ISSN 0910-6707

1992

Japan Computer Quarterly

Japan Information Processing

Development Center

Information-related Examinations in Japan

No.88

Japan Computer Quarterly

1992

Japan Computer Quarterly (JCQ) is published quarterly by the Japan Information Processing Development Center (JIPDEC), Kikai Shinko Kaikan Bldg., 3-5-8 Shibakoen, Minato-ku, Tokyo 105 Japan.
Publisher: Eiji Kageyama, President
Editor: Yuji Yamadori, Director Research & International Affairs

JIPDEC is a non-profit organization founded in 1967 with the support of the Ministry of International Trade and Industry, the Ministry of Posts and Telecommunications and related industry circles for the purpose of promoting information processing and the information processing industry in Japan.
JCQ, formerly called the *JIPDEC* Report, was first published in September, 1970 and is prepared with the assistance of the Japan Keirin Association through its Machine Industry Promotion Funds.

Translated and Printed by The Translation Institute of Technology, Science & Culture
Printed in Japan, January, 1992

CONTENTS

No. 88

From the Editor

Bolstered by advances in technology, information is assuming an increasingly important role in Japan's industrial, as well as social life. It is spreading wide and penetrating deep in an environment becoming more and more reliant on networks. Industrial activities across the country are reaching ever higher levels of sophistication with the gigantic strides visible in technology, compaction of "knowledge," and availability of services that are easy on the consumer's pocket. One of the results of this is a slowing down of the growth rate of steelmaking, shipbuilding, and other heavy industries, had once held sway in Japan. Southeast Asia's newly industrialized economies (NIES) are on Japan's heels while the yen's appreciation continues. The very foundations that sustained the country's industry are giving way, and huge structural changes are in the offing. In short, the more information is gaining ground in this country, the deeper are information-oriented industrial activities taking root. According to a projection by the Ministry of International Trade and Industry's Industrial Structure Council, information industry will enjoy a market greater than 144-trillion yen in the year 2000 with a growth rate 20% or more than that of the GNP.

Side by side, with Japan's spectacular leaps in technology, economics, and social activities over the recent years, sharp changes are visible in the pattern of demands in the information industry. Especially, user networks widening their coverage, system integration, SIS development, and increasing system complexity will require a high level of technical competence but, in Japan, engineers, who can satisfy these needs are far fewer than the number required. Indeed, the situation is becoming ever more serious. The same MITI's Council estimates that by the year 2000, the country will run short of close to one million information processing engineers. But the number alone will not solve the problem. They must have adequate knowledge and experience in the specific fields in which they will operate. The country must waste no time in educating and training information processing engineers to meet these requirements.

Information processing engineers are active today in a variety of fields at data service vendors, computer makers, and users. These engineers include graduates of not only university engineering faculties and technical schools, but also those who had their education in the arts faculty. Accordingly, many of the enterprises have been feeling the necessity of evaluating the competence of these engineers on the basis of some standard. In addition, there is need to educate the man in the street on what the industry is all about and also to improve the intellectual capabilities of the people that the industry employs. This was what led the Ministry of Industrial Trade and

Industry to introduce the Information-Technology Engineers Examination in 1969, treating it as a state examination. The number of examinees rose sharply from the eighties, totaling 540,000 in 1990. This number is the largest for any of Japan's state examinations and it is still on the increase. Indeed, the ministry is having difficulty these days finding places to hold the examinations and finding supervisors for the examinations.

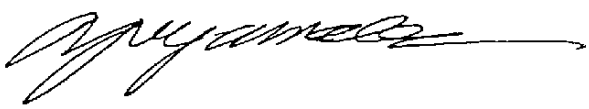
Many information-related enterprises are encouraging the holding of this examination and some of them are even making it compulsory for their employees to take it. Some of these, again, are arranging conveyances to the test location for their applicants on the day of the examination and providing them with lunch. Most of these enterprises are also increasing the salary of those who pass the examination according to their results. The move has acted as a stimulant, increasing the number of examinees.

Recently, the percentage of students among the applicants for the examination has started increasing. They come not only from universities, but also from technical or senior high schools. There are also applicants from the junior high schools. Sometimes the results of the examination are startling. There is, a case on record of a junior high school teacher taking the examination together with his son, a junior high school student. The son passed the examination, but the father did not. At any rate, the range of applicants is widening.

Information-related activities are seen everywhere these days, in hardware as well as in software, covering the entire range from microcomputers to very large, general-purpose computers. Today, the examination is being held in five areas, but the number may increase hereafter, although in the beginning it comprised just three stages. This, of course, has been necessary also because of branchings in the fields of specialization. Similar examinations are also being held in related specialization fields by other institutions promoting information processing.

Information technology has really made spectacular advances in recent years. It is not unusual in this field for an engineering approach to become outdated in just a few years. This trend makes it necessary to acquaint oneself with the basic technology and, at the same time, to keep abreast of the new technologies. Someone who passed the examination some time in the past cannot expect to do it again with only the same knowledge. In fact, one of the tasks from now on is to have such people keep up with the progress of technology.

This issue will introduce readers with some of the examinations that seem to be of importance to Japan's information industry. We hope that the readers find the information useful.



Yuji Yamadori
Director
Research & International Affairs

Information-Technology Engineers Examination System

0. Introduction

The Information-Technology Engineers Examination (ITEE) was first implemented 23 years ago in 1969, and is the only national-level equivalency exam aimed at information processing-related engineers and programmers in Japan.

1. Establishment of the Examination System

1969 Launched as the Information-technology Engineers Equivalency Examination.
1970 Effected as a national test based on the Law on Facilitation Information Processing.
1971 Systems Engineer Examination was added.
1982 The number of applicants exceeded 100,000 for the first time.
1984 Japan Information Processing Development Center (JIPDEC) commissioned to run examinations.
1985 The number of applicants exceeded 200,000.
1986 Systems Auditor Examination was added.
The frequency of the Programmer Examination increased to twice a year.
1988 Online Systems Engineer Examination was added. The number of applicants exceeded 400,000.
1989 The Senior Programmer Examination was changed from fall to spring.
1990 The number of applicants exceeded 500,000.
1991 The number of applicants exceeded 600,000.

(1) Launching of the System in 1969

The Ministry of International Trade and Industry began performing a basic survey in 1967 in order to consider the need for an increasingly large number of information processing engineers and the demand for a qualification system for programmers. MITI also was the editor of the "Senior Information Processing Engineers Education Guideline," based on which the Information-technology Engineers Equivalency Examination was launched in 1969 as a qualifying test for programmers under the auspices of the Ministry of International Trade and Industry.

This examination system is basically arbitrary, as it neither stipulates any legal rights or obligations nor grants any qualifications or certificates. However, since the system could have a considerable effect on educational policies and curricula, it was deemed that the examination should be implemented by a genuinely neutral organization in step with the latest trends in the industry, uninhibited by

prejudice or dogma. Consequently, the examination was designated as a national examination.

(2) Objectives of the System When Established

1) To provide targets for information processing engineers employed in industry and governmental offices with the intent of encouraging them to raise their own technical abilities.

2) To guide those concerned with educating and training programmers at schools, plants, and corporations in the principles of education and research in order to enrich their curricula.

3) To provide an evaluation standard for computer users, e.g. corporations, organizations and governmental offices for employing, positioning, and promoting information engineers, and to establish a form of social status for the engineers themselves.

(3) Examination Categories and Targets

There are two categories of information-technology engineers equivalency examinations, the programmer equivalency examination and the senior programmer equivalency examination. No particular qualifications are required of applicants for the examination. However, the following have been assumed to be the image of typical applicants in each category.

The senior programmer examinee is presumed to be an information processing engineer with at least three years' programming experience and to be engaged mainly in designing programs, preparing high-level programs and instructing average programmers. The programmer equivalency examinee is presumed to be an average programmer engaged mainly in preparing programs based on program design charts, to have at least one full year of programming experience, and the equivalent of a high-school education.

(4) Regulations in 1970

The first examination, implemented in 1969, created a great sensation, and had a large impact on the Japanese nation. As a result, a basis for regulation was established under the law concerning the Information Technology Promotion Agency, Japan and Related Matters (this title was changed to the Law on Facilitation of Information Processing in April 1, 1986) in 1970, and the name of the examination was changed from the Information-Technology Engineers Equivalency Examination to the Information-Technology Engineers Examination.

In Article 6 of the above law it is stipulated that "the Ministry of International Trade and Industry implements the Information-Technology Engineers Examination to examine the knowledge and skills required for processing information, with the goal of improving the technical level of the people involved in information processing."

(5) Addition of Systems Engineer Examination in 1971

The Systems Engineer Examination was added in 1971, as the role of system engineers became more important due to the rapid advancement of information processing technologies.

The Systems Engineer examinee is presumed to be a systems engineer, 25 years or older, engaged mainly in analyzing and designing information processing systems, to have the general knowledge equivalent of a college graduate, three or more years of actual work experience in the field of systems engineering, a specialized knowledge in a number of fields, including computers, and to be capable of analyzing and designing information processing systems.

(6) Commissioning of Examination Work in 1984

Japan Information Processing Development Center (JIPDEC) was assigned by the Minister of International Trade and Industry as the official examination agency in April 1984, when it was decided that the examination work would be commissioned by the government to a private organization in order to simplify and reduce administrative affairs.

JIPDEC accepted the commission and established the Japan Information-technology Engineers Examination Center (JITEC).

(7) Addition of Systems Auditor Examination in 1986

The interim report of the industrial structure council in 1983 recommended establishing a system audit guideline in order to urge positive introduction of system auditing. In response to this report, a guideline was established by MITI's informatization committee "system audit subcommittee" in 1984. At the same time, the subcommittee recommended establishing a systems auditor examination. As a result, the examination was implemented in 1986. The Systems Auditor Examination assumes that the systems auditor examinee is 27 years of age or older, engaged mainly in auditing information processing systems, to have the general knowledge equivalent of a college graduate, five or more years of actual work experience in the field of systems auditing, a specialized knowledge in planning, developing, operating and auditing information processing systems', and to be capable of systems auditing.

(8) The Programmer Examination is given twice a year.

Since 1982, the number of applicants has exceeded 100,000 and, as of 1985, it has exceeded 200,000. To respond to these rapidly increasing numbers, the Programmer Examination has been implemented twice a year since 1986.

(9) Addition of Online Systems Engineer Examination in 1988

Computer systems, operated conventionally as corporate inhouse systems, have been quickly growing into networks of systems between corporations. In these circumstances, the examination system study committee recommended establishing the Online Systems Engineer Examination. As a result, the examination has been implemented since 1988. The Online Systems Engineer examinee is presumed to be an online systems engineer engaged mainly in analyzing and designing information processing systems using networks, to have the general knowledge equivalent of a college graduate, three or more years of actual work experience in the field of Online systems engineering, a specialized knowledge in information processing and networking, and to be capable of analyzing, de-

signing and evaluating Online systems.

(10) Change in the Timing of the Senior Programmer Examination in 1989

Applicants requested that the examination coincide with school curricula in order to increase opportunities to take the examination. As a result, the Senior Programmer Examination was changed from fall to spring in 1989.

Thus, people can take several examinations in the same year, e.g. the Senior Programmer Examination and the Systems Engineer Examination or the Senior Programmer Examination and the Online Systems Engineer Examination.

2. Details of the Examination System

(1) Objectives of the Examination

① to enhance information processing technology by providing goals and incentives for information processing engineers;

② to contribute towards the establishment of standard information processing-related education programs by defining the various skill levels required by information processing personnel;

③ to provide objective criteria for the evaluation of information processing engineers; and

④ to foster a broad awareness of the information movement among the Japanese people by providing them with the opportunity to sit for Information-Technology Engineers Examinations.

The main feature of these examinations is that, unlike many other national examinations such as those for doctors, lawyers, etc., no business qualifications are granted, nor are corporations required to employ qualified examinees (i.e. as in the Electric Chief Engineer Qualification Examination, etc.).

Instead, the examinations can be regarded as a recommended system for improving technologies, etc.

(2) Examination Categories, Targets and Levels of Expertise (Table 1)

Category	Level of Expertise
Systems Auditor Exam	This examination is targeted at systems auditors engaged primarily in the auditing of information processing (IP) systems. Systems auditors should possess general knowledge equivalent to that of college graduates, have five or more years of actual work experience, possess specialized knowledge in the planning, developing, operating and auditing of IP systems, as well as in their specialized fields, and be capable of auditing IP systems.
Systems Engineer Exam	This examination is targeted at systems engineers engaged primarily in the design and analysis of IP systems. Systems engineers should possess general knowledge equivalent to that of college graduates, have three or more years of actual work experience, possess specialized knowledge in a number of fields, including computers, and be capable of designing and analyzing IP systems.
Online Systems Engineer Exam	This examination is targeted at online systems engineers engaged primarily in the analysis, design and evaluation of online systems. Online systems engineers should possess general knowledge equivalent to that of college graduates, should have three or more years of actual work experience, possess knowledge of online systems, including information processing, and be capable of analyzing, designing and evaluating online systems.
Senior Programmer Exam	This examination is targeted at senior programmers engaged primarily in the design and preparation of advanced programs and the supervision of programmers. Senior programmers taking this test should possess general knowledge equivalent to that of college graduates and have three or more years of actual programming experience.
Programmer Exam	This examination is targeted at programmers engaged primarily in the preparation of programs based on program design charts. Programmers taking this test should possess general knowledge equivalent to that of high school graduates and have at least one full year of actual programming experience.

