

# Resource and Workflow Management Support in Teletranslation

**Klaus Schubert**

**Fachhochschule Flensburg**

**Abstract** Value-added service providers in the technical and business translation market are increasingly organizing themselves into teams whose members work in different locations connected by the Internet or an enterprise-wide intranet. Through this technology it becomes possible to offer a compound service based on the work of translators, revisers, terminologists, a co-ordinator etc., each in a different place. The contribution reports on a project<sup>1</sup> which models the overall workflow from the customer to the service provider and onwards to the professionals involved. It also caters for a variety of automation solutions to be used by the professionals, including terminology databases, translation memories and translator's workbenches as well as machine translation systems. It enables the customer, the service provider and the professionals to manage, share and forward to each other translation-relevant resources such as terminology databases, translation memories and MT parameter sets. The underlying issues of resource and workflow management are discussed.

## 1 Teletranslation and the Internet Revolution

"The Internet has revolutionized professional translation services." Sentences like this are written and read many times when the development and the perspectives of our trade are discussed. One could easily replace *professional translation services* by *the book market* or *banking* or *trade and industry* at large. The Internet has revolutionized many fields of professional activity. Essentially, the Internet is a means of communication, and as such it serves both the book market, the banking business and many other branches of trade and industry. For translation services, however, communication is not only a means, but at the same time it is the essence of the

---

<sup>1</sup> The *Virtueller Übersetzungsdienst* R&D project is carried out at the Fachhochschule Flensburg in cooperation with the International Communications Europe GmbH in Rendsburg, Germany, and with funding from the German Ministry of Education, Science, Research and Technology (BMBF, Project No. aFuE 1702998). The project team consists of Dorothea Kratz and Lisa Link with the author as project leader.

business. For professional translation services, the Internet revolution has not only drastically changed the ways of communicating, but it has turned the trade's content itself upside down.

In a contribution to a previous *Translating and the Computer* conference (Schubert 1997) I analysed the question what is new about the concept of teletranslation. If the term is understood as in Minako O'Hagan's publications (O'Hagan 1994, 1996: 13), it describes a translation service in which the customer and the service provider establish and maintain their contact by means of telecommunications. If this were all that had changed through the Internet revolution, teletranslation would not differ very much from telebanking or electronic commerce. But in translation, communication is not only an instrument, but the content of the work. Therefore, the revolutionary impact of the Internet technology on teletranslation services goes much further. The main conclusion of my 1997 study was that for an activity to count as new it is not sufficient to substitute the Internet for what was done by fax and express mail before – the really novel characteristics of teletranslation are those workflows and those individual activities within workflows which could not have been realized without the Internet technology. With this conclusion and with the focus on workflows, the scope of the question what is new about teletranslation becomes at the same time much wider and considerably more precise.

The Internet revolution is possibly the farthest-reaching and arguably the most visible of the developments the translation trade is undergoing. But it is by no means the only impetus for rapid and continuous change. In recent years, the professional translation service business has seen many developments alongside the coming of the Internet. These include changed requirements on the customers' side:

- Customers very often send source texts as computer files which often travel as e-mail attachments.
- Customers often send complex source documents rather than plain text files. Such documents may contain tables, graphics, photographs, audio and video sequences and computer programs, and it is understood that the translation should look the same as the original.
- A rapidly growing market segment, the software localization industry, requires translated text to be fitted in with program code and translated programs to be tested and validated.
- Quality assurance measures increasingly include linguistic issues such as the enforcement of company-specific terminology or compliance with conventions of linguistic style.
- More and more often customers require adapting translation, i.e. translation work in which the text is not only translated as exactly as possible from one language into another, but where it is at the same time to be adapted to a different audience or a specific regional variety of the target language or where the source text in defective or non-native language is to be translated into high-quality style (cf. Zeumer/Schmidt 1996).

As a consequence of these changed demands, many translation agencies long ago transformed themselves into value-added service providers in computer-aided multimedial business and technical communication. And this is not a mere change of labels. The work these service providers do has become increasingly involved with the technical medium of the

communication, with file formats, lay-out requirements, graphics, hypertext, web sites, on-line documentation, software user interfaces, help text and the like. At the same time, the translation work proper is becoming more and more specialized, so that both translators, revisers and quality assurance managers need very specific knowledge as to the terminology and the technical style of a broad range of domains and the linguistic and cultural conventions of various target countries.

