Machine Translation Trends in Europe and Japan.

Sophia Ananiadou [1]
Department of Computing & Mathematics
Manchester Metropolitan University
S.Ananiadou@doc.mmu.ac.uk

Abstract

In this paper, we examine current trends in MT in Europe and in Japan. Our comparison is based on types of user profiles, issues of standardisation and localisation, role of MT providers and use of translation aids.

Introduction

In this paper, we examine current trends in machine translation (MT) in Europe and in Japan. The market for MT systems has changed drastically in the past few years in both regions. The main reasons for this change have been: the urgent demand for keeping abreast with business needs; the voracious appetite of information systems (IS) which process increasingly vast amounts of documentation in a multilingual environment; and the unabated growth of the WWW. In order to compare trends and foresee future developments, we have concentrated on the following aspects:

I. What types of MT users are there in Japan and in Europe?
II. What types of user are being targetted by MT providers?
III. How do attitudes to issues of localisation and standardisation compare?
IV. How advanced are the translator's aids, i.e. multilingual dictionaries, terminology management systems, translation memories, alignment tools.

All four standpoints are interdependent. On the one hand, the predominance of a specific type of user will force the market to cater for their needs. Ultimately, this will affect the types of aids and tools provided for translation. On the other hand, new research developments, such as use of corpus based techniques, example-based MT, statistical techniques and measures, e.g. similarity measures for word sense disambiguation, will eventually be used by MT systems. ATR Interpreting Telecommunications Research Laboratories in Japan has recently developed a prototype spoken language system called Chat Translation[2] which is capable of two-way translation between Japanese, English, Korean and German using just such research developments (Mima et al. 1997).

1. Types of user profile

Translation has changed image as the amount of text to be translated has increased and the number and range of people involved with translation have grown. More people want to have fast access to the main contents of documents without

---

necessarily aiming at stylistic or indeed linguistic accuracy. Users of MT systems range from large organisations to casual, novice users.

Translation varies depending on the quantity of translated text and the type of translation work, the intended use of the translated text, the text type and related terminology, the languages involved, and so on.

Products can be customised for different types of organisations, e.g. a MT system can be intended for a translation company, to be used there by a professional translator, with experience of MT products. The type of MT required or the type of customisation required is further dependent on the answers to such questions as: What is the nature of a company's international activity? Is it concerned with using MT for localisation, for export, etc.? What is the business of the company? Is it concerned only with domestic markets, a public organisation or an international or multinational organisation?

All these factors are important when we examine types of user profiles and how these affect the expected demand for translation quality. Different levels of translation quality range from raw translation to high quality translation or even adaptation of the original text (product localisation).

Surveys of Japanese MT products (ASCII, 1996; AAMT, January 1997) show the predominance of raw translation where the central meaning of the original text is conveyed. In the Japanese market, users use MT predominantly to get outline information from English sources for quick reference purposes.

1.1 Differences between users of MT in Japan and in Europe

In Japan, MT has been the language processing technology with the highest profile since the early 80s (promoted by the Mu project (Nagao et al., 1985) in collaboration with major IT companies). Several of Japan's largest industrial companies have developed MT systems and market them commercially. In the past, in Japan, MT systems were designed for professional translators or professional post-editors in large organisations. Other users included public service organisations such as JICST, the Japan Information Center for Science and Technology. The driving force behind the introduction of MT systems in Japan was cost reduction. However, as the cost of human post editors escalated, MT users reported varying degrees of success. On average, overall productivity gains were observed, although greater success was reported for MT in restricted domains.

Recently, however, MT has changed drastically in Japan. Today, a different type of MT system is popular in the Japanese market: MT enabled WWW browsers which target the novice/casual user. Recent studies of the Japanese market (AAMT, 1997; ASCI 1,1996) conclude that users engaged in web-browsing employ MT systems as they are looking for speedy access to roughly translated information through user friendly interfaces, whereas high quality translation is the object of a different type of MT (and user).

Japanese Internet-oriented MT systems are typically bilingual (and largely English-Japanese), PC-based and low in price — the lowest price is around ¥6,000 (roughly 26 pounds) according to AAMT (1997). Some studies report that the needs for MT in Japan are as high as the needs for word processing.

