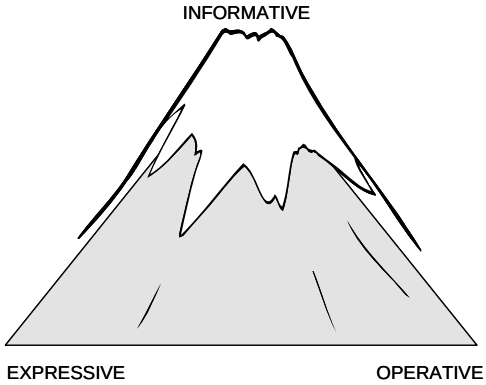


Figure 11. Main functions of language and text types.

Thus, the foundation is formed by the traditional theory for “solid” long-lived translations, which are usually created by professional translators. On top of this the theory for “ephemeral” short-lived translations is built; these refer to translations that are needed immediately but which may not be stored for later reference. This is the domain where computers can be used, because here the on-time delivery of the translation is more important than accuracy or fluency.

While computers can have different uses in translation, it is important to define what the computer can do and how the computer can be used in a way that people generally use machines. Usually, machines are used to *ease human labour*; to *provide a service that human beings cannot provide* in terms of accuracy, consistency, or precision; or to *increase productivity* (Sager 1994: 120). The next chapter will concentrate on the translation process and the different roles of the computer in it.

4 Computers in the Translation Process

The MT "perfectionists" of the 1960s aimed at fully automatic high-quality translation (FAHQT). This goal has since been abandoned, because it is recognised that revision of the translation, whether done by humans or by computers, is to be expected if high quality is required (Hutchins 1986: 329). If the development of machine translation systems were based on a theory of translation, the time and effort would probably have been spent on tools to improve the total process, and not on trying to carry out the whole process automatically. Accordingly, Sager (1994: 303) maintains that the goal should always have been MATPUT (Maximum Assistance in Text Processing, Understanding and Translating).

In this chapter, I will first take a look at the traditional translation process in an industrial setting and discuss different types of computer software products which have been developed to help translators in their work. I will then go on to describe the traditional translation process using translation technology products. When describing the traditional translation process, my intention is to concentrate on the tools that translators have at their disposal during the process of translation and not so much on the thought processes taking place in their heads. Thus, no discussion will be provided, for example, of the use of think-aloud protocols or TAPs in the study of the translation process (for discussion of TAPs, see e.g. Jääskeläinen (1999)). Still, even if we are not going any deeper in the translator's mind, let us briefly consider the description Mason and Rinsche (1995: 19) give of the mental processes:

> Translation is a highly skilled activity involving comprehension, recognition and memory. Translators use a variety of thought processes and skills when interpreting the meaning of a sentence from one language and conveying that same meaning faithfully in another.

This would seem to suggest that the human thought processes work along the same lines as most machine translation systems do: on a sentence for sentence basis, with emphasis on the source language. Unfortunately for system developers[10], the translation process

[10] and fortunately for the professional translator

that takes place in the human mind is far more complex and very difficult to describe in any practical detail. If it were simpler, we might have software tools carrying out fully automatic high-quality translation (FAHQT).

However, even though the fully automatic high-quality translation has been abandoned, there is still a need for fully automatic machine translation (FAMT). It is valuable when non-translators use it for assimilation of information from a source language they do not understand. Starting in the 1990s, cheaper PC-based software has appeared on the market to be used by people who only want to grasp something of the gist of texts but who do not know the language in question (Hutchins 1997: 119).

In addition, the multilingual Internet has also boosted the need for machine translation, and there are even several MT services available for free on the Internet[11]. Machine translation is now readily available for a large number of people with versatile language skills and communication needs. This is likely to give rise to new challenges for the developers of machine translation in the multilingual email and newsgroups domain. Accordingly, Climent et al. (2003), for example, report of a research project on the linguistic characteristics of the e-mail register in the newsgroups. The aim of this research is to prepare for the creation of an online machine translation environment for computer-mediated communication (CMC) on the Internet. (Climent et al. 2003).

The impact of computers on the translation process will also be discussed in 4.4 below. Before that, however, we will take a look at the traditional translation process.

4.1 Traditional Translation Process

When translation is seen as an industrial activity, translation can be identified as a purposeful activity or process leading to a result or product. In this view, translation is a deliberate human activity, a production process with an input of material, instructions concerning the task, and an output. The material input is a document; the instructions are a specification of the expected product and (possibly) how to produce it, and the

[11] See, for example, Babelfish in http://babelfish.altavista.digital.com/.

output is a document which has to measure up to certain expectations. The process is a temporal sequence of actions or events which can be broken down into separate stages, as illustrated in Figure 12 (Sager 1994: 136).

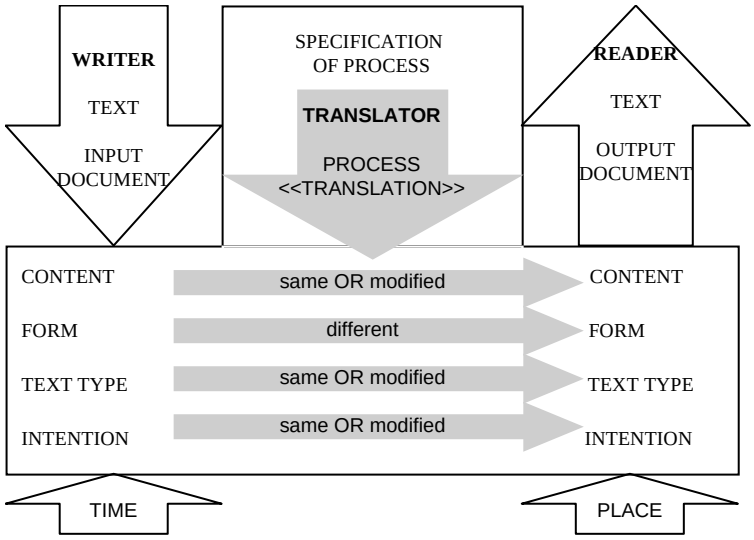


Figure 12. The process model of translation (Sager 1994: 136).

In the process model of translation, input, process, and output are all variables which sequentially influence each other. These variables are

- different types of input which can be processed in different ways, according to the specifications and the nature of the input;
- different methods of processing, applicable to different types of input and leading to a diversity of output documents;
- different types of output, resulting from the nature of the input and the processes to which it is submitted.

In this model, Sager (1994) includes the specification of the translation task which admits the possibility of modifications to the source content. The model separates text type from form, thus admitting that text type can be changed independently in response

to a change of intention. Translations with different functions are needed when the intention of the source text is so situation-bound that it cannot be transferred as such to the new situation of communication created through the translation. Sager thus here introduces new possibilities of translations with modified content and text type in view of the existence of such well-established translation activities as second language abstracting and summary translations. One of the best-known types of translation is "gist" translation of documents such as business letters, in which the translator only summarises the content (Sager 1994: 136, 182). This seems to be a fairly reasonable extension of the scope of translation activities. It also serves to show that the gap between human translation and machine translation may at least in some cases be narrower than is sometimes thought. In many cases, translations produced for assimilation by an MT system have purposes which are different from those of the original text. Take, for example, the "gist" translations referred to above.

The translation process can be seen to consist of several smaller tasks; Sager (1994: 166), for example, divides the translation process into four phases: the specification phase, preparation phase, translation phase, and evaluation phase. These phases are seen differently by different translators because they may have varying views of the task they have to perform, and they depend largely on their familiarity with the subject matter and the text types in hand. In the following, I have divided the process into three phases: specification, translation (consisting of analysis, transfer, synthesis), and revision. The tasks of Sager's (1994: 185) preparation phase are in this approach taken care of in the analysis part of the translation phase.

The next few sections will discuss the various phases of the traditional translation process to lay a foundation for the introduction of computers in the process. The corresponding translation process with computers involved is discussed in 4.4 below

4.1.1 Specification

In order to be able to carry out a practical translation task, translators require proper instructions that enable them to produce a satisfactory end product. In a sense, *specification of process* could be seen as the commission (or assignment) as discussed

by Vermeer (1989: 182). Someone who translates does that either as a matter of choice or because he is required to do so. In other words, one translates as a result of either one's own initiative or someone else's, that is, one acts in accordance with a "commission".

Commissions are normally given explicitly, and they should comprise as much detailed information as possible. In real life, however, the specification of purpose, addressees, and so on, can be sufficiently apparent from the commission situation itself or earlier experience. If, for example, a staff translator in a customer documentation department of a company manufacturing cars gets a manual to translate, he knows what is expected on the basis of his earlier experience. However, if he gets a new type of document to translate, there may be a need to redefine the commission. The specification phase can become routine or automatic for most staff translators, except when they are confronted with an unfamiliar task. In many organisations, staff translators follow a "default" commission or fixed specifications where practically all the features of the task except maybe for the deadline remain constant unless otherwise stated.

Once the specifications have been interpreted, every subsequent step in the process of translation is conditioned to a notable extent by pragmatic considerations, and all translators' choices on the semantic and linguistic levels are therefore limited (Sager 1994: 211).

4.1.2 Translation

The second phase is where the actual translation takes place. It requires a mixture of knowledge and skill, or art and craft according to the nature of the text to be produced. It could be considered a process within a process, that is, a human thought process within an industrial production process. In many cases, the translation phase has been divided into three phases: analysis, transfer, and synthesis (e.g. Höge 2001: 17).

- In the *analysis* phase, the translator needs to take into account various intratextual factors such as subject matter, content, presuppositions, text composition, non-verbal elements, sentence structure, and suprasegmental features (Nord 1991: 84-143, Höge 2001: 17-19). In addition to the intratextual factors, there are a number of

extratextual factors involved such as sender, sender's intention, recipient, medium/channel, place, and time of communication, and motive (Nord 1991:39-70, Höge 2001: 16). See also section 3.2 for discussion on translation in the communication framework, and Figure 8 for the total translation process.

- In the *transfer* phase, the translator makes use of the analysis results in a heuristic process to decide, for example, which terms to use in the target language and whether the scope of the terms suits the skopos. (Höge 2001: 20). In this phase, translators may also create 'provisional' or translation equivalents in the target language for source language lexical units for which there is no matching concept in the target language culture. (Sager 1994: 253).

- In the *synthesis* phase, translation units have to be combined into an acceptable target language text (Höge 2001: 20). If the source language contains lexical or syntactic innovations or deviations from the norm of the source language, the translator may also create equivalences by the substitution of conventional expressions in the target language, or even attempt to re-create corresponding innovations and deviations from the norm of the target language (Sager 1994: 253).

In addition to the three-phase model, a two-phase model with analysis-synthesis has also been suggested. Bell (1991: 45), for example, divides the translation process into analysis and synthesis. Between them there is a phase where the semantic representations of the individual clauses of the text to be translated are organized into an *integrated schema* which contains all the information the reader has accumulated in the course of reading the text. (Bell 1991: 61). The main difference between these two models is the fact that in the three-phase model, the transfer from the source into the target language is considered to be performed via a supralinguistic medium, whereas in the two-phase model, source and target language units are considered to be directly correlated. (Höge: 2001: 11).

Interestingly enough, the same three-phase model (analysis, transfer, synthesis) has also been used in describing the machine translation process based on the transfer approach as discussed in section 2.2. In order to differentiate between the human process and

machine process Sager (1994: 250) suggests contrasting the phases of the human process and machine process as follows: comprehension for analysis, matching for transfer, and writing for synthesis.

During translation, the various phases are not necessarily clearly separated; rather, translation can take place at several levels at the same time in a non-linear way. Accordingly, Nord (1991: 34) proposes a model which describes translating as a circular, basically recursive process with an indefinite number of feedback loops. These feedback loops allow the translator to return to earlier stages of the analysis. Likewise, the process proposed by Bell (1991: 45) forms an integrated process where back-tracking, revision and cancellation of previous decisions are the norm rather than the exception. The perception of translation as an unlinear process can also be seen in Newmark's (1988: 22) suggestions for translators:

> So a part of your mind may be on the text level whilst another is elsewhere. Translation is pre-eminently the occupation in which you have to be thinking of several things at the same time. (Newmark 1988: 22).

The human capability for parallel and recursive processing during translation clearly differentiates the human translation process from the traditional transfer-based machine translation approach where the sentence goes through a pre-defined set of subprocesses (as described in section 2.4.1, for example). There are, however, also attempts to introduce more human-like processing for machine translation (see e.g. Bond 2000). Even though machine translation cannot do the job of a human translator, the translation phase can be supported by different types of computer applications, and their use has become more and more widespread especially in technical translation. In fact, various computer tools have become so important for the translation process that for translators there is no longer any question of whether or not to use computers and networks (Austermühl 2001: 7). Translation technology products will be discussed in 4.2 below.

4.1.3 Revision

The basis of the revision work is on the theoretical evaluation of translations in general as discussed in section 2.3. Traditionally, evaluation has worked with the concept of *error* of translation. House (1981: 96), for example, proposes three types of "overtly

erroneous errors": omissions, additions, and substitutions, which are further subdivided into wrong selection and wrong combination. Even though the revision carried out for a specific individual translation does not necessarily involve deep theoretical analysis, translators need to compare the translation to the source text and job specification in order to check for omissions, inconsistencies, or errors in spelling. (Sager 1994: 237).

If we regard translation as a circular, recursive process with an indefinite number of feedback loops (as suggested by Nord (1991: 34)), it is quite difficult to see exactly where translation ends and revision starts; at least if the revision is carried out by the translator himself. Accordingly, Sager (1994: 237) makes a distinction between the control and adjustment usually carried out by translators themselves immediately upon completion of the task, and control and adjustment of content and form which is carried out either by translators themselves or by others. The first check is to ensure that the content of the source text is present in the translation according to the instructions derived from the job specification. This corresponds to the "analysis of TT skopos", the final phase of the recursive translation process, suggested by Nord (1991: 34). In the second check, the emphasis is more on the target text, and adjustments are made in view of the specification of the task. (Sager 1994: 238).