Along with the ever-growing time and cost pressure, these requirements bring about a situation in which service providers are compelled to create a working environment where shifting constellations of in-house staff, external staff, subcontractors and free-lance professionals can co-operate fast and smoothly, making use of all available means of automation and software support. Whilst a good deal of the discussion on translators and the Internet focuses on the communication between the customers and the service provider, I report here on a project which is equally interested in the communication in the backoffice, the *Virtueller Übersetzungsdienst* or *Remote-Access Translation Service* Project. In this sense, the present contribution is concerned with a special variety of computer-supported co-operative work in the professional translation business. In particular, the objectives of the (on-going) project are the design and a prototypical implementation of a software system to support the management of linguistic resources and the routing of tasks through a network of specialized professionals linked by an intranet or the Internet.

## 2 Resource Management for the Medium-Sized Service Provider

Before looking into the backoffice workflows in section 3, I shall give a brief account of the resources which can be involved in various types of translation assignment I discuss the resources against the background of business and technical translation at large, taking into account both human translation with all applicable computer aids and combined workflows with machine translation and all required human activities needed to make a marketable service out of it.

### 2.1 Consistency

A requirement of major importance in business and technical translating is *consistency*. Under this requirement, many other requirements and many indicators of quality can be subsumed.

Consider, for example, the translation of volume 5 of the twenty-volume user handbook for version 3.7 of a complex computer-controlled production line from German into six languages. The translation needs to be consistent with many reference documents. It is to be consistent with the original. It is to be consistent with the translations of version 3.6 of the handbook of the same product, but the previous version has not been translated into each of the six languages, in which case the translation currently at hand should be consistent with the most recent translation made into each target language in question. Further, the translation should be

consistent with the other nineteen volumes to the extent that some version of these has been translated into the relevant language. In addition, of course, the translation should be consistent with the standards and recommendations which are in force in each of the possible target countries. Similarly, the translation should be consistent with the customer's corporate standards or style conventions. And finally, not to be forgotten, the translation should be consistent with the quality standards of a first-rate professional translation.

In this context, the concept of consistency covers a variety of characteristics. I shall first discuss various kinds of linguistic consistency. Consistency at the level of terms means that each source language term, be it a single word or a multi-word unit, is always translated into a given target language in the same way. This type of consistency can be supported by providing the translators with a glossary list or, preferably, a terminology database with the prescribed terms and their target language equivalents. Consistency at the level of sentence structures, collocations and phrases may to some extent be achieved by providing a translation memory.

## 2.2 Translator's Workbench Systems

Terminology databases and translation memories are the two major types of primary linguistic resource which can be used to support consistency in professional translation work carried out by human translators. Along with a word processing function, they are the basic elements of functionality of translator's workbench systems.<sup>2</sup> Roughly speaking, they cater for consistency at the level of terms (words or multi-word units) and at the level of sentences. In order to assess the kind and the degree of consistency which can be supported by means of translator's workbench systems it is worthwhile considering the capabilities and limitations of these systems from a theoretical point of view.

As far as the linguistic capacity and quality of translator's workbenches is concerned, it is interesting to note that they do address some types of consistency-relevant translation unit and do not address some other types. They do include words, multi-word units and sentences.<sup>3</sup> They do not include units of syntactically linked non-adjacent words. The latter type of unit is important from a translational point of view because it contains much of the functional collocations which make up the technical language and thereby the style of business or technical documents. Especially the collocations of verbs and prepositions, verbs and their object nouns, verbs, prepositions and nouns, and the like play a central role in determining the technicality of a text, but the words on which this linguistic property hinges do not appear as uninterrupted strings of

---

2 I do not discuss individual products, since I trust that the latest news in this field will be amply demonstrated for the participants of this conference and fully documented for the readers of these proceedings by all major manufacturers. Published presentations by manufacturers' representatives are found for example in Hoppe (1998), Kauere (1998).

3 The documentation of these systems often speaks of "translation units", acknowledging the fact that headlines, list elements, captions etc. may be identifiable units of text without being sentence-formed. Additionally some systems offer the option of choosing the paragraph as a unit of translation. I leave this option undiscussed, since it occurs to be essentially the same as handling a number of sentences simultaneously.

words. Obviously these collocations are part of the sentences in which they occur, but two sentences with the same collocation will not match in a translator's workbench system, unless the entire rest of the sentence is identical or reasonably similar.