(3) Examination Subjects and Methods (Table 2)

Category	Subjects	Methods
Systems Auditor Exam	① Knowledge of Organization and Functions of Information Processing Systems ② Knowledge of Planning, Development and Operation of Information Processing Systems ③ Information Processing System Auditing Skills ④ Related Knowledge	(Length of Exam: 6 hours) Multiple choice questions Fill in the blanks Short answers
Systems Engineer Exam	① Knowledge of Computer Hardware ② Knowledge of Computer Software ③ Information Processing System Design Skills ④ Related Knowledge	(Length of Exam: 6 hours) Multiple choice questions Fill in the blanks Short answers
Online Systems Engineer Exam	① Knowledge of Computer Hardware ② Knowledge of Computer Software ③ Online System Design Skills ④ Related Knowledge	(Length of Exam: 6 hours) Multiple choice questions Fill in the blanks
Senior Programmer Exam	① Knowledge of Computer Hardware ② Knowledge of Computer Software ③ Program Design Skills ④ Program Preparation Skills ⑤ Related Knowledge	(Length of Exam: 5 hours) Multiple choice questions Fill in the blanks
Programmer Exam	① Knowledge of Computer Hardware ② Knowledge of Computer Software ③ Program Preparation Skills ④ Related Knowledge	(Length of Exam: 5 hours) Multiple choice questions Fill in the blanks

(Note: The following programming languages are used in examining the program preparation skills of persons taking the Programmer and Senior Programmer Exams.)

Category	Programming Languages
Senior Programmer Exam	Assembler (CASL), plus choice of one of following: FORTRAN, COBOL, PL/I
Programmer Exam	Choice of any of the following languages: Assembler, FORTRAN, COBOL, PL/I

(4) Qualifications for Examinees

- Systems Auditor Examination
  Examinee must be 27 years or older as of April 1 in the year of the examination.
- Systems Engineer Examination
  Examinee must be 25 years or older as of April 1 in the year of the examination.
- Online Systems Engineer Examination, Senior Programmer Examination and Programmer Examination
  Open (no education, sex, age or nationality requirements)

(5) Time of Examination (1991)

The examinations are implemented twice every year. See the Table 3 below for the details.

(6) Examination Locations

The examinations in 1991 were implemented in the following 47 cities:

Sapporo	Obihiro	Aomori
Morioka	Sendai	Akita
Yamagata	Koriyama	Mito
Utsunomiya	Maebashi	Saitama
Chiba	Tokyo	Hachioji
Yokohama	Atsugi	Niigata
Nagano	Kofu	Shizuoka
Nagoya	Toyohashi	Toyama
Kanazawa	Fukui	Kyoto
Osaka	Kobe	Himeji
Yonago	Matsue	Okayama
Hiroshima	Yamaguchi	Takamatsu
Matsuyama	Kochi	Fukuoka
Kitakyushu	Saga	Nagasaki
Kumamoto	Oita	Miyazaki
Kagoshima	Naha	

Exam date	Category	Publication in official gazette	Application	Announcement of results
3rd Sunday in April	• Senior Programmer • Programmer	Middle of December (previous year)	Beginning of January to middle of February	Beginning of June: Programmer End of June: Senior Programmer
3rd Sunday in October	• Systems Auditor • Systems Engineer • Online Systems Engineer • Programmer	Middle of June	Beginning of July to end of July	Beginning of December: Programmer End of January, next year: Systems Auditor Systems Engineer Online Systems Engineer

Table 3: Dates of Examinations and Publication of Results

(7) Examination Fees

Each category of examination: ¥3,600

(8) Delivery of Qualification Certificates

Examinee numbers are published in official gazette, and the Minister of International Trade and Industry delivers qualification certificates.

3. Status of Application and Successful Applicants

(1) Applicants

1) Trends in 22 years

The graph in Figure 1 shows changes in the number of applicants. Starting with forty-two thousand in 1969, when the examination was established, the number continued to decline slowly, reaching twenty-three thousand in 1972. Since then, however, the number has been steadily increasing with a striking increase after 1980. As is clear from the graph, the rate of increase is rising year after year.

In particular, starting from 1986, the Programmer Exam began to be offered twice a year, spring and fall, and its annual total changed from 224 thousand in 1985, to 346 thousand in 1986 and 544 thousand in 1990, showing a marked rise.

According to data published by the Ministry of International Trade and Industry, the total number of information-technology engineers in Japan is approximately 400 thousand. The annual total of 304 thousand (excluding the spring applicants for the Programmer Exam) indicates that, even after subtracting the students and those applicants whose profession is not directly related to information processing, a large portion of information-technology engineers have applied for the examination.

2) Employment

The largest proportion of total applicants are employed by software companies. This trend is also seen with the applicants for the Systems Auditor Examination, the Systems Engineer Examination and the Online Systems Engineer Examination. With regard to the Programmer Examination, students represent the largest percentage of applicants. As the levels of examination becomes higher, the proportion of employees of computer manufacturers and sales planning corporations also increases.

About 70 to 80% of applicants for the Systems Engineer Examination, the Online Systems Engineer Examination and the Senior Programmer Examination are employed by computer manufacturers, sales planning corporations, software houses, and information processing services companies (See Figure 2).

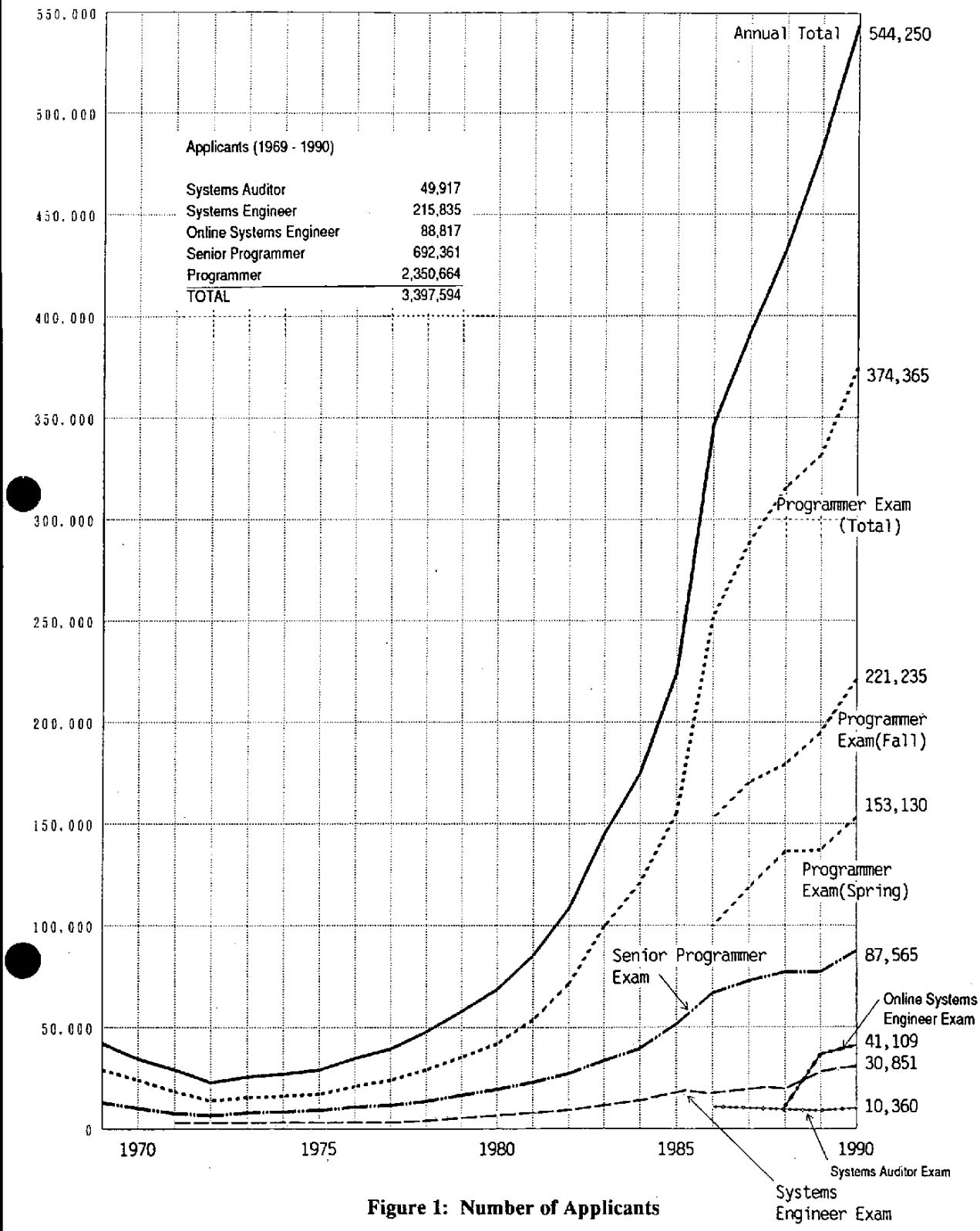
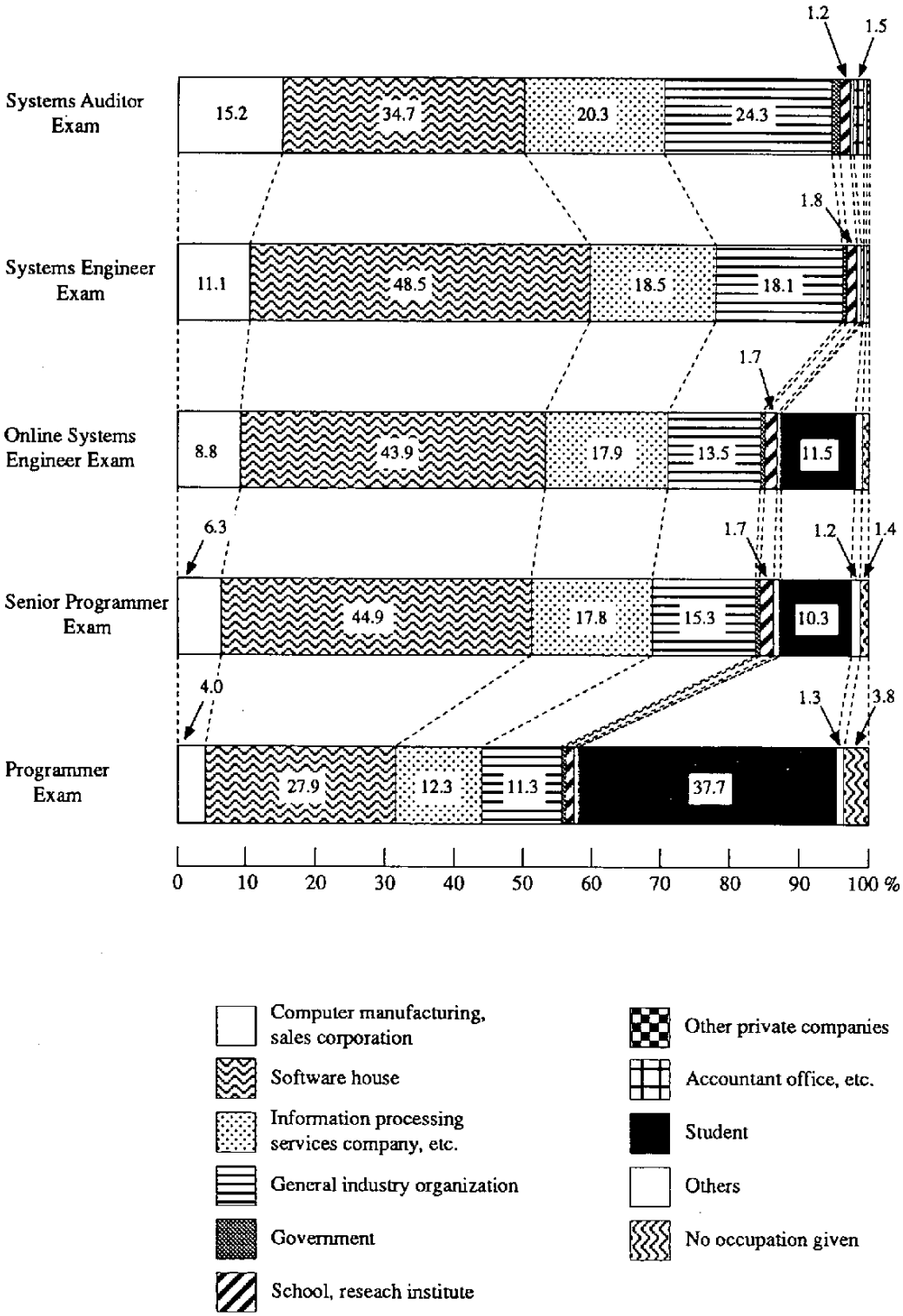


Figure 1: Number of Applicants

(Note: The Programmer Exam in the spring and the Systems Auditor Exam have been offered since 1986. The Online Systems Engineer Exam has been offered since 1988.)

