# 'Career Development and Human Resources Management of Researchers and Engineers for the Promotion of Effectiveness in R&D'

## A Research Note on a UK-Japan Comparative study

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## Introduction

This research note presents a brief and preliminary overview of the outcomes of two recent surveys in the UK, in comparison with the results of a similar survey carried out in Japan, at a simple level of analysis. These surveys are part of the global comparative project initiated at the Institute of Industrial Research at Keio Gijuku University in Japan earlier in the 1990s. The research aims to identify the career development patterns and working environment that encourage scientists and engineers employed in research and development. Given the increasing strategic importance of R&D for industry to maintain a competitive edge in today's global market, it is the quality of the people who work in R&D that is crucial. According to a UK industrialist, 'investment, technology and scale of operations can be copied, but not the quality of the employees'[1]. Clearly, how the R&D personnel are managed becomes a strategic issue.

The original Keio survey focused on Japan was mounted in 1994. This probably reflected the underlying anxiety in Japan that the Japanese R&D communities lacked creativity, and this would hamper the Japanese industry's global competitiveness in the long-term. As her technological capability had caught up with the West, it would be crucial for her to be at the forefront of scientific and technological advance by creating her own original ideas and making new discoveries rather than improving on the existing technologies. The second stage of the research shifted its focus on to the international study, and in 1997 a new survey was mounted in Japan. Using a revised questionnaire that could be used to facilitate international comparison, the suvey was replicated in other countries including the UK. The international project now targets some ten countries worldwide.

The two UK surveys in this report, one in the UK research centres of Japanese firms and the other in the research centres of UK-based non-Japanese companies, were carried out from Cranfield School of Management in 1997 and 1998, and are referred to in this study as UK1 and UK2 respectively. A summary of the comparative analysis of the UK97 and Japan 94 surveys has been written by this author and Dr. Nagano of Meiji University and currently being considered for publication[2]. However, the data of the UK1 sample used in this survey has been reduced[3] to bring it into a

[1] Managing Director of British Chrome and Chemicals, in 'Competitiveness through Partnerships with People, a working document produced by DTI and DfEE, 1997, p. 1.

[2] H. Nagano & L. I. Okazaki-Ward, *'Kenkyû kaihatsu jinzai to sono manejimento no nichiei hikaku* (The UK-Japan Comparison of R&D Human Resource and its Management), to be published in the next issue of *Keio Keiei Ronshû*, 1999.

[3] Reduction of the sample size of UK1 by removing the data of one company from the original sample was deemed necessary because, accounting for one-third of the total sample size, they were found to exert undue influence on the outcome of the analysis when they were taken out and compared with the rest. This company, established as a UK company in the 1960s, became an affiliate of a Japanese company in the early 1990s, and taken over completely only a year before the survey was carried out but clearly remained essentially British. The sample characteristics of this company were also very different from the rest of the UK97 survey. Unpublished report by this author.

sharp contrast to the result of the UK2 survey in 1998 as well as to that of the Japan97 survey with which it is compared.

What this paper is concerned with is not so much the academic debate on creativity. Nor does it offer a review of the literature in the field[4]. Rather it aims to contribute to our understanding of the impact of personnel practices on the perception of the R&D employees and their performance. In comparing the survey outcomes from the UK and Japan, the influences of the differing values and cultural backgrounds of these two countries will have to be borne in mind. One that immediately comes to mind is that of independence-conformism contrast in the psychological orientations in the two cultures. Another is the so-called 'lifetime' employment practice, and its accompanying system of seniority-based hierarchy in Japan, which is distinct from the hire-and-fire practice and performance-based pay and promotion system in the West. We expect a broad difference in the answers to some of the questions between the UK and Japan on these cultural lines.

**The background to the UK surveys**

Why did Japanese companies invest heavily in setting up R&D facilities in the UK in the 1990s? There have been two developments which caused their presence in the UK particularly and in Europe in general. One was the drive of the Japanese manufacturing companies to locate within Europe before the integration of the European market in 1992. There had been genuine anxiety on the part of the Japanese, though it turned to be unwarranted, that it would create a 'Fortress' Europe from which non-European import would be shut out. One of the consequences of this action on the Japanese companies was that R&D facility became a necessity in meeting both the local content stipulation and for the modification of the products to suit the demand of the European market. The other was the tightening of intellectual property rights laws by the West which necessitated the Japanese companies to do more basic research themselves, and keep abreast with the technological developments by locating in the UK initially and later as establishments for forming actual collaborative research projects in cutting-edge technologies with the UK academic institutions.

Consequently, the Japanese R&D facilities in Europe are of two kinds: those attached to the manufacturing establishments engaged in modifying and developing the Japanese designed products to meet local demands, and those which are independently established and engaged in research closer to the basic and applied field. The Japanese R&D facilities of both kinds numbered 146 (with 25 of these as independent facilities, not attached to the manufacturing units) in Europe in 1989 and increased to 363 (independent facilities 82) at the end of 1997. In the UK which had the largest share of the Japanese R&D facilities in Europe, the figures were 47 (9) in 1989 and 127 (27) in 1997[5].

According to the 1996 survey of the Japanese companies with R&D facilities in the UK by the British Embassy in Tokyo, 27% of respondents said that their research was in the basic and applied area, 48% said it was for developing products for the UK or for wider Europe, and 24% said that it was for developing products for global markets[6].

Taking a more practical approach in classifying the types of Japanese R&D facilities in the UK, Colin Bradley, the former Science Councellor at the British Embassy in Tokyo,

[4] For a brief review of the literature on human resources management of researchers, see Ishida, H., *Kenkyû jinzai manejimento no genjô to kadai* (Current Human Resources Management of Researchers and its Issues), in *Soshiki kôdô kenkyû*, No. 26, 1996, and its English version.

[5] JETRO, 'The Fourteenth Survey of European Operations of Japanese Companies in the Manufacturing Sector', JETRO London, 1998.

[6] Science and Technology Section, British Embassy, Tokyo, Sept. 1996, cited in Turner, L, Ray, D. and Hayward, T, *'British Research of Japanese Companies'*, Insight Japan, London, 1997.

who is now Managing Director of Sharp Laboratory of Europe, groups them under the following four headings:[7]

- Blue Sky/North Star Laboratories
  Fundamental research operations, closely attached to British universities,
  e.g., Hitachi, Toshiba, Eisai, and Fujisawa
- Basic and applied research on science parks
  e.g., Sharp, Kobe Steel, Canon and Yamanouchi.
- Applied R&D at a narrower range of products
  e.g., Sony, Fujitsu/ICL, Matsushita, Mitsubishi Electric and NEC
- Substantial development/design activities
  e.g., Nissan, NSK/RHP and Komatsu.

The R&D centres in the last two categories above are, by the nature of their activities, much larger and closely allied to the manufacturing activities of their companies in the UK even if they do not physically locate on the same sites. Some of these companies also have more than one R&D site, and a few, like Sony, have been in the UK since the 1970s.

The R&D facilities in the first two groups are all of recent establishment—in the 1990s, and, as centres, they are on a small scale, mostly employing fewer than 30 fully-fledged researchers. The majority of these are headed by a non-Japanese academic, with a Japanese scientific staff as his deputy, and they have close ties with the British academic research community from which they mutually benefit through collaborative research, not only within the UK but in Europe as well. The majority of the companies in our UK1 sample group in this paper come from these two categories of research laboratories.

There are other strategic reasons which brought the Japanese R&D activities into the UK. The excellence in science and research base in the UK not only help broaden the outlook, experience and knowledge base, but also offers the Japanese access to broader European academic and technology communities, and leads to what Turner and his colleagues term 'insiderisation' of their R&D[8]. Also the research centre in the UK is an important element of their tri-polar strategy which by adding the European centre to the existing Japan and US basis, allows 24-hour round the global relay R&D through the use of computer network, enabling the time of new product development to be shortened.

Tapping into a pool of excellent researchers at relatively low cost is also an important consideration for the Japanese companies which face a prospect of a shortage of researchers in Japan. Another important advantage is for the Japanese managers to be able to work with focused project teams, drawn from different national cultures and from disparate research backgrounds rather than from a single pool made up of people in the 'lifetime' employment. With exchange of ideas and research traditions and actual exchange of research personnel between the laboratories in the UK and Japan, it helps the Japanese companies to overcome the strangling effects of what Sakakibara terms the force of intra-company isomorphism that tends to push the Japanese researchers towards conformity, killing the buds of individualism and creative thinking[9]. To what extent the problems of managing people in the UK research centres of Japanese companies differ from those in Japan as well as those that are seen in the non-Japanese UK research centres indicated in this paper at this preliminary stage could be of considerable interest.

Of course, the Japanese are not the only people who are investing heavily in science and technology. Britain has long enjoyed an enviable reputation in producing original

[7] A speech delivered at a conference on 'Performance Measurements for R&D' held at DERA, Farnborough, 29–30 April, 1997. Cited also in Turner, et al., ibid.

[8] Turner, et al., ibid.

[9] Sakakibara, K., *Nihon kigyô no kenkyû kaihatsu manejimento* (Management of Research and Development by Japanese Companies), Chikura Shobô. Tokyo, 1995.

ideas, and has an excellent science base[10]. However, the UK is not known to excel in commercialisation of the output from research laboratories. Corporate investment on R&D, an item with a long-term payback, tended to lag behind their international competitors, and it was realised that this would have serious implications for the long-term competitiveness of the UK economy. The UK Government has been active from the early 1990s to remedy the situation by trying to bring the academic and business communities together to create a scientific and technological network through which the fruits of scientific research in the universities and independent research laboratories could be quickly brought to market. The DTI and the Office of Science and Technology in collaboration with other ministries and various research and funding councils and private trusts, have jointly been promoting from the beginning of the decade, a large number of initiatives to encourage strategic alliances between universities and industry putting the money up for winning proposals which are to be matched by the companies involved. These initiatives are, to mention only the major ones, Link, Foresight, TCS (Teaching Company Scheme for technology transfer), Connect, Heroic, the Science Enterprise Challenge, and most recently, the University Challenge in 1998[11]. The European Union also have their own initiatives, such as Eureka, and Leonardo.

The Foresight Programme which was announced in the White Paper in 1993 can serve as an example. Its 16 panels, each addressing a different sector of industry, involved some 10,000 people in consultation, identifying long-term social and economic trends and development in science, engineering and technology. Since the publication of the report in 1995, the Foresight findings have influenced both the government's development of policy and spending decisions on science, engineering and technology, as well as those of the Research Councils. In 1996 a sum of £92 million was provided, £62 million by industry and the remaining £30 million by the Office of Science and Technology Challenge funding, for the consortia of business and the science base to compete for the government fund to undertake projects identified by the Foresight programme. Through these activities, the Foresight programme is intended to foster an expansion of links between business and universities so that the UK businesses can take full advantage of the accumulated know-how, skills and longer term thinking in the latter to maintain and sharpen their competitive edge over their competitors in other countries.

In 1999 the second phase of the Foresight programme is to begin, building on the successes of the first stage. The latest of the initiatives, the University Challenge, was promoted by the new Labour Government in 1998. The sustained initiative by the UK government probably reflects the fact that R&D intensity (R&D expenditure as a proportion of sales) in the UK top corporate sector (2.2%) was found to be lower than France, USA, Germany or Japan in 1996, and an urgent need was felt for improving this figure[12]. For the 1999–2000 period, the government is making available

[10] "With only 1% of the world's population, the UK carries out 5.5% of the world's research effort and is a major force in research with an 8.0% share of world's scientific publications and a 9.1% share of world citations. In absolute terms, this places us a clear second to the much larger USA, significantly ahead of larger countries including Japan, Germany and France." The Quality of the UK Science Base, Office of Science and Technology, DTI, March 1997, Summary, p.i.

