# 8

# The practical use of MT systems

In this chapter we turn to examining the 'modes of use' of MT, the ways in which computers can be used for translation and the practical environments in which MT systems are and can be used. We include discussion of different types of systems, the kinds of users envisaged, what kinds of hardware facilities are required and provided, and how these factors affect the designs of systems.

There is a common view, represented diagrammatically in Figure 8.1, which places human translation and MT at two ends of a spectrum of translation methods with various kinds of human–machine cooperation between them. At one extreme are wholly computerised systems with no human involved producing translations of a high quality: fully automatic high quality translation (FAHQT). At the other extreme is human translation involving no mechanical aids whatever as it has been practised for centuries. Beween them come **Human-Aided Machine Translation** (HAMT) and **Machine-Aided Human Translation** (MAHT). Both encompass a range of system types and methods: not only are the acronyms and names confusing but it is sometimes difficult to categorise systems as one or the other, hence the term **Computer-Aided Translation** (or 'Computer-Assisted Translation') is often used to cover all types. Essentially, however, MAHT includes the use of (generally) computer-based tools as aids for professional translators, whereas HAMT covers the use of MT systems to produce translations with the assistance of human operators before, during or after the computerised processes.

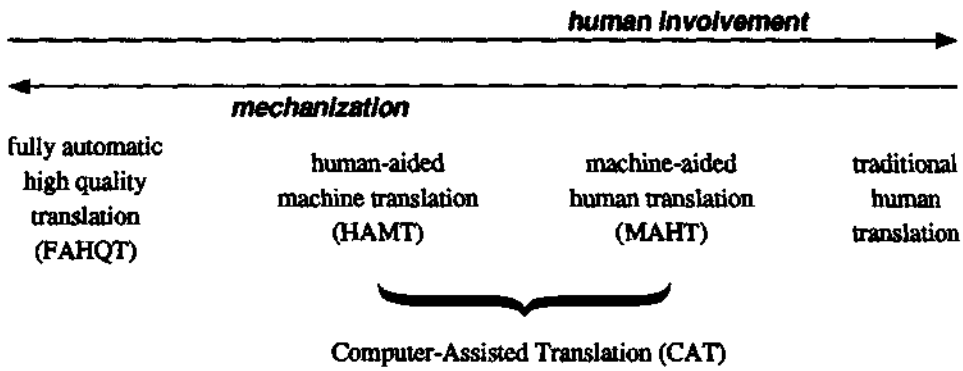


Figure 8.1 Human and machine translation

## 8.1 Fully automatic high quality translation (FAHQT)

The notion of **fully automatic high quality translation** (commonly known by its acronym FAHQT) came into currency in the first period of MT development (section 1.3). The term originated with Yehoshua Bar-Hillel, who consistently argued from 1951 that fully automatic translation of a quality comparable to that of human translators was not merely an unrealistic aim for research but also impossible in principle. His criticisms of contemporary research, particularly in a 1958 report (more widely available in 1960), were interpreted as condemnations of MT activity as a whole, and undoubtedly influenced the later ALPAC report of 1966 (cf. section 1.3). However, Bar-Hillel's main objective was to direct MT efforts to the more realistic aims of 'Human-Aided Machine Translation'.

His arguments against FAHQT were that translation involved certain human abilities which no computer could ever replicate. In particular, he focused on the problem that we now know as 'real world knowledge' (see section 5.2.1), and his example was the now famous lexical ambiguity problem with *pen*: sentence (1) can be understood only if we assume *pen* here to mean 'a child's playpen' rather than 'a writing utensil'.

(1) The box was in the pen.

Even given an appropriate context, it is the knowledge that we have about the relative sizes of typical pens and boxes which allows us to make the correct disambiguation, and hence the correct translation. Bar-Hillel argued that we cannot envisage incorporating this kind of knowledge into an MT system, and that since this kind of knowledge is essential for FAHQT, the aim of FAHQT is itself impossible.