Figure 2: Component Ratio of Applicants by Place of Employment (1990)



(2) Successful Applicants

1) Trends over the 22 year period

The graph in Figure 3 shows changes in the number of successful applicants. The total number up to and including 1990 exceeds 323 thousand. The number of successful applicants in each category is also shown in the Figure.

Advancing from the Programmer Exam to the Senior Programmer Exam is a well established career path, so it is safe to assume that a significant part of those who succeed on the Programmer Exam go on to take the Senior Programmer Exam. It is thus clear that there is an overlap between the two categories. Even though advancing from the Senior Programmer Exam to the Systems Engineer Exam is not necessarily common career path, it appears that not a few have succeeded in both. Moreover, there are cases where an applicant who passes the Systems Engineer Exam applies for the Senior Programmer Exam, or an applicant who passes the Programmer Exam advances directly to the Systems Engineer Exam.

2) Employment

The largest proportion of the total number of successful applicants is employed by software houses, similar to the status of all applicants. This trend is also seen in the Systems Engineer Examination, the Online Systems Engineer Examination and the Senior Programmer Examination. With regard to the Programmer Examination, students represent the largest number of successful applicants.

Employees of computer manufacturers and sales corporations have the highest passing rates for the Systems Engineer Examination and the Online Systems Engineer Examination (See Figure 4).

3) Average ages of successful applicants

Table 4 below shows the average ages of successful applicants in 1990: 22.7 years of age for the Programmer Exam, 26.5 years of age for the Senior Programmer Exam, 29.0 years of age for the Online Systems Engineer Exam, 30.8 years of age for the Systems Engineer Exam, and 36.1 years of age for the Systems Auditor Exam in that order.

Table 4: Average Ages of Successful Applicants

Category	Average ages
Systems Auditor Exam	36.1
Systems Engineer Exam	30.8
Online Systems Engineer Exam	29.0
Senior Programmer Exam	26.5
Programmer Exam	22.7

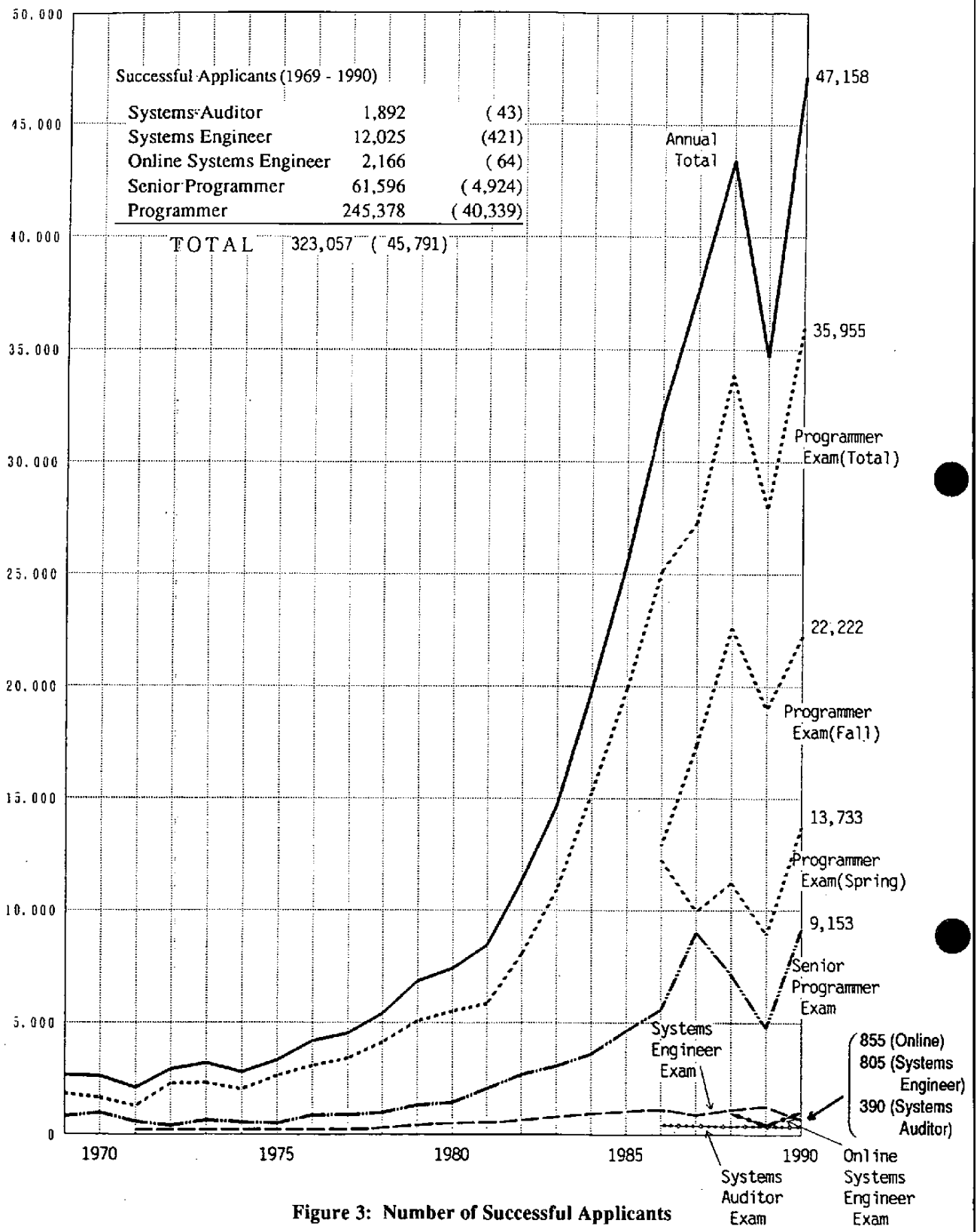
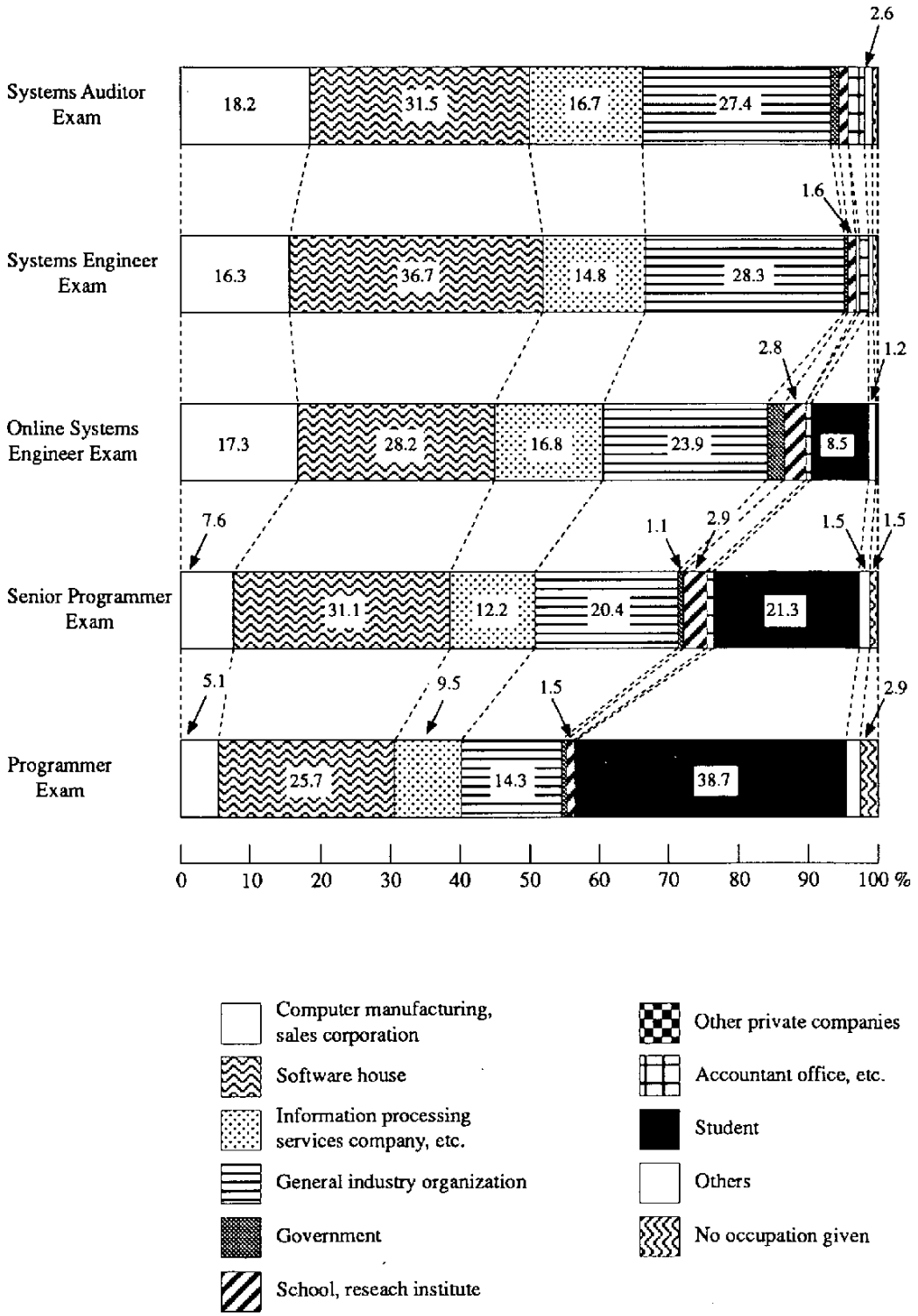


Figure 3: Number of Successful Applicants

(Note: Figure in parentheses indicate the number of females.)

Figure 4: Component Ratio of Successful Applicants by Place of Employment (1990)



4) Passing rate

Table 5 below shows the passing rate in each category of examinations for the past 22 years. The total number of applicants was 3,397,594, the number of examinees was 2,145,289, and the number of successful applicants was 323,057, implying a passing rate of 15.1 percent.

Category-wise passing rates decline as the level of category advances: 16.3 per cent in the Programmer Exam, 14.1 percent in the Senior Programmer Exam, 4.6 percent in the Online Systems Engineer Exam, 9.7 percent in the Systems Engineer Exam, and 6.6 percent in the Systems Auditor Exam. In other words, the examinations become more difficult to pass as an examinee advances from programmer to systems engineer. The increasing difficulty has led to a high reputation for the examination itself, and the successful applicants are considered to be a selected group among information-technology engineers and are evaluated highly.

4. Organization of the Japan Information-Technology Engineers Examination Center (JITEC)

Table 6 illustrates the organization of JITEC. Under this organization, JITEC performs the series of operations starting from the creation of examination questions, to execution of nation-wide examinations, through marking, and up to the determination of successful applicants.

5. Evaluation of the Examination

Since there are investigative results with regard to how the successful applicants are evaluated in corporations, we will introduce these as a means of evaluating the examination.

This investigation was performed using questionnaires and was executed by JITEC in 1988. Since the Online Systems Engineer Exam had not yet been executed at that point, results for the other four categories are totalled.

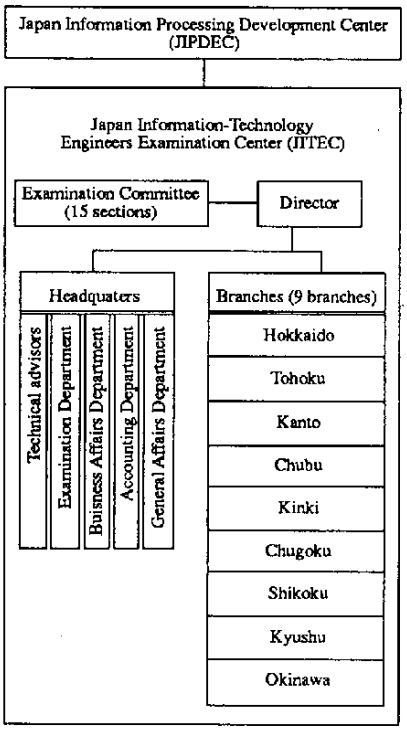
The questionnaires ask how the following three items are evaluated with respect to the four categories of Systems Auditor, Systems Engineer, Senior Programmer, and Programmer: (1) Evaluation standard for engineers' abilities; (2) Role in training of engineers; (3)

Table 5: Passing Rate in Each Category in the Past 22 Years

Category	Applicants	Examinees	Successful Applicants	Passing Rate (%)
Systems Auditor	49,917	28,573	1,892	6.6
Systems Engineer	215,835	123,846	12,025	9.7
Online Systems Engineer	88,817	47,521	2,166	4.6
Senior Programmer	692,361	436,113	61,596	14.1
Programmer	2,350,664	1,509,245	245,378	16.3
TOTAL	3,397,594	2,145,298	323,057	15.1

$$\text{PASSING RATE} = \frac{\text{Successful Applicants}}{\text{Examinees}} \times 100$$

Table 6: Organization of JITEC



Headquaters
General Affairs Department:
Overall adjustment of business affairs

Accounting Department:
Accounting operations

Business Affairs Department:
Execution of examinations

Examination Department:
Support to the Examination Committee

Technical Advisors:
Advice on the creation of examination questions

Examination Committee:
Creation of examination questions and marking

Branches: Execution of examinations

Improvement in company image as the number of employees who pass increases.