"The UK receives on average 168.2 citations each year for every £million the Government spent on civil R&D in 1991; by this criterion, the UK is the most cost-effective producer of research of the G7 countries.", ibid.

"Some 29% of the 25–34 year old age group who hold a higher education in the UK do so in science and engineering; this is above the mean of 23% for OECD countries." Ibid., p. 24.

[11] From various information packs supplied by the Office of Science and Technology on these initiatives.

[12] DTI, 'The UK R&D Scoreboard, 1997', Company Reporting Ltd., 1997, p. 6. In fact, the UK came 12th out of 15 countries.

**Table I-1: Size of data, number of companies involved and the recovery rate for effective data for the three groups.**

| | Number of effective responses | Number of companies involved | Rate of effective questionnaires recovered (%) |
|---|---|---|---|
| UK1 | 123 | 11 | 97.0 |
| UK2 | 575 | 12 | 41.7 |
| Japan | 1,219 | 14 | 76.2 |
| Total | 1,986 | 38 | 53.9 |

over £100 million to foster and develop the activities of the current initiatives further[13]. With all this money on offer, the level of R&D activities in the UK is bound to increase. However, the money spent on R&D is one aspect. How the people who work in R&D are motivated to produce improved performance will surely become even more important to make the most efficient use of the resources.

## I. Survey Procedures and Data Distributions by Sector

The procedures for the UK surveys were restricted by the highly sensitive and strategic nature of the R&D to companies, and access to the potential survey population of R&D personnel was difficult to obtain. In these surveys, the companies themselves decided who and how many of their R&D staff should be involved in the survey. The questionnaire was distributed to the target population by the companies, and the completed questionnaire was either returned by the respondents in an unmarked, sealed envelope to the company which sent them back to Cranfield or more rarely, posted by the respondents in a prepaid envelope. The questionnaire survey for UK1 was carried out between September 1997 and February 1998, and another for UK2 was undertaken between July and December 1998. Because of the way that the data were collected, any results from them cannot be claimed to be representative of the general population. The size of the final, effective data, number of companies involved, and the rate of recovery in three sample groups, UK1, UK2 and Japan 97 are given in Table I-1 above.

[13] The figure was given by an Office of Science and Technology official as an answer to private enquiry by the author.

**Table I-2: Sectoral distribution**

**UK1**

| | No. of companies | Percentage of total sample |
|---|---|---|
| Materials | 6 | 22.0 |
| Applied field | 3 | 40.6 |
| Software Development | 2 | 37.4 |
| Total | 11 | 100.0 |

**UK2**

| | No. of companies | Percent of total sample |
|---|---|---|
| High technology | 5 | 44.3 |
| Medium technology | 5 | 45.1 |
| Low technology | 2 | 10.6 |
| Total | 12 | 100.0 |

**Japan**

| | No. of companies | Percent of total sample |
|---|---|---|
| Pharma & medical | 7 | 46.6 |
| Electronics | 2 | 28.5 |
| Steel | 2 | 6.0 |
| Chemicals | 3 | 18.9 |
| Total | 14 | 100.0 |

As the table shows there is a large differences between the three groups in the size of the data, and in the rate of the effective questionnaires recovered. The very high recovery rate of the UK1 survey was helped by one company returning 45% more questionnaires than originally delivered.

Grouping of the companies in each of the UK samples posed some problem, particularly for UK2, as many of the companies were single entities in their sectors, leaving them exposed if the companies were grouped by sector. This was overcome, in the case of UK2, by classifying them under the rubrics of high, medium

and low technology, using the classification of sectors into these three categories which was featured in Scoreboard, 1997, the publication by DTI mentioned earlier[14].

In preparing the tables, the constituent figures are calculated on the basis of effective number of data, and given as percentages of the total effective number, without including the missing data, and the actual effective number is given as N wherever this is appropriate.

### Current areas of work distribution

Distribution of the respondents in the three samples working in different fields of research activities is given in Table I-3 below. As the table shows, more than three-quarters of the respondents in all three sample groups worked in the three fields of basic research, applied research and product development/design, but the figure for Japan was as high as 91.4%. The distribution pattern for the first two fields was very similar for all three samples, but for product development/design, the Japanese figure was much larger than the UK figures, which were almost the same to each other. One more noticeable factor is that 13.1% of the UK1 sample and 7.3% of the UK2 sample were in research planning, certainly quite high figures compared with 1.3% for Japan. Also, the Japanese had 5.2% of its sample in production technology, where the UK1 had no one currently working. as well as in sales technical support. The UK2 had none in patent administration and the Japanese and UK1 in sales technical support.

## II. Sample Characteristics

In this section demographic and other characteristics of the surveyed groups are compared.

**Table I-3: Current field of work** (%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Basic research | 12.3 | 10.8 | 11.2 |
| Applied research | 40.2 | 44.9 | 44.9 |
| Product development/ design | 23.0 | 22.6 | 35.3 |
| Production technology | 0.0 | 2.3 | 5.2 |
| Production management | 0.8 | 0.7 | 0.2 |
| Information processing | 2.4 | 1.7 | 0.7 |
| Patent administration | 1.6 | 0.0 | 0.1 |
| Research planning | 13.1 | 7.3 | 1.3 |
| Sales technical support | 0.0 | 4.5 | 0.0 |
| Others | 6.6 | 5.1 | 1.2 |
| N | 122 | 572 | 1214 |

Missing observations: 9

### Age profile

As Chart II-1 below shows, the distribution patterns of the age groups differ between the sample groups in this study. For UK1 and Japan, the 30–34 years old age group is the largest and they have a similar upturned U-shape whilst for the UK2, the <29 years old age group is the largest and also the >45 years old group is larger than the two younger groups directly before it, causing the age distribution pattern to become U-shaped. The UK1 sample group had the youngest mean age score.

Average age

| | |
|---|---|
| UK1 | 34.8 years |
| UK2 | 35.5 years |
| Japan | 36.6 years |

### Length of years in the company

How long the respondents have been with their companies in each of the sample groups is shown in Chart II-2 below.

[14] DTI, 1997, op. cit., p. 5. High technology sector includes such industries as healthcare, pharmaceuticals, telecommunication, and aerospace; the medium technology sector has industries such as chemicals, electronics and electrical equipment, electrical machinery, transport equipment; while low technology includes mechanical engineering and other manufacturing.

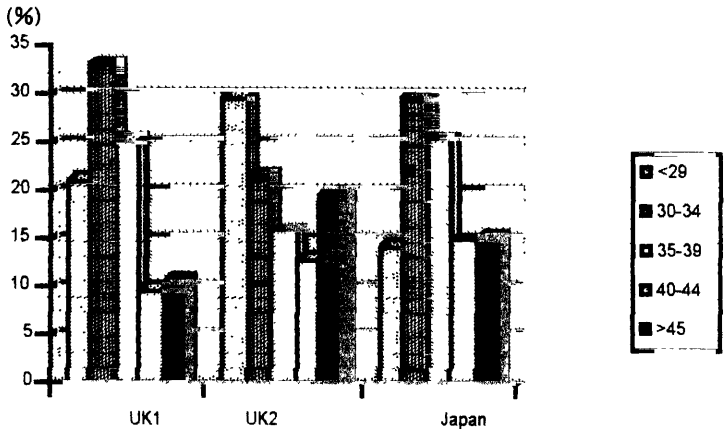


**Chart II-1: Age profile of the sample groups (%)**

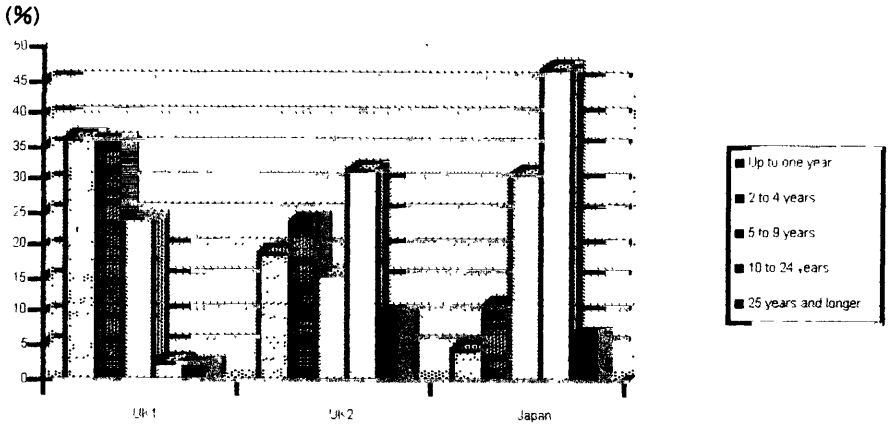


**Chart II-2: Length of service in the present company (%)**

**Table II-1: Relationships between age and tenure profiles by group (%)**

| | UK1 | | UK2 | | Japan | |
|---|---|---|---|---|---|---|
| | Age | Tenure | Age | Tenure | Age | Tenure |
| Age: <29<br>Tenure: <4 years | 21.1 | 71.9 | 29.9 | 42.9 | 14.3 | 15.7 |
| Age: 30–34<br>Tenure: 5–9 years | 33.3 | 24.0 | 21.7 | 15.9 | 29.8 | 30.8 |
| Age 35 & over<br>Tenure: >10 years | 45.6 | 4.1 | 48.4 | 41.2 | 55.9 | 53.5 |
| N | 123 | 121 | 575 | 571 | 1218 | 1217 |

Missing observations: Age: 1 Tenure: 8

Average length of tenure:

| | |
|---|---|
| UK1 | 3.5 years |
| UK2 | 9.45 years |
| Japan | 11.32 years |

Reflecting the short years most of the centres in the UK1 group have been in operation, the mean age of the UK1 group is very short. Also its distribution pattern is extremely skewed towards the shortest years of working with the current centres. In contrast, 10-24 year group in the Japanese group is exception-

**Table II-2: Academic backgrounds**

(%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Doctorate | 50.8 | 39.7 | 17.7 |
| Master's degree | 20.5 | 19.8 | 55.0 |
| First degree | 27.1 | 36.7 | 23.3 |
| Others | 1.6 | 3.8 | 4.0 |
| N | 122 | 573 | 1209 |

Missing observations: 13

ally large. When the age and tenure bands are collapsed, an interesting closeness between these for each of the sample groups emerge, as Table II-1 above indicates.

A remarkable closeness of the figures between the age and tenure for the Japanese sample can be noted, reflecting, one would assume, its so-called 'lifetime' employment system, and predicting a very small size of interfirm mobility among the respondents. The discrepancy between the two categories for the UK1, at the shortest and longest tenure ends, is marked, reflecting a high proportion of its sample that has changed companies, and also the relatively recent origin of these research centres in the UK. The table infers that the UK2 group's mobility rate would be higher than Japan, but not of the magnitude of the UK1 group

### Educational backgrounds

The respondents' academic backgrounds for each of the sample groups are shown in Table II-2 above. The proportion of those with a doctorate among the Japanese sample is unusually small compared with the two UK sample groups, but those with a master's degree is much larger. Between the two UK sample groups there is very little difference for all categories of degree holders.