The purpose of revision is to ensure certain equivalence between the source text and translation because equivalence is the fundamental criterion of translation quality. However, as already discussed in section 2.3.1, there are different views to equivalence. The functional pragmatic model suggested by House (2001: 247), equivalence is related to the preservation of *meaning* across different languages and cultures. She further distinguishes three important aspects of meaning: a semantic, a pragmatic and a textual aspect. (House 2001: 247). If the target text complies with the pre-defined purpose of the target text, the translation is successful (Höge 2001: 13), and it is ready for publishing and delivery.

The various phases of the translation process described in this section may also include computer support in the form of translator workbenches or machine translation, as will be discussed below.

4.2 Automating the Translation Process

As noted by Carbonell and Tomita (1987: 70), much of the time of a human translator is wasted on manual lexicographic searches, document editing, and formatting. Time consuming as they may be, these are the simplest tasks that a translator must perform, and therefore the easiest to automate effectively. As far as searches for the appropriate terminology and existing translations are concerned, several translation technology products have been developed. The actual translation activity, however, is rather difficult to automate. Translation technology products (or computer tools for translators) provide a varying degree of automated support during the translation process. There are three major categories of tools currently available to assist or automate the translation process:

- machine translation tools,
- terminology managers, and
- translator workbench tools.

The three types of products are not mutually exclusive. Increasingly, they are being used to address different parts of the translation process in order to provide more flexibility and offer a combined solution which the individual product would be unable to provide (cf. Mason & Rinsche 1995: 20).

4.2.1 Machine Translation Tools

As discussed in Chapter 2, machine translation systems are designed to carry out the translation task without any need for human intervention. Therefore, they need special programs, comprehensive dictionaries, and collections of linguistic rules. Based on this information, the system then generates the target version of the text to be translated. The imperfect nature of most machine translation output, however, requires that humans revise the output to remove errors if so desired (Mason & Rinsche 1995). This is the case if the translation is to be published.

If human intervention is considered essential for the result, there are three points in the process where the human translator can intervene: after the machine has finished (post-editing), while the machine is operating (interactive MT), or before the machine starts (pre-editing).

- *Post-editing*. Johnson and Whitelock (1987: 140) argue that the safest way to organise man-machine co-operation in translation is to use a human post-editor to verify the output of an MT program. They expect the post-editor to be at least as skilled in all the following domains as the original translator: the subject area, the target language, the text-type, and contrastive knowledge. The main factor which decides the amount of post-editing that needs to be done on a translation produced by an MT system is the quality of the output. But this itself depends on the requirements of the client, such as the translation aim and the time available. As discussed in 3.1 in connection with translation directions, translations in general are mainly needed for dissemination or assimilation of information. Similarily, MT can be used either by professional translators for translating "outgoing" texts, or by other users for translating "incoming" texts for information retrieval. Human intervention (in the form of manual corrections) only takes place after translation, and may not be needed if the translation is used for seeking information only.

- *Interactive MT*. In most MT systems, where there are doubts and uncertainties about the structure, or about the correct choice of word for a translation, they are resolved by heuristic means. As the rules-of-thumb may be wrong for a particular case, it has been suggested that MT systems could usefully interact with translators by pausing from time to time to ask simple questions about translation problems (Arnold et al. 1994: 32). In the interactive mode therefore, the system may prompt the user to choose from among possible translation options. This method is fairly close to the post-editing scenario; the possibility of interaction only reduces the size of text fragments to be post-edited from full texts to sentence-sized units (Johnson & Whitelock 1987: 141). This system needs to be operated by a person who possesses all the expert skills of a translator. If the editor has features that allow it to "learn" based on the corrections the translator makes and takes these into account later on in

the translation, this will naturally make the process more productive. If, on the other hand, the same correction must be done several times, it may become frustrating. In this case, it would be more fruitful to have the complete rough translation in the word processor and use the search-replace function once.

- *Pre-editing*. In pre-editing environments, documents have to be specially drafted in a special restricted language using a restricted syntax and restricted vocabulary. This is actually carried out in the *source preparation* phase (see also 4.4.1). Here the human needs only active, expert knowledge of the restricted language; all other aspects of translation expertise are supplied by the machine. This may seem to be a nice solution, but the restricted languages tend to become so specialised and unnatural as to place unreasonable demands on the expertise of the pre-editor (Johnson & Whitelock 1987: 141).

4.2.2 Terminology Managers

Unlike MT products, terminology products have no ability to analyse the source language and generate the target language, and they therefore support any source and target language combination which uses the character sets they support. Their main task is to enable translators to identify, build, and manage terminology to assist in the translation stage. They can nevertheless be considered an essential part of the overall professional translation task (Mason & Rinsche 1995: 27).

Terminology products focus on the special terminology of a particular subject area. They provide processes for tasks such as entering new terms, modifying entries, entering additional information such as definitions, and managing the data. In many cases, these are nowadays integrated in the translator workbench tools, but they have traditionally been used independently to assist translators.

It should be noted here that the information contained in electronic dictionaries for human use does not coincide with that contained in automatic dictionaries for an MT system. The needs of translators are quite different. Translators rarely need to know about details of things like grammatical functions, syntactic and semantic categories, or inflected forms; all this data is, however, essential for automatic analysis. Translators,

on the other hand, are able to consult words in a dictionary under “base form”, and additional information, such as grammatical information, may not be needed if the languages concerned are already familiar to the translator (Hutchins 1986: 295; Bowker 2003: 52).

Naturally, translators need some of these, but they also need reliable information about meanings, connotations, ranges of application, definitions, and, if possible, examples of usage. Moreover, contrary to popular belief, translators do not often look up source to target language dictionaries to find out the translation equivalent of a word or expression. For the experienced translator, dictionaries are more like a memory aid which comes into play especially when translation fatigue sets in (Sager 1994: 206).

If an MT system is used in a translation organisation, it is advantageous to maintain the source data of automatic dictionaries for MT and electronic dictionaries for humans in the same database because it saves the effort in compiling the dictionaries. Suonuuti & Nuutila (1992: 177) describe a solution where the translation rules are generated from a terminology database when necessary to the desired format. In order to do this, the terminology database was first modified to accept grammatical information needed in generating the rules. The database only contains special terminology because usually an MT system provider also provides the general language dictionaries required by the system.

4.2.3 Translator Workbench Tools

As already noted in 2.2 above, fully automatic machine translation is not quite appropriate for professional translators. Translators do not want to serve machines and only revise poor quality MT output. Rather, they would like to use sophisticated translation tools to assist them. Since the early 1990s, translator workstations have offered translators the opportunity to make their work more productive without taking away the intellectual challenge of translation. Translator workstations combine access to dictionaries and termbanks, multilingual word processing, the management of glossaries and terminology resources, and appropriate facilities for the input and output of texts (cf. Hutchins 1997: 115).

Nowadays, one of the most important tasks for ensuring productive, cost-effective translation is concerned with translating updated materials. Translators may be able to remember a sentence which they have translated before, but may not be able to locate it quickly. For many companies, the need to translate updated documents quickly has been a pre-requisite to selecting a translation technology product (Mason & Rinsche 1995: 7).

Accordingly, translator workbenches provide tools which make the translator's work easier and more productive. Translators are in control of the translation process, and are provided with a range of tools which may include: checking tools for spelling, grammar, and style; online access to reference works; tools for building and managing terminology; automatic terminology look-up; translation-memory or update-processing tools; tools for project management and administration; and post-translation checking tools (Mason & Rinsche 1995: 29).

The most important feature of a translator workbench system is a component based on the concept of translation memory (TM) with the automated re-use of previously translated terms and sentences. The general idea of a translation memory is fairly simple: all translations made by a translator are stored in a database and are then immediately retrievable in case a similar or identical sentence has to be translated. The term *fuzzy match* is used to describe sentences which are similar to some degree but which are not identical (Mason & Rinsche 1995: 30). Identical sentences in turn are referred to as an *exact match*.

The translation memory approach is based on the recognition that documents are in part repetitive and that the writing process frequently consists of utilising previously translated text segments. Technical documents usually occur in multiple editions and versions, reflecting different stages of product documentation. Since only relatively small sections of new versions of computer manuals, for example, require completely new translations at any one time, a comparison of existing and new source documents and existing translations not only saves re-translation of unmodified parts of the document but also provides control over the new translation of the document (Sager 1994: 279). Since a translation memory tool only presents the differences between new

and previous versions for translation, the system re-uses what has been translated before, thereby saving time and money and improving consistency. Thus, the quality is based on texts that were previously translated by human translators. Translation memory systems seem to have a close resemblance with the example-based approach to machine translation discussed earlier. However, their main difference is in the fact that TM is an interactive tool whereas EBMT is an automatic translation technique (Somers 1999: 115).

4.3 Tools of the Trade

There should be no need to see computer-based translation systems as rivals to human translators. Rather, they are tools which help translators to increase productivity in technical translation or they provide means of translating material which is not considered worth translating by human translators. In this context, Hutchins (2001b: 5) distinguishes different categories of translation tools:

- *translation tools for translators* which support the professional translator when producing the translation; and
- *machine translation for translators*, which aims to undertake the whole translation process, but whose output must be revised by the translator; or
- *machine translation for non-translators*, which produces only rough versions to aid comprehension. These are targeted at the 'occasional' non-translator user.

How about *translation tools for non-translators*? This is an unlikely category, at least when translation memory systems are concerned. We will come back to this in 4.3.4 below.

These differences were first recognised in the late 1980s. Before that the assumption had been that MT systems could serve all these different functions. The failure to identify the different needs and to design systems specifically to meet them has contributed to misconceptions about what translation technology can do for the professional translator (Hutchins 2001b).

4.3.1 Translation Tools for Translators

The tools on the professional translator's desktop have changed significantly. In the past, automation of the professional translation process was mostly connected to the use of machine translation (MT), whereas today the keywords for professional translators are computer-aided translation tools, where several functions are integrated into one "workbench". (Heyn 1996: 1).

Machine translation systems usually translate without human intervention since they are designed to "mimic" the human translation process. Where machine translation tools provide the user or translator with computer-generated material to review, translator workbenches provide interactive assistance to the human translator, making the translator's tasks easier and more productive. Mason and Rinsche (1995: 29) list a variety of tools that may be included:

- checking tools for spelling, grammar, and style,
- online access to reference works,
- tools for managing and searching terminology,
- translation-memory or update-processing tools,
- tools for project management and administration, and
- post-translation checking tools.

We might also add machine translation to this list of available tools. In this case, however, it will be just a tool among tools. Thus, when working with translator workbenches which have been designed to assist the translator, the translator is in control of the total translation process. This is the case even if MT is integrated into the workbench.

4.3.2 Machine Translation for Translators

Translators may benefit from machine translation if the documents are translated for the first time and the terminology is well covered by the system's lexicon. In some cases,

the post-processing task of a long document can be tedious, but even in these cases the translator may want use the MT system to extract the specific terminology used in the document. This helps him to use consistent terminology. Thus, machine translation does have a niche of its own in the total translation process. Heyn (1996: 3) lists the conditions for the successful use of MT by a translator. He suggests that if a translator is confronted with a sentence and:

- this sentence or a sufficiently similar sentence cannot be retrieved from a translation memory;
- the sentence lies syntactically more or less within the scope of the capabilities of the MT system;
- there is an adequate coverage of the MT dictionaries of the required subject area;
- the MT system preserves the formatting;
- the MT system is a keystroke away and responds quickly;
- the MT system uses the terminology of the private termbank system of the company,

then a good proposal of the MT process can speed up editing time.

However, if improperly used for the wrong types of documents, MT can actually slow down the translator. Furthermore, MT is not well suited to handling document revisions, as it always produces the translation from scratch according to translation rules, and therefore the modifications made by the translator in the previous version are not taken into account unless specifically added to the database of translation rules. This is caused by the fact that today's MT systems are not able to learn automatically. Any changes in the translation rules require special expertise, and are usually not carried out by the translator. The problem has also been seen by system developers as more and more MT systems are integrated into translator workbenches. This way, all machine-translated sentences are reviewed by the human translator before storing them in the translation memory. If a similar sentence must be translated some time later, the translation is

suggested on the basis of the contents of the translation memory. Thanks to this, translators only need to revise the rough machine-translated output once.

4.3.3 Machine Translation for Non-Translators

It can be argued that machine translation has a proper place beside human translation as an alternative technique for achieving different objectives. In the case of Roughlate, for example, the service can be used in several ways. First, employees with no knowledge or very little knowledge of Finnish may use it for information retrieval. They can translate memos, minutes, instructions, or e-mail messages just to see if the contents of such documents are relevant to their purposes. Secondly, they may produce a rough translation of a text and then finalise it in English. This helps them in using consistent terminology, which the system is able to find in the company termbank. To get the best benefit from the rough translation, the user should ensure that the Finnish text is as good as possible. The Finnish original text should therefore consist of concise, simply constructed sentences, and be grammatically correct. Idiomatic expressions and colloquial style should be avoided.

There is also research on systems for speakers or writers who are ignorant of the target language. In these cases, what is required is a means of conveying a message in an unknown language; it does not have to be a translation of any existing original (Hutchins 1997: 116). This study does not deal with this aspect of bilingual communication at all. By contrast, the use of Roughlate requires that the user knows the target language.

4.3.4 Translation Tools for Non-translators?

Non-translators can well benefit from the use of terminology databases and machine translation, but if we take a look at translation memories from the point of view of non-translators who do not know the source language, such translation aids do not seem to be the optimal tools.

Whereas machine translation tools can be used by lay users to provide rough translations, translation memory systems do not provide rough translations in that sense.