It should be said that more recently both these assertions have come to be questioned. There are claims that real-world knowledge can be incorporated into MT systems and there are certain projects which are attempting to do this, looking for help and support from research in Artificial Intelligence (cf. Chapter 18). On the other hand, there is a school of thought which disputes the claim that 'understanding' of this nature is *a priori* required for translation, whether

by humans or by computers. Nevertheless, there seems to be general agreement about the present impossibility of developing fully automatic systems capable of translating to a high standard without either human assistance at some stage or controls or restrictions on the language of texts. We can have either fully automatic translation or high quality (computer-based) translation, but we cannot have both. As far as Figure 8.1 is concerned, FAHQT at one end is unachievable and human translation at the other end is not a topic of this book; what we discuss in this chapter is the area in between.

## 8.2 Machine-Aided Human Translation (MAHT)

Machine aids have been available to translators for a long time. There can be few translators still using only pen and paper (certainly not most technical translators); typewriters and dictaphones are familiar pieces of equipment. It is computational aids which are changing the ways translators work, threatening (in the opinion of some) the image of translation as more an art, craft or skill than as a technique or job. There is, of course, no reason for fearing that the availability of computer-based aids should make translation any less intellectually and artistically demanding, any more than the availability of dictionaries and typewriters does. The fear stems from a belief (usually held by translators of literary works) that computerisation necessarily implies a loss of humanity.

At the most basic level, the word processor (or word processing program for a microcomputer) may be regarded as a 'machine aid'. But its use can scarcely be called MAHT. At the very least, MAHT must involve a computer-based linguistic aid, such as a program for checking spellings, grammar or style of the translation. The availability of **spelling checkers** depends on the target language; for English, there are very good and efficient spelling checkers available, for other languages the picture varies according to the commercial attractiveness of the particular language. Most spelling checkers are based on very large dictionaries with very fast look-up, but have no linguistic 'intelligence' (e.g. to spot *there* as a misspelling of *their*), though some have quite ingenious algorithms for trying to guess the correct form of a misspelling. **Grammar checkers** and **style checkers** are slightly more sophisticated tools, working typically by pattern matching, although some use parsers of the computational linguistic kind. Grammar checkers look for errors such as the non-agreement of subjects and verbs, word repetition (e.g. *the the*), sentences lacking finite verbs, and so on. Style checkers look for features considered to be stylistically awkward, such as clichés, sentences beginning with conjunctions or ending with prepositions, sentences which are too long or too short, and so forth. Of course, not all translators would find a need for such aids.

Of more direct value is the increasing availability of **on-line reference works** such as dictionaries, thesauri, encyclopaedias and other general sources of information which translators may consult. Laser disks and CD ROMs, holding large amounts of information in convenient form, can now be integrated in word-processing environments and accessible on-line. Particularly attractive are the **on-line bilingual dictionaries** now available commercially.

The integration of the various resources has led to the development of what is generally known as the **translator's workbench** (or translator's workstation). Typically, systems are based on microcomputers (even small personal computers) with split-screen or multi-window facilities: one part of the screen is the work area for the target text, function keys open windows or subdivide the screen for perusal of on-line dictionaries, consultation of other on-line information sources, and perhaps searches of a store of previous translations on similar topics or for the same customers; full integration means that information can easily be transferred from one window to another. Source texts can be input directly at the keyboard or in machine-readable form, received on a diskette, or transmitted via a telecommunications link, or converted from a print copy by an optical character reader (OCR). Facilities are frequently provided for the creation of **text-oriented glossaries**, lists of the words occurring in a particular text (excluding common vocabulary and perhaps other non-technical words on a 'stop list') with suggested equivalents in a target language: the lists may be in alphabetical order or in the order of occurrence in the original, and the equivalents may come from translators' own glossaries or from other (on-line) sources. There is often an alternative option in the form of **automatic term look-up**, the consultation of in-house and external terminological databases for technical and specialised words in a particular text. These workbench facilities can save much effort by translators; it has been estimated that technical translators spend as much as 60% of their time consulting dictionaries and reference works in terminology research.