In contrast the proportion of the respondents in the UK1 group who have a Ph. D. is exceptionally high, accounting for just over half of the total, and that in the UK2 almost 40%, whereas that in the Japanese group is surprisingly small. The high ratio of Ph. D.'s in

**Table II-3: When the doctorate degree was obtained: before or after entry into the first job**

(%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Before | 91.8 | 87.6 | 27.1 |
| After | 8.2 | 12.4 | 73.9 |
| N | 61 | 226 | 214 |

Missing observations: 2

UK1 could be explained by the fact that the majority of the companies involved in the survey were engaged in the basic and applied areas of research, and recruited people with a Ph. D. and with a good research track record in the basic and applied field of research whenever possible.

The survey asked when the doctorate degree was obtained, either before the respondents obtained their first job, or after entering employment for the first time, and Table II-3 gives the results. It shows a very clear divide between the UK groups and the Japanese group, as around 90% of the Ph. D.'s in the UK groups obtained it before they entered the job market, whilst more than 70% of those in the Japanese group obtained it after they have entered into employment. Clearly, a possession of a Ph. D. was important for finding the first job in the research centres for the UK employees. Post-hire study in domestic and foreign universities is recognised as an effective method of development by 5.8% of the Japanese respondents, whilst this was considered so by 1.9% of UK2 and only 0.8% of UK1, as is shown in Table IV-2 below.

### Area of highest educational degree

Just above half of the respondents in the UK 2 came from natural sciences background whereas in the Japanese group this proportion was a low 16%. Just over half the UK2 and 47% of the Japanese groups have the engineering science background. One clear difference which divide the UK groups and the Japanese group is that the proportion of the Japanese group who came from other than these two

**Table II-4: Subject areas of highest educational qualification**

(%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Natural Science | 36.5 | 51.6 | 15.9 |
| Engineering Science | 51.2 | 37.6 | 46.8 |
| Others | 13.2 | 10.8 | 37.3 |
| N | 121 | 564 | 1205 |

Missing observations: 27

**Table II-5: Gender distribution**

(%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Male | 88.6 | 78.1 | 92.8 |
| Female | 11.4 | 21.9 | 7.2 |
| N | 123 | 575 | 1218 |

Missing observations: 1

science disciplines accounted for more than one-third of the total whilst this was below 15% for the two UK groups.

### Gender

The proportion of female respondents in both UK samples was higher than that of the Japanese sample, and the UK2 was the highest of them all, though even it was far from equal. R&D appears still highly dominated by male employees, as Table II-5 shows.

### Nationality

This question was asked only in the UK surveys, presumably because of the assumption that almost all of the employees in the research centres in Japan would be Japanese, and those who would fill in the questionnaire written in Japanese would certainly be Japanese. Also there was an expectation that in the UK research centres would be staffed by a wider range of nationalities. Table II-6 shows the UK results.

The large majority of both sample groups are, however, British, though marginally, the proportion of other nationality groups in UK1 is larger than UK2.

**Table II-6: Nationality of employees**

| | UK1 | UK2 |
|---|---|---|
| British | 83.3 | 91.2 |
| Japanese | 2.5 | — |
| Other European | 8.3 | 5.7 |
| North American | 3.4 | 0.7 |
| Other Asian | 1.7 | 1.1 |
| Others | 0.8 | 1.3 |
| N | 120 | 558 |

Missing observations: 20

**Table II-7: Job positions**

(%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Director | 2.5 | 0.9 | — |
| General Manager | 5.0 | 1.8 | 3.2 |
| Assistant Gen. Manager | — | 1.0 | 2.9 |
| Section Chief | 11.6 | 10.0 | 22.0 |
| Sub-section Chief | 23.1 | 24.4 | 31.0 |
| Non-managerial | 50.4 | 48.2 | 40.4 |
| Other | 7.4 | 13.5 | 0.6 |
| N | 121 | 570 | 1219 |

Missing observations: 7

### Current position at work

The distribution patterns of positions at work shown in Table II-7 above are specific to these particular samples, and do not apply generally to the populations in either country. There was no category for director in the Japanese questionnaire.

Those who are non-managerial is the largest category of respondents in all three groups, and in UK1 it is just over half of the total responses. Almost 20% more of the Japanese respondents fall in the positions of section and sub-section chief than in the two UK groups, who in turn has about ten percent more in the non-managerial category. There was only 0.6% of the Japanese sample who had 'other'

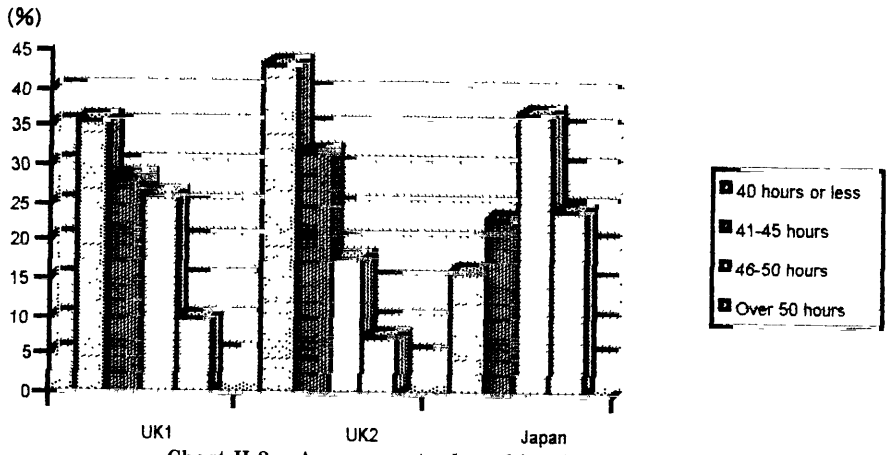


**Chart II-3: Average actual working hours per week**

positions whilst this was 7.4% with UK1 and 13.5% with UK2. Since the title hierarchy is based on the practice in Japan, it is possible that some of the UK respondents did not find the equivalent on the list of titles in the questionnaire.

### Average working hours

The percentage of both UK groups who work longer hours fell as the hours worked becomes longer, whereas that of the Japanese group increased with the increase in the length of hours worked until the average weekly working hours rose beyond 50 hours. Almost one quarter of the Japanese group worked more than 50 hours a week whilst this was 10% or less for the UK groups. The mean working hours per week for the Japanese R&D workers is considerably higher than the UK groups.

Mean working hours per week

| | |
|---|---|
| UK1: | 44.7 hours |
| UK2: | 43.6 hours |
| Japan: | 49.5 hours |

### Summary

It can be said from the foregoing that as far as this survey data are concerned, the Japanese sample on average, is older, has longer years in the current company, has a smaller proportion with a Ph. D. than the UK sample groups, and about three-quarters of those with a Ph. D. obtained it after they have entered the company compared with around 10% in the UK sample groups. A smaller proportion of the Japanese sample came from the natural science background, it is more male dominated, and works much longer hours on average than the UK samples. Also the proportion of people increased as the average working hours increased, while this was opposite with the UK samples. More of the Japanese sample are in the lower middle management than the UK samples but the latter have a larger proportion in the non-managerial position. Of the two UK sample groups, the UK1 group is younger on average, has a shorter tenure length, a higher proportion of the respondents with a Ph. D., a lower proportion of female respondents, a higher proportion of non-UK nationals, than the UK2 group.

## The Study

In this section the data are compared at the simple level of analysis, under the four rubrics of: (1) interfirm mobility and recruitment patterns; (2) careers; (3) ability development, achievement and reward; and (4) attitudes, views and perceptions.

**Table III-1: Inter-firm mobility (%)**

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Yes | 64.2 | 38.9 | 6.9 |
| No | 35.8 | 61.1 | 93.1 |
| N | 123 | 568 | 1218 |

Missing observations: 8

## III. Inter-firm Mobility and Recruitment Patterns

### Inter-firm mobility

From the figures for age and length of service in the current company, a high rate of inter-firm mobility was predicted for the UK samples, particularly for the UK1, and a low rate for the Japanese. Table III-1 above bears this out.

As was predicted in Table II-1, the proportion of the UK1 sample with previous employment experience is almost two-thirds of the sample: in contrast, the figure for the Japanese sample is just under 7%; and that for the UK2 coming somewhere between the two. Given that the UK2 respondents who have not changed company is 61.1%, and those aged 35 years old and with a length of service of 10 years or more are both more than 40%, the rate of job stability in this group appears to be relatively high. The very low mobility in the Japanese group clearly reflects the so-called 'lifetime' employment practice.

The mean frequencies of job change were:

| | Mean |
|---|---|
| UK1: | 2.2 times |
| UK2: | 1.6 times |
| Japan: | 1.2 times |

The maximum number of times anyone in the UK1 changed his/her job was six times whereas this was as many as ten times with the UK2 sample though this latter was a rare case.

**Table III-2: Reasons for changing jobs (Multiple Answers, MA)**

(%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| I was head-hunted | | | 11.0 |
| To conduct further research | 6.2 | 8.1 | 12.4 |
| Maximise one's potential | 2.0 | 12.2 | 0.0 |
| Favourable financial terms | 21.1 | 39.8 | 15.3 |
| Better promotional opportunities | 9.2 | 15.4 | 0.0 |
| More satisfactory working conditions | 11.6 | 8.6 | 7.3 |
| Better prospect for research | 12.3 | 3.1 | 0.7 |
| Less Stressful human relations | 4.1 | 0.5 | 5.8 |
| Brighter future prospect | 13.0 | 6.8 | 21.9 |
| Company's stance towards R&D more agreeable | 8.9 | 0.5 | 11.0 |
| Others | 11.6 | 5.0 | 14.6 |
| N | 79 | 220 | 84 |

Missing observations: 0

### Reasons for changing jobs.

What are the reasons for changing the job? Table III-2 above provides the answers. The first item, 'I was head-hunted' on the table was not included in the UK questions. Also for Japan, 'others' includes 'for no special reason' (1.4%) which was not asked in the questions for the UK.

The financial inducement was the most often quoted reason for both UK sample groups though this was almost twice as frequent for the UK2 as for UK1, and that was the second main reason for the Japanese. The brighter future prospect in the current employers was the most quoted reason by the Japanese. On the whole, the reasons for moving company for the UK2 respondents were more focused on a narrower range of reasons whilst for the Japanese it was spread over a wider range, even if no Japanese moved company to either maximize one's potential or for better promotional opportunity. Favourable financial terms was the only reason in

**Table III-3: Channels of Recruitment**

(%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Introduced by university professor | 6.6 | 4.0 | 42.8 |
| Introduced by university alumni | 0.8 | 1.2 | 10.1 |
| Introduced by University placement office | 0.8 | 3.7 | 13.1 |
| Introduced by parents & friends | 6.6 | 2.4 | 5.7 |
| Applied direct | 13.2 | 39.3 | 12.5 |
| Responded to advert and prospectus | 36.4 | 31.5 | 8.3 |
| Approached by the company | 6.6 | 7.2 | 3.1 |
| Introduced by employment agency | 24.8 | 7.2 | 1.7 |
| Others | 4.1 | 3.5 | 2.8 |
| N | 121 | 572 | 1212 |

Missing observations: 12

which all three groups scored more than 10%, and apart from much brighter prospect in the present company where UK1 and Japan scored more than 10%, other reasons with a score of 10% or higher in all three groups do not coincide with any in other groups.