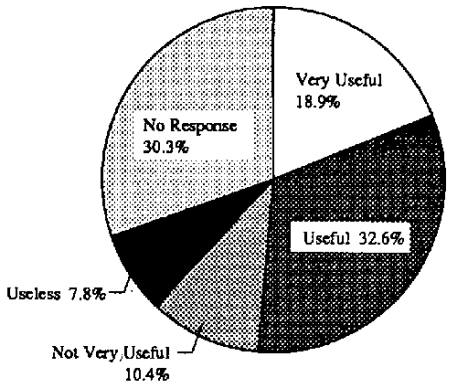
The investigation results from the present evaluation of the Information-Technology Engineers Examination show that (1) Improvement in company or group image as the number of employees who pass increases is evaluated most highly and is followed by (2) Role in training of engineers and (3) Evaluation standard for engineers' abilities in that order.

Figure 5 shows the evaluations given to evaluation standard for engineers' abilities. The rates of the number of companies who answered "very useful" or "useful" were 78.5 percent for the Programmer Exam, 79.5 percent for the Senior Programmer Exam, 62.9 percent for the Systems Engineers', and 51.5 percent for the Systems Auditor.

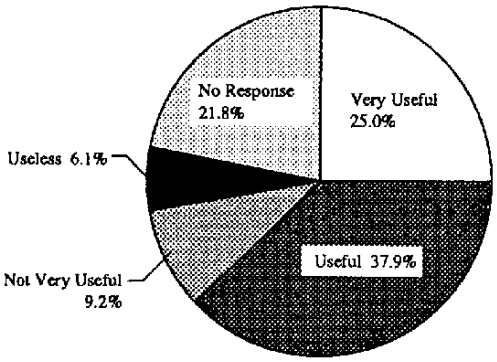
As is seen here, especially in the Programmer Exam and the Senior Programmer Exam, about 80 percent of companies evaluate the Examination as useful as a standard of evaluation for engineers' abilities.

For the other examinations, more than 50 percent of companies answer that they are "very useful" or "useful".

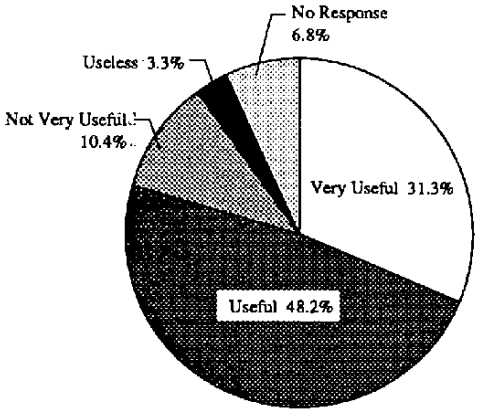
Systems Auditor Exam



Systems Engineer Exam



Senior Programmer Exam



Programmer Exam

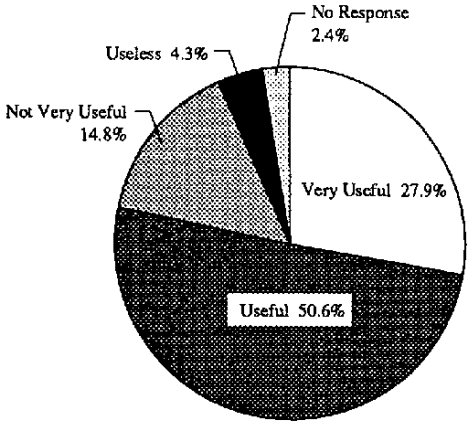


Figure 5: Evaluation of the ITEE as a Measure of Examinees' Skill Level

6. Treatment of Successful Applicants

Treatment of successful applicants was analyzed based on compensation conditions in information services companies. The analysis data is based on the "Fiscal 1990 Wage Investigation" (survey of 183 companies) executed by the Japan Information Service Industry Association (JISA).

(1) Compensation Conditions

Table 7 shows the conditions of compensation granted to the successful applicants of the Examination in companies. 92.9 percent of the surveyed companies grant some kind of compensation for passing.

The methods of supplying compensation are a monthly allowance added to monthly salary and one-time compensation supplied at the time of passing the Examination. Table 8 shows conditions by supply method with respect to companies who supply compensation for all examination categories: 28.8 percent of companies supply a monthly allowance only; 19.4 percent of companies supply one-time compensation only; and 15.9 percent of companies supply both a monthly allowance and one-time compensation.

(2) The Number of Supplying Companies by Examination Category

Table 9 shows the compensation supply conditions by examination category. For the supply of monthly allowance, the number of companies that supply it to the successful applicants of the Senior Programmer Exam is the greatest, at 125, followed by the Systems Engineer Exam and the Programmer Exam in that order. For the supply of one-time compensation, the number of companies that

Table 7 Compensation Supply Conditions

Compensation supply conditions	Number of companies	Component ratio (%)
A monthly allowance or one-time compensation is supplied to one or more Examination categories.	170	92.9
No allowance or compensation supplied.	13	7.1
Total	183	100

Table 8 Supply Content

Supply content	Number of companies	Component ratio (%)
A monthly allowance is supplied for all categories.	49	28.8
One-time compensation is supplied for all categories.	33	19.4
Both a monthly allowance and one-time compensation are supplied for all categories.	27	15.9

(The component ratio is the ratio to the 170 companies which supply allowances.)

supply it to the successful applicants of the Systems Engineer Exam is the greatest, at 96, followed by the Senior Programmer Exam and the Programmer Exam in that order.

The numbers of companies that supply compensation to the successful applicants of the Systems Auditor Exam and the Online Systems Engineer Exam are smaller than in the other three categories. It is thought that these two examinations began relatively recently and have not yet been dealt with as subjects for compensation.

(3) Average Amount of Compensation

Table 10 shows the average amounts of compensation. The amounts of both monthly allowance and one-time compensation supplied to the successful applicants of the Systems Auditor Exam are the highest, followed by the Systems Engineer Exam, the Online Systems Engineer Exam, Senior Programmer Exam, and the Programmer Exam.

As clarified by these investigation results, information services companies highly evaluate the successful applicants of the Examination and also treat them well in terms of monetary compensation.

7. Internationalization

With the internationalization of the Examination, we are actively performing public relations activities, such as giving presentations about our Examination System in overseas and participating in examination-related international meetings held by overseas examination institutes. Upon requests from Singapore and China, we are cooperating and interchanging personnel with respect to the examinations.

(1) Participation in International Meetings

- We participated in an international conference related to "Qualification and authorization related to information-technology engineers" sponsored by the ICCP (Institute for Certification of Computer Professionals), an American examination institute. (1989)
- A thesis about the Examination in Ja-

Table 9 Numbers of Supplying Companies by Examination Category

(Number of companies)

	Systems Auditor	Systems Engineer	Online Systems Engineer	Senior Programmer	Programmer
Monthly allowance	91	123	97	125	112
One-time compensation	74	96	75	94	91

Table 10 Average Amounts of Compensation by Examination Category

(Yen)

	Systems Auditor	Systems Engineer	Online Systems Engineer	Senior Programmer	Programmer
Monthly allowance	25,549	19,600	12,501	10,736	4,760
One-time compensation	121,265	95,662	61,715	53,602	24,490

pan was presented at the WCCE/90 (Fifth World Conference on Computers in Education) sponsored by the Education Subcommittee of the IFIP (International Federation for Information Processing).

We also participated in the meeting related to the "Common evaluation of information-technology engineers" held during this conference and sponsored by the chairman of the Vocational Education Section of the IFIP Education Subcommittee. (1990)

(2) Overseas Cooperation

- With respect to the Chinese Information-Technology Engineers Examination that is executed mainly by Shanghai City, we interchange personnel with Shanghai City in China, provide examination know-how and cooperate in drawing up questions for the Systems Engineer Exam.
- The curriculum executed by the Japan-Singapore Technical Training Center, an information-technology engineer training school in Singapore, was authorized under the name of the director of the Data-Processing Promotion Division of the Ministry of International Trade and Industry as covering the scope of the Information-Technology Engineers Examination of Japan. (1989)

JITEC performed technical evaluation related to the authorization of the curriculum. We are going to make an effort to improve the examination system in Japan by maintaining cooperative relations with overseas examination institutes and by obtaining overseas examination-related information. From the viewpoint of personnel training cooperation, we would also like to cooperate with Southeast Asian countries through examinations for those countries upon request from them.

8. Future Problems

More than 20 years have passed since the establishment of the Information-Technology Engineers Examination (ITEE) System. The Examination is well known among people involved in information processing. It contributes greatly to raising the technical level of information-technology engineers and plays a role as an objective standard for engineers' abilities, and as a stimulus for self-improvement, etc.

However, advancements in computer technology have greatly changed the surrounding environment in which information-technology engineers operate, resulting in raising new needs related to the ITEE System.

These needs are as follows.

(1) With the diversification, complication, and enlargening the scale of information processing systems, a new capability, system integrator, is required in the information services industry. Therefore, a need for engineers in the fields furthest upstream has arisen, subjects which are not covered by the present examinations.

(2) Among the differences between the demand for and supply of software engineers, the need for system engineers has been especially increasing recently. The only category of examination that is intended for SEs is the Systems Engineer Exam at present. Therefore, more detailed examination categories are desired.

(3) With the advancement of information processing systems in user industries, specific fields, such as databases, are becoming more important and the technologies supporting such fields are becoming more diversified and more complicated.

(4) With the wide ranging progress of information technology, new industries, such as for the development of microcomputer application systems, are growing rapidly, resulting in need arising for the engineers who have technical knowledge in fields that are not covered by the present examinations.

(5) Besides this, the types of engineers who are covered by the present examinations might differ from the types of engineers actually required in the industrial world. Therefore, it has become necessary to actively introduce into the ITEE advanced information processing technology for which application to commercial systems is in rapid progress.

Based on the trends mentioned above, we were asked to examine the following matters and summarize the basic direction with regard to them. We recently started this investigative work.

(1) Investigation of the types of information-technology engineers to be trained and of the examination categories

① Investigation of the definitions of the types of information-technology engineers who can immediately respond to improvements in information processing technology

② Investigation of the categories of the information-technology engineers and the corresponding images of them

③ Investigation of what types of information-technology engineers need to be trained and of the corresponding examination categories.

(2) Measures to improve the methods of information publication for the examinees were investigated, such as for determination and publication of examination curriculum and publication of the correct answers to questions, in order to more effectively achieve the objectives of the examination system, such as providing a stimulus for information-technology engineers to work for self-improvement.

① Investigation of the basic examination curriculum policy that corresponds to the information-technology engineers in each examination category

- Scope of the basic knowledge that information-technology engineers in each examination category should have
- Scope of the technical knowledge and practical ability that information-technology engineers in each examination category should have

② Investigation of the examination curriculum created based on the basic policy

③ Investigation of the trends in the correct answers to each question and the methods of publication of passing criteria

We would like to make the current ITEE System one that corresponds to the public needs on the basis of the results of this investigation.

Examination for Microcomputer-based Systems Engineers

1. Background

Advances in semiconductor technology have also helped microelectronics technology to make vigorous strides. Microcomputers, which occupy a central position in the microelectronics field, find application in all branches of industry. They are the supporting pillars upon which the sought-after high-tech developments and information-oriented social changes in Japan rest. Because of their very small size, high performance, reliability, low price, and other excellent characteristics, microcomputers are widely used in industrial products and production equipment. The fact that they aid in the development of the compact, light-weight products much in demand today explains why they are so much in use. Indeed, the engineers who design and develop these products must be acquainted with microcomputers directly or indirectly.

This situation has led to a sharp rise in demand for microcomputer-based systems engineers. In fact, there is an ever-widening disparity today between the number of engineers familiar with microcomputers and the number who are in demand. This labor shortage poses serious problems for Japan's industries.

The Japan Information Processing Development Center has been striving to train microprocessor-based systems engineers and provide them to the nation to sustain Japan's progress towards the creation of an informtion-oriented society. These experts have hitherto hardly been in the public eye, but the center is making efforts to help them earn social recognition. At the same time, the center is striving to improve the technical level of these engineers and to secure their position in industry by conducting an examination to test their qualification. Basic grade examinations for microcomputer-based systems engineers started in November, 1985, while the senior grade examination was introduced in 1987.

2. Examination outline

1) Object

The examination aims to

a. Evaluate the technical level of engineers
b. Promote improvement in the level of expertise
c. Raise engineers.