This is a feature most translator's workbench systems share. The reason why this linguistically powerful instrument of syntactic and style consistency is not made use of lies in the fact that identifying non-adjacent words as syntactically dependent requires a full-fledged parsing mechanism, while the matching techniques used for words, units of adjacent words and sentences can be based on unparsed or superficially parsed strings. String matching is much simpler to achieve than full parsing, and due to the vagueness and shiftiness of the semantics of human language to date no parsing algorithm for any language is known which would function automatically without human help or correction. Using a full parsing algorithm would therefore require a linguistically and grammatically skilled professional to resolve ambiguities encountered by the system or to answer the system's questions. This type of interactive natural-language processing, which was in vogue in the 1980s, no longer has many followers among the designers of translation tools.

So far, I have discussed only the linguistic aspects of consistency, which are the most intricate problems encountered in business and technical translation work. But of course consistency has a very important technical side as well. At this level, translator's workbench systems perform much better than at the linguistic level. They provide quite efficient software support for translating units of text encapsulated in tables, captions, headers, footers, footnotes and for preserving the lay-out of documents in a variety of formats for printers, document viewers and web browsers. The translator's workbench systems extract and re-insert captions of graphics and photos and perform many similar tasks which are time-consuming if carried out manually.

Software localization tools have much in common with the technical format-preserving functionality of translator's workbench systems, while for the linguistic functionality they can be linked to or incorporate a translation memory.<sup>4</sup>

In sum, the main resources for consistent business or technical translation are terminology databases and translation memories which can be combined in translator's workbench systems. In section 3 I shall look more closely into how these resources can be incorporated into workflows.

## 2.3 Machine Translation

There may still be customers who dream of fast and cheap layman-operated fully automatic high-quality translation of unrestricted texts. Translators and computational linguists know that this is an impossible dream. However, it is an acknowledged fact that there are domains in which machine translation can contribute to professional translation services in a worthwhile way. If the condition of "fast and cheap" machine translation is left aside, the impossible dream contains

---

4 Software localization tools lie outside the scope of the *Virtueller Übersetzungsdienst* project. Cf. Esselink (1998), Pajatsch (1998).

four conditions: (1) layman-operated machine translation, (2) fully automatic translation, (3) high quality and (4) unrestricted text. Machine translation can be efficiently used in settings where some of these conditions can be slackened. I shall look at the four conditions in turn.

Condition (1) cannot be met in any case. Machine translation systems need skilled operators, in particular for maintaining the system resources. Essentially, the need for skilled personnel is not surprising at all. But a glance at the machine translation market shows that many of the manufacturers are gearing their systems more and more towards the lay market.<sup>5</sup> As a consequence, the market segments of professional translation services and machine translation may part completely in the years to come. If this striving after the lay market is pursued, this may lead machine translation into a fundamental contradiction which can prove fatal. To understand where the fatal danger lies, it is useful to consider for what kind of activities professionals and laypersons apply automation. Laypersons resort to automation for carrying out activities they are not skilled to carry out themselves. As a consequence, they have to rely on the results and cannot judge or correct them. Professionals use automation for activities they could do themselves but which are done by software systems faster or cheaper or more consistently or the like. The professional users can judge and correct the results of automated work, either by extending and adapting the system dictionaries or by post-editing the raw translation. Machine translation systems need this kind of human correction. They cannot deliver high-quality translations for immediate use in uncorrected form. They are tools for the hands of professionals, who can increase their productivity in workflows combining human and machine activities. The fatal contradiction lies in a machine translation market going in the direction of those users who cannot make proper use of the systems.<sup>6</sup>

The present analysis is concerned with professional translation services. It may therefore seem less relevant what lay users can or cannot achieve with machine translation systems. But since the *Virtueller Übersetzungsdienst* project reported on here addresses automation in professional translation services against the background of small or medium-sized companies (cf. section 4), it would be desirable to be able to work with the cheaper PC-based machine translation systems. The conclusion from the above analysis, however, is that not only the systems perform badly in lay hands, but that some of the available systems fail to provide the functionality needed for more skilled hands.

From the four conditions mentioned above, condition (2), fully automatic translation, can easily be slackened in a professional setting. When machine translation systems are used in combined workflows where professionals improve the translation quality by means of dictionary work, pre-editing and post-editing, machine translation can become a useful tool.

---

5 This can best be seen in those PC products which have been derived from functionally more powerful workstation-based systems such as Lernout & Hauspie's T1 (marketed by Langenscheidt) derived from Siemens's Metal system or IBM's Personal Translator (marketed by von Rheinbaben & Busch) derived from IBM's LMT system.