Overall, there is more commercial commitment to MT in Japan than in Europe, given the early interest expressed by private companies. Nevertheless, Europe has made significant advances. A Japan Electronic Industry Development Association (JEIDA) questionnaire on the use of MT-enabled Web browsers revealed that the main reason for using them is information gathering (90%) rather than dissemination. (http://www.jeida.or.jp/committee/textsyori/sec-0.html).

In Europe, MT is used much more for dissemination than information gathering. A high percentage of MT products target the casual user in Japan, whereas in Europe they target companies, organisations and translators (Equipe, 1996).

There are many MT products on the Japanese market compared to Europe, some promising 'high quality' translation results. As ever, though, one has to be realistic in terms of what to expect from most MT products. There are to our knowledge no easily accessible in-depth evaluations of available products. However, a few computer magazines have published evaluations of these systems. Mostly, such evaluations are informal, e.g. there is no specification of exact parameters of comparison between systems. Nevertheless, there is agreement among evaluators that one should not expect full translations (especially for languages as diverse in linguistic structure and culture as Japanese and English). Reviews such as that by Myers (1996) of 4 Japanese-to-English Microsoft Windows based translation packages reveal the limitations of commercial Internet MT systems. These include some necessary amount of pre-editing of the original Japanese text to e.g. shorten or simplify sentences. This often extensive pre-editing is a time consuming prerequisite of most such systems.

The European Commission has a keen interest in assessing the conditions under which MT is used in-house. MT is freely available to all in-house Commission translators and other administrators via the EC intranet. As Senez (1997) reports, translator users see benefits such as speed and terminology assistance, and see MT as a worthwhile tool but with limitations (heavy post-editing required). A different EC user group, administrators, use MT for scanning in languages unknown to them, and since they do not aim at high quality translation, they find MT is a very valuable tool, saving them time, with an acceptable quality of output.

From a wider European perspective, in 1996, Equipe conducted a survey of MT products and services. In their findings, they observe that users come mostly from organisations, i.e. telecommunications companies, government organisations, etc. They are mostly professional translators, having an average experience of using MT of 2.4 years, rather than casual users. As the majority of the work is being carried out on technical material, terminology dictionaries and terminology handling tools are very important. Most users employ the terminology packages provided with their MT product, others rely on other technical dictionaries. The annual volume of MT output per organisation is quite small, ranging from 300 pages to a high of 30,000 pages. It was rather difficult to measure the translation throughput, the raw MT turnaround, or post-edited turnaround time between users and to compare this situation with that of casual users. Most users reported that they were happy with the interface, the helpsystem and the documentation provided with their system (Equipe, 1996).

2. Attitudes to localisation and standardisation

2.1. Localisation

MT is closely related with the issue of localisation. Product localisation demands high quality translation which takes into account not only the linguistic but also the cultural aspects of the country concerned. This could not be more true with respect to Japan. In Japan, the actual use of MT for localisation is still quite limited, although many MT developers are well aware of its potential benefits. Much work has been carried out on the localisation of software from elsewhere to suit the Japanese market but not on the process of how Japanese software will become global, despite strong demand for this. One reason for this slow adaptation lies in the complex Japanese writing system (a mixture of 2,000 Kanji characters and the phonetic Kana) but the most important one lies in the linguistic and cultural complexities related with Japanese to English translation. As the human resources available to undertake this job are scarce, MT systems geared for the localisation of Japanese software products not only into English but into other languages are much needed.

European interest and investment in localisation on the other hand is impressive. Ireland is the world centre for software localisation involving publishers, software companies (Lotus, Oracle, Microsoft), and translation service providers (Berlitz, Mendez) .The Localisation Resources Centre and the Software Localisation Interest Group (SLIG) in Ireland bring together interest groups from industry, translator associations and research institutes. Lisa (the Localisation Industry Standards Association) recently organised a forum in Japan to address the issue of localisation of Japanese products.

2.1 Standardisation

In Japan, more than 20 companies are engaged in developing their own MT products (whether MT-enabled web products or more traditional varieties), which are delivered with basic resources: users typically have to build their own dictionaries. Moreover, in order to use systems effectively, users must rely heavily on pre-editing. Systems cannot re-use the results of pre-editing and the process itself really requires experienced users. Post-editing of the output is considered too time-consuming for it to be widely supported. In the search to improve the quality of translation results, interest has focussed on the sharing of user dictionaries through use of common formats.