2) Examination types and targets

a. Basic grade examination
   Those who take the examination are expected to possess basic knowledge in microcomputers and application systems in addition to about one year's experience.

b. Senior grade examination

Those who take the examination are expected to have three to four years' experience and be fully knowledgeable about microcomputers.

3) Examination locations

Tokyo and eight other examination centers across Japan.

4) Frequency

Once a year.

5) Examination fee

Basic grade — 4,120 yen
Senior grade — 4,635 yen.

6) Conducted by

The Japan Information Processing Development Center.

3. Range of questions

All questions on the examinations conform to the educational policy for basic and senior grade microcomputer-based systems engineers laid down by the Japan Information Processing Development Center's Central Academy of Information Technology (CAIT).

1) Basic grade examination

a. Software

The scale of the systems that are the target of the examinations is that of the very basic level systems that use simple input-output type machines, using any one of the general-purpose 8-bit microprocessors (8085, Z80, or 6809 can be selected). In particular, acquaintance with the following areas is required:

- System development process
- Supporting software and languages
- Software development, etc.

b. Hardware

The examinations assume basic knowledge and understanding of operations involving general-purpose 8-bit microprocessors applications (8085, Z80, or 6809). They seek to evaluate the ability of the examinees to produce simple logic diagrams as seen from the point of view of design. In particular, acquaintance with the following areas is required:

- System development process
- Role of hardware in a system
- System components
- System circuit design
- System packaging technology and installation environment
- Power source and grounding
- Basics of instrumentation
- Terminology
- Problem solving, etc.

2) Senior grade examination

Examinations will assume the level of competence needed to develop standard microcomputer system hardware and software on the basis of given specifications. Examinees will be expected to not only possess knowledge in related technologies but also the ability to analyze and comprehend details.

Examinees will be required to have mastered the use of general-purpose 8-bit microprocessors (8085, Z80, or 6809) and also to have

acquired familiarity with the outline or characteristics of general-purpose 16-bit microcomputers (8086 or 68000). In particular, acquaintance with the following areas will be required:

- Basics of microcomputers
- Microprocessors
- Memory
- Input-output devices
- Interface circuits
- Input-output control
- Programming language (assembler or C can be selected)
- Operating system
- System development and evaluation
- Networks
- Packaging technology, etc.

4. Year to year changes in the numbers of applicants, examinees, and passers

Tables 1 and 2 show the year-to-year changes in the numbers of applicants, actual number of examinees, and the numbers of those who passed for the basic and senior grade examinations.

Table 1 Number of applicants, examinees, and passers of basic grade examination

Year	Number of applicants	Number of examinees	Number of passers	Pass ratio (%)
1985	4,600	3,634	1,779 (16)	49.0
1986	6,499	5,199	2,272 (32)	43.7
1987	7,883	6,023	1,194 (16)	19.8
1988	7,793 (242)	5,671 (162)	904 (9)	15.9
1989	6,523 (237)	4,868 (172)	902 (12)	18.5
1990	6,975 (259)	5,122 (192)	1,946 (33)	38.0
1991	7,032 (321)	5,117 (233)	1,543 (29)	30.2
Total	47,305	35,634	10,540 (147)	29.6

Note: Figures in the parentheses indicate number of females.

Table 2. Number of applicants, examinees, and passers of senior grade examination

Year	Number of applicants	Number of examinees	Number of passers	Pass ratio (%)
1985	—	—	—	—
1986	—	—	—	—
1987	2,594	2,013	245 (1)	12.2
1988	2,007 (19)	1,466 (12)	146 (0)	10.0
1989	1,439 (9)	1,013 (7)	117 (0)	11.5
1990	1,585 (24)	1,147 (16)	190 (3)	16.6
1991	1,967 (21)	1,383 (11)	203 (2)	14.7
Total	9,592	7,022	901	12.8

Note: Figures in the parentheses indicate number of females.

5. Outline of the examination held in 1991

5.1 Basic grade examination

As Table 1 shows, there were 7,032 applicants for the basic grade examination held in 1991. Out of these, 5,117 actually took the examinations. Including 29 women, 1,543 passed the examination, the pass ratio working out to 30.2% (composed to 38.0% in 1990). The passers averaged 25.8 years of age (Table 3).

Table 3 Average age of basic grade examination passers

	Applicants	Examinees	Passers
Average age	23.7	23.5	25.8
Age of the juniormost examinee(s)	16	16	16
Age of the seniormost examinee(s)	65	65	65

Analyzed according to places of employment, among those employed in the general category of enterprises*, 336 (21.8% of the total) of passers were found to work in the manufacturing industry, 277 (18.0%) were engaged in jobs relating to manufacturing or sales of computers/semiconductors, and 245 (15.9%) were students. The pass ratio, however, was the highest among examinees from schools and research institutions (32 examinees, 47.8% of the total). This was followed by 44.6% in the manufacturing industries and 43.4% in manufacturing or sales of computers/semiconductors (Table 4).

* General category enterprises exclude those relating to manufacturing or sales of computers/semiconductors, systems houses, mechatronics related enterprises, and information processing services.

Table 4 Places of employment of basic grade examination passers

Place of employment		Applicants	Examinees	Passers	Pass ratio(%)
Manufacturing or sales of computers/ semiconductors		886	638	277	43.4
Systems houses		518	334	122	36.5
Mechatronics related enterprises		558	410	175	42.7
Information processing services enterprises		1,110	664	211	31.8
Other general enterprises and groups	Manufacturing industry	999	753	336	44.6
	Non-manufacturing industries	456	320	121	37.8
Government and municipal offices		17	7	3	42.9
Schools and research institutions		95	67	32	47.8
Students		2,309	1,866	245	13.1
Not known		84	58	21	36.2
Total		7,032	5,117	1,543	30.2

Analysis of examinees according to their jobs indicated that 1,866 (36.5%) were students, followed by 1,575 (30.8%) researchers and developers. Among those engaged in research and development, the pass rate was 44.4%. The number of passers here was 699, or 45.3% of the total (Table 5).

Table 5 Jobs of basic grade examination passers

Job	Applicants	Examinees	Passers	Pass ratio(%)
Research and development	2,206	1,575	699	44.4
Information processing	1,149	670	229	34.2
Manufacturing	621	464	186	40.1
Maintenance and service	180	139	41	29.5
Sales	75	55	18	32.7
Surveys and planning	17	10	2	20.0
Education	101	69	37	53.6
Students	2,309	1,866	245	13.1
Miscellaneous	305	221	72	33.6
Not known	69	48	14	29.2
Total	7,032	5,117	1,543	30.2

Analyzed according to the number of years of experience, engineers with at least a year's background were found to total 1,658 (32.4% of the total number of examinees. The corresponding pass ratio was 46.5%. Those with no experience or with a background of less than a year numbered 3,374 (65.9%), the corresponding pass ratio being 22.4% (Table 6).

For reference, Tables 7 and 8 provide the academic backgrounds of the passers and their fields of specialization.

Table 6 Number of years of experience of basic grade examination passers

Number of years of experience	Applicants	Examinees	Passers	Pass ratio(%)
No experience	3,583	2,690	532	19.8
Less than one year's experience	939	684	225	32.9
At least one year but less than three years	1,288	900	350	38.9
At least three years but less than five years	548	381	202	53.0
At least five years but less than ten years	504	337	192	57.0
More than ten years' experience	53	40	27	67.5
Not known	117	85	15	17.6
Total	7,032	5,117	1,543	30.2

Table 7 Academic background of basic grade examination passers

Academic background	Applicants	Examinees	Passers	Pass ratio(%)
University graduate school	131	91	63	69.2
Universisity/high schools in old education system	2,376	1,633	754	46.2
Junior colleges	225	165	40	24.2
Technical high schools	245	189	86	45.5
High schools/intermediate schools in old education system	1,003	760	223	29.3
Other schools, including technical schools	2,916	2,163	361	16.7
Miscellaneous	31	23	8	34.8
Not known	105	93	8	8.6
Total	7,032	5,117	1,543	30.2

(Academic background also includes students still in school)

Table 8 Fields of specialization of basic grade examination passers

Field of specialization	Applicants	Examinees	Passers	Pass ratio(%)
① Hardware engineer	860	624	239	38.3
② Engineer engaged in hardware-related jobs	854	639	288	45.1
③ Engineer engaged in software-related jobs	929	675	326	48.3
④ Software engineer	1,487	901	325	36.1
Subtotal	4,130	2,839	1,178	41.5
Miscellaneous	2,464	1,939	318	16.4
Not known	438	339	47	13.9
Total	7,032	5,117	1,543	30.2

5.2 Senior grade examination

As Table 2 shows, there were 1,967 applicants for the senior grade examination held in 1991. Out of these, 1,383 actually took the examination. Including 2 women, 203 passed the examination, the pass rate working out to 14.7% (slightly less than that of the 16.6% in 1990). The passers averaged 28.5 years of age (Table 9).

Analyzed according to places of employment, 48 (23.6% of the total) of passers were engaged in jobs relating to manufacturing or sales of computers/semiconductors. Among those employed in the general category of enterprises, 45 (22.2%) were found to work in the manufacturing industry, and 30 (14.8%) were engaged in mechatronics-related enterprises. The highest pass rate was 20.6%, and this also was in the fields of manufacturing or sales of computers/semiconductors (Table 10).

Analysis of passers according to their jobs indicated that 138 (68.0%) were researchers and developers, followed by 25 (12.3%) persons who worked in jobs relating to information processing (Table 11).

Analyzed according to the number of years of experience, of those who took the senior grade examination, 77.1% (1,066) were engineers with at least a year's background. The pass rate was an extremely high level of 80.8% (164). In contrast to this, those with no experience or with a background of less than a year numbered 22.4% (310), the corresponding pass rate being 18.2% (37) (Table 12).

For reference, Tables 13 and 14 provide the academic backgrounds of the passers and their fields of specialization.

Table 9 Average age of senior grade examination passers

	Applicants	Examinees	Passers
Average age	28.4	28.1	28.5
Age of the juniormost examinee(s)	17	18	19
Age of the seniormost examinee(s)	59	54	54

Table 10 Places of employment of senior grade examination passers

Place of employment		Applicants	Examinees	Passers	Pass ratio(%)
Computers and semiconductors or sales		325	233	48	20.6
Systems houses		256	193	26	13.5
Mechatronics related enterprises		231	166	30	18.1
Information processing services enterprises		418	270	20	7.4
Other general enterprises and groups	Manufacturing industry	415	296	45	15.2
	Non-manufacturing industries	164	107	17	15.9
Government and municipal offices		5	5	1	20.0
Schools and research institutions		47	38	5	13.2
Students		95	70	11	15.7
Not known		11	5	0	0.0
Total		1,967	1,383	203	14.7

Table 11 Jobs of senior grade examination passers

Job	Applicants	Examinees	Passers	Pass ratio(%)
Research and development	1,084	777	138	17.8
Information processing	404	258	25	9.7
Manufacturing	192	132	17	12.9
Maintenance and service	49	34	2	5.9
Sales	29	19	2	10.5
Surveys and planning	6	5	1	20.0
Education	52	43	4	9.3
Students	95	70	11	15.7
Miscellaneous	44	37	2	5.4
Not known	12	8	1	12.5
Total	1,967	1,383	203	14.7

Table 12 Number of years of experience of senior grade examination passers

Number of years of experience	Applicants	Examinees	Passers	Pass ratio(%)
No experience	301	213	28	13.1
Less than one year's experience	137	97	9	9.3
At least one year but less than three years	385	280	35	12.5
At least three years but less than five years	411	283	36	12.7
At least five years but less than ten years	626	437	75	17.2
More than ten years' experience	99	66	18	27.3
Not known	8	7	2	28.6
Total	1,967	1,383	203	14.7

Table 13 Academic background of senior grade examination passers

Academic background	Applicants	Examinees	Passers	Pass ratio(%)
University graduate school	74	51	16	31.4
University/high schools in old education system	1,165	794	132	16.6
Junior colleges	39	29	2	6.9
Technical high schools	113	87	13	14.9
High schools	209	148	16	10.8
Other schools, including technical schools	357	267	23	8.6
Miscellaneous	7	5	1	20.0
Not known	3	2	0	0.0
Total	1,967	1,383	203	14.7

(Academic background also includes students still in school)

Table 14 Fields of specialization of senior grade examination passers

Field of specialization	Applicants	Examinees	Passers	Pass ratio(%)
① Hardware engineer	293	214	39	18.2
② Engineer engaged in hardware-related jobs	453	333	62	18.6
③ Engineer engaged in software-related jobs	542	379	66	17.4
④ Software engineer	491	314	22	7.0
Subtotal	1.779	1.240	189	15.2
Miscellaneous	149	113	10	8.8
Not known	39	30	4	13.3
Total	1.967	1.383	203	14.7

Small and Medium Enterprise Management Consultant Examination (Information Category)

Japan Small and Medium Enterprise
Management Consultants Association
(J-SMECA)

Small and Medium Enterprise Management Consultants (SMECs) are authorized by and registered at the Ministry of International Trade and Industry (MITI). This SMEC license, established in 1952, is the only governmental license for business management consultants. There are now three license examination categories for SMECs: 1. Manufacturing and mining 2. Commerce 3. Information.