Usually, translators will use these aids and facilities much as they do printed dictionaries and reference works and enter translations manually, but there are programs being developed which allow lexical substitution semi-automatically and provide a kind of draft translation. Programs for **machine pre-translation** replace source words and phrases which have unique target language equivalents (e.g. terminology which has to be translated consistently) while leaving in the original those words which have many possibilities in the target or which cause particular problems; the latter would include words such as English *use* when translating into French (*usage*, *emploi*, *utilité*, etc.), and all function words (prepositions, conjunctions, pronouns, etc.) and common adjectives and verbs such as *several*, *any*, *make*, *occur*. This sort of pre-translation is in some sense a mechanization of the activity, familiar to translators, of checking through a text for unfamiliar or technical vocabulary for the translation of which some research may have to be done.

## 8.3 Human-Aided Machine Translation (HAMT)

Whereas in MAHT the human translator is in charge, using machine aids or not as required or desired, in HAMT it is the system itself which takes the main responsibility for translation, with human assistance to help in the process when needed. Human involvement may be either during the process, in an 'interactive' mode, or outside the process, in 'pre-editing' or 'post-editing' stages.

The use of the term 'interactive' may be confusing and requires clarification; it refers strictly to human involvement during the actual processes of translation

(analysis, transfer, and generation) when the computer seeks assistance in the interpretation of structures, the resolution of ambiguities and the selection of lexical items. It does not refer to any interaction between users and systems before or after translation processes. In many systems pre-editing and post-editing is done interactively: in the case of pre-editing, the system foresees what problems it is going to have and interacts with the user, for example, by flagging unknown words and asking the user to provide target language equivalents before it starts translating; in the case of post-editing, the system alerts users to places in the text where alternatives have been offered and asks for choices to be made. These may be called examples of **interactive pre-editing** and **interactive post-editing**. Of course, in actual systems there may be borderline cases where it is unclear whether something is 'pre-editing' or 'participating in the translation process', but here we attempt to maintain the distinction for the sake of clearer exposition of the basic concepts.

## 8.3.1 Pre-editing

Typically pre-editing involves checking source texts for forseeable problems for the system and trying to eradicate them. It can include the identification of names (proper nouns), the marking of grammatical categories of homographs, indication of embedded clauses, bracketing of coordinate structures, flagging or substitution of unknown words, etc. In its extreme form, it involves the reformulation of the text using a 'controlled language'.

An example of pre-editing, without restrictions on vocabulary and syntax, is found in the SUSY system (described in Chapter 11). This system has the option of marking source texts with special symbols, e.g. proper names are indicated by an '=' sign (e.g. *Tom=*); paragraph and section headings can be distinguished (by the prefix *$U*), so that the system does not try to analyse them as sentences; a clause without a finite verb can have the prefix *$S*; a sentence with an embedding can be flagged *$SA*, and the beginning and end of embeddings indicated by *$EA* and *$EE*; the disambiguation of homographs can be helped, for example, by marking a following word as a finite verb (*$FIV*); the non-idiomatic use of an apparent idiom can be flagged; and so on. Pre-editing is optional, which means that the system will look out for these 'flags', but will still attempt to produce a translation even if they are not there: pre-editing can improve the overall standard of the translation, but it is not indispensable.

Closely related to pre-editing is the use of **controlled language** in source texts. The approach has been successfully applied with Systran and other systems. It recognises that major obstacles to quality MT output stem from the inability of systems to interpret certain constructions correctly and from the problems caused by homographs and ambiguities. The use of controlled language is aimed at adapting source texts to constructions and vocabulary which the system can deal with. The writers of texts for translation are thus restricted to particular types of constructions and to the use of terminology and even words of common vocabulary in predefined meanings. For example, *replace* can mean two different actions in (2).

(2a) Remove part A and replace it with part B.

(2b) Remove part A, adjust part B and then replace part A.