A group of MT companies (NEC, Toshiba, Nova, Sharp, Fujitsu, Matsushita) is working with the Asian Association for MT (AAMT) to design standard formats for sharing and exchanging user dictionaries among different MT systems. This initiative is supported by the Information Technology Promotion Agency (IPA) of Japan. Their Universal Platform (UPF) aims at providing a common format for user dictionaries and making available to the public the electronic environment for the sharing of dictionaries (Kamei et al. 1997).

In Europe, projects like OTELO aim to integrate existing translation resources.
        (http://www2.echo.lu/langeng/en/le1/otelo/otelo.html)

One of the objectives is to allow users to combine local and remote translation products such as MT systems and translation memories (TMs). Another is to define standardised common lexical resources and text-handling formats. There is much awareness of the benefits for defining an interchange format for groupware support. Such concerns rely fundamentally on standardisation and localisation.

We note however that, in contrast to Japan, standardisation efforts in the language engineering field are not new in Europe, especially in the field of lexical resources, where there have been several initiatives and projects whose genesis can be traced back to 1986. We refer especially to past and ongoing efforts of the EAGLES group to provide guidelines for the standardisation of lexical encoding. EAGLES (Expert Advisory Group on Language Engineering Standards) has at any one time about 200 people from across the European Union working, largely voluntarily, on a set of topics that are widely agreed to be ripe for de facto standardisation, including corpus annotation, evaluation of language engineering products, resources for speech processing and lexical resources, to name but a few areas.

Recommendations and guidelines developed by EAGLES are widely disseminated (http://www.ilc.pi.cnr.it/EAGLES/home.html) and feedback incorporated from the user and developer community. Regarding lexical resources, EAGLES addresses the problem of finding a protocol which will help to normalise and structure the information needed for the creation of reusable lexical resources. The aim is to improve the performance of MT and other document management applications such as information retrieval, information extraction and summarisation. Our own experience in EAGLES has been most positive, especially as EAGLES recognises that standardisation relies ultimately on sustained commitment from industry and has been very successful in driving standardisation via a strong industry-academia partnership. We conclude that Europe has then taken the lead in pushing towards standardisation in the language engineering area, but that in Japan the ongoing efforts are promising (it is noticeable, by the way, that US efforts in this area are some way behind both Europe and Japan).

3. Changing role of MT providers

In Japan, it has largely been the MT developers who have guided trends inMT. User involvement in the development of MT is still scarce. As a result, potentially useful technologies, such as translation memories, alignment tools,etc., have not been fully exploited for the user's benefit. In Europe, in contrast, there is more awareness of the user's role in the development of MT. This can be traced in large part to the role of the EC, where the focus of EC investment in language engineering has become increasingly user centred. User requirements are reflected by the need for up-to-date technology, tools and MT services. MT suppliers thus necessarily become ever more closely engaged in taking into consideration user requirements. Moreover, MT suppliers in Europe are keen to invest in new markets by integrating language engineering tools to improve the quality of MT. Most European MT suppliers, for example, now incorporate some form of translation memory in their products (examples of TMs are Trados Translator's Workbench, Langenscheidt's T1 Professional developed for PCs by Gesellschaft für Multilinguale Systeme (GMS), IBM Translation Manager, etc.)

For those who do not know what a translation memory is, it can broadly be defined as

"a multilingual text archive containing (segmented, aligned, parsed and classified) multilingual texts, allowing storage and retrieval of aligned multilingual text segments against various search conditions."

EAGLES (1995)

If we however turn to look at Japan, there is marked absence of user involvement in the development of systems. This absence of user involvement may explain the relatively low interest there in TM systems, as they are not found as widely integrated in translation environments as they are in Europe.

1 MT related tools

There is in addition a knock-on effect of the lack of user involvement inJapan in terms of the absence of other MT related tools in Japanese MT environments. For example, text alignment tools which can among other things be used for generating translation memories are largely absent from Japanese systems. Another largely lacking component of a translation environment in Japan is the terminology management system. Such systems consist of a terminology database, lookup software and utilities for maintaining and updating the database. Some include automatic term recognition tools to capture terms from running texts.