1. Circumstances and Background of Establishment of the License Examination System

(1) What is the SMEC System?

The SMEC system aims at promoting the self-initiated efforts of small and medium enterprises and rationalizing their managerial administration. Under this system, upon request from small and medium enterprises, Small and Medium Enterprise Consultants (SMECs) conduct research and analysis of the actual status of their management, point out managerial problems, and recommend practical measures for improvement.

SMECs are therefore required not only to have profound knowledge of and extensive experience in small and medium enterprise management; they must also be persons of trustworthy character.

A registration system for qualified Small and Medium Enterprise Management Consultants (SMECs) was accordingly established in 1952.

Based on this new registration system, since 1963 an examination for Small and Medium Enterprise Management Consultants has been conducted in the two categories of manufacturing and mining and commerce.

(2) Establishment of an Information Category

With the rapid development of an information-oriented society beginning in the 1980s, it has become more and more difficult for SMECs, who have specialized only in the manufacturing and mining, and commerce categories, to cope with the information-oriented problems and to offer proper guidance in the field of information management. In other words, it has become indispensable to have SMECs who can give proper guidance and advice regarding information-oriented issues, not only experts in the two conventional categories, so that small and medium enterprises can deal with the newly-emerging situation.

Under these circumstances, and out of the necessity of providing SMECs who possess expert knowledge on both overall management and administration and on information processing technology, an information cat-

egory was newly established in 1986 as a registration categories for SMECs. There are now three categories: 1. Manufacturing and mining 2. Commerce 3. Information.

(3) Registration of SMECs

To be registered as an SMEC, one must go through one or the other of the following procedures:

1) Pass the examinations (first and second examinations and practical training) arranged by the Japan Small and Medium Enterprise Management Consultants Association (J-SMECA)

2) Complete the course of study (1 year) for developing small business consulting skills given by the Japan Small Business Corporation Institute

The course 2) is designed mainly for municipal government officials, and has a fair number of restrictions, so almost all private individuals follow the examination procedure 1).

Total number of registered SMECs are as follows (See in Table 1).

Registration by categories	Number of SMECs registered
Manufacturing and mining	4,110
Commerce	7,167
Information	293
Total	11,570

Table 1. Total Number of Registered SMECs (as of April 1991)

2. Purpose and Outline of Examination

The examination is conducted with the aim of evaluating the knowledge and capacity which is necessary for an SMEC to have, using the procedures detailed below:

(1) Examination Categories

There are three categories:

1) Manufacturing and mining
2) Commerce
3) Information

(2) Steps

There are three steps in all categories:

First examination

To evaluate the basic knowledge in management and administration that an SMEC must have.

Second examination

To evaluate the professional consulting capacity and applicability (including creativity) that an SMEC must have.

This examination is only for those who pass the first examination.

Practical training

To evaluate practical consulting capacity through practical training.

This examination is only for those who have passed the second examination during the past 3 years.

(3) Qualifications

There are no specific restrictions concerning age, sex, education, etc.

(4) Passing Level

To be successful in the examination, the average for all subjects combined must be over 60 points, on condition that no single subject has a score less than 40 points.

(5) Examination Locations/Schedule

Examination locations and schedule are given in the following Figure 1 & Table 2.

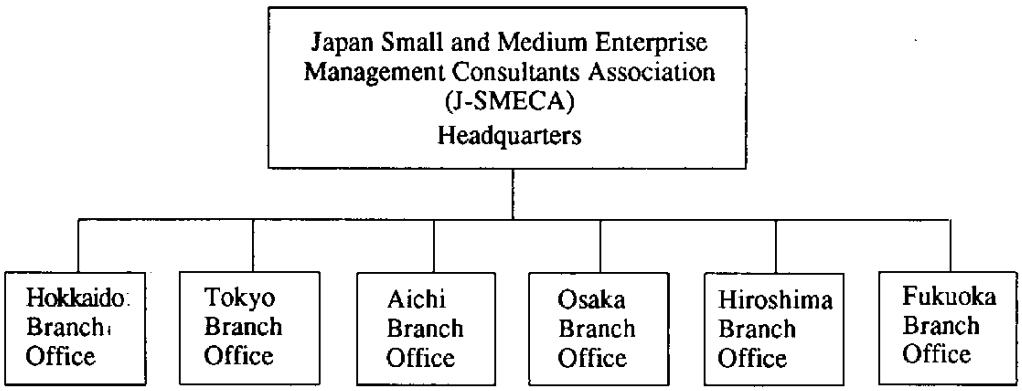
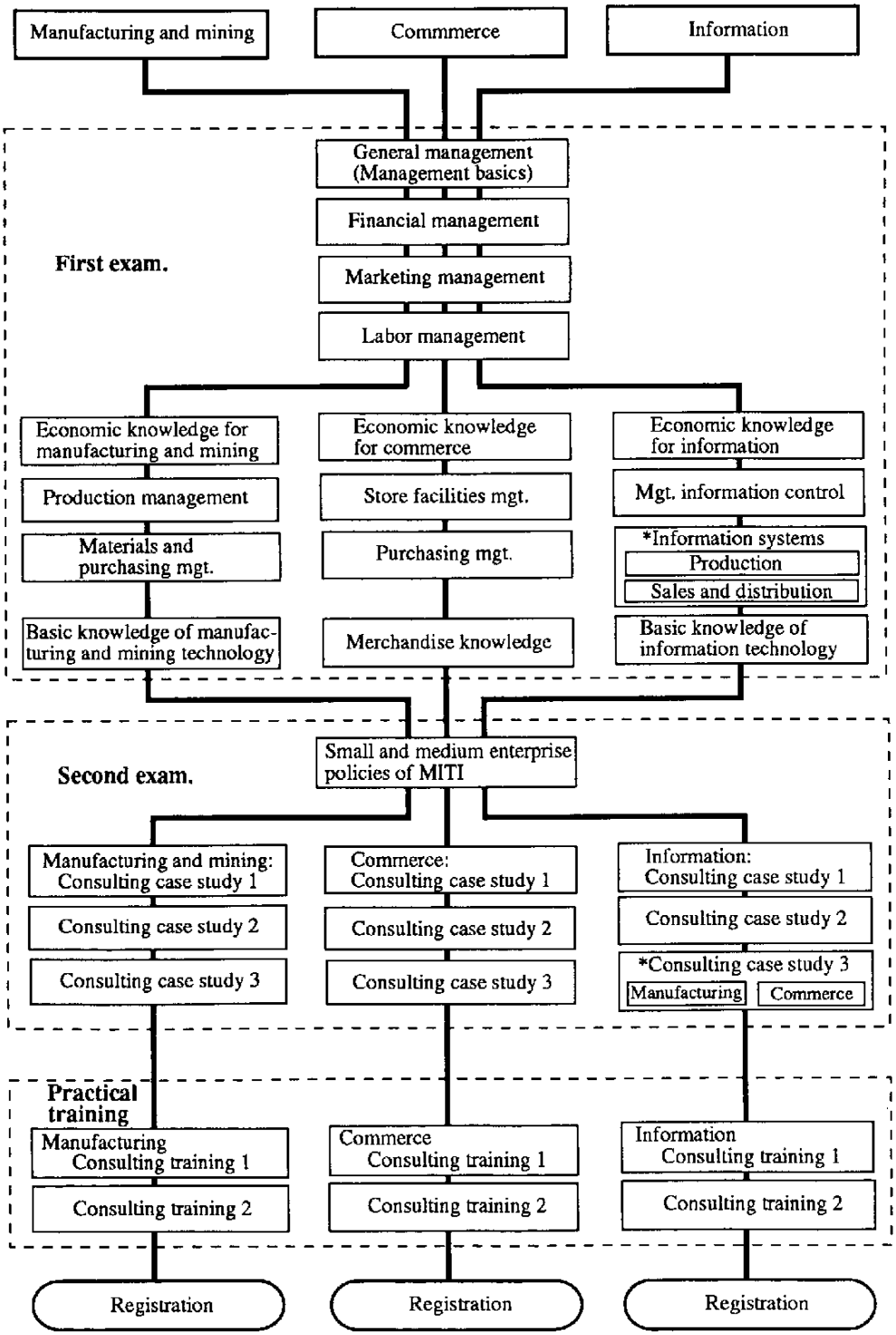


Figure 1. Examination Locations

Classification	Time	Period
First examination	August of every year	2 days
Second examination	October of every year	1 day
Practical training	January of the next year	15 days

Table 2. Examination Schedule

(6) Examination Subjects by Category (See in Figure 2)



Note: * marked subjects are electives.

Figure 2. Examination Subjects by Category

(7) Subject Exemptions

Subjects exemptions in the first examination are as follows:

Certified public accountants/Certified public accountant trainees:

- General management
- Financial management

Licensed tax accountants:

- Financial management

Technicians (Persons registered in the information processing category):

- Information systems
- Basic knowledge of information technology

Persons who have passed the Information-Technology Engineers Examination which includes:

Systems Auditor Exam/Systems Engineer Exam;

- Information systems
- Basic knowledge of information technology

On-line Systems Engineer Exam/Senior Programmer Exam;

- Basic knowledge of information technology

Note: There are no subject exemptions in the second examination or in practical training.

(8) Content of Information Category Examination Subjects

First examination

A written examination is conducted on the following 8 subjects.

<Subjects common to all examination categories>

1. General management

Outline of general management (principles of management and administration, management process etc.), types of enterprises (legal enterprise types, private enterprise and public enterprise, etc.), functions of managers and administrators (duties, role, leadership, etc.), managerial ideas (purpose and mission of enterprise, corporate culture, etc.), management strategy (strategic decision making, strategy planning, etc.), management organization (basic structure of organization, management levels, etc.), corporate planning and management control, problem solving and decision making, relations between organizations (business cooperation, joint operation amalgamation, etc.), Japanese-style management, management internationalization, other items related to general management.

2. Financial management

Purpose and themes of financial management, financial management and corporate accounting, financial diagnosis (profitability, liquidity, capital structure, financial management organization, etc.), financial statements, raising and investment

of capital (capital procurement sources, sales receivable management, inventories management, property management, etc.), equipment investments (including leasing) and economic evaluation, financial analysis, profit planning, budget management, cost management, fund management, other items related to financial management.

3. Marketing management

Marketing and marketing management, marketing concepts, strategic marketing planning, marketing environment (including consumerism, ecological marketing, social marketing), marketing information system, market research and data analysis, demand forecast and sales planning, consumer purchasing behavior and organization purchasing behavior, marketing of capital goods and consumer goods, market segmentation, product and service strategy, marketing outlet strategy, promotion strategy, price strategy, physical distribution strategy, internationalization of small and medium enterprise and marketing strategy, other items related to sales management.

4. Labor management

Outline of labor management (significance, current problems, Japanese-style labor management, etc.), employment management (personnel planning, personnel system, office regulations, working hours, etc.), personnel management (job analysis, merit rating, etc.), wage management (wage structure, wage and productivity, etc.), human relations management (organizational activity and human activity, small group activities, etc.), security and hygiene, welfare, relations between labor and management (labor laws, labor union, Japanese-style relations between employees and employer, etc.), other items related to labor management.

<Information category subjects>

5. Economic knowledge for information

Basic issues of small and medium enterprises (trends in industrial structure, character and role of small and medium enterprises, etc.), Japanese economy and international economy, changes in economic environment and counterplans of small and medium enterprises (modernization, upgrading, organization of small and medium enterprises, labor problems of small and medium enterprises, etc.), movements in regional economies (regional differences, regional developments, etc.), distribution economics (distribution mechanisms and distribution functions, modernization and computerization of distribution, etc.), consumers and enterprises (consumer movement, counterplans for consumer protection and enterprise activity, etc.), problems and themes of computerization of small and medium enterprises, economics of computerization of small and medium enterprises, networking of small and medium enterprises (communication systems, joint use, division of functions, etc.), movements in computerization of small and medium enterprises, security issues, other items related to computerization of small and medium enterprises.

6. Control of Management Information

Function of management and administration, management organization (information control organization), management strategy (decision making system, etc.), management policy (computerization of management by objectives), gathering, storage, retrieval and communication of management information, joint use, networking, and efficiency of information processing, basic management information systems, decision support information systems (simulation), development and operational control of management information systems, other items related to management information

7. Information systems (elective subject)

(A) Production information systems

Production jobs (orders received, design, purchasing, manufacturing, distribution), production types and production methods, organization of production information, information systems for demand forecasting, product development, orders received and sales management, production planning, inventory control, scheduling, materials control, subcontractor control, quality control , cost control, process control, work control, technology control, equipment control and after sales service etc., production management indexes, trends in production information systems, other items related to production information systems

(B) Sales and distribution information systems

Sales and distribution jobs (orders received, procurement, distribution), sales and distribution types and distribution methods, organization of sales and distribution information, information systems for sales estimation, sales planning, merchandising, purchasing control, commodity control, sales control, inventory control, customer control, warehouse and delivery control, pricing and commodity display etc., index of sales and distribution control, POS, VAN, card systems, trends in sales and distribution information systems, other items related to sales and distribution information systems.