The exact matches are naturally reliable, but fuzzy matches are likely to pose problems. Let us consider a situation where the translation memory contains a sentence pair

Source*: Tiedosto tallennetaan painamalla punaista nappia.*

Target*: The file is stored by pressing the red button.*

The user (who does not know the source language at all) inputs the sentence *Tiedosto tuhotaan painamalla punaista nappia* into a translation memory system, and will get a fuzzy translation **The file is stored by pressing the red button*. While the target sentence makes sense the user is happy with the result.

On the other hand, a rule-based system may have produced something like *The file is destroyed by pressing a red button*. Even if the word *tuhota* 'destroy' were not found in the lexicon, the translation would have been *The file is **tuhota*** by pressing a red button*. This would have led the user to search for more information, whereas in the translation memory case, he would probably have happily pressed the red button believing it to store his file.

Maybe the fairly low fuzzy match percentage in the first example (ca. 80% if we estimate that it is based on the fact that one word of five was changed) would have been enough to warn the experienced user. However, if we take another example where the system proposes a 99% fuzzy match for a sentence and the only difference between the new sentence and the one in the memory is an added negation and the user does not know the source language well enough to notice this, there may be problems. Thus, as far as systems based on translation memory are concerned, I feel they should only be used by translators. At least the user must have a good knowledge of both languages used.

4.4 Translation Process with Computer Assistance

As discussed above, the two main approaches to applying specialised software in translation are machine translation systems and translation memory systems. These approaches which are rather different from each other, are defined by Heyn (1996: 2) as follows:

- A TM stores in a computer all translations made by a translator. In the case of re-translation, these translations are retrieved automatically.

- An MT system applies grammatical rules and information from dictionaries to a given source sentence in order to translate it.

Thus, where machine translation tries to replicate the translator, a translation memory system tries to support the translator by freeing him from boring and repetitive tasks that are best suited to machines. If you consider MT and TM from the point of view of human translators, TM products seem to suit them better. Machine translation systems as such are not the tools for professional translators, as they do not need a system that handles syntax and morphology but rather a reliable termbank or a translation memory covering the subject field of the source text.

I would agree with Gordon (1996: 4), who argues that the major advantages of TM over MT from the translator's viewpoint are, first, that all output is human output, and secondly, that the quality of previous final translations is retained or improved with every translation. One can test this by imagining the results if the same version 2 of a manual is translated in parallel using MT and TM. MT will make a fresh attempt at translating the text, unaware of the post-editing changes which were necessary to make the first version acceptable. The translator would then have to post-edit the whole text again. TM, however, will remain faithful to version 1 and identify the changes requiring translation. These are then translated in context by the human translator with the eventual support of fuzzy matches. There is no separate post-editing phase. Some systems combine the advantages of both TM and MT. If the TM does not find an exact or even a fuzzy match for a sentence, it is automatically fed into an MT system. Once the translation suggested by the MT system is edited, it becomes a future exact match. Thus, if post-editing is seen as a problem in MT, this might serve as a solution (Gordon 1996: 5).

Translation technology products can be used at different points in the translation process. The process consists of stages like source preparation, pre-translation, translation, post-translation, and delivery (Mason and Rinsche 1995: 33). These are,

however, preceded by the *specification* stage as discussed in section 4.1.1. For pre-translation, translation and post-translation, Melby (1998: 1) differentiates between term level and segment level tasks. In this context a segment is a coherent piece of text larger than a term, usually a sentence. He further suggests that infrastructure and translation workflow should also be considered in the translation environment model.

In this context, infrastructure refers to issues such as document creation and management systems, terminology databases, and telecommunications (Melby 1998: 1). Even though workflow management is not a part of a translation process as such, it is important for tracking the progress of larger translation projects. It can, for example, keep track of the location of outsourced translations and their due dates. Billing management becomes increasingly important as the size of projects increases. (Melby 1998: 2).

Figure 13 presents a traditional approach to the various translation technology products as discussed by Mason and Rinsche (1995: 33).

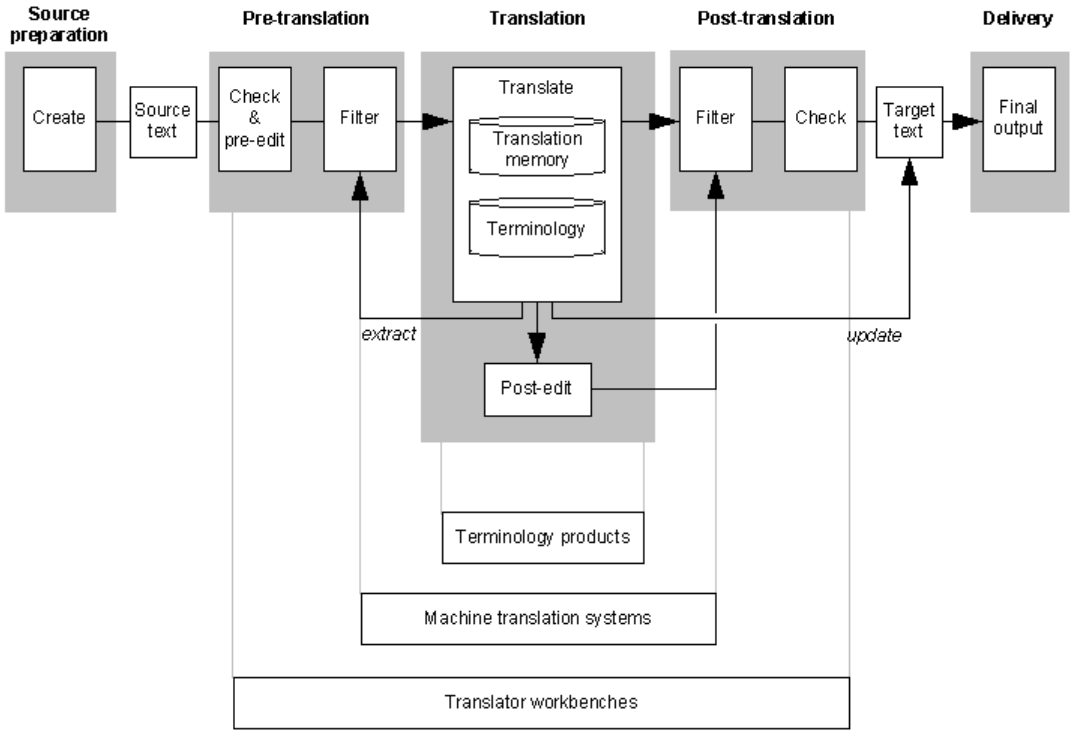


Figure 13. Total translation process.

In the following section we will consider the process as reflected by the needs of dissemination and the translator. The assimilation and non-translator aspects are discussed as a comparison after these in 4.5.

4.4.1 Source Preparation

Even though source preparation is not part of the translation process as such, it has a strong impact on it. It is advantageous that the source text is produced with an eventual translation in mind. This could be seen as a pre-requisite to successful implementation of any type of translation technology product. The source text must be clear, consistent, and error-free if it is to be translated accurately (Mason & Rinsche 1995: 33). If proper attention is not paid to the fact that the text will be translated, the resulting translation is likely to be of a poor quality; at least if the translation is carried out by a machine. If the source text is written with translation in mind, it will be more suited for translation (whether by human or machine). See also Bernth & Gdaniec (2001) for suggestions on how to write MT-translatable English.

A human translator will, naturally, compensate for the low-quality source text by consulting the author; this, however, takes time. As far as machine translation is concerned, even computers of the latest generation are not able to treat language in its entirety. The main reason for the challenge is that a computer needs all kinds of explicit information, even when this information is too much of a truism to the human mind (e.g. polysemy, intentions, world knowledge). This has lead to the idea of using restricted input in machine translation (Gingras 1987: 25).

4.4.2 Pre-translation

In the pre-translation phase, the source text is transferred into a form the translation process can accept. Conversion programs and filters are used to import the text into the translation environment while retaining all the tags and formatting of the source material. The extent to which this stage is required depends on how well the source preparation was done and in which environment the editing is carried out. The more the source text is originally written with translation in mind, the less work is required when sending the text into the translation process (Mason & Rinsche 1995: 34).

At the term level, *term candidate extraction* is used first to determine what words might be candidates for inclusion in a termbank. This is followed by *terminology research* to find an appropriate term in the target language for the concept. Terminology research can draw on many resources, including the Internet. At the segment level, the tasks include new text segmentation, previous source-target text alignment, and indexing. The resulting aligned, indexed source-target bitext is vital for the correct functioning of translation memory tools (Melby 1998: 1).

The translator may also need to clean up the source text with the help of grammar, style, and spelling checkers if this was not completed in the source preparation stage (Mason & Rinsche 1995: 34).

4.4.3 Translation

The translation can be carried out either in “batch” mode (in the case of MT), which requires no human intervention (but entails post-editing), or in “interactive” mode, where the translator uses tools in an integrated workbench environment. It is also possible to use a hybrid of these two modes (Mason & Rinsche 1995: 36). As mentioned in 3.2 above, the actual translation phase could be seen as a process within a communication process. If the source is prepared optimally and the pre-translation phase is carried out successfully, all routine tasks are carried out and repetitive sentences (i.e., sentences that appear more than once in the text) are translated. In most programs, the sentences found in the translation memory are indicated with a certain colour so that the translator can see clearly which parts need to be translated.

Machine translation and translation memory lookup usually work at the segment level. Automatic terminology lookup could be seen as the term level equivalent of machine translation (Melby 1998: 1). Terminology tools and termbanks can help translators to identify and record new terms and phrases at the translation stage even though the actual terminology work is carried out at the pre-translation phase. A terminology database could also include audio and visual material to provide the translator with the non-verbal background often needed (Bergen 2004: 145).

The actual translation takes place in the human translator's mind. It may, however, be started by MT software that prepares a rough translation for revision. The translator's task at this stage, therefore, is to translate or review the text that was suggested either by the translation memory or machine translation system.

4.4.4 Post-translation and Delivery

In the post-translation stage, the translated text is transferred into its final form. Before that, terminology consistency checkers can be used to verify consistent use of terminology. Similarly, at the segment level, missing segment detection, and format and grammar checkers can be used to check for missing segments, and verify correct grammar and formatting (Melby 1998: 2). This stage can be seen to include the *revision* stage of the traditional translation process discussed in section 4.1.3.

For dissemination purposes, the final forms should meet the requirements of the final publication and delivery process. This might require the usage of tagging and formatting tools to ensure that all tags and formatting information are complete in the target text (Mason & Rinsche 1995: 36). The final output process involves activities such as publishing, printing, and final quality checks (Mason & Rinsche 1995: 36). Depending on the volume of documentation, one could add an archiving process before delivery. In such a case, it would be advisable to carry out the quality checks before archiving the documents.

4.5 Translation Stages in Assimilation

Let us now take a look at the various stages of the total machine translation process where the target is to retrieve the basic idea (or gist) of the text at hand. Usually, this is done by a person who does not know the source language.

- *Source preparation*. Since machine translation for assimilation is generally used on texts that are not produced with translation in mind, the user of the MT system probably does not even know the writer, and so cannot do much at this stage. Naturally, if the writer of the text produces clear, consistent, and error-free

sentences, the resulting rough translation will convey the original message more accurately.

- *Pre-translation*. While the non-translator user of a system used for assimilation of information does not know the source language, there is not much that he can do to the text itself. Therefore, besides ensuring that the text is in a suitable format and character encoding, there seems to be no actual pre-translation if the system is used for assimilation.

- *Translation*. In dissemination, the internal translation process may be started in an MT system, but the final decisions take place in the human translator's mind. In assimilation, on the other hand, the process is carried out automatically by MT software. The translation is executed on the basis of a set of attributes selected by the user. The attributes may include the source and target languages, and the subject domain of the text. In other words, the user can have something to say but quite a lot is "hard-coded" in the translation tool.

- *Post-translation and delivery*. For assimilation purposes, there may be no need for any post-translation. The translation is usually consumed as such, even directly from the computer display.

Machine translation can be used to decrease the cost of translation and to increase the efficiency of human translation. When it is used to assist the translator with routine translation, the translation process follows the stages of the traditional translation as described in section 4.1 above. However, if machine translation is run by a lay user for assimilation purposes, we might say that the internal translation process is actually carried out by the people who wrote the software and prepared translation vocabularies and rules. The user of the system carries out the other related tasks, such as defining the purpose or commission, and setting the translation attributes accordingly.

All in all, there clearly is a demand for machine translation even if the output is not (to be) a particularly of high quality. One should not think that because machine translation cannot replace the human translator, it is utterly useless. This was also pointed out in Implementing Machine Translation (2004), a LISA Best Practices Guide.

> This is like saying that because bicycles and automobiles cannot substitute for humans, they are useless (p. 34).

They went on arguing that just like any other power tool, machine translation has certain built-in limitations but that within these limitations it can be very effective (Implementing 2004).

5 Carrying out the Study

In the previous chapters we have seen that, in principle, we might apply the same process whether translation is carried out by man or machine. However, this would only apply to the external processes – not the mental processes involved. We argued that the primary reason for translation is communication. In that context, it also became evident that people are sometimes satisfied also with a lower quality translation if they just want to know what the source text is about at a fairly general level. This also holds true with Roughlate, which has been in use for several years now.

5.1 Preliminary Assumptions

When initiating this study, there were a number of questions waiting for an answer:

- What is the purpose of using rough machine translation? What types of texts are translated and by whom?
- How useful are the translations that the rough translation service produces for different needs?
- What do the users think about the quality? How could the machine translation service be improved? To what extent are the improvement ideas related to the language of the translations and what could be improved in the user interface?

Naturally, there were some preliminary assumptions as answers. It was assumed, for example, that the main purpose of the Roughlate service was to provide a rough English translation of a Finnish source text that gives the reader a gist of the message. However, the service was also used to prepare an English translation as the basis for further editing. Users of the first type would be those who do not know Finnish but who know English. Users of the latter type would be those who know Finnish fluently but who need assistance in producing English. As for the translation for interaction, we felt that Roughlate could only cater for one half of the need since currently it only translates from Finnish into English. In addition to these, some people had reported in preliminary inquiries that they also used Roughlate for studying Finnish.