In (2a) it means 'exchange' and in (2b) 'put back'; a controlled vocabulary would restrict usage to only one of these. Similarly, *switch* can be either a noun or a verb; writers are asked to use it only as a noun and to use for the verb *diverge*, *transpose*, *substitute* as appropriate. Simple and clear unambiguous sentences are the goal. So, for example (3a) might be replaced by (3b).

(3a) Loosen main motor and drive shaft and slide back until touching back plate.

(3b) Loosen the main motor. Loosen the drive shaft. Slide both parts until they touch the back plate.

There is evidence that in technical writing such restrictions actually produces better source (English) texts. Xerox has been using this approach with Systran for over 15 years and has found that the texts that their writers produce are clearer and more understandable. The main advantage, however, is that the output from the MT system needs little or no post-editing. The extra expense involved in producing source texts is easily justifiable when, as in the case of Xerox, translations of technical manuals are needed in a number of different target languages.

The use of controlled language with MT systems must be distinguished from the 'sublanguage' approach to MT (section 8.4 below). In the latter case, the system itself is designed to deal with the vocabulary and typical constructions of a specific subject area and/or document type; but there need not be any restrictions on writers or on the texts input to the system. Controlled language is not limited to a sublanguage, it may range over all the subject areas covered by a particular user; and the MT system itself is not designed to deal only with texts in the controlled forms, it can deal with uncontrolled input (even if less successfully). However, it is certainly possible for the two approaches to be combined; indeed there could be obvious advantages in a system dealing with a controlled sublanguage, and an example is given below.

## 8.3.2 Post-editing

The task of the post-editor is to correct output from the MT system to an agreed standard: minimally in the case of texts wanted only for information purposes, by someone familiar with the subject matter, and thoroughly in the case of texts for widespread publication and distribution (see section 9.7).

In early systems, post-editing was typically done by hand, even with paper and pencil in some cases, but more recently on a word processor. Every error has to be spotted by the editor: there is no help from the system itself. Every lexical and structural change has to be done by retyping. A basic requirement is that the source text is available with the MT output on the same screen, and that one word may be easily substituted by another throughout a text.

With a more sophisticated program it is possible to incorporate function-key facilities for transposing words and phrases. In translating the Spanish (4a), an MT system might generate (4b).

(4a) *En este studio se buscará contestar dos preguntas fundamentales.*

(4b) In this study it will be sought to answer two fundamental questions.

Within the text, the best rendition might be (4c), which retains the same topic-comment structure as the original, but is more natural.

(4c) This study will seek to answer two fundamental questions.

If changes of this kind are common, then it ought to be possible to produce active verb forms from passive forms (and vice versa), and to change a 'prep + X, *it*...' construction to a construction with X as the subject.

Interactive post-editing represents a further advance. The system alerts the editor to sentences or phrases which may be wrongly translated (e.g. contain an ambiguity it could not resolve, or a construction it could not analyse). It provides the option of correcting similar errors automatically throughout the text once the editor has replaced a mistranslation by a corrected form. More sophisticated still are **linguistically intelligent word processors**; these could spot certain structural ambiguities and enable alternative structures to be generated; or automatically change gender agreements in a whole phrase, e.g. if a masculine noun has been changed by the editor into a feminine one, then all the dependent adjectives and determiners would also be changed; or insert appropriate prepositions automatically, e.g. if *discuss* is changed to *talk*, then *about* is inserted before the direct object. However, such systems are still some way in the future at the moment.

## 8.3.3 Interactive MT

The third mode of human assistance occurs in **interactive** systems. The idea of an MT system which halts during translation processes and asks users for help to solve problems of ambiguity and translational equivalents has been current for many years. However, there are still few truly interactive systems available.