8. Basic knowledge of information technology

Basic information processing technology (hardware, software, programming), types of information processing and related technology, data bases, data structures, networks, data transmission, systems analysis and design methods, computer systems and control technology, probability, statistics, OR, trends in information technology, other items related to information technology.

Second examination

A written examination is conducted on the following 4 subjects.

1. Measures for small and medium enterprises (subjects common to all examination categories)

Questions are asked about policies for small and medium enterprises and related laws.

Table 3. SMEC First Examination Pass Rate

YEAR	Item / Category	Number of Applicants	Number of Examinees	Number of Passers	Pass rate (%)	
					Compared to number of applicants	Compared to number of examinees
1986	Manufacturing and mining	775	722	128	16.52	17.73
	Commerce	2,579	2,335	431	16.71	18.46
	Information	656	601	126	19.21	20.97
	Total	4,010	3,658	685	17.08	18.73
1987	Manufacturing and mining	924	840	214	23.16	25.48
	Commerce	2,920	2,608	633	21.68	24.27
	Information	611	508	100	16.37	19.69
	Total	4,455	3,956	947	21.26	23.94
1988	Manufacturing and mining	892	802	148	16.59	18.45
	Commerce	3,097	2,678	573	18.50	21.40
	Information	653	530	106	16.23	20.00
	Total	4,642	4,010	827	17.82	20.62
1989	Manufacturing and mining	842	753	149	17.70	19.79
	Commerce	3,418	2,901	635	18.58	21.89
	Information	729	614	143	19.62	23.29
	Total	4,989	4,268	927	18.58	21.72
1990	Manufacturing and mining	963	855	165	17.13	19.29
	Commerce	4,179	3,360	653	15.63	19.43
	Information	1,000	814	171	17.10	21.00
	Total	6,142	5,029	989	16.10	19.66
1991	Manufacturing and mining	1,021	882	183	17.92	20.75
	Commerce	4,417	3,667	701	15.87	19.12
	Information	1,307	1,037	184	14.08	17.74
	Total	6,745	5,586	1,068	15.83	19.12

Table 4. SMEC Second Examination Pass Rate

YEAR	Item / Category	Number of Applicants	Number of Examinees	Number of Passers	Pass rate (%)	
					Compared to number of applicants	Compared to number of examinees
1986	Manufacturing and mining	415	414	91	21.93	21.98
	Commerce	961	936	203	21.12	22.69
	Information	113	111	25	22.12	22.52
	Total	1,489	1,461	319	21.42	21.83
1987	Manufacturing and mining	475	469	84	17.68	17.91
	Commerce	1,202	1,161	230	19.13	19.81
	Information	159	155	28	17.61	18.06
	Total	1,836	1,785	342	18.63	19.16
1988	Manufacturing and mining	468	458	90	19.23	19.65
	Commerce	1,342	1,292	243	18.11	18.80
	Information	181	177	32	17.68	18.07
	Total	1,991	1,927	365	18.33	18.94
1989	Manufacturing and mining	480	463	85	17.71	18.36
	Commerce	1,471	1,417	288	19.58	20.32
	Information	252	236	49	19.44	20.76
	Total	2,203	2,116	422	19.16	19.94
1990	Manufacturing and mining	492	480	90	18.29	18.75
	Commerce	1,520	1,459	289	19.01	19.81
	Information	330	318	60	18.18	18.87
	Total	2,342	2,257	439	18.74	19.45
1991	Manufacturing and mining	505	492	92	18.22	18.70
	Commerce	1,717	1,627	314	18.29	19.30
	Information	403	381	74	18.36	19.42
	Total	2,625	2,500	480	18.29	19.20

2. **Consulting case study I**

3. **Consulting case study II**

4. **Consulting case study III**

Questions about development and introduction of information administration systems as well as about construction and application will be asked for 3 consulting case studies. Case study III will be selected from either the manufacturing area or the commerce area.

Practical training

Practical training is conducted in a workshop environment, through desk-top study and on-the-job consulting programs at 2 firms.

On the job consulting, how to perform consulting, how to make reports after consulting as well as presentation of consulting results are conducted for the two cases described below:

1) In the case of a firm that has not yet adopted computers:

   Constructing a management control system through introduction of computers

2) In the case of a firm that has already adopted computers:

   Reassessing the present information processing system, and reconstructing or re-applying a more efficient information system

(9) SMEC Registration

Those who pass both the first and second examinations and finish the practical training are registered as Small and Medium Enterprise Management Consultants.

3. Trends of Applicants, Examination Passers, Examination Pass Rate

Refer to Attached Tables 3 & 4.

4. Future Examination Prospects

The information category was established as a new category in 1986. The number of examinees is increasing every year. In recent years the yearly rate of increase has been 30%, showing a rapid increase.

It is estimated that with the development and advancement of the information-oriented age the number of examinees, particularly in the information category, will increase even more.

Database Searchers' Examination

Tatsuo Kotake
The member of the board
Information Science and Technology
Association (INFOSTA)

1. Background

Since 1985, the Information Science and Technology Association (INFOSTA) has been conducting annual examinations to evaluate the qualifications of database searchers. This paper will outline the examinations and their purposes, the examination items, and the number of applicants who have passed the examinations successfully so far.

In 1976, the Japan Information Center for Science and Technology (JICST) started offering online information retrieval services (JOIS) across a special line. In 1978, JOIS services were extended to enable use of public telephone networks. Following this, use of PATOLIS, DIALOG, and ORBIT, the three online services launched in Japan from 1979-1980, paved the way for full-scale use of online information retrieval services. The number of databases available to users in Japan went on increasing year by year after this. So did the number of database searchers. Before long the term information retrieval became synonymous with the online information retrieval. Personal computers appeared everywhere in the office environment and, apart from professional searchers, database retrieval was performed by general end users as well.

However, databases differ according to their contents. In the same way, their retrieval methods and the commands differ between search systems: Such methods can be acquired through training and experience. It is doubtful that all searchers select the right databases and conduct searches efficiently in accordance with the requirements. On the other hand, an efficient search procedure, supported by advanced knowledge of methods, experience, and techniques, is not necessarily given much value by surrounding persons, including the top management of organizations. The Database Searchers' Examination (popularly referred to as the "Searchers' Examination"), conducted by INFOSTA since 1985, is intended to improve this situation. It aims at the objective evaluation of the knowledge and competence required of searchers and at securing better understanding in society of the searchers' job. In addition, the examination seeks to improve the quality of this knowledge and the related techniques and to improve searcher proficiency levels.

2. Examination essentials and targets

The following is quoted from the INFOSTA materials that explain the essential characteristics and objects of the examination.

1) Essentials

Searchers are required to act according to the

nature of the inquiries they receive for specific information. They must be in a position to determine where the information is available, obtain it, and process and arrange it as requested. Thus, the searchers' job has been known to be a specialized one since long ago. A dramatic increase in the number of information sources and online databases, however, has now given the searchers' job a new significance, requiring it to cover a wider range of functions.

Searchers who are expected to act accordingly are also called database searchers now. Based on experience and specific examples, various views have been expressed already about the knowledge and technical competence required of these database searchers. However, basic guidelines and a system must be laid down to check the adequacy of a searcher's knowledge and ability by taking into account the current situation and probable future changes in the information environment.

Needless to say, only the proper classification of this knowledge and competence and a thorough analysis and evaluation of it will suffice to lay down such guidelines and establish such an examination system. These conditions were taken into consideration by INFOSTA. At the same time, the association set up a committee to propose an examination system. On the basis of deliberations by the committee, INFOSTA finally started conducting the Database Searcher's Examinations (Classes 1 and 2).

Based on its Notification No. 9 of July 10, 1989, entitled "Rules for examining the knowledge and technical competence of database searchers", Science and Technology Agency issued a notification, No. 10 dated August 10, recognizing INFOSTA's examinations.

2) Object

INFOSTA's examinations aim at objectively evaluating the knowledge and competence required of online database searchers. They also seek to create greater social recognition of this expertise and better standards of knowledge and competence on the part of the searchers.

3. Examinations and qualifications required of those who take them

The examinations are divided into Classes 1 and 2. Of these, Class 2 is open to anyone irrespective of academic background, experience, or age. The Class 1 examination, however, is intended only for those who pass the Class 2 examination. Class 2 has only a written examination. Class 1 starts with a written examination (part 1), and those who pass it are then interviewed. A final overall evaluation determines which searchers successfully pass.

In simple terms, those who pass the Class 2 examination are capable of using a given machine, freely selecting a database, and retrieving information from it. Class 1, which is an extension of Class 2, assigns a higher rank to the searchers. It requires successful applicants to not only be able to carry out proper and efficient retrieval but also to be able to guide beginners as well as Class 2 searchers and to advise on construction of databases.

The days on which the examinations are carried out differ slightly from year to year. In general, however, the Class 2 and Class 1/Part

1 examinations are held on a Sunday in November or December, while the Class 1/Part 2 examinations are conducted in February or March of the following year.

Until recently Class 2 and Class 1/Part 1 examinations were conducted in Tokyo and Osaka only. However, Nagoya was added in 1991. (Because of unavoidable circumstances, however, the examinations were held in Kobe instead of Osaka in 1991.) Class 1/Part 2 examinations are held in Tokyo only.

The examination fees charged are 5,000 yen for Class 2 and 10,000 yen for Class 1.

4. Examination details

The examinations evaluate the knowledge and competence of applicants in five broad areas. These are:

1) Computers and terminals, telecommunications, and related software

2) Documentation technique centering on information retrieval

3) Databases
   ① Familiarity with databases in general
   ② Knowledge of specific databases (files) and competence in retrieving information from them

4) Distribution and use of information

5) Knowledge of subject matter and ability to make use of it

For further details on the above, refer to Table 1.

The total time allotted for the written examinations is two hours, with another 40 minutes after a recess of 20 minutes.

Part of the first two hours of the Class 2 written examination used to be made up of descriptive (essay-type) questions. At present, however, the number of applicants taking the examination has increased to more than 1,000, and this part of the Class 2 examination is now made up exclusively of multiple-choice and True-False type questions. The first half of the Class 1 examination consists mostly of descriptive questions. However, the second half of the examinations, contains only descriptive questions for both Class 1 and Class 2 questions. It is not that the questions are formatted in the above way as a matter of principle, but over the years this has been the norm and it is highly likely that this format will be followed in the coming years.

The Part 2 examination in Class 1 consists of interviews of individual applicants. Therefore, it takes a considerable amount of time. A number of examiners interview the applicants one by one, spending about 30 minutes per applicant. The number of applicants has been on the increase year by year. Even a fairly large number of examiners cannot complete all the interviews in one day. At present, the interviews take two days to finish.

5. Number of applicants

Table 2 provides data on the numbers of applicants who have taken the examinations each year.

Table 1 Examination outline

Area	Class 1	Class 2
① Computers, terminals, telecommunications	a. General knowledge of types and functions of computers and terminals b. General knowledge of terminal hardware configurations c. General knowledge of telecommunications technology and its applications (such as knowledge about channels, communication speeds, couplers, and modems.) d. General knowledge of computer networks and their configurations	a. Knowledge of technical terminology b. Basic knowledge of computer system configurations c. General knowledge of terminal functions and uses d. General knowledge of communication equipment e. Ability to read and follow manuals
② Documentation techniques	a. Knowledge of classifications and indexing methods in specific fields and ability to apply them b. Knowledge of abstraction techniques and ability to refer to abstracts as information sources c. Knowledge of file structuring methods and ability to build files d. Knowledge of general search methods and ability to select and evaluate them e. Knowledge of retrieval techniques for specific types of files and ability to apply these techniques f. Knowledge of basic rules underlying compilation of thesauri and ability to use thesauri of different types	a. General acquaintance with technical terms b. General knowledge of information management c. Knowledge and application of standard classifications d. Knowledge and application of standard indexing techniques e. Knowledge of abstracting and ability to use abstracts f. General Knowledge of thesauri and ability to use them
③ Databases	a. General (a) Knowledge of database building and distribution mechanisms (b) Selection of databases according to the object in view (c) Knowledge of retrieval and output based on database systems and use of related methods (d) Ability to read, understand, and write existing manuals relating to individual database systems (e) Knowledge and application of DBMS b. Individual databases (a) Knowledge of command languages relating to individual databases and ability to compare and select from them (b) Knowledge of individual database details and retrieval ability (a candidate may restrict himself or herself to any chosen area) (c) Knowledge and ability to make use of individual database record formats, knowledge of data items and their entry (d) Knowledge of and ability to select individual database output formats (e) Evaluation of outputs and knowledge of secondary operations (f) Knowledge of how to evaluate the cost of using databases	a. General (a) Knowledge of overall current status of databases (b) Knowledge of database service types and names (c) Ability to read and understand manuals (d) Knowledge of search commands b. Individual databases (a) Knowledge and ability to make use of basic commands and operations (b) Acquaintance with various database characteristics (c) Knowledge of database configurations (d) General knowledge of the method of devising search procedures
④ Information distribution	a. Knowledge of INS and new media, and ability to evaluate and use different systems b. General knowledge of office and laboratory automation, ability to lay down basic principles underlying application -specific configurations c. Selection of distribution channels and media according to requirements d. Knowledge of and ability to evaluate distribution costs e. General copyright-related knowledge	a. General knowledge of information transmission and distribution b. General knowledge of information transmission and distribution systems c. General knowledge of equipment and media used for information transmission and distribution
⑤ Knowledge of subject matter	a. Knowledge of and ability to make use of the methods of analyzing a subject (a candidate may restrict himself or herself to any chosen subject) b. Ability to analyze requests relating to specific subjects c. Ability to inter-relate subjects and requests d. Knowledge of search aids for specific subjects, and the selection and use of such aids	Knowledge of and ability to apply search aids for individual areas (subjects)