Terminology is demonstrably important for quality translation. However, the integration of terminology tools in Japanese translation environments is still at a nearly stage. Although lack of user involvement is again a crucial factor here, another factor that must not be neglected is the different attitudes in Europe and Japan to the types of expert involved in the design and building of MT products. In Europe, it is not unusual to find linguists, lexicographers, terminologists and translators working together with computer scientists and computational linguists on the development of MTsystems. It is recognised in Europe that an interdisciplinary approach is required to help automate the translation process. Europe has indeed a long history of interdisciplinary collaboration in this area. However, in Japan, the development of MT systems is largely driven by engineers and computer scientists. Academic input, since the early days of the Mu system, has been peripheral to Japan's MT effort and mainly restricted to contributions by computer science and electrical engineering experts. There has been a dearth of contributions whether academic or industrial from theoretical linguists, lexicographers and terminologists. Here we then have a crucial difference in attitudes to MT development in Europe and Japan.

However, the boot is on the other foot when it comes to advances in sharing and the collection of lexical resources. This is apparently impressive in Japan, while it is hardly nascent in Europe. In particular, dictionaries developed by EDR (Japan Electronic Dictionary Research Institute), NTT and IPA are used by many companies as common lexical linguistic resources. However, there is a lack of bilingual or multilingual terminology databases. While computerised collections of English-Japanese pairs of technical terms are available, there is little control over their terminological quality. In Europe, terminological collections are arguably of higher

quality (again largely due to greater use of professional terminologists in Europe). Above, we referred to Japanese efforts in the sharing of lexicons as being 'apparently impressive'. They are indeed impressive in terms of size. However, evaluations of the vast EDR resource in particular, carried out by EAGLES and foregoing EC lexical projects, reveal that the design of this resource leaves much to be desired from a formal linguistic point of view. This is a prime example of a resource built by computer scientists. Moreover, questions were raised about its actual level of reuse in Japan: that is, it was hard to discover to what extent the resource is actually being used (reportedly predominantly academic) and with what degree of success (in terms of being able to provide the type and quality of translation that would satisfy an end user).

3.2 MT services

Remote translation services over the Internet from a central server have become popular in both Europe and Japan. We mention, on an indicative basis only, a few of the translation services. We distinguish these services from the MT enabled Web browsers we have mentioned earlier.

1.   ATLAS MT Service was developed by Fujitsu, with 22 technical dictionaries available, where the original text is sent by e-mail to a remote MT server and the translation returned in the same manner. The input documents have to be pre-edited according to such guidelines as limit the original document to 12,000 characters, use word wrapping instead of splitting words by hyphenation at the end of a line, keep sentences as short as possible, etc.

2. JST (Japan Science and Technology Corporation) offers an on-line Japanese-English MT service through e-mail (the service is free for STA associated organisations but not for the general public). For more information see:
                    http://www-jmt.jst.go.jp/index-E.html
One of the restrictions imposed is that the documents to be translated cannot exceed 20,000 Japanese characters.

3. AltaVista Translation with Systran (http://babelfish.altavista.digital.com/)
Currently, the languages offered are French, German, Italian, Spanish and Portuguese with English. The service is free and allows Web users to translate Websites from and into English. SYSTRAN offers an online translation service called SYSTRANET, which is available on subscription from the company's URL, http://www.systransoft.com

4. Globalink's on line translation service, Comprende, which provides real-time Website translation services to and from English and French, German, Italian, Portuguese and Spanish. Additional languages will include Japanese, Chinese and Russian. Users can access Comprende at http://comprende.globalink.com for a free beta-test period. After that period, the monthly fee is $19.95 for basic Website content translation only, and $49.95 for a premium service including newsgroup translations of chat and email.

4. Conclusions

As a result of our investigation of MT trends in Japan and Europe, we are able to state the following major conclusions:

• There is a difference in typical user type of MT between Japan and Europe: in Japan, the casual user predominates; in Europe, the professional. Reasons for this lie mainly in the fact that most major Japanese IT companies saw the viability of MT as a mass commercial product, which is not true of Europe, where this market has as yet to be exploited. Nevertheless, we must be careful to note that the quality of MT offered for a mass market of casual users is necessarily poor. However, it is clear that Japanese IT companies have invested a great deal in this market and are making reasonable if not large profits from it. Other reasons for this difference in user type lie in the different purpose that MT serves in each region: in Japan, MT is mainly used for information gathering; in Europe, it is used mainly for dissemination.