### Channels of securing employment

What differences are there in the channels through which the respondents have been recruited by the companies for which they currently work? Table III-3 provides the answers.

For UK1, 'responding to advertisement and prospectus' was the most utilized channel for job hunting, followed by 'introduction by employment agency' and 'applied direct', these three channels accounting for 74% of all channels utilized. As this group has the highest proportion of its members having the experience of moving companies, it is not surprising to find that the university-related channels were little relied upon to find them a current job.

For UK2, 'applying direct' was the most utilized channel, followed by 'responding to advertisement and prospectus', accounting for 71% of the total. On the whole, the UK respondents actively sought jobs on their own initiative. On the other hand, for the Japanese group, the three university-related channels accounting for 66% of the total, and particularly 'introduction by professor', were the main channels of job procurement. Given that most of the respondents have joined the company straight from university and remained with it, this is not surprising, and the professors in science and technology/engineering are known to have a strong influence on companies' hiring decisions, which rely on the professors to provide promising students.

## IV. Careers

### Career patterns

We already know from Table I-3, in which parts of the R&D establishments the respondents currently work. In all three groups, applied research accounts for the largest proportion of respondents, followed by product development/design and basic research. These three areas accounted for 75.5% of the UK1, 78.3% of the UK2 and 91.4% of the Japanese group. Research planning where 13.1% of the UK1 and 7.3% of the UK2 respondents currently work, and production technology where 5.2% of Japanese respondents belong came the small fourth in each of the three groups.

**Table IV-1: Where they currently work and where they wish to move in the future**

(%)

| | UK1 | | UK2 | | Japan | |
|---|---|---|---|---|---|---|
| | A | B | A | B | A | B |
| Basic research | 12.3 | 17.5 | 10.8 | 9.3 | 11.2 | 19.2 |
| Applied research | 40.2 | 33.4 | 44.9 | 32.8 | 44.9 | 37.4 |
| Product development/design | 23.0 | 20.0 | 22.6 | 24.4 | 35.3 | 27.5 |
| Production technology | 0.0 | 0.8 | 2.3 | 1.9 | 5.2 | 4.1 |
| Production management | 0.8 | 2.5 | 0.7 | 3.9 | 0.2 | 0.7 |
| Information processing | 2.4 | 2.5 | 1.7 | 0.4 | 0.7 | 0.8 |
| Patent administration | 1.6 | 1.7 | 0.0 | 0.7 | 0.1 | 0.7 |
| Research planning | 13.1 | 13.3 | 7.3 | 12.5 | 1.3 | 6.6 |
| Sales technical support | 0.0 | — | 4.5 | 4.7 | 0.0 | 0.2 |
| Others | 6.6 | 8.3 | 5.1 | 9.5 | 1.2 | 2.8 |
| N | 122 | 120 | 572 | 570 | 1214 | 1205 |

Number of missing observations: A 9; B 22

The figures for the sections where they worked the longest differ little to where they currently are working, as they are concentrated in the three first areas on the table, and applied research being the largest for all three sample groups. The only thing that sticks out is the percentage for basic research which is larger than the figures for current work areas for all three groups but much larger for the UK groups. This is more than twice the current rate figure, showing that there has been a much larger movement out of this area into other areas of work in the UK, somewhat more so with UK1, than in Japan. The reasons for this may be complex, affected by the combination of age, length of tenure, rate of inter-firm mobility, reason for moving to the present company, and the actual number of years for the term, 'longest', being different with each individual.

In Table IV-1 above, figures showing where the respondents are currently working (under A), and those showing where they wish to work in the future (under B) are placed side by side for each of the sample groups.

There is a common trend in the respondents of all three sample groups in wishing to move out of applied research in future. But an upward trend for basic research is only shown by the respondents in UK1 and Japan, where respondents also wished to move out of product development/design. The movements in these two areas in UK2 are in the opposite direction. More respondents in UK2 and Japan wish to go into research planning in the future but the differences in the figures are not great. On the whole, there is no clear cut differences between the UK samples and the Japanese sample.

### Preference for specialist/managerial career routes

Table IV-2 illustrates that whereas both UK sample groups have very similar views as to whether they prefer to stay in the specialist career route or not, and those for and against are roughly equal, around 40% each, the figures for the Japanese show that those who prefer to be specialists are more than twice as many as those who do not wish to become one, and the figure for neutral position is much larger than those for the UK groups. Clearly, more of the Japanese group prefers to become

**Table IV-2: Desirability of becoming a special-status specialist researcher**

(%)

| | UK1 | | UK2 | | Japan | |
|---|---|---|---|---|---|---|
| No, definitely not | 16.5 | | 17.4 | | 4.9 | |
| Prefer not to | 21.5 | 38.0 | 22.2 | 39.6 | 13.5 | 18.4 |
| No preference | 21.5 | 21.5 | 21.7 | 21.7 | 34.4 | 34.4 |
| Prefer to | 23.1 | | 24.5 | | 35.6 | |
| Yes, absolutely | 17.4 | 40.5 | 14.2 | 38.7 | 11.6 | 47.2 |
| N | 121 | | 571 | | 1219 | |

Number of missing observations: 6

**Table IV-3: Reasons for preferring to become specialist status researchers (MA)**

(%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Large-scale research work can be undertaken | 39.8 | 32.1 | 8.7 |
| Higher internal status recognition | — | 1.0 | 0.3 |
| Better terms & conditions | 1.1 | 0.3 | 0.7 |
| Higher social status | 1.1 | 0.3 | 2.1 |
| Desire to concentrate on research | 23.6 | 22.7 | 40.6 |
| Character/capability conducive to research | 33.3 | 39.9 | 46.0 |
| Other reasons | 1.1 | 3.7 | 1.6 |
| N | 49 | 220 | 576 |

Missing observations: 1

a specialist-status researcher than becoming a manager.

For those who prefer to remain in the specialist career route, the three main reasons for their preference are that 'their character and capability are more suited to research', they 'can do interesting work as research fellow' and 'they desire to concentrate on research work', accounting for more than 90% for both UK1 and UK2 groups, as Table IV-3 indicates. The remaining reasons hardly mattered, and they were very focused on the specialist career. For the Japanese, the reasons were even more focused, concentrated in two areas accounting for 86% of the total, and these were that their personality and ability were suited to be a researcher and that they desired to concentrate on research.

For those who do not prefer to become specialist-status researchers two major reasons, 'the wish to gain experience outside research', and 'interesting work can be done as a manager' were common to all three groups. For the Japanese group, the personality/ability factor was another major reason for preferring managerial career ladder to the specialist route, as Table IV-4 next shows. Reasons for which the researchers would prefer the managerial career route appear to be more widely spread than those who would wish to remain in the specialist route.

### Issues of age in career development

The surveys show that there is one age band gap (5 years) between the UK groups and the Japanese group, in their perception of at what age the company actually appointed the researchers to the post of fully-fledged researcher, project leader, and managerial position, and

**Table IV-4: Reasons for not preferring to become specialist status researcher (MA)**

(%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Interesting work can be done as a manager | 20.6 | 20.8 | 31.3 |
| Higher internal status recognition | 9.6 | 6.8 | 3.2 |
| Better terms and conditions | 8.4 | 16.4 | 3.2 |
| Higher social status as a manager | 1.2 | 0.7 | 1.6 |
| Promotion opportunity better as a manager | 13.2 | 13.0 | 3.2 |
| Wish to gain experience outside research | 27.7 | 22.2 | 26.1 |
| Character/capabilities more suited as manager | 8.4 | 13.6 | 26.1 |
| Other reasons | 10.9 | 6.5 | 5.4 |
| N | 46 | 225 | 231 |

Missing observation: 4

**Table IV-5: Age limit for researchers**

(%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Yes | 28.7 | 22.0 | 53.9 |
| No | 71.3 | 78.0 | 46.1 |
| N | 121 | 574 | 1219 |

Missing observations: 3

**Table IV-6: When the age limitation sets in**

(%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Early 20s | 0.0 | 1.6 | 0.0 |
| Late 20s | 3.0 | 5.6 | 0.0 |
| Early 30s | 0.0 | 3.2 | 2.0 |
| Late 30s | 18.2 | 9.5 | 14.5 |
| Early 40s | 21.2 | 10.3 | 15.5 |
| Late 40s | 3.0 | 6.3 | 30.8 |
| >50 (Japan only) | — | — | 4.1 |
| Depends on the individual | 54.6 | 63.5 | 22.1 |
| N | 33 | 126 | 644 |

Missing observations: 13

their views of the desirable age when these positions should be available to them. The UK sample groups opted for an age younger than the Japanese by about one age band, and respondents' view of the desirable age for these positions was ahead of what they perceived to be the age when the company appointed, for all three groups. However, the proportion of those who thought that age was irrelevant for all three positions is much higher for the UK groups than the Japanese group, particularly for desired age, as the average for all three positions for the three groups is indicated below

| | UK1 (%) | UK2 (%) | Japan (%) |
|---|---|---|---|
| Age is irrelevant for promotion | | | |
| Actual age | 16.1 | 8.1 | 0.9 |
| Desired age | 25.2 | 18.3 | 4.2 |

Clearly, age assumes the least important position in the view of the UK1 group at the one end, and the most important position in the view of the Japanese at the other, with regard to judging individual's suitability for promotion, and the Japanese concern with age was further demonstrated in the answers to the question asking whether there is an age limit for a researcher to be effective, as is seen in Table IV-5.

Fewer than 30 percent of the UK respondents thought that there was an age limit to researchers performing their duties effectively, whilst this was almost 54 percent of the Japanese respondents. These levels of age-'fixation', however, have been somewhat miti-

gated when those who were positive about there being an age limit to effectiveness, were asked either to specify a certain age when they thought this limitation comes into effect, or to endorse a view that it depended on the individual.

About 55% of the UK1 (of 28.7%), 64% of the UK2 (of 22.0%) and 22.0% of the Japanese group (53.9%) who were positive about age-limit said that it depended on the individual, as is shown in Table IV-6, reducing the figures for those who were given to a belief in age limitation shown in Table IV-5, approximately down to 13% for UK1, 8% for UK2, and 42% for the Japanese. Those with age-oriented views about researcher effectiveness among the Japanese respondents, however, is still quite high.

Where the respondents indicated the specific age, the largest proportions of the respondents in the UK groups thought that the early 40s were the limit, but this for Japan was the late forties. A small proportion of the UK respondents indicated that the age limit sets in as early as in the 20s—this is another way of saying that some people reach the limit of their effectiveness in their twenties and it depended on the individual. (Table IV-6)

As to the causes for the age limitation, all three groups were broadly in agreement, and the three main causes were: administrative duties interfering with research work; other tasks interfering with research work; and lack of fresh ideas and creativity. The first two causes are something that could be removed if the researcher is freed from these administrative and other tasks that interfere with being effective.

### Perception of individual's creativity by self and by others

The respondents were asked to respond to two statements: if they perceived themselves to be creative; and if they were told by their supervisor/colleagues that they were creative. The consecutive integer scoring of 1 to 5 where 1='not at all' and 5='very' was used for self-perception, and 1='never' and 5='frequently' was used for perception by colleagues. The mean scores are given below.

| | Self-perception | Others' perception |
|---|---|---|
| UK1 | 3.98 | 2.81 |
| UK2 | 3.93 | 2.94 |
| Japan | 3.25 | 3.02 |

The UK groups' self-perception of being creative is much higher than the Japanese group's. In fact, no one in UK1 admitted him/herself to be not at all creative. But the likelihood of UK researchers' receiving (or giving for that matter) words of praise even occasionally is negative whilst that of their Japanese counterparts receiving it is only just in the positive score.