6 This entire paragraph is based on a more detailed analysis in Schubert (forthc.).

Condition (3), high quality, may be slackened in some settings. For some customers a raw translation quality is acceptable for informative purposes, and in such a setting a fully automatic (and thus very fast) translation service can be an interesting offer.

Condition (4), unrestricted source texts, can be slackened for all customers who need translations of texts of a strictly technical character, a monotonous, repetitive style and a limited vocabulary which come in large volumes on a regular basis. However, it does not go without saying that the restrictions in vocabulary and stylistic variation which are constitutive to the technical text type suffice to make the combination of machine translation and human work more efficient than human translation with translation tools. Therefore, in each larger translation project with texts of a restricted technical character it is important to assess in advance whether the benefits are likely to outweigh the efforts. If this is not the case, one way out leads into human computer-aided translation and another one leads into restricting the text even more, that is, introducing controlled language.

The resources needed for translation services based on machine translation are one or more machine translation systems. These systems include dictionaries which are similar but not identical to terminology databases for human users. Some machine translation systems contain a translation memory as well.

With a view to the resource management task addressed here, another rather specific piece of data turns out to *be a* resource in its own right. That is the parameter settings for the machine translation system. When starting a translation job, a machine translation operator normally has to choose, depending on the particulars of the system, from a variety of parameters such as source and target languages, subject fields, style levels, skip marks for strings not to be translated and individual language pair-specific settings such as the choice of terms of address and the like. When translation jobs travel through a network, it is useful in some scenarios to let the parameter settings accompany the text.

When designing workflows in which the resources are used, it is necessary to take into account the various places where the resources can be physically held and the places from where they are accessed. With the resources discussed above, the following settings can be distinguished:

- A proprietary terminology database held by the customer
  - o with a task-specific extract to be uploaded from the customer to the service provider and onwards to the translator and the reviser or
  - o opened by the customer for on-line viewing by the translator and the reviser.
- A terminology database held by the service provider
  - o as a general dictionary for all translation tasks or
  - o as a general dictionary with specific sets of terms labelled as being preferred or prescribed terminology for the task at hand (or all tasks from the current customer) and
  - o with a task-specific extract to be uploaded from the service provider to the translator and the reviser or
  - o opened by the service provider for on-line viewing by the translator and the reviser.

- A proprietary machine translation dictionary held by the customer
  - with a task-specific extract to be uploaded from the customer to the service provider.
- A machine translation dictionary held by the service provider
  - as a general dictionary for all machine translation jobs or
  - as a general dictionary with specific sets of terms labelled as being preferred or prescribed terminology for the job at hand (or all jobs from the current customer).
- A proprietary translation memory held by the customer
  - with a task-specific extract to be uploaded from the customer to the service provider and onwards to the translator and the reviser or
  - opened by the customer for on-line viewing by the translator and the reviser or
  - with a task-specific extract to be uploaded from the customer to the service provider and used by the machine translation system.
- A translation memory held by the service provider
  - as a general memory for all translation tasks or
  - as a general dictionary with specific sets of translation units labelled as being applicable to the task at hand (or all tasks from the current customer) and
  - with a task-specific extract to be uploaded from the service provider to the translator and the reviser or
  - opened by the service provider for on-line viewing by the translator and the reviser or
  - to be used by the machine translation system.
- A machine translation parameter set
  - to be uploaded from the customer to the service provider as a data file and executed by the machine translation system or
  - to be transmitted from the customer to the service provider by e-mail, fax or phone and to be manually set at the user interface of the machine translation system by the operator.

This enumeration of options and combinations may seem puzzling at first sight, but it is not complete. A variety of other options are conceivable. For instance, terminology data held in a database for human users may be converted into a machine translation dictionary. Normally such a conversion (or succession of export and import steps) yields only a partially filled-in dictionary for the machine translation system, due to the technicalities of each individual system and due to the fundamental difference in requirements for translators and machine translation systems.<sup>7</sup>

---

<sup>7</sup> An R&D project studying this problem was carried out between 1995 and 1997 at Fachhochschule Flensburg under my supervision and with funding from the German Ministry of Education, Science, Research and Technology (BMBF). Cf. Lass (1996, forthc.), Borkowski/Lass/Schubert (forthc.).