5.2 Evaluation of Roughlate

5.2.1 Evaluation During Development

It is interesting to note that when measuring the overall performance of the TranSmart[12] system during the initial development phase in the 1990s, we adopted the traditional fluency and fidelity approach as it seemed to be the only way to assess the MT output. At that stage, the judges were professional in-house translators who had also participated in the preparation of translation vocabularies for the system. All in all, ten in-house translators participated in the testing. They were selected to participate in the development work so that they would know what kind of output they could expect from the system.

The evaluation was carried out by counting various types of errors at the structural and lexical level. When the same text was evaluated once or twice a year, we obtained a diagram indicating the general direction of development. In a sense, you might say we presented qualitative measures in a quantitative disguise. One should not, however, mix up subjective and objective measures, as warned by King (1993: 115), for example:

> A look at the literature on evaluation will reveal how important it is not to get these mixed up; it is only too easy to give a spurious air of objectivity to what is basically a set of subjective judgements. This is especially true when extraneous factors may influence the judgements made.

Accordingly, in the hope that different personal preferences would cancel out each other, we divided the evaluation task between several translators. In this way, we expected to gain at least a degree of objectivity.

The purpose of the evaluation at this stage was to locate problem cases and to find out the general level of performance of the system. Problem cases related to general language issues were sent to Kielikone so that they could be solved and added to the general language modules (either morphological analysis, parsing, general transfer, or

---

[12] Roughlate service uses the TranSmart machine translation engine. TranSmart is further discussed in section 2.4.1.

general lexicon). In this context, we will not go into more detail about this part of the evaluation but will rather focus on evaluating the usefulness of the service at the moment.

5.2.2 Evaluation During Production Use

Evaluation as described above is well suited to the development phase. However, when evaluating an existing system for usability, usefulness, and for spotting development needs, we may need to employ different methods.

As Hutchins (1997: 116) noted, translation is itself a means to an end - a task which can never be “perfect”. There are also other possible translations of the same text depending on the varying circumstances and requirements. Similarly, there cannot be a “perfect” automatic translation. Should we evaluate MT from the viewpoint of human translation or should we devise new methods and criteria especially for MT? I feel that after we accept the fact that MT really is different from HT and serves different needs, we might also evaluate it by its own merits.

Along these lines, the evaluation in the production phase of Roughlate is not so much on how good the resulting translation is grammatically or stylistically. Rather, a fairly subjective method is used. The users rate the usefulness of each translation in their particular situation. It may be that the translation is grammatically a disaster but it can still help the user in the task at hand. This time, judges of MT results were lay users. All users of the machine translation service had the chance to participate in the evaluation. A total of 239 rough translations by 140 users were evaluated. The actual evaluation process will be discussed in more detail in 5.3.2 below.

5.3 Research Material

Because Roughlate has been running for several years, it has been possible to develop various means and tools of collecting usage data for analysis. The material used in this study consists of

- an *online questionnaire*,

- *online voting*, and
- *log information* accumulated automatically during the use of Roughlate.

The main data analysed was that collected with the online questionnaire; the log information and voting buttons served as a means to see whether the conclusions were consistent. This is a survey type of study with quantitative and qualitative aspects. It also comprises features of a statistical study because log files are used to count various user numbers, and the log information was also used as the basis when selecting people for the survey.

5.3.1 Questionnaire

There were two questionnaires. The first survey was arranged in spring 2002 and the second in autumn 2002. The spring survey was arranged in order to test the first version of the questionnaire. The autumn survey was then analysed in more detail.

In the spring survey, the questionnaire form was distributed as a Word file, which was downloaded from the online Roughlate page. After filling it in, it was sent either directly to the person carrying out the survey or anonymously to the Roughlate feedback database. During the spring survey period, 20 May 2002 – 19 June 2002, we received 46 replies. During the survey period, Roughlate was accessed 11727 times by a total of 991 different users. The response rate was 4.6 %. The most probable reason for the low percentage was the fact that the survey form was in Word and you needed to download it and attach it to the feedback form in Roughlate or to an e-mail message. All this was far too complicated and time-consuming.

For the autumn survey, the survey form was improved in such a way that it could be filled in on a web page and no additional downloading or e-mail was needed. In addition, a sample of 200 users were picked randomly from the log file and they were sent an e-mail notification of the survey. These measures seemed to help in getting a higher response rate. During the survey period 23 October 2002 – 22 November 2002, there were a total of 1,068 different users with a total of 10,857 translation requests. The

questionnaire was filled in by 307 (i.e. 29 %) of all users of that period. The questions used in the autumn survey are listed in Appendix B.

5.3.2 Online Voting and Log Information

The administrator of the Roughlate service can activate the voting feature of Roughlate for a certain period of time. For this survey, it was used to ask the users to rate the usefulness of each translation. Even during the test period, the service was used around 200 times a day, and a suitable voting period was considered to be two days. At least two days were needed in order to give users around the world the chance to participate.

Usefulness was measured on the basis of the subjective rating of the users. After each translation, the user could select a value on a 4-point scale: *very useful – slightly useful – useful – not useful at all* (see also Figure 14 which illustrates the layout of the voting buttons, and an example translation). In addition, the user was able to select *test* if he was only testing the service or if the text was personal or otherwise confidential, and he did not like the idea of it being analysed later on. If *test* was selected, information on the translation event was still written in the log file even if the text itself was not stored for analysis.

After each translation (which was typically one sentence or a couple of sentences), the user gave a rating from 4 (very useful) to 1 (not useful at all) by pressing the corresponding button as illustrated in Figure 14.

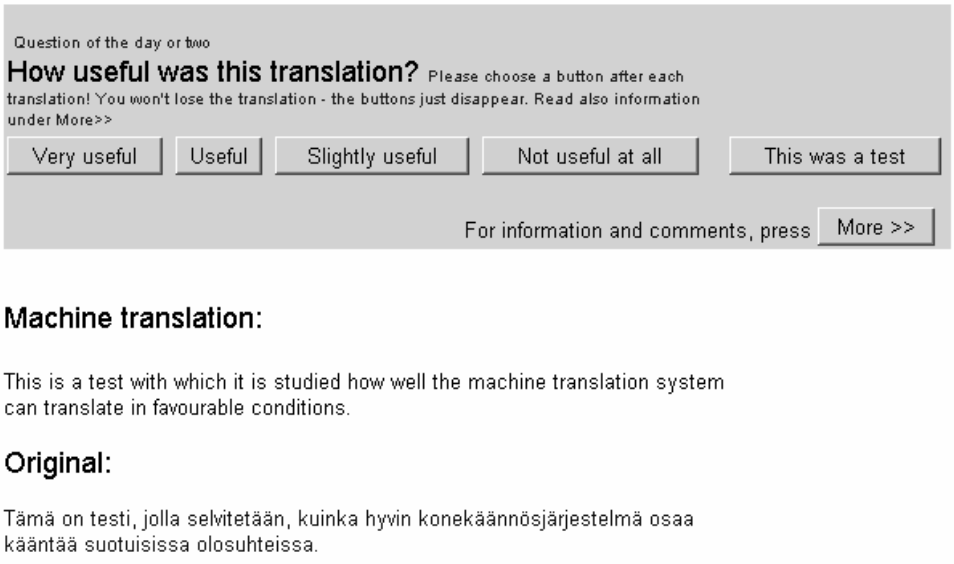


Figure 14. Voting buttons and a rough translation.

At the same time, the source text and translation were stored in a log file for further analysis. Therefore, after this "primary" evaluation by end-users, we could then take a look at the most "useful" translations and carry out a "secondary" evaluation on them by inspecting how well the content gets through, how good the translation is grammatically, and how well the vocabulary is covered. That would give us information on where to concentrate when improving the usefulness. It might be that it is not necessarily the grammar that should be tuned.

My attempt in the evaluation is not so much to prepare generally applicable theories of testing. Rather, my foremost interest here is to uncover the development needs. Due to the lack of resources, the evaluation concerning usefulness is necessarily light in this study, but it can be studied more deeply in a follow-up study.

In addition to the data accumulated by the online voting, each translation request is logged. For each translation, the following information is stored in the log file: user information, date, day of week, time, size of request, and mode of translation. In order to protect the privacy of the users, the actual texts and their translations are removed automatically from the system after translation.

5.4 Analysing the Material

Initially, the respondents were divided into three categories: native Finnish speakers, native English speakers, and people for whom both Finnish and English are foreign languages.

5.4.1 Preparing for Analysis

For the analysis, the survey data was transferred into a tabulated text format which could then be imported into an Excel[13] sheet or analysis software. The lessons learned from the spring survey were taken into account in the autumn survey.

The spring survey. The analysis of the spring survey started with the laborious task of transferring the answers from the Word documents into Excel sheets. The purpose of this was to convert each Word document into a single row in an Excel sheet to facilitate the analysis using the Excel functions. This involved a lot of cutting and pasting. In addition to being hard work, it also turned out that many "required" fields were missing. This was caused by the fact that there was no way of enforcing or checking what was completed or not in the Word document. Based on these findings and the fact that the response rate was relatively low, it was decided that an online form would be a better alternative for the actual survey in the autumn.

The autumn survey. The online survey forms were stored directly by the user in a Lotus Notes database. For analysis, they were first extracted from the Lotus Notes database in a file in structured text format. The structured text file was then sent through a program that tabulated the text in a format that could be opened as an Excel sheet, which facilitated the analysis using the Excel functions.

However, before using any analysis software, the file was still processed with a pre-processing tool especially written for that purpose. The tool was able to interpret languages correctly (even if there were typing mistakes or differing cases or languages). For example, *Suomi*, *Finland*, *Finn,* and *Finnland* were interpreted as *Finland*. After

[13] Excel is a trademark of Microsoft Corporation.

these preliminary preparation steps were taken, we had a tabulated text file that could be opened in Excel and the actual analysis could start.

5.4.2 What Was Analysed

The survey records contained versatile data; some was quantitative (figures that could be calculated, summed up, etc.), some was qualitative (suggestions for improvement, benefits). Different approaches for their analysis were required.

The main questions waiting for answers were:

Who uses Roughlate?

How often and for what purposes?

What would be the alternative ways to translate their texts?

How useful is the service?

How satisfied are the users?

How could we improve the service?

These will be discussed in more detail in the next chapter.

6 Results

The previous chapter described how the empirical part of this study among the users of the Roughlate machine translation service was arranged. This chapter presents some answers to the various questions (who uses Roughlate, how is Roughlate used, what might be the alternatives to Roughlate, and how useful Roughlate is).

6.1 Roughlate Users

One of the tasks of the study was to find out who actually uses Roughlate. We knew that around a thousand different users accessed it monthly. Who were they? An interesting question was naturally their language skills but also their educational background and the tasks they were doing. Information on these was seen beneficial in directing any further development efforts to the right audience, and possibly also in advertising Roughlate to those who were not yet using the service.

6.1.1 Native Language of the Users

The spring survey had shown that the respondents could be divided into three groups according to their native language. A similar division was made in the autumn survey, as shown in Table 2.

Table 2. Native language of the respondents.

	n	%
Native Finnish	103	34
Native English	66	21
Other	138	45
	307	100

Approximately one third of the respondents were native Finnish speakers and one fifth spoke English as their mother tongue, which left 45% for other languages. About 82% of respondents were working in Finland, 13% elsewhere in Europe, and 5% elsewhere in the world. All in all, the respondents spoke more than 40 different languages as their mother tongue.

Originally, the purpose was to compare how these three groups differed from each other. However, in the initial analysis of the groups, it became apparent that although the latter two groups differed slightly in some aspects, they also seemed to have so much in common that it was considered to be more fruitful to combine them and carry out the final comparison between native Finnish speakers and all others.

For example, the main purpose of rough translations for native English speakers and those whose native language was neither English or Finnish was assimilation (understanding Finnish texts), whereas native Finnish speakers were more concerned with the dissemination or drafting aspect, that is, producing English texts. We might refer to this as *translation for drafting* since the result need not necessarily be of publishing quality. We will return to the idea of translation for drafting in sections 6.2.2 and 7.1 below. Thus, in the analysis below, a number of comparisons have been made between native Finnish speakers and all others.

6.1.2 Educational Background and Tasks

The respondents could be divided into the following groups according to their educational background:

- technical (81%),
- commercial (8%), and
- humanities (3%), leaving
- 8% for other fields, including law, education, mathematics, and journalism.

The types and contents of the work were described as follows: administration, analysis, application support, coding, documenting, human relations, information management, management, marketing, patent-related, project management, product management, production testing, reporting, research and development, specification, testing, training, and translation. Software development covered one fourth of the respondents; other fields were more evenly distributed.

The educational background and the tasks of the respondents clearly indicate that the service is used by a wide and versatile audience. We can see that there is a considerable percentage of people with a technical background, which is only natural when considering the fact that the respondents work in a telecommunications company. This also emphasises the need to keep the company-specific technical translation vocabulary up-to-date.

6.2 Roughlate Use

In order to prepare for future development needs of the service, it is important to know how it is used currently. The current use was studied from three aspects: frequency of use, purpose of use, and the types of texts translated.

6.2.1 Frequency of Roughlate Use

The users were asked how often they used Roughlate. The alternatives ranged from 5 (several times a day) to 0 (practically never). The average was 2.7, which indicates that on average they used it more often than once a month but not quite every week. The alternatives and findings are given in Table 3 below.

Table 3. Frequency of Roughlate use.

	n	%
5 (several times a day)	15	5
4 (every day)	39	13
3 (every week)	127	45
2 (every month)	67	23
1 (less than every month)	36	12
0 (practically never)	6	2
	291	100

Almost one fifth (18%) of the users used Roughlate either every day or several times a day. Based on these figures, we also calculated the share of daily, weekly, and monthly use to make the figures comparable with the log information for that period. These, together with the annual figures for 2002 and 2003, are given in Table 4 below:

Table 4. Frequency of Roughlate use.

