Language Skills for International Engineering:
A Study of English-Japanese Bilingual Engineers

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1. Introduction

In today's global economy, the work environments of engineers and scientists have become increasingly international. More frequently than ever, these engineers and scientists interact with foreign peers and customers, travel abroad on business, work in foreign countries for an extended period, and face situations in which they must obtain information from foreign sources. Most companies in America, however, are not prepared for this change—particularly when they deal with Asian countries, whose languages are not easy for Americans to learn. In most cases, communication is done in English simply because companies have no bilingual technical specialists. But, this practice is not without consequences, for example, a possible loss of business opportunities, products with low market potential in target countries, higher production costs, longer production time, delayed delivery, poor technical support, and daily frustration, among others.

Recently, companies have begun to realize that this problem is too serious to ignore. The fact that bilingual engineers and researchers are now in great demand is one indication of this. More specifically, the increased demand for English-Japanese bilinguals is particularly noticeable. For example, Table 1 shows the number of companies that placed position announcements for English-Japanese bilingual engineers and scientists in the *Nikkei Placement Guide International* (a yearly recruitment publication) each year for the past four years.[1]

Table 1: Companies recruiting bilingual engineers and scientists

Year	Number of companies that recruit bilingual engineers and scientists (total number of companies listed)	Place of employment		
		Japan	US	Others
1998	86 (86)	84	23	15
1997	94 (99)	94	41	26
1996	72 (75)	72	22	15
1995	50 (53)	47	14	9

As can be seen here, the number of companies employing bilingual workers almost doubled between 1995 and 1997. (Due to the current recession in Japan, 1998 figures are lower than those of 1997.) It is noted that more than half of the companies are US company subsidiaries in Japan and other multi-national companies.

2. Japanese language skills needed by engineers: Surveys and findings

While we intuitively understand that bilingual skills are highly useful in engineering practice today, it is not necessarily clear what specific engineering tasks and situations require foreign language skills and what kinds of skills those tasks and situations require. In order to learn more about this, the author conducted two surveys.

2.1. Survey 1

The first survey involved nine English-Japanese bilingual engineers who use Japanese regularly for their jobs. The purpose of this survey was to find out how such engineers actually use their Japanese skills for business. The survey asked subjects in what business situations they use Japanese language skills, whom they talk or write to in Japanese, what kinds of materials they read in Japanese, what kind of documents they produce in Japanese, and what tasks they are supposed to or want to do but find hard to do given their Japanese skills.[1]

The following is a summary of the survey responses.

(1) Business occasions in which the subjects use Japanese language skills:
    technical support, marketing support, designing, development, testing, work force coordination, information gathering, meetings

(2) People to whom they talk or write in Japanese:
    customers, prospective customers;
    subsidiaries, subcontractors, distributors;
    colleagues

(3) Materials they read in Japanese:
    manuals, specifications, drawings, on-line documents, on-line messages;
    e-mail, memos, regular mail;
    Web sites, journals, newspapers, advertisements;
    patents

(4) Documents they write in Japanese:
    e-mail, memos

(5) Documents they translate (from Japanese to English):
    Test reports, patents

(6) Tasks which they are supposed to or want to perform but find difficult given their language skills:
    advanced-level technical/business conversation, technical presentations, the reading of legal documents, translation/interpretation in both directions

How frequently they use Japanese depends on where they work and what they do. Naturally, those who work in Japan use Japanese much more often as do those who work on products localized for Japan.

2.2. Survey 2

The second survey involved twenty-two engineers, scientists, and managers at Boeing (8), Microsoft (9), Battelle Pacific-Northwest National Laboratories (3), and other companies (2) who took the first-year and second-year Japanese courses through the University of Washington's distance learning program. The main purpose of this survey was to find out what those professionals wanted to do using their Japanese skills. The survey asked the subjects how often they meet business people from Japan or in Japan, how and how often they communicate with Japanese people in either Japanese or English, and what professional duties or tasks they perform, or want to perform, using their Japanese skills.

The following is a summary of the survey responses.

(1) How often the survey subjects meet business people from Japan or in Japan:

rarely:	13
several times/year:	6
monthly:	1
weekly:	1
daily	1

(2) How often they communicate with Japanese people in Japanese or English:

less than once a month:	9
monthly:	6
weekly:	5
daily	2

Communication is done mostly by e-mail and telephone, and less frequently by FAX and face-to-face.

(3) What professional duties or tasks those surveyed perform, or want to perform, using their Japanese skills:

(a) Speaking/listening-related tasks:
greetings and small talk, conversation when traveling in Japan, daily business conversation, discussion at meetings, presentations

(b) Reading-related tasks:
Web pages
technical documents such as specs and drawings, on-screen messages and other on-line documents, e-mail from news groups

(c) Writing-related tasks:
e-mail communication

(d) Other:
assisting executives at meetings in Japan as an interpreter, helping colleagues who go to Japan and work with Japanese, training Japanese co-workers, developing a system for Japanese hand-written character recognition

2.3. Findings

The information obtained from the above surveys identified two foreign language skill areas crucial for engineers. These are communication and reading.

(1) Communication
How: Oral and e-mail skills are the most common skills needed for communication in Japanese. Oral communication is done either face-to-face or by telephone.

With whom: Most of those surveyed routinely communicate in Japanese with customers, prospects, subsidiaries, subcontractors, and distributors. Subjects also use Japanese when working with Japanese colleagues in the same office.

For what: Japanese is used to perform such duties as technical support, marketing support, development, testing, coordination of an international work force, and information gathering.