### 3 Workflow Management in the BackOffice

A service provider who wishes to offer a comprehensive range of professional translation services needs to make use of all the resources mentioned in section 2. To do so, it is necessary to draw up workflows which link the demand, the means and the people. The workflow designs should identify the requirements of the various kinds of translation tasks customers are likely to issue, define a sequence of activities to be carried out for each task, the professionals who will do so and the tools they will use.

#### 3.1 Activities and Roles

The workflows designed in such a way, as it were, by following a translation task through the organization, comprise the primary activities in a translation service centre. Along with the primary, time-critical, activities, however, a number of secondary activities needs to be carried out, some of which are time-critical for a given translation task and some of which are not. Secondary activities are among others those needed to maintain the resources:

- Terminology work
- Terminology database maintenance
- Machine translation dictionary maintenance
- Translation memory maintenance

The primary and secondary activities are carried out by professionals in seven or eight different roles<sup>8</sup> (cf. Schubert 1997: 21-22):

- The customer
- The translation agent
- The translator
- The reviser
- The machine translation operator
- The reviser/post-editor
- The dictionary coder
- The translation memory maintainer

The combination of roles and resources yields a variety of workflow scenarios. In a previous study (Schubert 1997), I have sketched thirteen such workflows, the last of which sums

---

8 I speak of *roles* rather than *persons* or *professionals* to emphasize that especially in the setting of a small or medium-sized translation agency a single person may well play several of these roles. But since the roles may be distributed differently for the next assignment, they are kept separated throughout the design of the system.

up all other workflows together. Figure 1, which is taken from Schubert (1997: 19), shows the combined picture. (The figure shows documentation as a separate resource which is not discussed here.)