Period	daily (%)	weekly (%)	monthly or less (%)
Survey answers	18.90	43.64	37.46
Log of Oct-Nov 2002	18.56	29.02	52.39
Log of year 2002	18.10	26.06	55.84
Log of year 2003	19.87	31.38	48.75

The share of daily use calculated on the basis of the survey information seems to correspond with the figures based on the log information. However, the weekly share is considerably higher, which may result from the fact that the survey was answered by the more active Roughlate users.

6.2.2 Purpose of Roughlate Use

The users were asked to rate on a scale from 5 (most often) to 0 (never) their purpose in using Roughlate. Table 5 shows the average value of each alternative separately for native Finnish speakers and others.

Table 5. Purpose of use.

	Finnish speakers n=69	**Other users** n=167
Assimilation	0.15	**4.74**
Drafting	**4.17**	0.44
Studying Finnish	0.06	**1.64**
Studying English	**1.88**	0.13
Other	1.00	0.48

There were two main tasks for which Roughlate was used:

- translation for **assimilation** scored an average of 4.74 among native English speakers and speakers whose native language was neither Finnish nor English. They used it mainly for understanding Finnish.

- translation for **drafting** scored an average of 4.17 among native Finnish speakers. They used it mainly to produce rough English translations as the basis for an English text.

To a lesser extent, Roughlate was also used for studying English and Finnish. It is probably no surprise that Finnish speakers used it for studying English and non-Finnish speakers used it for studying Finnish. The category Other included issues like “to ensure that the understanding was correct”, and testing was also mentioned.

6.2.3 Types of Texts

In the spring survey, we asked the users which types of texts they used the service to translate. The alternatives were *technical texts*, *e-mail messages*, *internal memos*, or *other texts*. When going through the explanations of the “other” category, an unanticipated group of texts that needed translation was discovered. This group consisted of official texts which were not purely work-related, rather they made living in Finland easier for non-Finnish speakers. Therefore, we refined the autumn survey to include *official information* as a separate category.

The users were asked to rate on a scale from 5 (most often) to 0 (never) what kinds of texts they translated by Roughlate. The results are given in Table 6.

Table 6. Types of texts translated.

	Finnish speakers (drafting) n=69	**Other users** (assimilation) n=167
Technical documents	**3.31**	2.04
E-mail messages	**2.79**	**3.56**
Internal memos	2.05	1.74
Official information	0.80	**2.68**
Other texts	0.93	1.54

Finns who prepared texts for distribution translated actual technical documents somewhat more often than others (an average of 3.31 where the highest score was 5). The reason for this is obviously the fact that technical documents are generally written directly in English, and therefore English-speaking persons had no need to translate

them. On the other hand, non-Finnish speakers translated e-mail messages to get to know what they contained. It may happen that a problem or issue is first discussed in a small group in the mother tongue of the people involved (in our case Finnish). Later non-Finnish speakers take part in the discussion, and it is in those cases that Roughlate becomes useful.

The fact that Finnish speakers used Roughlate to write memos in English could partly explain why non-Finnish speakers need Roughlate less to understand the memos.

6.3 Alternatives to Roughlate

If Roughlate were not available, the alternatives would be different for those who used it for assimilation and those who used it for drafting. The users were asked to rate on a scale from 5 (most likely) to 1 (least likely), and 0 (never) the alternatives to Roughlate. The results can be seen in Table 7.

Table 7. Alternatives to Roughlate.

	Finnish speakers (drafting) n=69	**Other users** (assimilation) n=167
Professional translator	1.00	0.65
Colleague	1.75	**3.92**
Secretary	0.51	1.64
User himself	**4.54**	1.86
Nobody	0.65	**2.64**

The non-Finnish users of Roughlate would most probably either turn to their colleagues for help or leave the text untranslated. This would either burden the colleagues who probably are already fully booked, or a piece of information would be missed. On the other hand, Finnish speakers would need to do the translation themselves even without the help of Roughlate.

How about the professional translator in this context? How often would the users of Roughlate turn to him for help if Roughlate were not available? For the Finnish speakers who used Roughlate for drafting, the professional translator would have been the third alternative with a rating 1 (least likely). For those, using Roughlate for

assimilation, the rating of the professional translator as an alternative would have been even lower – the last and the least probable alternative. This seems to indicate that machine translation is used for translating texts that otherwise in many cases would not be translated at all.

6.4 Usefulness and User satisfaction

Usefulness of the service and user satisfaction were viewed from a quantitative and qualitative point of view. The numbers analysed for the quantitative part cannot be regarded as exact scientific figures, rather they reflect user opinions. However, the averages represented in this connection give a good overall idea of the users' perception of the service. The plain numbers were complemented by users' opinions about the service and suggestions for future development. Finally, in Chapter 6.4.3 How Good is Useful?, there is a comparison of the perceived usefulness and how 'good' the translation actually was when considering the content, grammar and vocabulary

6.4.1 Quantitative Perspective

In order to find out how users felt about Roughlate's usefulness, they were asked to rate the following eight features in a scale from 5 (very satisfied) to 1 (not satisfied at all) with an additional option of 0 (cannot rate). See also Appendix B. *Survey questions*. The features were characterised as follows:

Interface. How intuitive the user interface is for a new user? Is something missing?

Support. If problems arise, is there timely help available?

Instructions. If problems arise, is the answer easily found in the instructions. Are the instructions readily available and relevant?

Speed of translation. How satisfied are the users with the speed of translation? There was a different process for short translations that appeared on the display as soon as the translation was completed (SpeedOS) and for longer translations, such as attachment files, that were translated in a batch queue and sent to the requester as e-mail messages (SpeedEM).

Quality. What is the quality of the result?

Vocabulary. What is the coverage of the vocabulary? Are there too many unknown words?

Usefulness. How useful is Roughlate for the purpose used?

There were no strict metrics for any of these, just a subjective feeling was expected. The Figure 15 gives a general average view of user satisfaction.

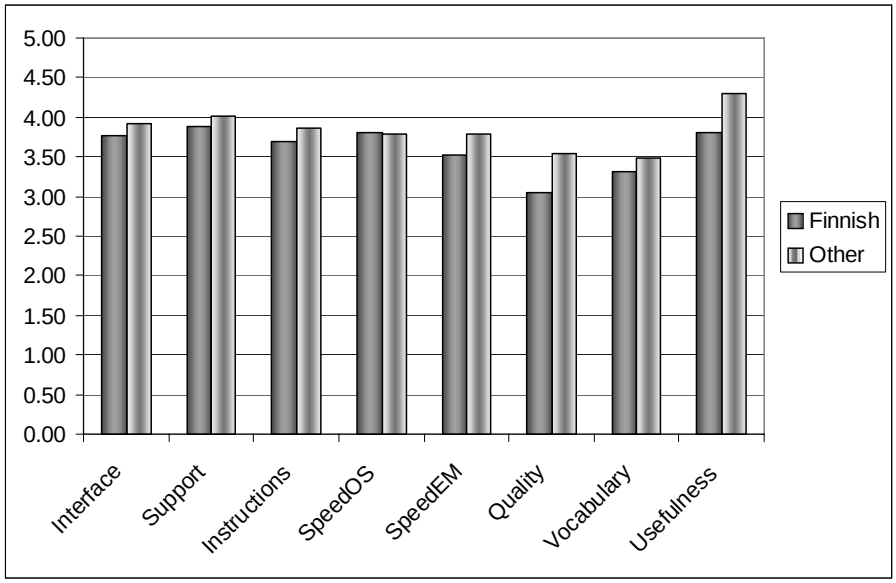


Figure 15. Usefulness of Roughlate.

All in all, we can see that users were fairly satisfied with the system; even the lowest score (i.e., *Quality* as rated by the native Finnish speakers) exceeded 3, and the overall average was 3.62. More detailed information on user satisfaction is given in Table 8.

Table 8. Usefulness.of Roughlate.

	Finnish speakers		**Other users**	
	Score	n	Score	n
Interface	3.77	69	3.93	167
Support	**3.88**	43	**4.02**	108
Online help	3.70	40	3.85	117
Speed (on-screen)	3.81	68	3.79	164
Speed (e-mail)	3.52	27	3.78	59
Quality	3.06	69	3.54	167
Vocabulary coverage	3.32	69	3.49	167
Usefulness	**3.81**	69	**4.30**	167

Usefulness and *support* received the highest two scores both from both the native Finnish users and others. As could be expected, the non-Finnish Roughlate users found the service more useful than native Finnish users (4.30 vs. 3.81).

An interesting issue here is the fact that even though *quality* and *vocabulary coverage* received the lowest two scores in both user groups, the service was found useful. Also the *interface* and *speed of service* received relatively high rating. This seems to indicate that as long as the users have enough support that they know what to expect, and they can get it easily and immediately, even a lower quality can be useful.

6.4.2 User Experience

In addition to the numbers, the users also wrote about their feelings regarding the service. In most cases, the views were fairly favourable. Here are a few quotations from the survey.

[Native English speaker]

> "Making Roughlate available has been an excellent idea, and I hope the service continues!"

> "Although I speak Finnish fairly well, Roughlate has been an incredible time saver for me. I often use it when I receive emails with large bodies of Finnish text. It allows me to quickly get the basic gist of the conversation and decide if I need to spend the time reading the Finnish text again or if I can get enough info to immediately reply without wasting time struggling with it."

> "The benefits are considerable. It becomes possible to understand and participate in discussions or elevated problems that have previously been discussed in Finnish."
>
> "Rough translation of Finnish meaning without need for outside help"

[Native Finnish speaker]

> "It prevents you doing the ridiculous mistakes in case if you don't have a slightest idea how to translate text at the first place..."

[Neither native English nor native Finnish speaker]

> "… a lot of email is written in Finnish, so Roughlate has dramatically help the work of mine and my Finnish colleagues, improve the efficiency of our communication. I would like to rate this tool as one of most important tool in my working."
>
> "Useful service, because some understanding of Finnish is better than none at all."
>
> "I can do my job much better."
>
> "Speeds up work compared to classical dictionary-usage."

Even though the responses in general were favourable, some of the answers also contained comments for improvement. In most cases, these were related to the technical issues and new ideas, which are further discussed in section 7.1. Some users also asked for better quality but at the same time were satisfied with the service:

> “Sometimes with Fin-Eng transalation I think the quility of the translation has to be revised” -- “it is very valuable when I face a problem with some Finish document or text that I need to know what does it says and the English text is not available. However, the is very common that I face many Finnish text that needs to be understand.”
>
> “quality of technical translations is not so good.” -- “As I am part of a total finnish team, sometimes email messages are still in Finnish. With the translator, I can at least have some idea on what is in the mail.”

It is not a big surprise that the poor quality is mentioned. What is more surprising is the fact that the poor quality was only mentioned in a few occasions. This clearly indicates

that the users have understood the limits of the tool and have set their expectations accordingly.

6.4.3 How Good is Useful?

The users were presented the question *How useful was this translation?* after each translation as discussed in 5.2.2. The idea was that they could as easily as possible rate the usefulness of the translation. They did not need to consider the grammaticality or style. This can be considered an example of social judgement rather than linguistic evaluation (House 2001: 254; see also section 2.3.1). There were four alternative answers in the form of push buttons: *Very useful*, *Useful*, *Slightly useful*, and *Not useful at all*. In addition, there was a button *This was a test*, the pressing of which served to skip storing the text.

A total of 239 translation requests were evaluated this way by the users during two days. The source text and translation were then stored automatically for closer linguistic analysis. Only if *This was a test* was selected, the text and translation were not stored. There were 33 test cases, which left a total of 206 cases for linguistic analysis. The overall usefulness rate is shown in Table 9.

Table 9. Overall usefulness.

	Finnish speakers		Other users	
	n	%	n	%
Not useful	11	14	5	4
Slightly useful	17	22	11	9
Useful	37	47	37	29
Very useful	13	17	75	58
Total	78	100	128	100

All in all, it can be seen that the users in the group *Other users* were more satisfied than the *Finnish speakers*. The others rated the translation either *Useful* or *Very useful* in 87% of cases, whereas Finns reached 65%.

Some of the example sentences were corrupted, which left 192 sentences that could be analysed. The analysis consisted of rating the source text and various features of the

target text on scale from 4 (very good) to 1 (poor). The target text features examined were content, grammar, and vocabulary. There is no division between Finns and non-Finns as the information was not stored. The results can be seen in Table 10.

Table 10. Analysis of translated texts.

	Content		Grammar		Vocabulary	
	n	%	n	%	n	%
1 (poor)	42	22	**79**	**41**	46	24
2 (satisfactory)	43	22	44	23	**57**	**30**
3 (good)	44	23	33	17	39	20
4 (very good)	**63**	**33**	36	19	50	26
Total	192	100	192	100	192	100

Transfer of content was found to be good or very good in 56% of the cases, even if grammar was poor or satisfactory in 64% of cases, and vocabulary was poor or satisfactory in 54% of cases. In 129 cases from the total of 193, the average vote of the users was higher than the average rate calculated on the basis of content, grammar, and vocabulary. The vote average was 3.1 and the rate average was 2.4. This seems to indicate that users were satisfied with the rough translation even if the grammar and vocabulary were poor or satisfactory.

One aspect that was not considered in the analysis is the fact that in many cases the Finnish source text was poor and fragmented. A new study could also rate the Finnish source text and study its impact on the usefulness.

7 Conclusions and Discussion

This study has dealt with both empirical and theoretical elements of translation. We have seen various approaches to the theory of translation and also to the translation process in practice. It was argued that the current volumes of text to be translated demand the use of computers and also that there are different degrees of computer assistance. The main focus of human translators is on producing publishing quality translations. However, in addition to texts to be published, there are huge volumes of information in foreign languages on the Internet and in e-mail messages. Even with computer assistance, professional translators alone cannot cope with the translation of these, and therefore computer assistance has also been offered to non-translators who only need to understand the contents of a text at a general level.