A good example is the TransActive™ mode of operation with the ALPSystem (now marketed by the ALPNET company). This is the MT component of a package for translators providing multilingual word processing, access to on-line glossaries, etc., and can operate either interactively or non-interactively. When in interactive mode, as it progresses through the analysis of each sentence in the source text, it asks various types of questions. These questions may have to do with lexical problems, such as disambiguating a homograph, or choosing from a choice of target translations; they may have to do with syntactic ambiguities and ask the user to choose among paraphrases of the alternative readings; and some of the questions may be of a more stylistic nature. (Notice the mixture of questions to do with analysing the source text and with decisions about the target text.) To some extent, the questions that are asked are more or less under the control of users since they build the dictionaries which drive the interactions. If a user puts eight different translations of some word in the dictionary, the system will require a choice from those eight every time that word appears. However, users typically build a series of domain-specific dictionaries and indicate for any particular text which is to be the preferred source of equivalents. In many cases there will therefore be only one equivalent within each specific domain.

The difficulty with this kind of interactive system is that there are often so many interactions for a single sentence that it might have been quicker for the

user to translate from scratch. Furthermore, it is frustrating and irritating to have constant repetitions of the same interactions with the same lexical items. The system has, of course, no memory of similar problems and the earlier responses, nor could it be expected to 'know' (even if it could 'remember') whether a given query would elicit the same response in a different situation. Some probabilistic 'learning' from previous interactions has been claimed for some recent systems (e.g. Tovna), where preference is given to changes which have been made frequently.

### 8.3.4 Interactive systems for monolingual users

It may be noted that the assumption so far is that interaction involves knowledge of both source and target languages, i.e. the user is expected to be a translator. An alternative scenario can be envisaged where the user is monolingual: either knowing only the target language or knowing only the source language. In the former case it is clear that input and analysis must be fully automatic: a user ignorant of Arabic, Chinese or Japanese scripts, for example, cannot be expected to do any pre-editing of texts or provide any help in disambiguation. All that is possible is for assistance in the generation of fluent output, which could be done interactively.

Greater involvement is possible when monolingual users know only the source language and the system takes responsibility for producing the target text. There are two possible scenarios here: either the text has already been written, or it is composed at the time of translation. In the first case the system interacts with some user (who may be the original author) in order to ask questions when it encounters unknown words, ambiguities or structures which it cannot interpret, whether the problems are those of analysis or transfer or generation. For example, if translating from English into German, it may ask whether a particular occurrence of *wall* is referring to an interior or external structure (note that the system must solicit the information without referring to German words or linguistic facts, which will be meaningless to the user).

In the second case, the system interacts with the user in the composition of a source text which it can be sure of translating accurately into the target language. A typical situation is one in which someone wants to communicate a message, write a business letter, or participate in some kind of on-line dialogue. At its simplest (as in a project under development, see section 18.5), a system designed for a specific domain has a set of pre-translated set phrases (like a phrase-book) or of partial sentences with slots into which the user can insert phrases and which the system can translate in the usual way. There are two possible modes in which the system can operate. In a **menu-driven** mode, the system builds texts from series of questions. In the case of a business letter the user could be asked what type of letter it is to be: a complaint, an enquiry, a response to an enquiry, an order, and so on. This choice determines a rough template, the details of which must be filled in: the addressee's name, dates, the items being ordered, etc. for each of which further standard options are available. An alternative **dialogue mode** is where it is the user rather than the system who initiates the procedure, by proposing a draft source text. The system accepts the user's input in the normal way, and then tries to find the best pre-translated set phrase (or phrase template) that matches the

input, and asks questions to ensure the phrase selected corresponds to the user's intentions, or makes suggested changes to the input to make it more like one of its set phrases. This mode is being used in a system which aims to act as an intermediary in an on-line dialogue with another user (perhaps also monolingual), so there are both user–system dialogues when the content of the text is being negotiated, and user–user dialogues, which are the object of the translation.

The quality of the output is assured because the set phrases and partial sentences have been carefully selected, and because there will be no problems with ambiguity as users will know what they want to say. The situation is quite different from the standard MT environment. With no pre-existing source text, the emphasis is on text generation rather than analysis and transfer. Instead of trying to extract meaning from a text, here the system tries to extract meaning from a user. What is important is not the way something is expressed but what 'message' is intended. This system of **interactive composition** in an unknown language or 'MT without a source text' is clearly quite different from conventional MT where everything that needs to be discovered about the meaning has to be found in the words of the text.