(2) Reading
What: Materials the subjects commonly read in Japanese include e-mail, Web pages, journals, and newspapers. Some regularly read manuals, specifications, drawings, on-line documents, on-line messages, and advertisements. Though not common, some read patents. Those who live in Japan regularly read memos and mail in Japanese.

For what: Subjects read Japanese to perform such duties as technical support, marketing support, designing, development, testing, and information gathering for strategy planning.

(3) Other foreign language skills
Though not as crucial as the two skills mentioned above, other skills are important in some situations. For example, listening skills are necessary at meetings if engineers work in Japan, and so are presentation skills when they are involved in marketing there. Translation and interpretation skills are also important in certain situations. Writing skills are necessary for e-mail, although e-mail usually does not require high-level skills.

(4) Knowledge of culture
Today, for international communication, knowing the target country's culture is as essential as having strong language skills. Some subjects of this survey stated that knowing how Japanese communicate among themselves and how they express themselves to outsiders is often very crucial in achieving business objectives. It was also mentioned by some subjects that, for localization engineers and managers, broad understanding of the target country's culture is essential in every aspect of a job, including designing, developing, testing, marketing, and giving technical support.

3. Skill levels and corresponding tasks

The surveys made clear what kinds of Japanese skills are used by engineers in Japan-related jobs and what tasks and situations require those skills. Then, from the viewpoint of foreign language teaching, to what levels of proficiency do those skills correspond, and how long does it take to come to those proficiency levels? The ACTFL (American Council on the Teaching of Foreign Languages) Proficiency Guidelines are useful in answering these question because they provide descriptive standards for different levels of proficiency in the four language skill

areas.[4] Based on the ACTFL standards, the author has set up Japanese proficiency guidelines for engineers as follows:

a. Speaking
(1) Novice
    No meaningful tasks can be performed.
(2) Intermediate
    Can provide limited technical and marketing support in face-to-face situations. Can do simple information gathering through conversation. However, effective phone conversation is difficult at this level.
(3) Advanced
    Few communication problems are experienced in face-to-face situations. Can provide technical and marketing support by phone with occasional difficulty. Can give technical presentations. With minor difficulty, can do technical discussion with colleagues in development, testing, or other technical settings either individually or at meetings.
(4) Superior
    Can perform duties like native engineers. Can perform advanced level tasks, such as those involving persuasion. Can convey sensitive messages to customers effectively.

b. Reading
(1) Novice
    No meaningful tasks can be performed.
(2) Intermediate
    Can handle some routine technical documents, such as specifications and on-line messages. Can read simple manuals. Can obtain main ideas from some e-mail. Can do limited information gathering through reading.

(3) Advanced
    Can read e-mail with no difficulty. Can read most technical documents (test reports, manuals, specifications, drawings with notes, on-line documents, etc.) with accuracy. Can obtain information from newspapers, journals, and Web pages with little difficulty.
(4) Superior
    Can read highly difficult documents, such as contracts and patents.

c. Listening
(1) Novice
    No meaningful tasks can be performed.
(2) Intermediate
    Can understand parts of discussions at meetings with familiar agenda and can guess what is being discussed.
(3) Advanced
    Can understand a good part of presentations and discussions on familiar topics, but gets lost occasionally.
(4) Superior
    Can understand discussion among natives. Can understand hidden meanings and subtle nuances.

d. Writing
(1) Novice
    No meaningful tasks can be performed.

(2) Intermediate
Can compose simple e-mail messages and notes.
(3) Advanced
Can compose e-mail messages with no serious errors. Can prepare presentation materials with help from natives.
(4) Superior
Can compose such documents as business letters, technical reports, and proposals with no serious errors.

4. Training period

It usually takes two to three years for college students with no background to reach the Intermediate Level if they are trained in a regular academic language program. From past experience at the University of Washington's Technical Japanese Program, we know that focused and structured language training can bring Intermediate-level engineering students to the Advanced Level in a relatively short time. With reading, for example, two years of language training can bring students at the upper Intermediate Level to the mid-Advanced Level, and the lower Advanced Level to the upper Advanced Level. As for speaking and listening, it is essential to expose students to a Japanese-speaking environment for an extended period. Internships in Japan serve very well for this purpose.

5. Conclusion

Without a sufficient number of bilingual technical specialists, it is clear that engineering activities for the global marketplace face serious consequences. To combat this problem, foreign language education as well as other international training must be an essential component of engineering curricula. The author's survey showed that the most useful foreign language skills for engineers are communication and reading skills. Although there is no "quick fix" for language teaching, focused and structured training can bring students to a workable proficiency level in a relatively short period even with hard-to-learn languages like Japanese.

Note
[1] Eight of the nine subjects in this survey were graduates of the University of Washington's Technical Japanese Program, a two-year master's degree program which combines engineering and technical Japanese study.[2, 3] The backgrounds of the subjects are as follows:

(a) Majors:	Materials Science and Engineering	2
	Computer Science and Engineering	2
	Aeronautics and Astronautics	1
	Mechanical Engineering	1
	Electrical Engineering	1
	Biochemistry	1
	Technical Communication	1
(b) Job fields:	Computer	4
	Aerospace	2
	Electronics	1
	Materials	1
	Intellectual Property Law	1
(c) Ranks:	Engineers	6
	Managers	3

(d) Work places:	US		6
	Japan		3
(e) Citizenship:	US		9
	Japan		0
(f) Places of birth:	US		5
	Japan		3
	China		1

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