### Fairness of assessment

The responses to the question if their creativity was fairly assessed were given also by marking one of the five consecutive figures between 1 and 5, where 1='not at all' and 5='definitely'. The means for the three groups are given below:

| | |
|---|---|
| UK1 | 3.32 |
| UK2 | 3.25 |
| Japan | 3.04 |

The UK groups are somewhat more positive about having their creativity assessed fairly than the Japanese who are close to being not sure about it.

The UK groups are more positive about self-image of creativeness, less likely to receive words of praise from the close colleagues at the work place, but more certain of their creativity being assessed fairly, than the Japanese.

## V. Ability Development, Achievement and Reward

### Ability development

On the whole, respondents of all three groups are positive about the value of their education received before entering employ-

ment for doing their job, UK1 being the most positive, and the Japanese the least so, as Table V-1 below shows.

**Table V-1: Value of education for their job**

(%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Very or relatively useless | 5.9 | 13.6 | 19.9 |
| Neither useless nor useful | 14.4 | 15.6 | 17.5 |
| Relatively or very useful | 79.7 | 70.8 | 62.6 |
| N | 118 | 569 | 1208 |

Missing observations: 22

**Table V-2: Effective methods of development (MA, weighted)**

(%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| 1 Guidance by supervisor in on-the-job training | 21.4 | 25.1 | 23.9 |
| 2 Experience in highly responsible work | 17.3 | 15.4 | 18.3 |
| 3 Extensive rotation within the R&D department | 4.0 | 4.0 | 2.6 |
| 4 Transfer to operating department | 0.4 | 2.0 | 4.5 |
| 5 Participation in joint projects with researchers from other fields | 7.6 | 10.6 | 4.3 |
| 6 Planning and implementing new projects | 10.3 | 8.8 | 6.1 |
| 7 Temporary assignment in an affiliated company | 1.4 | 1.5 | 0.8 |
| 8 Participation in joint projects in other research institutes | 2.0 | 1.6 | 2.6 |
| 9 Post-hire study in domestic universities | 0.4 | 1.5 | 3.2 |
| 10 Post-hire study in foreign universities | 0.4 | 0.4 | 2.6 |
| 11 Self development | 18.4 | 15.4 | 9.8 |
| 12 Lectures/seminars in your professional fields | 2.4 | 3.2 | 6.6 |
| 13 Participation in exchanges and study groups with specialists from other companies | 0.5 | 1.0 | 4.2 |
| 14 Participation in study groups inside the company | 1.1 | 1.2 | 1.9 |
| 15 Attending academic meetings and conferences in your field | 9.2 | 6.3 | 8.3 |
| 16 Others | 3.2 | 2.0 | 0.3 |
| Total | 100.0 | 100.0 | 100.0 |

## Effective methods of development

What did they feel were the three most effective forms of developing their skills and abilities necessary as researchers, they have undergone? Out of 16 items, they were asked to choose three and place them as the first, second and third choices. The percentage figures for the first choice were weighted by multiplying them by 3, the second choice by 2 and the third choice by 1, and after they were added together for the items, were divided for each of the items to get the percentage figures.

The result is shown in Table V-2. As effective cases for each preference varied, no effective number is given.

In all three groups, 'guidance by supervisor in on-the-job training' is considered the most effective method of training, and two others, namely, 'experience in highly responsible work' and 'self development' follow it, though the order in which they occur is different in

**Table V-3: Number of achievements accomplished (MA)**

**(the mean)**

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Overseas patent application | 1.8 | — | 1.3 |
| Domestic patent application | 2.4 | — | 4.7 |
| Presentation at overseas academic meetings | 2.3 | 1.4 | — |
| Presentation at domestic academic meetings | 2.0 | 2.2 | 1.6 |
| Publication in foreign journal | 3.0 | 1.4 | — |
| Publication in domestic journal | 1.1 | 1.4 | — |
| Commercialisation of research achievement | — | 1.0 | — |
| Satisfied important demands from operating divisions | 2.7 | 3.5 | — |
| Lectured as invited guest | 1.1 | 1.5 | — |

UK1 from the others in that it is 'self development' which comes next, and these two score the same for UK2. Two other methods which came fourth and fifth also are similar among the groups. One of these, 'planning and implementing new projects' was prominent in all three groups, and the UK1 and the Japanese groups also recognize 'attending academic meetings and conferences in one's own field' as an important means of staff development, whilst UK2 respondents considered 'participation in joint projects with researchers from other fields' as an effective method for development after the first three already mentioned. One could say that methods of training regarded most effective by these three groups are the same, and there was not much difference between the UK and Japanese groups.

Interestingly, for the Japanese respondents post-hire study in both domestic and foreign universities account for 5.8% of the total sample, presumably offering company-sponsored opportunities for postgraduate study.

## Achievements

Then what were their achievements in their work? The respondents were asked to give a score for the number of times they successfully accomplished each of the 13 areas of achievement in the previous five years. Items for which the mean scores are greater than one are given in Table V-3.

Although achievements have been made in all 13 as well as in 'other' areas, those where the average value of more than one was scored for all three groups were limited to 9 areas as is shown in the table. The Japanese have only made it to three areas, with a very high score in domestic patent application, whilst UK1 and UK2 scored in eight and seven areas respectively. The UK1 group scored 2 or above in five areas. For this group, publication in foreign journals was the area where the high achievement had been scored. The area of the highest score for the UK2 group was in satisfying important demands from operating divisions, with one other item, presentation at domestic academic meetings scoring more than 2. The high level of achievement by UK1 could well have been related to high proportion of Ph. D., and the very high level of inter-firm mobility among its respondents who experienced different stimuli from the contact with heterogeneous environment.

### Reward

How do the respondents perceive their companies reward achievements now is contrasted with how they would wish to be rewarded in the future in this section. If there is a close proximity between the two, then the respondents can be taken to be fairly happy with the way the company rewards their achievements. They were again asked to pick out three out of

**Table V-4: Rewards offered by the company now, and preferred by the respondents in the future (MA, weighted)**

(%)

| | UK1 | | UK2 | | Japan | |
|---|---|---|---|---|---|---|
| | Now | Future | Now | Future | Now | Future |
| 1 | 23.9 | 24.4 | 22.1 | 21.7 | 17.8 | 18.5 |
| 2 | 12.0 | 16.2 | 24.8 | 17.1 | 21.2 | 19.3 |
| 3 | 0.7 | 1.0 | 0.3 | 2.2 | 0.3 | 2.4 |
| 4 | 0.2 | 1.5 | 0.3 | 1.9 | 0.1 | 2.3 |
| 5 | 10.3 | 5.2 | 17.1 | 5.7 | 16.3 | 2.9 |
| 6 | 4.3 | 8.6 | 6.3 | 12.8 | 6.2 | 10.5 |
| 7 | 15.5 | 19.1 | 7.1 | 13.8 | 5.6 | 14.8 |
| 8 | 8.7 | 6.1 | 5.7 | 7.7 | 3.1 | 10.4 |
| 9 | 5.5 | 6.8 | 2.3 | 6.5 | 3.6 | 5.2 |
| 10 | 4.7 | 6.3 | 2.2 | 3.2 | 3.3 | 4.8 |
| 11 | 1.3 | 1.3 | 1.1 | 3.9 | 4.7 | 6.1 |
| 12 | 3.2 | 0.6 | 5.7 | 2.3 | 16.6 | 1.3 |
| 13 | 8.7 | 2.9 | 3.3 | 0.6 | 0.8 | 1.4 |
| 14 | 1.0 | 0.0 | 1.7 | 0.6 | 0.4 | 0.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Keys to the numbers:

1. Pay raise
2. Bonus and individual rewards
3. Sabbatical leave
4. Long vacation
5. Promotion to managerial posts
6. Appointment to special status research specialist position (e.g. Fellow)
7. Greater freedom in setting research themes and how to proceed
8. Greater delegation of authority over research activities
9. Larger research budget
10. More research staff
11. Outside research opportunities (e.g., study in university)
12. Intra-company commendation
13. Acquisition of patent
14. Others

the total of 14 items, and place them in order of prominence with which these rewards are being offered now by the company, and also a separate set of three rewards in order of their own preference in the future. The results were also weighted in the similar manner employed in the section on development above, and the results are given in Table V-4 below.

'Pay raise' offered by the company figured prominently in all three groups, but not the most prominent in UK2 and Japan which placed 'bonus' as the most prominent reward offered by the company, with 'pay raise' coming in the second place. However, UK1 regarded 'greater freedom' as the second prominent reward offered by the company, followed by 'bonus' in the third place. For UK1, the importance of all these rewards increased in

desirability for the future. For UK2, both 'bonus' and 'pay raise', and 'promotion to managerial post' in the third place, offered by the company decreased in desirability, 'promotion to managerial post' in particular, whilst for Japan, the value of 'bonus' decreased slightly for the future, which was balanced by a slight increase in the desirability of 'pay raise' for the future, but that for 'intra-company award' which came third in terms of reward offered by the company, was rejected decisively for the future. Looking at other items beyond the third place, the importance of 'promotion to managerial post' offered by the company decreased consistently as the future reward for all sample groups. Conversely, for the Japanese and UK2 groups 'bonus and individual rewards' is more important than the pay, but less preferable in the future. But for UK1, 'greater freedom for research' comes second, and it is seen to be more desirable in the future. For the other two groups, this item also becomes of considerable importance to respondents in the future, though it is not much emphasized by the company now. 'Promotion for managerial post' which scores relatively high in all three groups, is not favoured for the future also by UK2 and in particular by Japan, whilst 'appointment to special status research specialist' is seen to be more desirable in the future by all three groups. Also for the Japanese group, greater delegation of authority over research activities is viewed with favour for the future.

### Sectional summary

As a summary to this section, it seems reasonable to conclude that all three groups consider the education they received prior to entry into employment as positively useful preparation for their current work, though slightly less so in the case of the Japanese group (this could be an effect of much larger proportion of the Japanese respondents having other than science or engineering degree), and that they regard in common the three most useful methods of developing their skills and ability though there is a difference between the UK and Japanese groups as to the most effective of the three. In terms of achievements, the Japanese group is more narrowly focused in terms of the areas where they have made achievements and particularly in applying for domestic patents, whilst these are spread in much wider areas for the UK groups, with UK2 group highly focused on meeting the demands of internal divisions and UK1 on their papers published in foreign journals though less intensely. Where the kinds of reward are considered, both in terms of those given by the company now and of those which they themselves would like to be given in the future, pay raise and bonuses and individual reward, come high in all groups. However, beyond these pecuniary provisions, the rewards given by the company now and desired by the respondents in the future do not always coincide. The remaining items seem to divide fairly clearly between those which are desired more in the future, and those which are likely to lose their appeal. Some which are offered now by the company are regarded as very unattractive in the future as forms of reward. Preferred rewards shown by the respondents here may be worth consideration as better incentives than some which are now offered by the company.

## VI. Attitudes, Views and Perceptions: Work and the Workplace

This section looks at the attitudes to, and personal views and perceptions of the respondents, about the environment in which they work, in order to see how it might affect their morale and motivation, and could promote, or hinder, their achievement.