## 8.4 Sublanguage systems

Human intervention or assistance is the most normal response to the difficulties of achieving MT output of good quality. The other is to minimise problems by imposing restrictions on the types of texts. One option, already mentioned (section 8.2), is to control the language of source texts. Another is to design systems for a specific well-defined range of texts. At its extreme, systems can be designed to translate just one particular corpus of texts, e.g. aircraft manuals from English into French (as in the TAUM-Aviation project at Montreal University from 1976 to 1981) or abstracts of articles on the textile industry (as in TITUS, see below), or even just one text. More common are systems intended for one particular subject domain where the texts are written in a particular **sublanguage**.

The 'sublanguage' approach to MT originated from work at Montreal on a system designed specifically to translate weather forecasts from English into French (Météo described in Chapter 12). It was recognised that the range of vocabulary and syntactic structures can differ quite significantly from those of the 'standard' language. An example of the 'sublanguage' of meteorological reports is (5a). Other sublanguages are those for stock market reports (5b), and for the law (5c).

(5a) Tomorrow cloudy with periods of light rain becoming heavy towards dawn.

(5b) On Monday the indicator plunged 13·76 points in a sell-off touched off by the news of a sharp boost in oil prices. Mines plunged sharply.

(5c) I the undersigned ... do hereby certify and attest that the document hereunto annexed is a true and faithful account.... In witness whereof I have hereunto set my hand...

In fact, nearly all specialisms have their own jargon, whether it be the language of natural science (*electron, catalyst, ion, protein*), of linguistics (*phoneme, parse, pragmatics*), of wine tasting (*smooth, fruity, bouquet*), or of military affairs (*missile,*

*ballistic*, *magazine*). In many specialisms the terminology has been standardised, including words of the common vocabulary used in special meanings (*field* and *mass* in physics, *tree* and *generate* in formal linguistics, *tank* and *force* in military language). This fact has been recognised since the earliest MT systems by the provision of specialised dictionaries, which users can activiate as needed for translating texts in particular subject domains.

Characteristic grammatical features are rarely specific to one sublanguage, but certain styles are more typical than others. Some have been illustrated already: the omission of definite articles is typical of operating manuals in English (as in (3a) above), whereas in French manuals a typical usage is the infinitive verb form in imperatives (6); the nominal style with passives is typical of much report literature in English but it is not so acceptable in Japanese; and complex noun compounds are common in technical manuals. Other examples are the custom in English for minutes of meetings to be written in the past tense (7a) but in French in the present tense (7b); and for legal documents to contain multiple embeddings, with no punctuation (8).

(6) *Ouvrir le régulateur.*

(7a) The working group's attention was also drawn to the fact that ...

(7b) *L'attention du groupe de travail est également attirée sur le fait que ...*

(8) The requirement that affidavits in opposition to summary judgment motions must recite that the material facts relied upon are true is no mere formality.

Another feature of sublanguages is that some grammatical properties of individual words differ from standard language. For example, the verb *present* in medical language does not require a direct object, so that (9) is acceptable in a doctor's report, but ungrammatical in standard English; and in the language used by airline pilots, *overhead* can function as a preposition (10), which is not normal in everyday English.

(9) The patient presented with a cold.

(10) Our routing tonight takes us overhead Paris.

MT systems can be designed to deal strictly with one particular sublanguage. The advantages are, generally, the availability of clearly defined terminology, the reduction of homography since other subjects are not involved, the concentration on grammatical problems which are frequent and typical in texts of the domain, and the creation of a system for a specific task with identifiable measures of success and acceptability. However, while this may be true in some cases (meteorology and the stock market, described in Chapters 12 and 18 respectively), in some sublanguages the pecularities heighten the difficulties and complexities of analysis rather than reduce them, as in the case of legal language.