• Although localisation is of great interest in both areas, there are major differences: in Japan, interest in localisation is of recent date and progress is apparently slow; in Europe, there is already a highly developed localisation industry, which has in addition recently begun to turn its attention to localising its products for the Japanese market

• Standardisation issues are equally of interest in both regions. However, again differences may be noted: Europe has a clear lead over both Japan (and indeed North America) in the drive for language engineering standards, with well-coordinated industry-academic initiatives such as EAGLES, whose results are widely disseminated and endorsed; in Japan, though, leading MT providers have recently been working with the AAMT to design standards for user dictionary formats and these will undoubtedly have a positive impact on the development and market penetration of Japanese MT products as users become better able to reuse their lexical resources in different systems.

• There are differences in the level of provision of MT-related tools. These again are due to differences in the predominant type of user in each area. Thus, in Europe, we find such tools as translation memories, terminology management packages and the like, being delivered with or used in conjunction with MT systems, and intended for the professional user,the predominant user type. In Japan, in contrast, there is not so much interest in providing such tools for the casual user. However, emphasis on the casual user leads also to the exploitation of different kinds of strategies for MT: for example, template-based MT can successfully be deployed for the casual user where it is typically inappropriate for the professional. It is important nevertheless to note that our conclusions relate to broad trends that can be detected. This is not then to deny that certain types of user or certain types of MT do not exist in either Japan or Europe. Thus, for example, there are highly-regarded Japanese MTsystems that are oriented to the needs of the professional user (e.g.systems offered by Hitachi, Fujitsu, NEC and Toshiba, among others).

What further conclusions may we draw regarding the future of MT in Japan and Europe? It is likely that casual users of MT will become increasingly predominant in

Europe through growing demand for web-based information. Thus, we can expect greater numbers of MT-enabled web browsers to become available in Europe. It remains to be seen how the question of quality of translation of such browsers will be tackled in Europe and in Japan. In Japan, there is growing realisation that the needs of the professional user are being neglected due to the commercial impact of the casual user. It is hard to say, however, whether the professional user community can attain enough commercial weight to persuade Japanese MT providers to cater more fully for their needs.

In looking at trends in MT in both Japan and Europe, it is not appropriate to engage in adverse criticism of some approach that is different to some other: differences are rooted largely in historical developments and in alternative commercial paths. This is why we believe that Europe will begin to move in the direction of current Japanese trends and Japan will similarly adopt European practices as each region strives to broaden the impact of language engineering for the benefit of their respective societies, encompassing many kinds of user.

References

AAMT The Asia-Pacific Association for Machine Translation (1997) Report on Commercial MT (in Japanese) http://ww.jeida.or.jp/aamt/list-j.html

Ananiadou S. (1998) Machine Translation Trends in Japan, Lisa Newsletter, Volume VII No 2, June 1998, pp.10-14.

ASCII July 1996.

ATR Interpreting Telecommunications Research Laboratories (1997) A Collection of Technical Publications, Department 3 & 4.

EAGLES Lexicon Interest Group:
http://www.ilc.pi.cnr.it/EAGLES96/rep2/ (on semantic encoding, ongoing)
http://www.ilc.pi.cnr.it/EAGLES96/synlex/synlex.html
    (on syntactic subcategorisation)
http://issco-www.unige.ch/ewg95/ewg95.html
(on evaluation of NLP systems)

Equipe Consortium (1996) Survey of MT products and services, in
http://www2.echo.lu/langeng/en/reps/mtsurvey/mtsun/ey.html

JST (Japan Science and Technology Corporation)
http://www-jmt.jst.go.jp/index-E.html

Kamei, S. et al. (1997) Sharable Formats and their supporting environments for exchanging user dictionaries among different MT systems as a part of AAMT activities, in MT Summit VI, Nov.1997.

Mima, H., Furuse, O., lida, H., Wakita, Y. (1997) Multi-lingual SpokenDialog translation System using Transfer-Driven Machine Translation, in Proc. of MT Summit VI, pp. 148-155.

MT News International, Newsletter of the International Association for Machine Translation, Issues 15,16,17,18,19.

Myers S. (1996) Can Computers Translate? Computing Japan magazine, ApriM 996.