This study has been looking for answers to a number of questions on how useful machine translation can be for lay users who may not know the source language at all. Let us now take a look at the findings of the survey and put forward a few suggestions for further research and development. In conclusion, there will be a brief review of the relation of translation theory to machine translation.

7.1 Findings and Future Development

As discussed in Chapter 6, the main questions in the empirical part of this study were: who are the users and what is their purpose in using the Roughlate service; how useful is the service for the users and how do they find the quality; and how can the system be improved. The main findings will be reviewed next.

Users and purpose. When taking a closer look at the users of MT systems in general, we can distinguish two main groups: *translators* and *others*. The original assumption had been that Roughlate was mainly used by people who did not know the Finnish language. In the survey, however, it became apparent that besides assimilation, machine translation was also used by the non-translator author seeking to produce target language text directly in a foreign language. This could be referred to as *translation for drafting*. Translation for drafting would be the application of machine translation tools

to produce draft text in the target language, which the author himself refines. MT is here used to speed up writing in the foreign language; the target is not necessarily to produce publishable quality texts.

Thus, the group *others* can be further divided into two more groups based on the main purpose of MT: those who use it for *translating for assimilation* and those who use it for *translating for drafting*. The target group for the Roughlate service was originally the group *others*, which can be further divided into the two sub-groups:

- Native English speakers and speakers whose native language was neither Finnish nor English used it when translating for purposes of assimilation. Their main purpose was to understand Finnish e-mail messages.

- Finnish speakers, on the other hand, used it when translating for drafting. Not very surprisingly, they used it mainly to produce rough English translations as the basis for more refined English technical texts.

Based on these findings the table presented earlier in Chapter 3.1 can be redrawn as follows:

Table 11. Translation directions with the drafting direction.

User	Translator	Non-translator		
Type of translation	dissemination	drafting	assimilation	interaction
Knowledge of source language	active	active	none	passive
Knowledge of target language	active	active/passive	passive	passive/none
Criteria	reliability of terminology, easy editing to get publishable quality	reliability of terminology, speed, ease of use	ease of use, easy access, speed of translation, wide domain (e.g. translation of productive words)	ease of use, two-way, wide subject domain, real-time translation (e.g. e-mail)

Thus, Table 11 has an additional category *drafting*. For drafting purposes, the user must have a good active knowledge of the source language and at least passive knowledge of

the target language. This is where translation for drafting differs most from translation for dissemination, because for dissemination the user must have excellent active knowledge of both the source and target languages.

Usefulness and quality. In general, users were fairly satisfied with the system. *Usefulness* and *support* received the highest two scores from both the native Finnish users and others. As already became apparent in Table 8, the non-Finnish Roughlate users found the service more useful than the native Finnish users. The reason for this is that the Finnish-speaking users already knew both the source and target languages, and Roughlate was only used for speeding up the production of English. Roughlate was not really an alternative for them – it was an assistant. In most cases, they would need to do the translation themselves, even without the help of Roughlate.

The group *others*, on the other hand, did not know the source language, and any information they could get out of a Finnish text was considered useful (even if it turned out that the text was, after all, not relevant for them). The answers to the questionnaire indicated that, if Roughlate were not available, the non-Finnish users of Roughlate would most probably either turn to their colleagues for help or leave the text untranslated. This indicates that Roughlate eases the pressure on colleagues who have their own specific tasks. Additionally, the service was used for translating texts which otherwise would not have been translated at all and where a piece of information would have been missed.

In addition to the questionnaire, data about the usefulness of the rough translations was collected by means of online voting, as described in 5.3.2. The evaluation in this case was carried out as follows. First, the users rated the results according to how useful they felt them to be. Afterwards, the translations were analysed by rating the source text and various features of the target text on a scale from 4 (very good) to 1 (poor). The target text features were content, grammar, and vocabulary.

For this study, the analysis was carried out on a proof-of-concept basis, that is, I rated the sentences based on my first impression of the translation. Thus, deeper analysis would be needed, and this study could be complemented by analysing the text material which was voted "useful". The deeper analysis could consist of the following:

- one group of translators translates the same sentences without a computer and without seeing the rough translations provided by Roughlate,
- one group only evaluates the translation result by Roughlate, and
- one group compares the translations by humans and Roughlate.

The research could then be further extended to find out, for each translation, what types of errors are produced. When the error categories are compared to the voting results, we could see what types of errors do not really diminish the usefulness of the service. It would then be possible to concentrate on fixing those errors that have the most adverse impact on usefulness.

Service development. Users were satisfied even with the current version of Roughlate. There were, however, a number of suggestions on how to improve the service. From the perspective of the purpose of use, three different paths can be seen:

- *Improve informal and everyday language for assimilation purposes*. The software used was not, of course, designed originally to deal with the frequently ungrammatical conversational style and the sometimes informal vocabulary of electronic mail. Even though some of the output is garbled and difficult to comprehend, a large number of users found the results to be a valuable aid for comprehension. This can be further improved by adding informal vocabularies to the translation rules.

  Finnish compound words are another challenge to the coverage of the vocabularies. While it is impossible to add all compound words to the translation dictionaries, and the compound translation is only available for compounds with two words, we might select another solution. We could prepare links of unknown words and compounds (even those translated as separate words) to human readable dictionaries. This way, users could quickly find the unknown words.

- *Improve technical language for dissemination or drafting purposes*. The system works fairly well with the structures of technical texts. However, the coverage or availability of the vocabularies could be improved. The official termbank

information could be added to the translation rules more regularly. Another way of improving the availability of the terminology information is by using similar linking, as described above in connection with improving the informal and everyday language for assimilation purposes.

- *Improve two-way communicative aspects*. Currently Roughlate cannot be used for translation for interaction. In this respect, we need to wait for a new version of TranSmart with English to Finnish translation ability.

In addition to the development paths based on the purpose of use, respondents gave a few more suggestions on how to improve the service:

> "I sometimes have the need to use Roughlate when I am not connected to the network, from my laptop. It would be nice to have local access to the tool."
>
> "roughlate software on the communicator -> that would be great ;)"

Accordingly, we can see a few more directions for the development of the rough machine translation service.

- *Improve the availability of the service*. We should make Roughlate available through different channels and means. First, we should make Roughlate mobile. This can be done by preparing a simpler order form for use via a Communicator, for example. Another interesting way to use Roughlate would be through SMS access. This would mean sending a short message to a given number, with the result appearing as a short message.

  A natural extension to the service would be the ability to translate web pages, as a number of free online services already do. This would diminish the need to cut and paste text.

  We might also add the function described in the imaginary scenario in the preface. While quite a lot of text is in printed format in the unknown language, it would be easier to scan the text in the tool or maybe take a picture as so many mobile phones already have an inbuilt camera. The picture would then be sent through optical

character-recognition software that would turn the contents of the picture into text. Only after that would it be possible to submit it for translation.

To a lesser extent, Roughlate was also used for studying English and Finnish. Should we try to find ways to improve Roughlate in that respect? This seems to be somewhat harder – maybe the keyword translation approach could be studied. But then it would only help in learning the words, not the structures. In the end, Roughlate is not a tool for language learning. It may have been found useful in that area, but it is not the main area where Roughlate will be developed. All in all, Roughlate has been found useful by thousands of users, and there are several paths available to make Roughlate even more useful for them.

This study clearly supports the suggestion that rough machine translation has an important role in the communication process especially when there is a need to read texts written in an unknown language (see also Chapter 3.2). This is also highlighted, for example, by the following user comments:

> "… Roughlate […] improve the efficiency of our communication."

> "… some understanding of Finnish is better than none at all."

7.2 Aspects of Translation Theory for MT

At the most practical level, the purpose of a theory of translation should be of service to the translator, to help him overcome difficulties in translation. Let us consider a situation described by Chesterman (1996: 4-5). There are seven versions of the same text by human translators and one by a machine of a rather complicated Finnish sentence into English. All these translations are fairly similar and this, according to Chesterman (1996: 4), is

> partly because the TranSmart system is pretty good, but partly because trainee translators often seem to translate like machines, carefully processing every word of the original into a grammatical target-language form. The results are comprehensible, but not particularly good translations.

He suggests that professional humans can do better because they have access to theoretical concepts that machines do not have, and these concepts affect the way they translate. He then describes a few theoretical tools that the translators could have used in translating the sentence. These tools include transposition (changing the word class), deverbalization (expressing the intended meaning in the target language without unwanted formal interference), iconicity (matching of form and meaning), and relevance (translate what is relevant). (Chesterman 1996: 4-5). This example clearly indicates that a theory of translation can be of service to the translator because it helps them to become aware of what they are doing. See also Chesterman & Wagner (2002) for further discussion between theory and practice.

In addition, I feel, the theory of translation could also be of service to the developers of translation technology products. There have already been attempts to improve the results of machine translation by adopting some of the best practices of human translators. Bond (2002), for example, describes a multi-pass machine translation which is based on the steps Eugene Nida proposed for human translation as early as 1964. The steps were very practical, consisting of reading the whole text and parallel texts to gain background information, preparing first a draft translation, and then refining it (Bond 2002). This supports the notion that a theory of translation devised for human translators can also be applied to machine translation as long as we do not try to match the cognitive processes of the human mind with the programmed processes of a computer software. When considering the four theoretical tools presented above, some level of transposition capability could be written in the translation rules of a machine translation system. However, the other three concepts seem to require a considerable amount of cognitive processing for which the computers of today are not capable. For example, how could a machine know what is relevant?

Thus, while it has been accepted in the functional translation theories that translation in general is possible (see e.g. Nord 1997), the question nowadays is whether or not *machine* translation is possible. When considering machine translation from the viewpoint of translation theory, we need to focus first of all on the purpose of the translation, that is, the need to communicate something or some things. This need may

be satisfied even with a non-grammatical rendering of the contents of the original text, and therefore in this context we can say that machine translation is possible.

However, “possible” does not necessarily indicate “fluent” or “accurate”. Therefore it is important that the users of a rough machine translation service understand that the translation is likely to be imperfect but that it can provide the basic idea of the source text which then allows the user to decide whether further translation by a professional human translator is necessary. We might consider this as an extension to the use of keyword translation. Where keyword translation only gives you a list of the most important words that occur in the text, rough machine translation gives the keywords in context.

An interesting question in the context of translation theory is where we should place the translation of texts that are written in informal language containing special language vocabulary or slang expressions. We might try to place it in Snell-Hornby’s (1988: 32-33) stratificational model (see also 3.4.1) as *Informal Language Translation*. However, we might also argue that the informal language translations only differ from those given in the original spectrum by a degree of formality, since informal language translations may be needed anywhere in the spectrum. Generally, they are not really written with translation in mind, but if the need arises we are most probably dealing with translation for assimilation or translation for interaction. A typical example of texts in this category can be seen in e-mail messages, where the source text is likely to contain informal or slang expressions of a particular domain. Should we translate the informal expressions of the source text as informal expressions in the target language? For communication purposes that is not necessarily the case, and I suggest, therefore, that in many cases it is best to give them as neutral a rendition as possible. The neutral equivalent is preferable because there are no equivalent informal expressions in all languages, and even if there were, the users might not be familiar with these expressions. Moreover, if a machine translation is used for assimilation of information, the user is normally more interested in the actual contents and not so much in the subtleties of the language.

Even though machine translation might sometimes be considered a poor substitute for human translation, it can be justified because there are not enough human translators

available to translate huge amounts of documents (at least not in time). Take, for example, the Internet, which has given rise to demand for immediate, low-cost translation which cannot be produced by human translators. It is difficult to imagine a human translator coping with all the person-to-person e-mail and short message service (SMS) messages. Likewise, human translators cannot provide translations of content produced dynamically from a database in real time (e.g. stock market reports). Even if delays were accepted, the cost of translation by humans would be huge. Moreover, data-driven information of this type has a short "shelf-life", and therefore the value of the information will decrease the more time elapses before the translation is available (Implementing 2004).

Naturally, we can still have arguments and counter-arguments about whether the output of an MT system is a translation or not. Sager (1994: 120) also contemplates the nature of machine translation output:

> An alternative interpretation is to postulate that the computer does something else, which may be similar in some respects, and the outcome of which is a derived document for which we have yet to find another name.

If a new term is needed, we might as well use the term "roughlation", as suggested in 1.1. Even if we name it differently, the fact remains that machine translation is useful as it is. In addition, machine translation can benefit from the theories of translation, and theories of translation cannot disregard machine translation.

My hope is that the discussion will continue and new ways to apply human translation theories to machine translation will be found. In the end, even with machine translation for assimilation where the translation is fully automatic, there is the human element behind the scenes. It was the developers of the software and the translation rules who made the system operate in the first place.

Works Cited

Ahrenberg, Lars, and Maria Holmqvist. “Back to the future? The Case for English-Swedish Direct MT”. To appear in Proceedings of RASMAT'04 - Workshop in Recent Advances in Scandinavian Machine Translation. Uppsala, 2004. URL: http://stp.ling.uu.se/~evapet/mt04/T4F.pdf. Available on 6 March 2005.

Allen, Jeffrey. “Post-editing”. In Harold Somers (ed.), Computers and Translation: A Translator’s Guide. Amsterdam/Philadelphia: John Benjamins B.V., 2003. 298-317.

Anderson, James M. Structural Aspects of Language Change. London: Longman, 1973.

Arnola, Harri, Kaarina Hyvönen, Jukka-Pekka Juntunen, Tim Linnanvirta, and Petteri Suoranta. "Kielikone Finnish-English MT system TranSmart in Practical use”. Translating and the Computer 18: Papers from the Aslib Conference Held on 14 & 15 November 1996. London: Aslib, 1996.