There are further difficulties. It is relatively rare to find texts restricted to a specific subject; a medical text may well include chemical and physical terminology and may refer to administrative and economic aspects of medical treatment, etc.; a chemistry text may include mathematical terms and refer to biological systems; and so forth. In addition, systems designed specifically for one particular sublanguage may not be easily extendible to another.

Although restriction to a sublanguage does not necessarily imply the 'control' of the language of input texts (section 8.3.1 above), the two features are often found together. One reason has already been given, namely that actual documents are rarely limited to one sublanguage. Another is that even restriction to a sublanguage does not ensure that all ambiguity has been tackled, hence we find **controlled sublanguage** systems.

An example is the TITUS system designed by the Institut Textile de France (described in more detail in section 18.4) for translating abstracts connected with the textile industry. Abstracts in one of four languages (English, French, German and Spanish) are entered interactively, with the computer asking for help with homographs (e.g. *control* meaning 'command' or 'test') and with ambiguous or 'unacceptable' constructions. Automatic translation into the other languages enables abstractors to check whether the correct analysis has been made.

## 8.5 Use of low quality MT

We have discussed revision of the output (post-editing), preparing the input (pre-editing and controlled language), interacting with users, translators and writers, and limiting the range of systems to sublanguages. There is one further option for the practical utilization of MT systems, namely the use of unrevised output from systems with no constrained or controlled input. Obviously, from what has been said in previous chapters, this 'raw' output is often of a relatively low quality. Nevertheless, there are many circumstances in which this is acceptable.

Experts in scientific fields need access to current documentation in languages they cannot read, e.g. reports on space technology in Russian. The output from an MT system is unlikely to be very good, but for technical readers who know enough about the field, who know what is going on generally in this science, and who can maybe even guess roughly what the article is about, it may well provide sufficient material to get at least some idea of the content of the text. In particular, they should have enough information to say whether they do or do not want this or that paragraph translated 'properly'. It is an economically sound use of low quality MT output, and indeed, for many people with financial and time constraints it is better to have a crude translation than no translation at all. It may not be what the designers of the MT system had in mind, but it is clearly a valued and practical use. Indeed, it has been reported that users of raw MT in the late 1960s came to learn 'Anglo-Russian' and claimed to prefer the raw output because it was more 'accurate' than the results of post-editing.

Such raw MT output may be even more useful to someone knowing the grammatical rudiments of the source language but not enough vocabulary to read texts fluently. For example, someone with expertise in road building and with an elementary knowledge of German could 'understand' a primitive 'translation' such as (11), where most of the terminology has been translated but the rest of the text has been left in the original.

(11) PROBLEM DES WATER-RUN-OFF VON ROAD SURFACE, WIE WIND DIRECTION, UNEVEN UND RUT, CAMBER DER ROAD UND LENGTH DES RUN-OFF PATH, WERDEN DISCUSS. SIEBEN DIFFERENT TYPE VON ROAD SURFACE MIT DIFFERENT

METHOD ZUR MEASUREMENT IHRER SKIDDING RESISTANCE UND ROUGHNESS WERDEN DESCRIBE.

An expert reader should be able to judge from this version of an abstract whether the original full text is likely to be of interest. Such output could also be of value as a 'pre-translation' for a translator, just as a pre-translation (section 8.2. above) could also be used as a very 'raw' translation for an expert with some knowledge of the source language.

Another context in which low quality MT would seem to be useful has been investigated in Japan. A fully automatic bi-directional MT system connected English and Japanese monolingual users in an on-line 'conversation' via a telecommunications satellite linked to computers in Europe and Japan. Although there were many mistranslations, especially due to the colloquial or conversational style of the input, it was nevertheless possible for bilingual conversations to take place, with both partners typing in messages and reading responses in their own languages. There is an obvious saving in time in comparison with writing a letter, having it translated (particularly expensive in the case of English from and into Japanese), and sending it by airmail, etc.