Nagao, M., Tsujii, J. and Nakamura, J. (1985) The Japanese Government Project for Machine Translation, Computational Linguistics 11, 2-3, pages 91-110.

Ostler, N. (ed) (1996) Lying in Wait at the Heart of the Web, Language Technology DTI-OSTEMS, September 1996

OTELO http://www2.echo.lu/langeng/en/le1/otelo/otelo.html

Senez, D. (1997) Users and Research in Europe, in MT News International, Issue No17, June/July 1997, pp.9-10.

Tanaka, H. (1997) MT R&D in Asia, in MT Summit VI, Nov.1997.

Acknowledgements

Appendix of commercial MT systems from AAMT report
(January 1997 http://www.jeida.or.jp/aamt/list-j.html)

1. **Yakushi nyorai** by CSK, operates on Windows95, NT3, language pairs English to Japanese, Japanese to English / French / German, dictionary of 200,000 words, optional terminology, price from ¥5,825.

2. **Perfect** Ver.2 by AlSoft, available on Windows95, Windows98, NT4, from Japanese to English. Translation tools (PRO version only) include a 124,000 word dictionary and 27 specialised dictionaries (the system can support the use of 6 specialised dictionaries at a time). These are based on an interlingua which is adapted for technical domains. Translation tools require pre-edited input (they incorporate a pre-editing checker for Japanese). Prices start from ¥12,800 for the standard version and ¥19,800 for the PRO version.

3. **TransLand** / JE Ver2.0 & EUDORA by Brother, runs on Windows95, Windows98, NT4.0, MacOS8. This system supports semantic transfer. The base model sells for ¥29,800. TransLand offers technical dictionaries which contain up to 811,600 entries.

4. **Word Kokusaijin** Versions 4.1, 2.0 by Sanyo, runs on Windows 95. The MT-enabled Web browser version sells for ¥9,800, the professional version costs ¥29,800 and includes a 120,000 dictionary.

5. **WD-01 SW, Power** E/J Ver.3.0 by Sharp, runs on Windows 95, Windows98. The system supports a template function for creating English letters and includes a 114,000 word dictionary and a 96,000 word terminological dictionary. The dictionaries (mono-lingual and bilingual) sell for ¥12,000.

6. **Pivot/JE , Pivot /EJ, CROSSROAD, Translation Adapter** 2, developed by NEC, run on Windows95, Windows98, NT4.0, Unix. Crossroad translates Web pages and also preserves document format (rtf,doc). NEC also provides a service called "timer translation" which translates documents overnight at a cheaper rate. They also provide dictionaries of 100,000 words for each language pair (E/J and J/E) with bilingual technical dictionaries. The program allows the user to define their own dictionary. An interesting aspect of Crossroad is that it offers a space for exchanging user dictionaries. It also provides an interactive translation interface converting a sentence gradually from Kana to English, i.e. initially the sentence has a mixture of English and Japanese, with the Japanese word order, then the object-subject markers are removed and lastly the sentence is put into English word order. The cheapest version is sold at ¥9,000. Translation Adapter 2 offers a bi-directional English-Japanese and Japanese-English system for browsing and translating Web pages and email. Besides translation and dictionary look-up, it includes an example retrieval utility which retrieves model sentences to help Japanese users to write letters.

7. **ATLAS** EJ/JE for Windows95/NT by Fujitsu. The professional version ranges from 12,000 to ¥35,000 and includes 24 technical dictionaries containing 1,200,000 words. Fujitsu also markets TransLinGO! (and Plus) which searches Japanese Webpages in English. With the Plus version the user can input English keywords to search Japanese homepages by using Japanese search engines. Prices range from ¥10,800 to ¥17,800 for the Plus version.Translation Surfin 1.0 provides English to Japanese translations using Netscape Navigator. The product offers four translation modes: on-line to Web sites, off-line, partial translation and title translation. Fujitsu sells lexical resources such as Denjikai V2.0 for Windows, which comprises a basic dictionary of 320,000 words. This can be put together with technical dictionaries to reach 3 million words. The basic dictionary sells at ¥24,000 and each technical dictionary at ¥50,000. Fujitsu also sells the EDR dictionary (730,000 words) at ¥50,000.