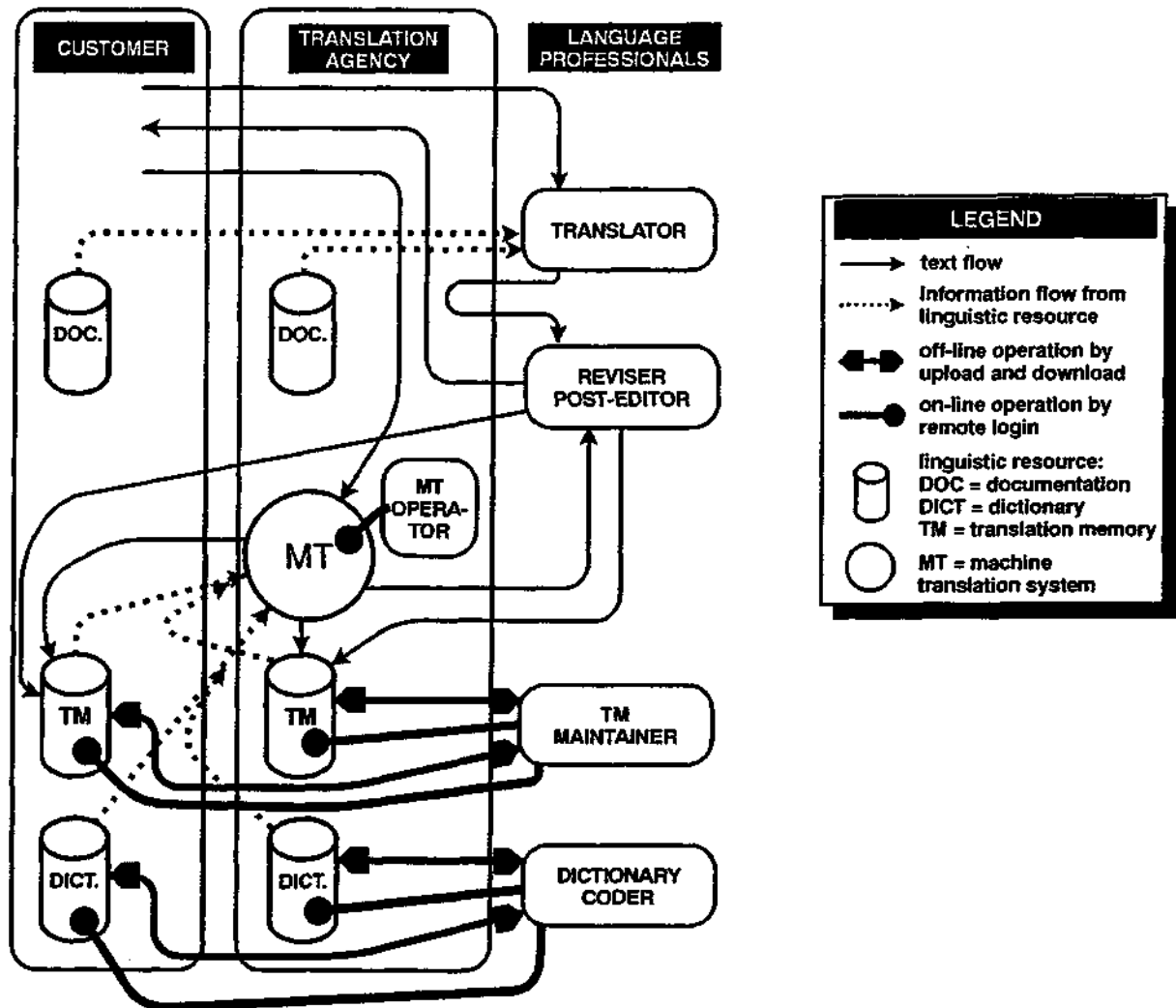


Fig. 1: Workflows and network links between a customer, a service provider and the professionals.

### 3.2 Accommodating Workflows in a Software Environment

The *Virtueller Übersetzungsdienst* project is not the first to conceive of a computer-supported environment for teletranslation services. Large enterprises and public bodies from both the manufacturer and the user side of the language industries have teamed up on a number of ventures and projects in this field which by far outdo the present project in manpower and funding. But large organizations tend to behave like large organizations - and some of the

solutions they find are at times less easily transferable into the world of the small and medium-sized companies which are so numerous in this business.

This project is aimed at modelling the setting of small service providers in the sector, and as such it addresses a specific objective. A specific condition which smaller companies share is that they normally can only use translation tools (and more general software tools) which are sold as program packages off the shelf. Any source code programming is normally out of their range. The resource and workflow management system being designed in this project is therefore the only component of the overall environment which is to be purpose-made. All translation tools, communication systems etc. involved are off-the-shelf products which are used with a user's license. In this sense the project is a test case for the open-systems philosophy.

For the purposes of the resource management aimed at here, the criterion for choosing a translator's workbench system may thus be how simple it is to identify, copy and send by e-mail a specific translation memory and how large the data files in question are. Similarly, the choice of a machine translation system may depend on such a never-thought-of feature as whether the parameter setting for a specific translation job can be isolated in a user-accessible file and whether a translation process can be started off by automatically placing a parameter and a text file in a certain directory. For a secondary activity, such as the maintenance of machine translation dictionaries by remote teleworking specialists, a decisive criterion could lie in the question whether complete dictionary entries can be written in an uploadable or importable data format which is easy to convey by e-mail.

## **4 Resource and Workflow Management - Product, Toolkit or Self-Help?**

The above sections outline the conditions and parameters for the design of a resource and workflow management support system. The system is aimed at small and medium-sized service providers in the professional translation business. With a view to this target sector, there is a certain emphasis on a solution which can be realized with off-the-shelf translation tools without any source code programming. For this type of professional use, tools with a sufficiently open architecture prove to be preferable, while systems set up in a more opaque way seem to be better suited for stand-alone use as is especially common with lay users.

Is this a viable approach? Are these limitations specific to the described research and development project only or are they typical for the settings in which workflows with a variety of professionals and a number of linguistic resources need to be managed? Looking at this question from a different angle, one could also ask what perspective will the project be able to offer when and if it is successfully accomplished? Should the developed software environment be professionally engineered and turned into a product? Or will the final outcome rather be a manual about how to automate one's own workflows in a small translation company?

The answer depends on a variety of factors. The software environment is to link up a variety of tools and systems from a quite diverse range of manufacturers. Which tools from which manufacturers are chosen is a question which cannot be definitively decided by the designer of the workflow management environment, because it is determined by the individual needs of the service provider. It depends on language pairs, characters sets, available and affordable resources, software and hardware platforms, and many other factors. The workflow management environment thus cannot reasonably accommodate only a predefined set of selected tools, but individual service providers need to be able to make up their own blend of tools according to their and their customers' requirements. If the workflow management environment is to be a product, it would therefore have to rely heavily on data format, interface and exchange format standards for linguistic resource data – and despite many applaudable efforts, these standards do not seem to be within easy reach.