### The culture and management practices at the workplace

The respondents were asked to rate each of the 15 statements about the culture and management practices usually found in the work environment on a five-point consecutive integer scoring scale, from 1 to 5, in which 1='not at all' and 5='always'. The score of 3 is considered to be a median point, above which it is

**Table VI-1: Management culture and practice**

| Statements | UK1 | UK2 | Japan |
|---|---|---|---|
| | Mean | Mean | Mean |
| 1. R&D is closely linked to the commercialisation of products | 3.78 | 3.83 | 3.74 |
| 2. R&D staff are provided with information on the market and customers | — | 3.25 | — |
| 3. Researchers are encouraged to take risks | — | — | — |
| 4. Members are encouraged to undertake independent research activities (e.g. underground) outside official projects | — | — | — |
| 5. Contribution of individuals are fairly evaluated even when work is done as a team | 3.53 | 3.31 | — |
| 6. An effort is made to reduce the time spent by research leaders in making arrangements among members and resolving conflicts | 3.06 | — | — |
| 7 Emphasis is placed on combining professionals with different backgrounds when forming a team for a research project | — | 3.38 | — |
| 8 There are many opportunities to exchange research information by inviting researchers within the company and from other firms | — | 3.31 | — |
| 9. Research exchange is promoted with other research institutes, professional societies and universities | — | 3.27 | 3.12 |
| 10. Many researchers from other research institutes and universities are Recruited | 3.34 | 3.14 | — |
| 11. Researchers have great freedom over expenditures and the management of staff at the research institute | — | — | 3.13 |
| 12. Researchers make independent decisions over the management of working hours | 3.67 | 3.54 | — |
| 13. The research theme is assigned in consideration of what individual researchers are interested in | 3.18 | — | 3.99 |
| 14. Research is usually conducted in project teams which are organised and disbanded as needs arise | 3.23 | 3.78 | — |
| 15. Project teams are used extensively to meet changing research needs | 3.27 | 3.84 | 3.28 |

regarded positive and below negative.

All the values below 3.00 have been removed to highlight the positive values. Also the values above 3.50 can be regarded as quite positive.

Table VI-1 indicates that all three groups have common factors in the environment of their companies. One such is that R&D is very closely linked to commercialisation of products in their company, and they all score high on this. One other is that project teams are used extensively to meet research needs, UK2 being the high scorer on this item. Given the first factor, it is not surprising that all groups are negative about researchers taking risks and doing blue sky research independently. Altogether the Japanese group score positively on much fewer statements (5) than UK1 (8) and UK2 (10), and this gives much fewer characteristics which the respondents positively identified. Only other item for which the Japanese group scored quite positively is that research theme is assigned to match the individual interest of researchers. UK1 scored very positively on two further items: 'fair assessment of individual contributions in a team work'; and 'discretion on managing their working hours', and UK2 on 'discretion on managing their working hours' and 'working in a fluid project teams'.

**Table VI-2: Factors important in stimulating researchers performance–in order of value magnitude (the mean)**

| UK1 | | UK2 | | Japan | |
|---|---|---|---|---|---|
| 24 | 4.47 | 1 | 4.45 | 1 | 4.61 |
| 1 | 4.46 | 9 | 4.33 | 3 | 4.38 |
| 9 | 4.29 | 24 | 4.33 | 4 | 4.27 |
| 23 | 4.17 | 13 | 4.24 | 2 | 4.23 |
| 15 | 4.16 | 14 | 4.24 | 23 | 4.18 |
| 4 | 4.10 | 23 | 4.24 | 6 | 4.17 |
| 3 | 4.09 | 4 | 4.16 | 7 | 4.12 |
| 14 | 4.06 | 15 | 4.15 | 9 | 4.09 |
| 2 | 4.05 | 7 | 4.13 | 8 | 4.08 |
| 18 | 4.05 | 3 | 4.11 | 21 | 4.06 |
| 13 | 4.04 | 26 | 4.02 | 14 | 4.04 |
| 7 | 3.93 | 8 | 4.00 | 16 | 3.98 |
| 25 | 3.90 | 5 | 3.94 | 5 | 3.92 |
| 26 | 3.90 | 25 | 3.94 | 13 | 3.92 |
| 21 | 3.78 | 18 | 3.88 | 18 | 3.84 |
| 8 | 3.71 | 2 | 3.87 | 19 | 3.78 |
| 5 | 3.66 | 6 | 3.67 | 25 | 3.78 |
| 16 | 3.63 | 17 | 3.67 | 17 | 3.77 |
| 17 | 3.62 | 21 | 3.64 | 15 | 3.75 |
| 19 | 3.46 | 11 | 3.56 | 24 | 3.73 |
| 11 | 3.45 | 16 | 3.50 | 11 | 3.54 |
| 6 | 3.38 | 19 | 3.42 | 26 | 3.53 |
| 10 | 3.23 | 12 | 3.28 | 12 | 3.50 |
| 12 | 3.14 | 20 | 2.95 | 22 | 3.14 |
| 20 | 3.02 | 10 | 2.78 | 20 | 3.02 |
| 22 | 2.61 | 22 | 2.76 | 10 | 2.78 |

Key to the factors

1. Clearly established research goals
2. Pertinent establishment of research theme
3. Sound evaluation of research achievement
4. Fair personnel evaluation
5. Promotion opportunities
6. Research-support staff
7. Research budget
8. Communication with other departments
9. Research facilities
10. Location of research site
11. Communication with other research institutes
12. Opportunities for research presentation outside the company
13. Opportunities for skill development
14. Leadership capability of supervisor/seniors
15. Human relations at the workplace
16. Freedom in research
17. Discretion allowed over work
18. Freedom in terms of time management
19. Remuneration directly linked to research achievements
20. Fringe benefits
21. Open organisational culture
22. Personnel rotation
23. Enthusiasm of top management for R&D
24. Recruitment of talented individuals
25. Diversity of research staff backgrounds
26. Employment security

The Japanese respondents appear to give a much more inward-focused emphasis in their responses to these statements than the UK groups. This may reflect the difference in the rate of mobility between the UK and the Japanese sample groups, with the Japanese tending to be more preoccupied with the internal situations, though one of the four positively scored factors was the exchange of researchers with external organisations. It is possible that this is being encouraged by management because staying with the same company so long, they could become victim to what Sakakibara terms intra-company 'isomorphism' and a need to have external stimuli may have been recognised. Its relatively modest score indicates a tentative attempt by the Japanese to cultivate an openness to outside stimulation.

### Factors important as stimuli for improving performance

Factors which together comprise the working environment are clearly crucial to those who work in it, and would make a difference in their performance. The respondents were asked to evaluate 26 factors on the consecutive integer scale score from 1 to 5 in which 1 equated with 'not important at all' and 5 'very important', with 3 standing for 'not sure'. The results for each of the groups are given, in the

order of the magnitude of the mean scores in Table VI-2.

Since this question on importance of the factors in their environment and the next one on the degree of satisfaction the respondents feel about them are at the heart of this enquiry, and in order to make the identity of these factors easier, they are listed above.

In all groups the majority of the factors were regarded important enough to score a positive value. Those with a negative value numbered only one in UK1 and Japan and three in UK2. At the opposite end, the number of factors which attracted a very high value, 4.00 or above, are also about the same for all three groups, with UK1 and Japan scoring 11 and UK2 12. These factors scoring 4.00 and above in each of the groups, however, are not identical, indicating that there is some variation in the kind of factors respondents in each group consider important in encouraging and motivating them to improve performance.

In the immediate following section, comments are made regarding these factors which attracted the mean score of 4.00 or higher, and could be considered being in the 'high score league', and taken very seriously by the respondents.

The following six factors appeared in the high score league of all three groups:

1. Clearly established research goals
3. Sound evaluation of research achievements
4. Fair personnel evaluation
9. Research facilities
14. Leadership capability of supervisory/seniors
23. Enthusiasm of top management for R&D

Notable in the positions these six factors occupied were: factor 1 which came top in importance in UK2 and Japan and only just second in UK1; and factor 23 in the upper half of the 'very important' factors for all group. Also factor 9 came second and third in the UK groups, whilst in the Japanese group, the second and the third places were occupied by factors 3 and 4, both to do with evaluation.

Factors 24 (recruitment of talented individuals), 15 (human relations at work) and 13 (opportunity for skill development) in the high scoring league, were common to the two UK groups only, and in both groups factor 24 (recruitment of talented individuals) occupies a very high position, coming top in UK1 and third in UK2 whilst coming a low 20th in the Japanese group. Since large Japanese companies (with big central laboratories) traditionally recruit individuals only at the beginning of their career, without any experience of work, and nurture them in house after they entered the company, this factor is not seen to be as important as it is to the UK groups. Factor 15 (human relations at the workplace) was more highly placed by UK1 than UK2, and factor 13 (opportunities for skill development) vice versa.

Factor 2 (pertinent establishment of research theme) was in the high value league for UK1 and Japan though its position was fairly high only in the Japanese group, whilst factors 7 (research budget) and 8 (communication with other departments) were common to UK2 and Japan, both occurring in the lower half of the table.

Looking at the table as a whole, one notes that the factors which appeared only in the table of each of the three groups separately were 18 (freedom in terms of time management) for UK1, 26 (employment stability) for UK2, and 6 (research-support staff) and 21 (open organisational culture) for Japan.

**Satisfaction level of the important factors**

The respondents were asked about the extent of satisfaction they felt with the same 26 factors at the workplace, and to mark one of the five integers, ranging from 1 to 5, for each of the 26 factors, where 1 equaled 'very dissatisfied' and 5 'very satisfied'. The neutral number, 3 was 'not sure'. The result of this consecutive integer scoring is given as means in Table VI-3, in which they are set next to their importance scores (the column headed by the letter I and given in order of the magnitude