Table 2 Statistical data on the annually conducted Database Searchers' Examination

Class 1		Fiscal 1985	Fiscal 1986	Fiscal 1987	Fiscal 1988	Fiscal 1989	Fiscal 1990
Number of applicants taking the examination		——	90	79	80	104	120
Number of examination passers (proportion of successful applicants)		——	19 (21.1%)	18 (22.8%)	19 (23.8%)	20 (19.2%)	24 (20.0%)
Proportions of male and female applicants (Figures within parentheses indicate the percentage of successful applicants)	Male	——	15 (78.9%)	6 (33.3%)	11 (57.9%)	11 (55.0%)	16 (66.7%)
	Female	——	4 (21.1%)	12 (66.7%)	8 (42.1%)	9 (45.0%)	8 (33.3%)
Average age of examination passers	Total	——	39.7 years	33.6 years	36.9 years	35.2 years	38.2 years
	Male	——	42.0 years	39.3 years	41.7 years	38.5 years	42.4 years
	Female	——	31.8 years	30.8 years	30.4 years	31.0 years	29.8 years

Class 2		Fiscal 1985	Fiscal 1986	Fiscal 1987	Fiscal 1988	Fiscal 1989	Fiscal 1990
Number of applicants taking the examination		223	219	490	560	816	1050
Number of examination passers (proportion of successful applicants)		140 (62.8%)	125 (57.1%)	224 (45.7%)	241 (43.0%)	301 (36.9%)	354 (33.7%)
Proportions of male and female applicants (Figures within parentheses indicate the percentage of successful applicants)	Male	77 (55.0%)	72 (57.6%)	113 (50.4%)	115 (47.7%)	126 (41.9%)	171 (48.3%)
	Female	63 (45.0%)	53 (42.4%)	111 (49.6%)	126 (52.3%)	175 (58.1%)	183 (51.7%)
Average age of examination passers	Total	32.9 years	33.7 years	32.7 years	32.7 years	32.4 years	30.9 years
	Male	37.3 years	37.6 years	36.5 years	37.6 years	37.3 years	35.2 years
	Female	27.5 years	28.4 years	28.8 years	28.2 years	28.9 years	26.9 years

In the first year, that is 1985, only Class 2 examinations were conducted. Class 1 examinations started being held in the following year, 1986. The number of applicants has been increasing steadily: in 1990, the Class 2 applicants alone numbered over 1,000.

Results of the examinations have yet to be announced for 1991. The number of applicants for the examinations appears in Table 3. This differs slightly from the number that actually took the examinations.

Table 3 Applicants for the fiscal 1991 examinations

Class 1

Total number for the current year			
Tokyo	Nagoya	Kobe	Total
97	8	36	141

Class 2

Total number for the current year			
Tokyo	Nagoya	Kobe	Total
944	165	208	1,317

Most of the successful applicants in the Class 1 and 2 examinations are employees of private enterprises. A small number are persons working in universities and libraries, students, and applicants whose source of income is not known to INFOSTA.

On the average, the successful male applicants are about 10 years older than the successful female applicants. This is attributed to the fact that most male applicants start performing online data searches only after being transferred from some other department to the information division, whereas women start working in online environments right from the beginning and attain familiarity with online retrieval quite early.

6. Evaluation

The numbers of successful applicants who have taken the examinations since 1985 total 100 in Class 1 and 1,385 in Class 2. These applicants are now active in various fields. Many persons engaged in the searching of databases as part of their routine activities as well as participants in database search courses have expressed a desire to take the examinations. Many who have passed the Class 2 examination look forward to taking the Class 1 examination in the future.

Database searching, of course, is job that can be performed by both those who pass this examination and by persons who have never taken these examinations. Nor does success in these examinations automatically lead to promotions or increase in pay. What advantage, then, do these examinations offer the applicants?

Successful applicants say that the examinations have helped them "arrange" their knowledge in the related area. In their day to day activities, they use commands they are familiar with to search specific databases they know well. However, they do not try to gain familiarity with the definitions of technical terms and the details of databases lying outside the range of their activities. The examinations, on the other hand, call for overall comprehension of databases. They have to study in order to prepare for the examinations, and this widens their range of vision.

This is not all, however. A searcher's job requires knowledge and skill. The very fact that the Database Searchers' Examination is approved by the Science and Technology Agency is enough to convince the public that

searching databases is not a simple job that anyone can do by using any word at all. Recognition by their superiors and other persons will encourage searchers to carry out their jobs with greater interest. This will also improve the position of database searchers. Passing the examinations is not essential for being appointed to the position of data searcher in an organization. But an applicant with INFOSTA's database searcher certificate will be able to produce evidence of an objective evaluation of his or her knowledge and skill.

Let us take the example of a laboratory in a certain company. The researchers coming in with requests for information retrieval had furnished little information about what exactly they were looking for. However, when the certificates obtained by the searchers were posted on the wall, the same researchers started to provide much more detail about the information they were seeking.

7. Reference materials about the examinations

Questions from previous examinations and essays by the successful applicants giving their impressions (all in Japanese) can be obtained from INFOSTA for a fee. "Joho-no Kagaku to Gijutsu" (Information Science and Technology), an INFOSTA journal, publishes previous examination questions and impressions by successful applicants every year.

For the convenience of those who may be interested, INFOSTA's address is provided below:

Information Science and Technology
Association (INFOSTA)
2-5-7, Koishikawa, Bunkyo-ku
Tokyo 112, Japan

Current News

*** Ten Japanese and U.S. Makers to Jointly Develop LSI for HDTVs**

Matsushita Electric Industrial Co., Ltd., NEC Corporation, LSI Logic Corp., and VLSI Technology Corp., and six other Japan and U.S. makers have agreed to join hands in developing large scale integrated circuits (LSI) for the "highvision," the Japanese transmission system of high-definition TVs (HDTV). The group of ten also includes Mitsubishi Electric Corporation, Pioneer Electronic Corporation, Sharp Corporation, Victor Co. of Japan Ltd., Matsushita Electronics Corporation, and NEC Home Electronics Co., Ltd. Among these, Matsushita Electric Industrial, NEC, and Mitsubishi Electric will take the lead in developing a decoder LSI for signals from satellites, making efforts to improve the picture quality within a reasonable cost limit.

Inclusive of the receiver, today's highvision TV systems, mostly products of leading makers, bear a formidable price tag of around 4 million yen, a factor that has tended to constrain their sales. Bringing the price down calls for the use of a limited number of special LSIs, cutting the number of semiconductors from today's 100 thereabouts to about 19 or less.

The group expects to develop the low-priced special LSIs for high picture quality by the spring of 1992. It will be commercialized individually by the respective participant firms.

*** April-September shipment of personal computers drop in 1991**

Shipment of personal computers from April through September, 1991, dropped by 1%, to 334.9 billion yen in value, and by 5%, to 1,227,000 in number, according to the Japan Electronic Industry Development Association (JEIDA)'s statistics. This was the first time the April-June shipment data had already shown a decline in value compared to the same period of the preceding year, the first half term (April-September) shipment data revealed a decline also in the number shipped.

The value of the domestic shipment of personal computers in Japan increased 6% to 299 billion yen from the same period of the previous year while the number shipped increased 4% to 1,013,000. JEIDA's survey, started in fiscal 1978, has so far revealed two-digit growths only. The marginal rise registered this year echoes, on the one hand, a slowing down of supplies to major corporate users drawing in the reins on capital investment and, on the other hand, the demand for notebook-type personal computers among individual users seems to have run its course. As for exports, they fell 39% to 35.9 billion yen in value. The number of units exported fell by a substantial 32% to 214,000. The August, 1991, relaxa-

tion of retaliative tariff on semiconductors helped the growth of North American exports, but the sluggish demand in the local markets depressed exports of all makers to Europe, Southeast Asia, and Australia.

A quick recovery over the second half of the year is hard to expect, makers say. Indeed, actual shipment over the year in fiscal 1991 is likely to fall substantially short of the initial target.

*** Japan-U.S. enterprises merge on multimedia technology development**

Sony Corporation, Apple Computers, and Motorola, Inc., have reached a collaboration agreement on multimedia personal computer development. Sony and Motorola have acquired stakes in General Magic Corp., an Apple group enterprise engaged in developing new activities with which the two plan to jointly develop new technologies. Sony and Motorola will offer AV-related technology and communication technology, respectively. New products are due for development by 1993.

Collaboration in multimedia technology is in the offing between Matsushita Electric Industrial Co., Ltd., and Sun Microsystems Inc. The two will join hands in developing interfaces for central control on several audio-visual units from workstations. Matsushita Electric Industrial is developing Sun-compatible workstations and will improve the existing machines, turning them into compact, high-performance models to form the nucleus of the targeted multimedia system. AV systems are to be developed by connecting TVs and video cassette tape-recorders with workstations to control recording and playback of the programs through satellite broadcasting and HDTVs. The high-performance system will also be connectable to communication units so as to use the workstation screen for display of received facsimile data.

Manufacturers are humming with collaboration activities right now on expectations of a massive rise in demand round the corner for multimedia units for household use. Others in the field are Fujitsu and NEC who have stakes in a Microsoft-AT&T spinoff, and Apple and IBM, who have signed an agreement for collaboration in a wide range of activities. Rivalry among developers in taking the lead in laying down multimedia standards is gaining momentum.

*** NEC develops virtual reality communication systems**

NEC Corporation has unveiled a virtual reality communication system allowing multiple-user entry across networks in an artificial world. Essentially a fusion between conventional virtual-reality communication systems and communication network technology, the system will make it possible for mutually distant terminals to share and exchange large volumes of data.

By wearing special gloves interlocked with a computer, system users will be able to rotate or truncate product models displayed on the screen by just a motion of the hand. They will be able to communicate with the users on the other side of the network in much the same way as holding a conversation among participants in the same room.

The virtual reality which stems from a technology to project oneself as though one ex-

isted within the computer screen has been drawing substantial attention these days because of the rapid advances made in computer graphics. It is expected to gain popularity in a wide range of applications, such as in automobile or aircraft related product design, TV conference with conference-hall presence or medical treatment. NEC is gearing up its development activities to accelerate practical use of the system.

* **Eleven major airlines agree to connect cargo data systems**

Eleven major airlines, including Japan Airlines, Singapore Airlines, and British Airways have reached an agreement on interconnecting their respective cargo data systems. The move is expected to improve services by making it possible for consignees and cargo handling companies to use their own terminals and to refer to data on the existing booking capacity of the airlines, consign cargo, and check the whereabouts of consignments. For the airlines, the step is going to automate related operations and improve their efficiency.

In July, 1990, JAL, Lufthansa, Air France, and Cathay Pacific started working on a system to supply data concerning space booking, customs clearance, or tracking the cargo movement by setting up Global Logistics System Inc. (GLS). Six additional airlines, namely, the British Airways, Singapore Airlines, KLM, Air Canada, Ireland Airlines, and Swiss Airlines, have joined in this time to form a ten-airline working group and start on connecting their individual cargo data systems with the GLS host computer. Korean Airlines, which also joined the group, is also considering investing in GLS.

Back Issues of Japan Computer Quarterly are as follows:

Published in 1991

No. 87: Workstations in Japan
No. 86: VAN Services in Japan
No. 85: CIM in Japan
No. 84: Laptop Computer in Japan — Market & User Strategies —

Published in 1990

No. 83: Distribution Information Systems in Japan
82: Computer Security in Japan
81: Financial Information Systems in Japan
80: EDI in Japan

Published in 1989

No. 79: Neurocomputers and Fuzzy Theory – R & D Trends in Japan –
78: Japan's Approach to Privacy Protection
77: State of CAL (CAI) in Japan
76: Software Industry in Japan – Striving for Increased Productivity –

Published in 1988

No. 75: Personal Computers in Japan – An Unabridged Account –
74: Globalization of Telecommunication Services
73: The Microcomputer Industry
– Training Engineers, Creating Applications –
72: Informatization – Handling Tomorrow's Problems Today –

Published in 1987

No. 71: Systems Security – The Fight Against Computer Crime –
70: The Informatization of Small and Medium Businesses
69: Expert Systems in Japan
68: Large-scale Projects in Japan

Published in 1986

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