Arnold, Doug. “Why Translation is Difficult for Computers”. In Harold Somers (ed.), Computers and Translation: A Translator’s Guide. Amsterdam/Philadelphia: John Benjamins B.V., 2003. 119-142.

Arnold, Doug J., Lorna Balkan, Siety Meijer, R. Lee Humphreys, and Louisa Sadler. Machine Translation: An Introductory Guide, London: Blackwells-NCC, 1994. URL: http://www.essex.ac.uk/linguistics/clmt/MTbook/PostScript/. Available on 13 April 2004.

Asher, Nicholas, and Alex Lascarides. “Indirect Speech Acts”. Synthese 128: 183–228. Kluwer Academic Publishers, 2001. URL: http://www.cs.brandeis.edu/~jamesp/classes/cs216/Asher-IndirectSpeechActs.pdf. Available on 5 September 2005.

Austermühl, Frank. Electronic Tools for Translators. Manchester: St. Jerome Publishing, 2001.

Bar-Hillel, Yehoshua. “The Present Status of Automatic Translation of Languages”. Advances in Computers, Volume 1, 1960. URL: http://hutchins.members.beeb.net/Bar-Hillel-1960.pdf. Available on 27 September 2004.

Bazzanella, Carla, and Rossana Damiano. “The Interactional Handling of Misunderstanding in Everyday Conversations”. Journal of Pragmatics. Volume 31, 1999. 817-836.

de Beaugrande, Robert Alain, and Wolfgang U. Dressler. Introduction to Text Linguistics. Harlow: Longman, 1981.

Bell, Roger T., Translation and Translating: Theory and Practice. London: Longman, 1991.

Bergen, David. “Translation Technology and Translator Training”. In Jorma Tommola (ed.), Kieli, teksti ja kääntäminen: Language, Text and Translation. University of Turku, 2004. 141-156.

Bernth, Arendse, and Claudia Gdaniec. “MTranslability”. Machine Translation, Volume 16, 2001. 175-218.

Bond, Francis, “Toward a Science of Machine Translation”. TMI-2002 Conference. Keihanna, Japan, March 13-17, 2002. URL: http://www.mt-archive.info/TMI-2002-Bond.pdf. Available on 4 October 2004.

Bowker, Lynne. “Terminology Tools for Translators”. In Harold Somers (ed.), Computers and Translation: A Translator’s Guide. Amsterdam/Philadelphia: John Benjamins B.V., 2003. 49-65.

Brown, Ralf D., "Adding Linguistic Knowledge to a Lexical Example-Based Translation System”. In Proceedings of the Eighth International Conference on Theoretical and Methodological Issues in Machine Translation (TMI-99), p. 22-32, UK, August 1999. URL: http://www-2.cs.cmu.edu/~ralf/papers/tmi99.ps. Available on 13 April 2004.

Cankar, Mihael. The Sauna Lexicon. 2003. URL: http://cankar.org/sauna/dictionary/lexicon.html. Available on 9 September 2005.

Carbonell, Jaime G., and Masaru Tomita. “Knowledge-based Machine Translation, the CMU Approach”. In Sergei Nirenburg (ed.), Machine Translation: Theoretical and Methodological Issues. Cambridge: Cambridge University Press, 1987. 68 - 89.

Carl, Michael, Catherine Pease, Leonid L. Iomdin, and Oliver Streiter. "Towards a Dynamic Linkage of Example-based and Rule-based Machine Translation”. Machine Translation, Volume 15 (3), 2000. 223 – 257.

Carlson, Lauri, Katina Bontcheva, Timo Järvinen, Mirkka Soininen, Pasi Tapanainen, Kimmo Huovila, Kaarina Hyvönen, and Pekka Rapinoja. ”The Incredible Machine: English-Finnish Machine Translation from Prefabricated Components”. Unpublished. May 18, 2001. URL: http://www.ling.helsinki.fi/kieliteknologia/tutkimus/lingmachine/Public/mtsummitix.rtf. Available on 17 October 2002.

Catford, J. C. A Linguistic Theory of Translation. An Essay in Applied Linguistics. Oxford University Press, 1965.

Chesterman, Andrew. "Psst! Theory can be useful!” Kääntäjä - Översättaren. 1996: 10. 4-5.

Chesterman, Andrew. “Translation typology”. In A. Veisbergs and I. Zauberga (eds.), The Second Riga Symposium on Pragmatic Aspects of Translation. Riga: University of Latvia, 49-62. URL: http://www.helsinki.fi/~chesterm/2000bTypes.html. 2000. Available on 12 April 2004. n.p.

Chesterman, Andrew, and Emma Wagner. Can theory help translators? A dialogue between the Ivory Tower and the Wordface. Manchester: St. Jerome Publishing, 2002.

Climent, Salvador, Joaquim Moré, Antoni Oliver, Míriam Salvatierra, Imma Sànchez, Mariona Taulé, and Lluïsa Vallmanya. “Bilingual Newsgroups in Catalonia: A Challenge for Machine Translation”. In Journal of Computer Mediated Communication JCMC 9 (1) November 2003. URL: http://jcmc.indiana.edu/vol9/issue1/climent.html. 2003. Available on 30 June 2005. n.p.

Dascal, Marcelo. Interpretation and Understanding. Amsterdam/Philadelphia: John Benjamins Publishing Company, 2003.

Gingras, Becky. "Simplified English in Maintenance Manuals”. Technical Communication, First Quarter, 1987.

Gordon, Ian. “Letting the CAT out of the Bag - or Was It MT?”. Translating and the Computer 18: Papers from the Aslib Conference Held on 14 & 15 November 1996. London: Aslib, 1996.

Gouadec, Daniel. “Traduction signalétique”. Meta 35 (2), 1990.

Grice, H. Paul. “Logic and Conversation”. In Peter Cole, and Jerry L. Morgan (eds.), Syntax and Semantics 3: Speech Acts. New York: Academic Press, 1975. 41-58.

Halliday, M.A.K. “Categories of the Theory of Grammar”. Word, Volume 17 (3), 1961.

Hatim, Basil. Communication across Cultures: Translation Theory and Contrastive Text Linguistics. Exeter: Exeter University Press, 1997.

Herring, Susan. C. ”Computer-mediated Discourse”. In Deborah Schiffin, Deborah Tannen & Heidi E. Hamilton (eds.), Handbook of discourse analysis . Oxford: Blackwell, 2003. 612-634.

Heyn, Matthias. “Integrating Machine Translation into Translation Memory Systems”. Proceedings of EAMT Machine Translation Workshop. TKE ’96, Vienna, Austria, 29-30 1996. Vienna: 1996. URL: http://j_hutchins.members.beeb.net/EAMT%201996%20workshop.pdf. Available on 6 October 2004.

Honkela, Timo, and Aarno Lehtola. ”Luonnollisen kielen tulkintatekniikka – Tietokantakyselyt suomen kielellä”. Publications of the Kielikone-project. Series C. Report No. 4. SITRA. 1987.

House, Juliane. A Model for Translation Quality Assessment. Tübingen: Gunter Narr Verlag, 1981.

House, Juliane. “Translation Quality Assessment: Linguistic Description versus Social Evaluation”. Meta 46 (2), 2001.

Hovy, Eduard . “Toward Finely Differentiated Evaluation Metrics for Machine Translation”. EAGLES Evaluation Working Group: Final Report. March 1999. URL: http://www.issco.unige.ch/projects/eagles/ewg99/. Available on 17 October 2002.

Hovy, Eduard, Margaret King, and Andrei Popescu-Belis. “Principles of Context-Based Machine Translation Evaluation”. Machine Translation, Volume 17, 2002. 43-75.

Höge, Monika. Towards a Framework for the Evaluation of Translators' Aids Systems. Academic Dissertation, University of Helsinki, June 2002. URL: http://ethesis.helsinki.fi/julkaisut/hum/yleis/vk/hoge/towardsa.pdf. Available on 1 February 2003.

Hutchins, W.J. Machine Translation: Past, Present, Future. Chichester, Eng.: Ellis Horwood Limited, 1986.

Hutchins, W.J. “Translation Technology and the Translator”. Proceedings of the Eleventh Conference of the Institute of Translation and Interpreting, 8-10 May 1997, pp. 113-120.
URL: http://ourworld.compuserve.com/homepages/WJHutchins/ITI-97.pdf. Available on 6 October 2004.

Hutchins, W.J. “Towards a new vision for MT”. Introductory speech at the ‘MT Summit VIII’ conference, 18-22 September 2001a, Santiago de Compostela, Galicia, Spain.
URL: http://ourworld.compuserve.com/homepages/WJHutchins/MTS-2001.pdf. Available on 4 February 2004.

Hutchins, W.J. “Machine Translation and Human Translation: in Competition or in Complementation?”. International Journal of Translation, vol.13, no.1-2, Jan-Dec 2001b, pp. 5-20.
URL: http://ourworld.compuserve.com/homepages/WJHutchins/IJT-India.pdf. Available on 6 October 2004.

Hyperdictionary. URL: http://www.hyperdictionary.com. Available on 3 October 2004.

Hyvönen, Kaarina, and Harri Arnola. "Kielikone MT Takes User-Friendliness Seriously”. Translating and the Computer 20, London, 12 - 13 November 1998. London: Aslib, 1998. 111 - 119.

Implementing Machine Translation. LISA Best Practice Guide. LISA, 2004.

Ivir, Vladimir. “A Case for Linguistics in Translation Theory”. Target 8/1, 1996. 149-156.

Johnson, Roderick L., and Peter Whitelock. “Machine Translation as an Expert Task”. In Sergei Nirenburg (ed.), Machine Translation: Theoretical and Methodological Issues. Cambridge: Cambridge University Press, 1987. 136 - 144.

Jäppinen, H., A. Lehtola, E. Nelimarkka, and K. Valkonen. ”Dependency Analysis of Finnish Sentences”. Publications of the Kielikone-project. Series C. Report No. 4. SITRA. 1987.

Järvinen, Timo, and Pasi Tapanainen. ”Towards an implementable dependency grammar”. In Sylvain Kahane and Alain Polguère, (eds.), Proceedings of the Workshop Processing of Dependency-Based Grammars. Université de Montréal, Quebec, Canada, 15th August 1998. 1 - 10.

Jääskeläinen, Riitta. Tapping the Process: An Explorative Study of the Cognitive and Affective Factors Involved in Translating. University of Joensuu Publications in the Humanities, No. 22. Joensuu, 1999.

King, Margaret. "Evaluation of MT software and methods". Machine Translation Today: Translating and the Computer 15, London, 18 - 19 November 1993. London: Aslib, 1993. 111 - 119.

Lisa Members in the News. "More Words Are Translated by Machine Translation Than by Humans" 6 September 2004. URL: http://www.lisa.org/press/membernewsmore.html/383. Available on 26 September 2004.

Mann, William, and Jörn Kreutel. "Speech Acts and Recognition of Insincerity". In Jonathan Ginzburg and Enric Vallduví (eds.), Catalog ´04: Proceedings of the Eighth Workshop on the Semantics and Pragmatics of Dialogue. 19-21 July 2004 Barcelona. 64 - 68. URL: http://www.upf.edu/dtf/personal/enricvallduvi/catalog04/papers/09-mann-kreutel.pdf. Available on 5 September 2005.

Manzi, Sandra, Maghi King, and Shona Douglas. "Working towards user-oriented evaluation". Proceedings of the International Conference NLP+IA/TAL+AI 96, Mouncton, NB, Canada, 1996, pp. 155-160.

Mason, Jane, and Adriane Rinsche. Ovum Evaluates: Translation Technology Products. London: Ovum Ltd, 1995.

Melby, Alan. "On Human-Machine Interaction in Translation". In Sergei Nirenburg (ed.), Machine Translation: Theoretical and Methodological Issues. Cambridge: Cambridge University Press, 1987. 145 - 154.

Melby, Alan. "Eight Types of Translation Technology". Presentation in American Translators Association, Hilton Head, November 1998. URL: http://www.ttt.org/technology/8types.pdf. Available on 10 March 2002.

Mel'cuk, Igor A. Dependency Syntax: Theory and Practice. Albany: State University of New York Press, 1987.

“METEO® Machine-Translation System - 20th Anniversary” 24 May 1997. URL: http://www.chandioux.com/press_meteo20_eng.html. Available on 23 January 2005.

Mitamura, Teruko, and Eric H. Nyberg. "Controlled English for Knowledge-Based MT: Experience with the KANT System”. TMI-95: Proceedings of the 6th International Conference on Theoretical and Methodological Issues in Machine Translation, 1995.

"MT On-line from CompuServe”. Language International 8.1 1996: 18 - 20.

Newmark, Peter. A Textbook of Translation. Hemel Hempstead: Prentice Hall, 1988.

Nirenburg, Sergei. "Knowledge and Choices in Machine Translation”. In Sergei Nirenburg (ed.), Machine Translation: Theoretical and Methodological Issues. Cambridge: Cambridge University Press, 1987. 1-21.

Nord, Christiane. Text Analysis in Translation. Theory, Methodology, and Didactic Application of a Model for Translation-Oriented Text Analysis. Amsterdam: Rodopi, 1991.

Nord, Christiane. Translating as a purposeful activity: functionalist approaches explained. Manchester: St. Jerome, 1997.

Nuutila, Pertti. "Roughlate Service for In-house Customers". Translating and the Computer 18: Papers from the Aslib Conference Held on 14 & 15 November 1996. London: Aslib, 1996.

Papineni, Kishore, Salim Roukos, Todd Ward, and Wei-Jing Zhu. “Bleu: a Method for Automatic Evaluation of Machine Translation”. IBM Research Report RC22176 (W0109-022) September 17, 2001.
URL: http://www1.cs.columbia.edu/nlp/sgd/bleu.pdf. Available on 5 March 2005.

Pinto, María. “Quality Factors in Documentary Translation”. Meta 46 (2), 2001.