We may conclude with the words of J.C. Sager who remarked in connection with Systran that MT can offer 'a choice to the customer, varying from the cheap and nasty of the dime store to the Tiffany or Cartier of translation' (Sager 1986:166). There is no single mode of use for MT, but a whole gamut of variations, with different qualities, different user profiles, different best-use scenarios, different hardware requirements, and consequently of course, different costs. In this chapter we have seen examples of this variety. In the next chapter we look at how the acceptability, suitability and usability of MT may be evaluated.

## 8.6 Further reading

In general, MT from the users' perspective is well documented in many of the proceedings of the Aslib series of conferences (Snell 1979, Lawson 1982, 1985, Picken 1986, 1988, 1990), and Vasconcellos (1988) consists of numerous articles on various aspects of MT, HAMT and MAHT, mostly from the viewpoint of translators.

Bar-Hillel's report on MT, in which he made the point about 'real world knowledge', was written in 1958, but is most widely available as Bar-Hillel (1960). For a discussion, see Hutchins (1986:153–7).

For a discussion of the necessity for understanding in translation, see Johnson's (1983:35f) brief remarks on the subject with reference to MT, and Tsujii (1986) for a more general discussion.

For a general discussion of machine aids for translators, see Somers and McNaught (1980), Lawson (1985), Magnusson Murray (1988) and Stoll (1988). A survey of commercially available tools suitable for multilingual word-processing (including translation) appeared in *LT/Electric Word* **13** (May/June 1989); see also Becker (1984) and Section I of Vasconcellos (1988). For information on spelling checkers, see (almost) any personal computing magazine. A good example of

a grammar or style checker is IBM's CRITIQUE system (Richardson and Braden-Harder, 1988). Lexical and terminological aids are discussed in Section II of Vasconcellos (1988). Term-banks in particular are discussed in Snell (1983); see also Chapter 3 of Bennett *et al.* (1986).

Proposals for machine pre-translation have been put forward by Bédard (1990).

The idea of the 'translator's work-bench' originated with Erhard Lippmann (1971) and Martin Kay (1980); it has been championed especially by Alan Melby (1982, 1983, 1987) with his 'multi-level translator workstation', and was incorporated in the commercial HAMT system developed by ALPSystems (Tenney, 1985). The idea has also been taken up by researchers in Malaysia (Tong, 1987).

Pre-editing is not widely covered in the literature. The idea of restricted syntax and controlled vocabulary is discussed briefly in Somers (1983:150f), and experiments by Xerox with Systran are reported by Elliston (1979) and Ruffino (1982).

Post-editing is discussed in five articles in Lawson (1982:97–136), in Wagner (1985), Vasconcellos (1987) and by McElhaney and Vasconcellos (1988), these last two articles concerning experiments at the Pan-American Health Organization in Washington DC with PAHO's SPANAM Spanish–English system.

Research on linguistically intelligent word processors has been a focus of interest in recent work by the Grenoble MT research group (Boitet and Gerber 1986, Boitet 1987, Zajac 1988).

The philosophy behind interactive systems is discussed by Johnson and Whitelock (1987). Interactive translation in ALPSystem is described in Bateman (1985) and in Weaver (1988). Another truly interactive system is the METAL system (see Chapter 15).

The scenario involving a monolingual user was first proposed by Kay (1973), and is the basis of the Ntran system (Whitelock *et al.* 1986, Wood and Chandler 1988) and the DLT system (see Chapter 17). Dialogue-based MT is discussed in Boitet (1989b) and Somers *et al.* (1990).

The sublanguage approach was pioneered by Raskin (1974) and is typified by research in Canada (Kittredge 1987, Lehrberger and Bourbeau 1988, Isabelle *et al.* 1988). For a general discussion of sublanguage, see Kittredge and Lehrberger (1982).

The use of 'raw' MT output, or MT output of a lower quality is discussed in Somers and McNaught (1980); the acceptability of raw Systran output for example is confirmed by van Slype (1979) and more recently by Bostad (1986) and Habermann (1986). The example of partial German–English translation is from Canisius (1977:267f). The preference of raw output for its 'accuracy' is reported by Martin Kay (personal communication). The comments of Sager are from Sager (1986:166).

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