There is another tendency which may complicate the problem enormously in the years to come. This conference is focused on automation in the *translating* business. However, there are neighbouring trades which work with the same documents as the translators, making use of software environments and tools some of which are shared with the translators and some of which are specific to their work. These are the technical writers and editors, the documentation engineers, the information managers and a number of other, new and not yet too precisely defined professions. A double tendency can be observed in this respect, which will have to have its reflexes in the automation solutions of the years to come. On the one hand, there is an integrating tendency, the distinctions between the professions of translators, technical writers, documentation engineers, information managers etc., are becoming increasingly blurred and the professional profiles overlapping more and more. On the other hand, within this common realm of multilingual business and technical communication, jobs and task profiles diversify. Technical writers engage in writing, updating and maintaining documentation in several languages in parallel, which takes them quite far afield from the classical profile of a monolingual text producer. Professional translators become more and more involved in handling the technical medium of the source and target documents, in an especially obvious way in the software localization business. And once one has embarked on managing resources and workflows in the translation business with tailor-made software environments, one will easily encounter the need to link up to the workflows preceding and following the translation work proper, ending up in full-fledged multilingual information management.

Modelling workflows in our shifting trade is a demanding task. The challenge which lies in this task mirrors a dynamic and developing field of computer-supported co-operative work for highly skilled professionals in the sphere of multilingual business and technical communication.

## References

- Borkowski, Inge; Jan Lass, Klaus Schubert (forthc.): "Multifunktionale sprachtechnologische Ressourcen." R. Walczak (ed.): *Forschungsbericht 1997/99*. Flensburg: Fachhochschule Flensburg
- Esselink, Bert (1998): *A Practiced Guide to Software Localization*. Amsterdam/Philadelphia: Benjamins
- Gerhardt, Stefan (1998): "Software-Lokalisierung." Mary Snell-Hornby, Hans G. Honig, Paul Kußmaul, Peter A. Schmitt (eds.): *Handbuch Translation*. Tübingen: Stauffenburg, 213-217
- Hoppe, Birgit (1998): "Multilinguale Übersetzung als Teamaufgabe: die professionelle Lösung mit TRANSIT 2.7 für Windows." Elisabeth Gräfe (ed.): *Herbsttagung 1998 in München*. Stuttgart: tekomp, 236-238
- Kauere, Ute (1998): "Mit TRADOS immer eine Übersetzung voraus!" Elisabeth Gräfe (ed.): *Herbsttagung 1998 in München*. Stuttgart: tekomp, 251-253
- Lass, Jan (1996): "Terminologiedatenbank für Mensch und Maschine." R. Walczak (ed.): *Forschungsbericht 1995/96*. Flensburg: Fachhochschule Flensburg, 81-88
- Lass, Jan (forthc.): "Terminologiedatenbank T42. Die Äquivalenzbeziehung im Zentrum eines hierarchisch strukturierten multifunktionalen Terminologieverwaltungssystems." [Jahrestagung der Gesellschaft für linguistische Datenverarbeitung, Leipzig 1997; forthcoming in the conference proceedings]
- O'Hagan, Minako (1994): "Translating in Cyberspace: The Coming Industry of Teletranslation." *Translating and the Computer 16*. London: Aslib, 89-98
- O'Hagan, Minako (1996): *The Coming Industry of Teletranslation*. Clevedon/Philadelphia/Adelaide: Multilingual Matters
- Pajatsch, Hans-Joachim (1998): "Effiziente Software-Lokalisierung und Übersetzung mit Corel CATALYST." Elisabeth Gräfe (ed.): *Herbsttagung 1998 in München*. Stuttgart: tekomp, 226-229
- Schubert, Klaus (1997): "Remote-Access Translation Services: Software Design with the User in Focus." *Translating and the Computer 19*. London: Aslib
- Schubert, Klaus (forthc.): "Zur Automatisierbarkeit des Übersetzens." Alberto Gil et al. (eds.): *Modelle der Translation*. Bern etc.: Lang
- Zeumer, Jutta; Runa Schmidt (1996): "Die Verantwortung des Übersetzers im Europa neuer Grenzen." Heidemarie Salevsky (ed.): *Dolmetscher- und Übersetzerausbildung gestern, heute und morgen*. Frankfurt am Main etc.: Lang, 45-56

## Author

Klaus Schubert is professor of computational linguistics and technical translation.

Address: Studiengang Technikübersetzen, Fachhochschule Flensburg, Kanzleistraße 91-93,  
D-24943 Flensburg, Germany. E-mail: <schubert@fh-flensburg.de>