**Table VI-3: The mean values of factors for importance and satisfaction (The Mean)**

| UK1 | | | UK2 | | | Japan | | |
|---|---|---|---|---|---|---|---|---|
| No | I | S | No | I | S | No | I | S |
| 24 | 4.47 | 3.56 | 1 | 4.45 | 3.53 | 1 | 4.61 | 3.28 |
| 1 | 4.46 | 3.35 | 9 | 4.33 | 3.85 | 3 | 4.38 | 3.05 |
| 9 | 4.29 | 3.88 | 24 | 4.33 | 3.36 | 4 | 4.27 | 2.95 |
| 23 | 4.17 | 3.22 | 13 | 4.24 | 3.65 | 2 | 4.23 | 3.44 |
| 15 | 4.16 | 3.56 | 14 | 4.24 | 3.22 | 23 | 4.18 | 3.07 |
| 4 | 4.10 | 3.28 | 23 | 4.24 | 3.04 | 6 | 4.17 | 2.90 |
| 3 | 4.09 | 3.04 | 4 | 4.16 | 3.27 | 7 | 4.12 | 3.24 |
| 14 | 4.06 | 3.20 | 15 | 4.15 | 3.69 | 9 | 4.09 | 3.23 |
| 2 | 4.05 | 3.32 | 7 | 4.13 | 3.07 | 8 | 4.08 | 3.00 |
| 18 | 4.05 | 3.83 | 3 | 4.11 | 3.11 | 21 | 4.06 | 3.06 |
| 13 | 4.04 | 3.29 | 26 | 4.02 | 3.39 | 14 | 4.04 | 3.08 |
| 7 | 3.93 | 3.46 | 8 | 4.00 | 3.31 | 16 | 3.98 | 3.17 |
| 25 | 3.90 | 3.42 | 5 | 3.94 | 2.79 | 5 | 3.92 | 3.02 |
| 26 | 3.90 | 3.64 | 25 | 3.94 | 3.58 | 13 | 3.92 | 3.04 |
| 21 | 3.78 | 3.25 | 18 | 3.88 | 4.00 | 18 | 3.84 | 3.52 |
| 8 | 3.71 | 2.80 | 2 | 3.87 | 3.36 | 19 | 3.78 | 3.24 |
| 5 | 3.66 | 2.89 | 6 | 3.67 | 3.03 | 25 | 3.78 | 2.77 |
| 16 | 3.63 | 3.39 | 17 | 3.67 | 3.38 | 17 | 3.77 | 3.10 |
| 17 | 3.62 | 3.24 | 21 | 3.64 | 3.22 | 15 | 3.75 | 3.57 |
| 19 | 3.46 | 2.83 | 11 | 3.56 | 3.34 | 24 | 3.73 | 2.66 |
| 11 | 3.45 | 2.98 | 16 | 3.50 | 3.23 | 11 | 3.54 | 2.84 |
| 6 | 3.38 | 2.90 | 19 | 3.42 | 2.90 | 26 | 3.53 | 3.55 |
| 10 | 3.23 | 3.69 | 12 | 3.28 | 3.39 | 12 | 3.50 | 3.04 |
| 12 | 3.14 | 3.13 | 20 | 2.95 | 3.09 | 22 | 3.14 | 2.78 |
| 20 | 3.02 | 2.81 | 10 | 2.78 | 3.69 | 20 | 3.02 | 3.16 |
| 22 | 2.61 | 2.74 | 22 | 2.76 | 2.98 | 10 | 2.78 | 3.52 |

Keys: I='Importance' scores; S='Satisfaction' scores.

of scores in Table VI-2 above, under the heading of letter S for satisfaction). The mean with a value of 3.50 or above is regarded as showing a high level of satisfaction.

For UK1, there were six factors which scored a high level of satisfaction: research facilities; freedom in terms of time management; location of research site; employment security; recruitment of talented individuals; and human relations at the workplace. Many of the factors with high satisfaction level seem reflect the history and the purpose for which the Japanese-owned UK research centres are located in the UK.

For UK2, there were seven factors: freedom in terms of time management; research facilities; human relations at the workplace; location of research site; opportunities for skills devel-

opment; diversity of research staff backgrounds; and clearly established research goals. Freedom in terms of time management (4.00) was not only the highest mean satisfaction score for the whole of the samples, but also higher than the score for importance factor. Also the score for location of research site was markedly higher than its importance score which was in the negative.

For Japan, there were four: human relations at the workplace; employment security; freedom in terms of time management; and location of research site which attracted high satisfaction scores. The number of factors scoring above 3.50 are fewer for Japan, and these were in the lower range of scores, e.g. in the 3.50s. This is seen in the averages: for Japan, the average of the satisfaction mean scores was 3.12, while UK1 and UK2 were 3.35 and 3.37 respectively.

Factors which scored more than 3.50 and are common to all three groups were: freedom in terms of time management; and location of research site. The former was only modestly important, and the latter not important, in the case of UK2 and Japan.

**Relationship between the factors of importance and satisfaction**

However, a more comprehensive picture of the relationship between the degrees of importance the factors were given and the scale of satisfaction felt for them by the respondents can be seen in Table VI-4 in which the means were converted into rank-figures as follows:

Rankings for Importance scores

| | |
|---|---|
| The mean values of $>4.00$ | 1 |
| The mean values between 3.00 and 3.99 | 2 |
| The mean values of $<3.00$ | 3 |

Rankings for Satisfaction scores

| | |
|---|---|
| The mean values of $>3.50$ | 1 |
| The mean values between 3.00 and 3.49 | 2 |
| The mean values of $<3.00$ | 3 |

Of the eleven factors which were regarded highly important by the respondents of UK1, four (research facilities, freedom in time management, recruitment of talented individuals, and human relations at the workplace) were identified by them as being present in their working environment at a very satisfactory level, and the remaining seven at a relatively satisfactory level. None of these was regarded as unsatisfactory. For UK2 where the number of highly important factors was twelve, four (research facilities, human relations at the workplace, opportunity for skills development, and clearly established research goals) were very satisfactory and 8 relatively so. Neither of the UK groups had factors which scored relation-rating of B- (For relation-rating scoring, see the bottom of Table VI-4). The factors with the relation-rating of A shared by UK1 and UK2 were 'research facilities', and human relations at the workplace'. However, in the case of Japan where eleven factors were regarded very important, none was thought to be present at a very satisfactory level. Worryingly, two factors with the top rating scores for importance were found to be unsatisfactory, and these were 'fair personnel evaluation' and 'research support staff'. Clearly, these factors must be taken note of.

Perhaps the factors with a R-rating of C- are also worthy of attention. For UK1 which has six factors with this rating, they were: 'communication with other departments', 'promotional opportunities', 'remuneration directly linked with research achievements', 'communication with other research institutes', 'research support staff', and 'fringe benefits'. For UK2, these were 'promotional opportunities', and 'remuneration directly linked with research achievements' which were both also the UK1's concerns. As for Japan, these were: 'diversity of research staff individuals'; 'recruitment of talented individuals' 'communication with other research institutes'; and 'personnel rotation'. Of these, only 'communication with other research institutes' was found among the UK1's factors of concern. The main concern of the Japanese here is to do with the introduction of more diverse contacts with people outside their own close-knit groups.

In summary, it can be said that there was a

**Table VI-4: Ranking of scores of factors for importance (I), satisfaction (S) and their Relationships (R)**

| UK1 | | | | UK2 | | | | Japan | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No | I | S | R | No | I | S | R | No | I | S | R |
| 24 | 1 | 1 | A | 1 | 1 | 1 | A | 1 | 1 | 2 | B |
| 1 | 1 | 2 | B | 9 | 1 | 1 | A | 3 | 1 | 2 | B |
| 9 | 1 | 1 | A | 24 | 1 | 2 | B | 4 | 1 | 3 | B− |
| 23 | 1 | 2 | B | 13 | 1 | 1 | A | 2 | 1 | 2 | B |
| 15 | 1 | 1 | A | 14 | 1 | 2 | B | 23 | 1 | 2 | B |
| 4 | 1 | 2 | B | 23 | 1 | 2 | B | 6 | 1 | 3 | B− |
| 3 | 1 | 2 | B | 4 | 1 | 2 | B | 7 | 1 | 2 | B |
| 14 | 1 | 2 | B | 15 | 1 | 1 | A | 9 | 1 | 2 | B |
| 2 | 1 | 2 | B | 7 | 1 | 2 | B | 8 | 1 | 2 | B |
| 18 | 1 | 1 | A | 3 | 1 | 2 | B | 21 | 1 | 2 | B |
| 13 | 1 | 2 | B | 26 | 1 | 2 | B | 14 | 1 | 2 | B |
| 7 | 2 | 2 | C | 8 | 1 | 2 | B | 16 | 2 | 2 | C |
| 25 | 2 | 2 | C | 5 | 2 | 3 | C− | 5 | 2 | 2 | C |
| 26 | 2 | 1 | C+ | 25 | 2 | 1 | C+ | 13 | 2 | 2 | C |
| 21 | 2 | 2 | C | 18 | 2 | 1 | C+ | 18 | 2 | 1 | C+ |
| 8 | 2 | 3 | C− | 2 | 2 | 2 | C | 19 | 2 | 2 | C |
| 5 | 2 | 3 | C− | 6 | 2 | 2 | C | 25 | 2 | 3 | C− |
| 16 | 2 | 2 | C | 17 | 2 | 2 | C | 17 | 2 | 2 | C |
| 17 | 2 | 2 | C | 21 | 2 | 2 | C | 15 | 2 | 1 | C+ |
| 19 | 2 | 3 | C− | 11 | 2 | 2 | C | 24 | 2 | 3 | C− |
| 11 | 2 | 3 | C− | 16 | 2 | 2 | C | 11 | 2 | 3 | C− |
| 6 | 2 | 3 | C− | 19 | 2 | 3 | C− | 26 | 2 | 1 | C+ |
| 10 | 2 | 1 | C+ | 12 | 2 | 2 | C | 12 | 2 | 2 | C |
| 12 | 2 | 2 | C | 20 | 3 | 2 | D+ | 22 | 2 | 3 | C− |
| 20 | 2 | 3 | C− | 10 | 3 | 1 | D++ | 20 | 2 | 2 | C |
| 22 | 3 | 3 | D | 22 | 3 | 3 | D | 10 | 3 | 1 | D++ |

Note: This method of evaluation is devised for convenience here, and has no statistical validity.

Keys to the relations rating (R-rating) between importance (I) and satisfaction (S)

| | | | |
|---|---|---|---|
| A: | I=1, | S=1 | High importance and high satisfaction |
| B: | I=1, | S=2 | High importance and moderate satisfaction |
| B−: | I−1, | S=3 | High importance and negative satisfaction |
| C: | I=2, | S=2 | Moderate importance and moderate satisfaction |
| C+: | I=2, | S=1 | Moderate importance and high satisfaction |
| C−: | I=2, | S=3 | Moderate importance and negative satisfaction |
| D: | I=3, | S=3 | Negative importance and negative satisfaction |
| D++: | I=3, | S=1 | Negative importance and high satisfaction |
| D+: | I=3, | S=2 | Negative importance and moderate satisfaction |

**Table VI-5: R-rating scores for three groups.**

| | A | B | B− | C | C+ | C− | D | D++ | D+ |
|---|---|---|---|---|---|---|---|---|---|
| UK1 | 4 | 7 | − | 6 | 2 | 6 | 1 | − | − |
| UK2 | 4 | 8 | − | 7 | 2 | 2 | 1 | 1 | 1 |
| Japan | − | 9 | 2 | 7 | 3 | 4 | − | 1 | − |

broad difference between the UK groups and the Japanese group in terms of the satisfaction they felt with those factors in their working environment which they felt were important in motivating them to improve their performance. But at the same time, the UK2 group had fewer factors which were important to the respondents but were not satisfactory than the UK1 group.

### Rating of the supervisor

The role of the supervisor clearly is of importance as the interface between the rank and file R&D staff and the management, and his/her leadership capacity can influence the environment of the workplace both in terms of human relations among the immediate members as well as other conditions that prevail. Leadership capability of the supervisor was one of the factors that scored the 1-rating importance for all three groups but B in the R-rating. So there is a room for improvement for all three groups. Also, human relations at work was the factor highly important for two UK groups and relatively important for the Japanese, but all three groups scored 1 for the satisfaction rating. How do the respondents see the roles their immediate supervisors play in their life at the workplace? One of the questions addressed this enquiry.

The respondents were asked to score on the consecutive integer scale of 1 to 5 in which 1 equated with 'not at all' and 5 with 'always', on 12 statements. The results are given as the means in Table VI-6 below.