8. **Pensee** / V Ver. 2.0, Ver. 3, for Internet, WWW Server & Pro developed by Oki, runs on Windows95, NT4.0, NT3.51, Solarisl .x. Pensee provides post-editing tools such as alignment of translation pairs (E/J). Pensee is also used for server based Web page translation.
http://www.okisoft.co.jp/OSG/KOSK/pnspeople.htm.

9. **Logo Vista** E to J Pro, Personal, **internet Plus** Ver.4.0 by Catena, runs on Windows95, Windows98, Mac, NT4.0. At a price of ¥97,000, Catena offers

a 140,000 word dictionary and technical dictionaries which reach 530,000 terms. It translates documents from HTML. The PRO version is designed for professional translators by providing a choice of alternative translations if a translation is ambiguous. The linguistic theory behind LogoVista is that of S. Kuno. Some contextual information is used by the system. The Logo VistaPersonal sells at 39,800. It has the same engine as the PRO version but does not include the alternative translations capability. Internet Plus was voted best choice by the DOS/V Magazine(1997.2.1) compared with 12 other products.

10. **ASTRANSAC** Sun WS, C/S, for Windows Ver.3.0, for Internet Ver.2.0 byToshiba for E/J and J/E. The professional version supports users' dictionaries, translation patterns and has an alternative translations capability like LogoVista. Price ¥98,000. Toshiba also sells MT for email and news with a dictionary of 240,000 words. Price ¥12,800 for the E/J pair and 16,800 for the J/E pair. ASTRANSAC for Internet provides Web translation without changing the original layout. The basic dictionary has 190,000 words and is sold at ¥12,800.

11. **J London** J/E, E/J, Ver.3, **WorldNet** /EJ developed by Kodensha Corporation, runs on Windows95, NT4.0. At ¥78,000, it includes OCR software. There are 34 specialised dictionaries for the J/E pair, including a 204,400 term medical dictionary, and 31 specialised dictionaries for the E/J pair. Jlondon supports a template function. The price for the specialised dictionaries starts at ¥29,800.

12. **Dr Surf** for Windows, Deluxe for Windows, for Macintosh Ver.2.0 by MediaVision, has a standard dictionary of 430,000 words, 18 technical dictionaries, and 8,500 words of Internet terminology (i.e. terms frequently used on WWW home pages). The system supports a mechanism for learning users' grammar and dictionary preferences. The price starts at ¥34,000. The system adopts a UPF standard.

13. **Translation Manager/2** by IBM runs on Windows95, WIndows98, NT4.0, OS/2. The cheapest product starts at ¥7,800. IBM sells a package that includes homepage building software, email authoring and MT-enabled Web browser with an * overnight' facility. The Translation Manager employs a pattern based translation which allows the users to define patterns. The pattern-based approach is geared to idiomatic, collocational, contextual and domain specific translations. The standard dictionary has 160,000 words and 66,000patterns and the technical dictionary 7,000 terms and 45,000 patterns. IBM has also a Summariser which translates and makes summaries.

14. **Net Surfer/ej** Ver.3.0, **PC-Transer /ej /je** Ver.5.0, 4.0 by Nova Corporation runs on Windows95, Windows98, NT3.51, NT4.0, MacOS8. PC-Transer/JE is one of the best known and most widely used products. The PC-ej product uses a dictionary of 200,000 words and 18 specialised dictionaries of around 950,000 words. The product includes a spelling and grammar checker and includes a function that allows users to construct templates of frequently used phrases and to choose among alternative translations. The system speed is 12,000 words per hour and the price is ¥198,000 plus 98,000

for the dictionaries. Nova has a patent translation product with automatic pre-editing of lengthy patent sentences (splitting long sentences intoshorter ones) and an automatic post-editing facility which involves mainly punctuation.

15. **HICATS** by Hitachi runs on Windows 95, Windows98, NT4, Unix. HICATS has a standard dictionary of 85,000 words, technical dictionaries of 170,000 terms and a business dictionary of 60,000 words. The starting price is ¥9,800. Hitachi has been developing an MT system for translating manuals and patents.This client-server system was released in 1998. As for on-line translation aids, HICATS/JE includes a function for diagnosing input Japanese sentences. It supports users in pre-editing by detecting morphological, syntactic and semantic ambiguities in input sentences and long sentences.