Reeder, Florence, Keith Miller, Jennifer Doyon, and John White. “The Naming of Things and the Confusion of Tongues: An MT Metric”. Machine Translation Summit VIII. Held on 18-22 September 2001. Santiago de Compostela, 2001. 55-59.

Reiss, Katharina. “Text Types, Translation Types and Translation Assessment”. In Andrew Chesterman (ed.), Readings in Translation Theory. Loimaa: Oy Finn Lectura Ab, 1989. 105-115.

Reiss, Katharina, and Hans J. Vermeer. Mitä kääntäminen on. Helsinki: Gaudeamus, 1986.

Sager, Juan C. Language Engineering and Translation: Consequences of Automation. Amsterdam/Philadelphia: John Benjamins Publishing Company, 1994.

Searle, John R. “Indirect Speech Acts”. In Peter Cole and Jerry L. Morgan (eds.), Syntax and Semantics 3: Speech Acts. New York: Academic Press, 1975. 59-82.

Shannon, C. E., “A Mathematical Theory of Communication”. Reprinted with corrections from The Bell System Technical Journal, Vol. 27, pp. 379–423, 623–656, July, October, 1948. URL: http://cm.bell-labs.com/cm/ms/what/shannonday/shannon1948.pdf. Available on 5 August 2005.

Shubert, Serena K, Jan H. Spyridakis, Heather K. Holmback, and Mary B. Coney. "The Comprehensibility of Simplified English in Procedures”. Journal of Technical Writing and Communication. 25 (4). Baywood Publishing Co., Inc., 1995, 347-369.

Snell-Hornby, Mary. Translation Studies: An Integrated Approach. Amsterdam/Philadelphia: John Benjamins Publishing Company, 1988. Revised edition 1995.[14]

Somers, Harold. "Review Article: Example-based Machine Translation". Machine Translation, Volume 14, 1999. 113-157.

Somers, Harold. (ed.), Computers and Translation: A Translator's Guide. Amsterdam/Philadelphia: John Benjamins B.V., 2003.

Suonuuti, Seija, and Pertti Nuutila. "Ways and methods of utilizing a termbank". EURALEX '92: Papers submitted to the 5th EURALEX International Congress on Lexicography. Tampere: University of Tampere, 1992.

Tarvi, Ljuba. "Graphic Equivalence in Translated Texts: A Statistical Approach", The Electronic Journal of the Department of English at the University of Helsinki. Volume 1, 2001. URL: http://www.eng.helsinki.fi/hes/Translation/grafic_equivalence1.htm. Available on 23 January 2005.

ten Haken, Pius. "Has There Been a Revolution in Machine Translation?". Machine Translation, Volume 16, 2001. 1-19.

Tucker, Allen B. "Current Strategies in Machine Translation Research and Development". In Sergei Nirenburg (ed.). Machine Translation: Theoretical and Methodological Issues. Cambridge: Cambridge University Press, 1987. 22 - 41.

Ungerer, Friedrich. An Introduction to Cognitive Linguistics. Harlow: Longman, 1996.

Vasconcellos, Muriel, and L. Chris Miller. "Recent Trends in Machine Translation". Translating and the Computer 18: Papers from the Aslib Conference Held on 14 & 15 November 1996. London: Aslib, 1996. n.p.

---

[14] All references in this study are made to the revised 1995 edition .

Vermeer, Hans J. “Skopos and Commission in Translational Action”. In Andrew Chesterman (ed.), Readings in Translation Theory. Loimaa: Oy Finn Lectura Ab, 1989. 173-187.

White, John S., "MT Evaluation and the User". Panel in MT Summit VII, Singapore, September 1999. n.p. URL: ftp://issco-ftp.unige.ch/pub/publications/king-summit-mteval.ps.gz. Available on 5 October 2002.

White, John S., “How to Evaluate Machine Translation”. In Harold Somers (ed.), Computers and Translation: A Translator’s Guide. Amsterdam/Philadelphia: John Benjamins B.V., 2003, 211-244.

Weigand, Ebba. “Misunderstanding: The Standard Case”. Journal of Pragmatics. Volume 31, 1999. 763-785.

Glossary of Terms

analysis	the stage in the machine translation process in which a source text is converted into an annotated intermediate representation
bitext	a dual-language text that is aligned as closely as is practical, usually at the sentence level
character set	a defined set of characters for a given language
communication	the transmission of information from a sender to a recipient
computer-mediated communication (CMC)	any form of communication between two or more individual people who interact and/or influence each other via separate computers. This does not include the methods by which two computers communicate, but rather how people communicate using computers. (http://encyclopedia.laborlawtalk.com/Computer-mediated_communication)
controlled language (also known as *restricted language*)	a language created by deliberate restriction of the forms and functions of a natural language with the purpose of more efficient automatic processing
direct approach (also known as *word-for-word approach)*	One of the three basic machine translation system designs. This is used for describing first generation systems, which were designed for one specific language pair in one direction only. See also *transfer approach* and *interlingua approach*.
equivalence	a semiotic value of the semantic similarity achievable between two units of language

exact match	two sentences which are exactly the same. See also *fuzzy match*.
FAHQT	fully automatic high-quality translation
FAMT	fully automatic machine translation
fuzzy match	two sentences which are similar in some way. See also *exact match*.
general language	the language used for everyday non-specialist communication within a speech community
generation	see *synthesis*
gist	the summary presentation of the essence of a message
human-assisted machine translation (HAMT)	a technique of translation using the computer for certain aspects of the process and human participation before, during, or after the computerised translation phase
information	knowledge communicated and acquired, relating to a specific fact, subject, or concept
interlingua	an abstract representation of meaning common to several languages
interlingua approach	One of the three basic machine translation system designs. This is used for describing systems which involve two stages: analysis of the source text into an interlingua presentation and synthesis of that into the target language. See also *transfer approach* and *word-for-word approach*.
key-phrase recognition	an analytic operation whereby a text is scanned for key words characteristic of a document stated by a user

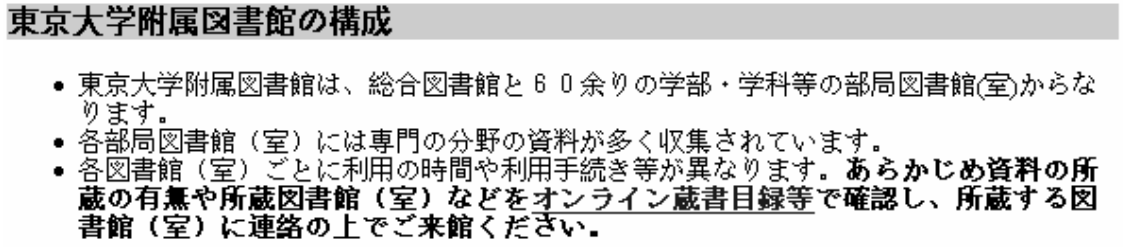
keyword translation	only the basic concepts of the text are translated to determine the necessity of full translation
lemmatisation	grouping related words together under a single headword
machine translation (MT)	any process in which there is an element of automatic analysis of a source language text, transformation of this text, and production of a target language text in another language
machine-assisted human translation (MAHT)	a translation strategy whereby translators use computer programs to perform part of the process of translation
morphological analysis	identifying potential combinations of stems and endings in words
parsing	the process by which words in a sentence are broken down to illustrate the structure of the sentence
post-editing	the adaptation and revision of output of a machine translation system
pre-editing	the annotation and modification of the input text before the automatic process in order to facilitate the automated translation process
purpose	the combination of a writer's intention and consideration of a reader's expectation
restricted language	see *controlled language*
sight translation	a mixture of interpreting and translating where the interpreter reads a document written in one language while translating it orally into another language
source language (SL)	the language of the text to be translated

speech act	intelligible human interaction performed by means of speech signals
structural transfer	the transformation of source text structures to equivalent structures in the target language text
synthesis (also known as *generation*)	the module of the process concerned with the production of a target language text
target language (TL)	the language into which a source language text is translated
transfer	the phase in the process which connects analysis and generation and in which a representation of content and form in the source language is changed into a representation of content and form in the target language
transfer approach	One of the three basic machine translation system designs. This is used for describing systems which involve three stages: analysis, transfer, and synthesis. See also *interlingua approach* and *word-for-word approach*.
translation memory system	the process of comparing text from different versions of a source file and reusing previously translated material. The data is usually stored in a translation memory database.
translation technology	computer applications which can help produce translations from one human language to another
translator workstation (also known as *translator workbench*)	an integrated suite of tools designed to help the human translator
usability	the effectiveness, efficiency, and satisfaction with which users

	can achieve tasks in a particular environment of a product. High usability means a system is: easy to learn and remember; efficient, visually pleasing and fun to use, and quick to recover from errors. (Hyperdictionary 2004)
word-for-word approach	see *direct approach*.

Appendix A. Case: You as a lay person

You sit at a table in a Japanese restaurant in Tokyo. While waiting for the waiter, you grab the sheet of paper on the table. It reads[15]:



東京大学附属図書館の構成

- 東京大学附属図書館は、総合図書館と６０余りの学部・学科等の部局図書館(室)からなります。
- 各部局図書館（室）には専門の分野の資料が多く収集されています。
- 各図書館（室）ごとに利用の時間や利用手続き等が異なります。**あらかじめ資料の所蔵の有無や所蔵図書館（室）などをオンライン蔵書目録等で確認し、所蔵する図書館（室）に連絡の上でご来館ください。**

You plan to order something but you don't know any Japanese. In order to avoid embarrassment you prepare a quick and rough translation of the text. Luckily, you have all the necessary equipment to help you. You scan the text into a computer with Japanese-English MT software, and press the button translate. The following appears[16]:

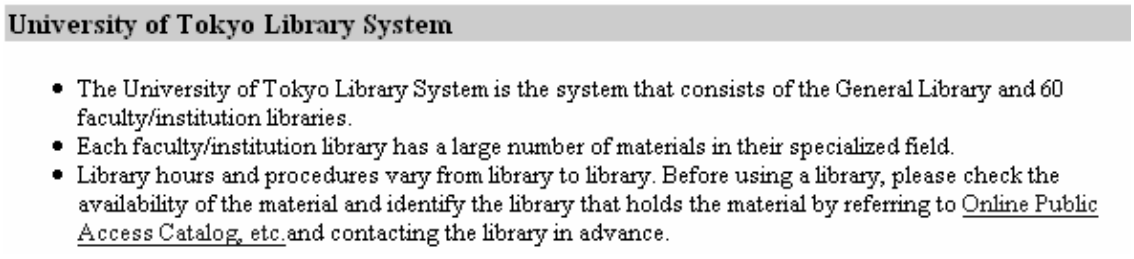
Constitution of the University of Tokyo attachment library

•The University of Tokyo attachment library consists of the general library and the department library of department * subject and the like a little more than of 60 (the room).

•The section bureau library (the room) the data of special field is collected mainly.

•Each library (every room) time and utilization procedure et cetera of utilization differ. Beforehand, presence of possession of the data and the possession library (the room) et cetera you verify in the online library catalog, and the like the library where it possesses (the room) you come in regard to communication, the mansion.

You notice right away that you are not dealing with a menu at all. You are even able to understand that the text has something to do with libraries. If you were interested in the subject, you might have it translated for you by a human translator. He might produce the following text[17]:



University of Tokyo Library System

- The University of Tokyo Library System is the system that consists of the General Library and 60 faculty/institution libraries.
- Each faculty/institution library has a large number of materials in their specialized field.
- Library hours and procedures vary from library to library. Before using a library, please check the availability of the material and identify the library that holds the material by referring to Online Public Access Catalog, etc. and contacting the library in advance.

[15] The text can be found in http://www.lib.u-tokyo.ac.jp/koho/guide/gakugai.html#gakugai

[16] Translated by T-Text in http://www.t-mail.com/t-text.shtml

[17] The text can be found in http://www.lib.u-tokyo.ac.jp/koho/guide/gakugai-e.html

Appendix B. Survey questions

Background information

Personal data

Mother tongue
Nationality
E-mail (optional)

Educational data

What is your educational background? technical, humanities, education, commercial, law, other (specify)
How many years have you studied English?
How many years have you studied Finnish?
How would you rate your English language skills? (5-0) 5 = native, 0 = none
How would you rate your Finnish language skills? (5-0) 5 = native, 0 = none

Company-related data

What is your organisation?
In which country do you work currently?
How many years have you worked in this company?
Do you have subordinates? yes, no
What is the scope of your job? assistance and secretarial, customer relations, documentation, human resources, hw development, information management, legal, management, marketing, project management, research, sw development, testing training, other (specify).

Roughlate

Usage

How often do you use Roughlate? several times a day, every day, every week, every month, less than every month, practically never
How long have you been using Roughlate? longer than 1 year, longer than 6 months, longer than 1 month, longer than 1 week, just started

What kinds of texts do you translate? (5-0: 5 = most often, 0 = never) technical texts, e-mail messages, internal memos, official info (authorities, banks, etc.), other (specify)

What is your purpose in using Roughlate? (5-0: 5 = most often, 0 = never) trying to understand Finnish texts, translation as a basis for an English text I need to write, studying Finnish, studying English, other (specify)

How satisfied are you with Roughlate? (5-0: 5 = very satisfied, 1= not satisfied at all, 0 = cannot rate) user interface, support (e.g. registration), online help and instructions, speed of translation (on-screen mode), speed of translation (e-mail mode), quality of translation, coverage of the vocabulary, usefulness for your purposes

Is there something that you would like to add or modify in the service?

What are the benefits of the Roughlate service when you think about your job?

If Roughlate was not available, your texts would be translated by (5-0: 5 = most likely, 0 = never) a professional translator, a colleague, a secretary, yourself, nobody

Future features

If there were a feature that allows you to translate Finnish web pages into English, how of the would you use it?
What would be the purpose of web translations?
If English to Finnish rough translation were available, how of the would you use it?
What would be the purpose of your English to Finnish rough translations?
Any other comments you may have about the Roughlate service