Although there is one negative score, there is very little difference between the mean values of the three groups for each of the 12 items, with the largest never being greater than the smallest by more than 0.42, and with some only 0.08 between them. This shows in the averages which are very close. The supervisor in UK1 is slightly more likely to give consideration to his/her subordinates' feelings and views, require staff members to perform their tasks to the limit of their ability, and talks with his/her subordinates about the future direction of research work more often than in UK2 and Japan. In UK2, the supervisor is depicted as slightly more inclined to be understanding about staff members' concerns and frustrations, to give constant encouragement to staff members to keep a critical mind, and to take the lead in his team's problem solving than in the UK1 and the Japanese group.

The supervisor in the Japanese sample is marginally more likely to demand his/her subordinates always to conform to his/her decision, constantly redefine the role of his/her department to meet the changing corporate strategies, suggests new ways and methods without being tied to convention, be better at building both internal and external information networks, demand his staff not to give up achieving their goals, and get support from other functional departments, than the UK1 and UK2 groups. The picture of the Japanese supervisor is one of more authoritative, and more autonomous figure, and that of a very assiduous networker with people of other departments and outsiders than the UK supervisor, but, as the averages indicate, the difference between them is by a very small degree.

### Views about work and company

Table VI-7 below shows the responses to a series of statements about work and company. On the whole, the respondents in all three groups share their positive feelings towards their work. They are very interested in and committed to their job, and spend much of their non-work time thinking about their job and studying to improve their performance. They are loyal to their profession, and intend to stay in their current job. However, they remain sufficiently detached and cool towards the statements that the most important things

**Table VI-6: Behaviour patterns of the supervisor**

| | UK1 | UK2 | Japan |
|---|---|---|---|
| 1. My supervisor gives consideration to staff members' feelings and viewpoints | 3.98 | 3.97 | 3.70 |
| 2. My supervisor demands that subordinates always carry out his/her decisions | 3.24 | 3.27 | 3.66 |
| 3. My supervisor requires staff members to fulfill tasks to the very limit of their ability | 3.71 | 3.59 | 3.47 |
| 4. My supervisor constantly redefines the role of our department to meet the changing policies and strategies of the corporation | 3.32 | 3.41 | 3.67 |
| 5. My supervisor suggests new ways and methods in our work without concern for convention | 2.89 | 3.07 | 3.25 |
| 6. My supervisor establishes internal and external information networks | 3.13 | 3.37 | 3.40 |
| 7. My supervisor understands staff members' concerns and frustrations | 3.42 | 3.46 | 3.05 |
| 8. My supervisor demands staff members not to give up achieving their goals | 3.55 | 3.57 | 3.64 |
| 9. My supervisor constantly encourages staff members to maintain a critical mind | 3.41 | 3.58 | 3.29 |
| 10. My supervisor talks with his/her subordinates about future directions of research work whenever an opportunity arises | 3.58 | 3.57 | 3.28 |
| 11. My supervisor often takes the lead in our team's problem-solving by suggesting his/her own proposals | 3.33 | 3.40 | 3.32 |
| 12. My supervisor usually gets support and cooperation of other departments such as marketing, finance, etc. | 3.44 | 3.26 | 3.59 |
| The averages | 3.42 | 3.46 | 3.44 |

that happen to them necessarily involve their work, that their values and those of the organization are close, and that job is the major source of their life's satisfaction. Nevertheless they are not very positive, and even slightly negative in the case of UK1 and Japan, towards the statement that most things in life are more important than work. Understandably, they are glad to be working with their present company.

UK1 is the most positive of the sample groups in all items but two where UK2 is slightly higher, and in the case of item 15 which is a negative statement, it disagrees most strongly making its members most committed to their professional field.

In contrast, the Japanese group was least positive in most of the responses, and scored more negative values than the UK groups. Where their score diverged from those of the UK groups was on the statement which said that the respondents were willing to put in a great deal of effort, beyond that normally expected in order to help this organisation to be successful. Given that the loyalty of the Japanese employees to their company is normally believed to be high, this result is rather surprising. Their negative score was in a marked contrast to the fairly high positive scores of the two UK groups. So will they be happy to continue working with the current company? Where do the respondents of all groups feel most committed? Answers to these questions are dealt with in the next section.

**Table VI-7: Attitudes towards work and the company**

| Statements | UK1 | UK2 | Japan |
|---|---|---|---|
| | Mean | Mean | Mean |
| 1. I am interested in my work | 4.63 | 4.47 | 4.30 |
| 2. I would like to improve my work by trying new methods and better ways | 4.52 | 4.48 | 4.42 |
| 3. Work would be dull if there were no opportunities to present my views | 4.37 | 4.45 | 4.01 |
| 4. I often study in my free time to do better work | 3.62 | 3.47 | 3.53 |
| 5. I would like to continue this job | 4.32 | 4.01 | 3.92 |
| 6. Even when I am not at work, I often think of how I should proceed with my work in the future | 4.33 | 4.09 | 3.95 |
| 7. The major satisfaction in my life comes from my job | 3.05 | 2.70 | 3.00 |
| 8. The most important things that happen to me involve my work | 2.71 | 2.40 | 2.61 |
| 9. I'm really a perfectionist about my work | 3.73 | 3.69 | 3.00 |
| 10. I am very much involved personally in my work | 3.96 | 3.86 | 3.07 |
| 11. Most things in life are more important than work | 2.93 | 3.22 | 2.85 |
| 12. I am willing to put in a great deal of effort beyond that normally expected in order to help this organisation be successful | 3.86 | 3.69 | 2.60 |
| 13. I find that my values and the organisations are very similar | 3.13 | 2.98 | 2.84 |
| 14. I am extremely glad that I chose this organisation to work for, over others I was considering at the time I joined | 3.84 | 3.70 | 3.48 |
| 15. I feel very little loyalty to my professional field | 2.07 | 2.36 | 2.13 |
| 16. I talk up my professional field to my friends as a great field to work in | 3.20 | 3.10 | 2.88 |
| 17. My professional field really inspires the very best in me in the way of research performance | 3.37 | 3.11 | 3.53 |
| The averages of the means | 3.63 | 3.52 | 3.30 |

## Loyalty and commitment

### Where they would like to work in the future

The respondents were asked to indicate which of the six possible places of employment they would choose to work in the future, including the current company. For all groups the current company was the main choice, and the Japanese group scored most highly. Given the 'lifetime' employment practice prevalent among large companies in Japan, this is not surprising, nor the very small figure for those who wish to work for another company. The relatively high proportion of the Japanese respondents who suggested a future alternative employment in non-industrial research facility such as university laboratories, is also understandable for the same reason. Given that mid-career entry into another company is fairly rare in Japan, an academic institution could be the most likely possibility.

Also given the sample profile of the UK1 group which shows that it is youthful, short in job tenure, highly mobile and with high educational qualification, perhaps it is not surprising that a larger proportion of this group than that of UK2 sees the future employment in another company, and in non-industrial research facility. Many of the centres they currently work have close research relationships with university research laboratories, and

some located within them. Also a marginally larger proportion of the UK2 group wish to set up their own business in the future. (Table VI-8)

### Commitment

In order to find out to whom the respondents felt most committed, or the greatest attachment, they were asked to place six items in the order of their preference, from 1 to 6. The results, based on a simple aggregate scores, are given as the mean values and shown in Table VI-9 below. The smaller the score, more committed to the items the respondents are.

The results show that the commitment patterns of UK1 and UK2 are very similar. They are both most committed to their colleagues at the workplace, and second, to their research subject. Commitment to their research profession comes in the third place for UK1, and to the company for UK2. In the fourth place comes direct supervisor for both UK samples, and in the fifth place, it is the company for UK1 and their research profession for UK2. And finally, it is the research institute to which both UK sample groups owe least commitment.

The pattern of commitment for the Japanese group is completely different from the UK groups. Their research subject comes first, followed by their research profession, colleagues at the workplace, the research institute, their direct supervisor, and lastly the company. That the company comes last in their commitment was something of a surprise.

**Table VI-8: Preferences for the future employment**

(%)

| | UK1 | UK2 | Japan |
|---|---|---|---|
| Current company | 61.0 | 69.8 | 76.1 |
| A different company | 17.1 | 14.1 | 5.5 |
| Non-industrial research facility | 7.3 | 3.7 | 9.4 |
| One' own establishment | 5.7 | 7.3 | 6.2 |
| Others | 4.1 | 4.8 | 2.8 |
| N | 117 | 562 | 1208 |

Missing observations: 30

## Implications

The analysis of the research data has been done at a very simple level, but the study found that, as were expected, there are several areas where there is a clear division between the UK groups on the one side and the Japanese group on the other. The differences in the recruitment patterns, in the rate of inter-company mobility, and in particular, the considerably more rigid, age-oriented attitudes towards promotion and effectiveness as researcher on the side of the Japanese data, are likely to have had their roots in the prevailing practice of lifetime employment and its ramifications.

There are others. The Japanese keenness to take the special status specialist route to career development rather than the generalist

**Table VI-9: Where commitment lies (aggregate mean)**

| | UK1 | | UK2 | | Japan | |
|---|---|---|---|---|---|---|
| | Mean | N | Mean | N | Mean | N |
| a. The company | 3.94 | 117 | 3.56 | 557 | 4.35 | 1210 |
| b. The research institute | 4.00 | 114 | 4.16 | 544 | 3.76 | 1209 |
| c. Direct supervisor | 3.59 | 113 | 3.67 | 556 | 4.15 | 1210 |
| d. Colleagues at the workplace | 2.87 | 116 | 2.60 | 557 | 3.32 | 1211 |
| e. Your research profession | 3.39 | 114 | 3.72 | 556 | 2.81 | 1211 |
| f. Your research subject | 3.14 | 114 | 3.16 | 558 | 2.58 | 1212 |

managerial route, in contrast with the UK groups which were split down the middle. But the difference was often highlighted not only by a different configuration of items the Japanese sample preferred but also in the fact that it scored rather less positively on many questions compared with the UK samples. In contrast, the UK1 sample frequently produced the results which placed itself at the other end of the comparison with the Japanese sample, and provided a sharp contrast to both the UK2 and the Japanese samples. From this it is difficult to ignore the inference that can be drawn: that the UK1 is, far from a half-way house between the UK2 and the Japanese samples, a special case of its own.

However, there are answers to some questions which are largely common to all three sample groups. The most effective methods of skill development and the most emphasised rewards for substantial achievements are same in all three groups.

On the question of what motivates the R&D personnel, answers to some of the questions were revealing. Take for example, the rewards. Beyond that of the pecuniary kinds, where what the company emphasised now matched what the respondents wished to have in the future in the views of all three sample groups, there were gaps between what were offered by the company and what the respondents preferred. Promotion to managerial post was such an example. This form of reward offered by the company was very decisively rejected by the respondents in all three groups, but particularly by the Japanese. Conversely, appointment to specialist status researcher was desired by the respondents of all groups but offered by the company without much enthusiasm. Clearly, effort must be made to eliminate such gaps if the rewards are to have their intended effect. Additionally, the importance/satisfaction paired scores for the various factors in the working environment can demonstrate the existence of a large gap between a high score of importance imputed to a factor and the negative score given to the satisfaction with the same factor felt by the respondents. An example of this was fair personnel evaluation, a factor which the Japanese sample felt did not exist at a satisfactory level despite the importance it accorded to it. In fact, fair personnel and research evaluation have appeared in some of the other questions as the problem areas for the Japanese sample group. Clearly, such problems must be seriously addressed if the employees are to be motivated.

Analysis of these comparative data at higher statistical levels could highlight further issues that may be pertinent to the human resources management of R&D personnel both in Japan and in the UK.