A Study on Multidimensional Quantification of Occupations: Development of Numerical Criteria for a Broad Range of Occupations

Shinsaku Matsumoto *The Japan Institute for Labour Policy and Training*
Tetzushi Kamakura *The University of Tokyo*
Mai Sato *The Japan Institute for Labour Policy and Training*

Following the Second World War, occupational information in Japan was systematically gathered and consolidated by the Ministry of Labour (currently the Ministry of Health, Labour and Welfare) and a research institute that was the predecessor of the Japan Institute for Labour Policy and Training (JILPT). However, until now, this occupational information has been qualitative and descriptive, as no method for the quantifiable expression of the relationships among occupations existed. Moreover, nobody has been able to indicate how occupations correspond with the results of vocational aptitude tests, etc., based on objective numerical data. Against this background, the authors gathered rated scores for the occupations of 24,000 people who are actually employed in those occupations from over three million web survey panels, using a method of web-based job analysis. We implemented this survey using the United States Department of Labor's O*NET project as a reference. We then developed numerical criteria for 601 occupations covering 30 aspects concerning the knowledge and skills needed to perform each occupation, the work environments of each occupation, occupational interests, and occupational values. These numerical criteria show a broad range of occupations in quantitative terms. We can quantitatively indicate relationships among occupations in Japan, and can show how occupations correspond with the results of vocational aptitude tests based on numerical data. We are expected to form the foundation for various quantitative studies of occupations.

I. Introduction

Occupational information is considered fundamental in finding employment, changing occupations, skills development, and other such activities, and thus they are gathered, analyzed, consolidated, and provided by the governments of developed countries. For example, in the United States, the Department of Labor provides an Occupational Outlook Handbook that describes detailed information on approximately 600 occupations. The Department of Labor has also developed O*NET, which quantifies occupations from various aspects, in order to provide data via the Internet as a replacement for its previous Dictionary of Occupational Titles. In the United Kingdom, the National Career Service provides Job Profiles. And France's Pôle Emploi and Germany's Bundesagentur für Arbeit develop and provide ROME and BerufeNet, respectively.

The activities of seeking employment or changing occupations require information on the person's own aptitudes, interests, experience, and education and training as well as information on occupations. Many occupations exist in society, and thus occupational infor-

mation can be likened to a roadmap or modern vehicle's navigation system. Occupational information helps people negotiate society in the sense that they help people get a full picture of available occupations as well as, when they find employment, identify the career path that the job leads to. At the same time, all developed countries grapple with the problems of scarcity of employment for young people and high unemployment rates. Occupational information serves as a "window" for young people in the sense that it allows them to see society as a whole, and as a "door" in the sense that they allow young people to choose an occupation and use it as a portal to society. Thus, in today's tough employment environment, occupational information plays an important role as both "windows" and "doors" for young people.

However, despite the fact that occupational information fulfills such important roles, their collection and provision are becoming increasingly difficult. One reason for this is the speed at which technologies and society are changing. Because technical and social changes are occurring at a faster pace, occupations are also undergoing faster changes. Consequently, efforts to gather, analyze, consolidate, and provide information cannot keep pace. Furthermore, as the next section will discuss, there is a need to quantify occupations in a multidimensional manner. Thus, in this paper, the authors report the results of an undertaking to gather and study quantified data on occupations using an unprecedented method. Specifically, the authors conducted a survey of approximately 3.31 million web survey panels affiliated with three research companies. Then, from the survey panels, we collected data from approximately 24,000 people who are actually employed in 725 occupations. This represented the world's first effort to use such a large number of web survey panels to systematically gather numerical data on a broad range of occupations.

It is thought that the society of each nation is reflected in the occupations available within it. Accordingly, the content of this paper applies solely to the quantification of occupations in Japan. However, at the same, it is also likely that some commonalities do exist among countries in terms of their occupations. The authors hope that the reader will find this paper of interest as an overview of Japanese society from the standpoint of "occupation" and as a discussion of occupation-related commonalities and differences among countries.

II. The Necessity of Occupational Information and Numerical Criteria for Occupations in Japan

Although occupational information was prepared and made available in prewar Japan, the systematic collection and broad provision of it began in the postwar era. Thus, this paper will first examine developments in the collection and provision of occupational information in postwar Japan.

The Ministry of Labour (currently the Ministry of Health, Labour and Welfare) began job analyses in 1947. Beginning in 1951, the ministry charged Public Employment Security

Offices throughout Japan with the collection of it, which they continued until 1962. This activity led to the analysis of 14,500 jobs in 12,000 establishments. The results were sequentially released for each job category as *Shokumu Kaisetsu* (explanation of occupations). The 172nd version of *Shokumu Kaisetsu* was published in 1961. The total number of jobs explained through this publication was 8,500. Explanations covered job content; required worker qualifications; methods needed to perform jobs (responsibility, knowledge, mental agility, dexterity, accuracy); physical requirements of workers; worker characteristics (physicality, perception, intelligence, temperament, inter-personal skills, etc.); work environment; and devices, materials, equipment, and consumables. *Shokugyo Jiten* (occupational dictionary) and *Sangyo Shokugyo Zukan* (illustrated encyclopedia of industries and occupations) were published based on this research and utilized in employment consultations and guidance at Public Employment Security Offices and schools. In 1974, the National Institute for Vocational Research, which was JILPT's predecessor, was launched to inherit the Ministry of Labour's occupational research functions. In 1974, *Shinjidai no Shokugyo* (occupations of the new era) was published. This publication explained trends in seven fields: computers, metal processing, apparatus industries, marketing and sales, business services, leisure industry, and social services. It also explained 65 occupations found in these fields in terms of work content, necessary education, training, experience, abilities, requirements, work environment, etc. The institute subsequently published *Shokugyo Handobukku* (occupational information handbook), which was sequentially released in separate volumes from 1981 to 1983. Ultimately, the handbook covered 241 occupations, providing details on each occupation, the characteristics of employees in that occupation, working conditions, and the history and outlook of that occupation. A second edition of *Shokugyo Handobukku* was published with 254 occupations in 1986, and followed by a third edition with 300 occupations in 1997. A CD-ROM version was developed for the third edition in 1998. In 2001, "OHBY" (Occupation Handbook for Youth, an occupational handbook for junior and high school students for use on personal computers) was made available to the public. And in 2006 the "Career Matrix," which provided comprehensive occupational information and related career tools, was set up as an Internet website. The New Career Matrix with enhanced functions and content was released in 2008. This website was unfortunately closed in March 2011; it contained information of 512 occupations at that time.

One condition necessary to develop the Career Matrix was the quantification of occupations. The Career Matrix sought to display occupations based on its web-based occupational interest assessment and corresponding mastered skills and knowledge. Achieving this required quantifying occupations from various aspects, and then tying assessments and acquired experience to occupations. Given that the US Department of Labor's O*NET project was already making progress in the multidimensional quantification of occupations, JILPT used it as a reference as it engaged in its own quantification and data collection based on quantification. The resulting statistical data obtained for each occupation can be considered

numerical criteria for occupations in Japan. We are expected to be put to broad practical use when people seek employment, change occupations, develop their careers, or engage in other such activities. Additionally, the ability to quantify a broad range of occupations makes it possible to study occupations quantifiably, something that had been impossible heretofore. This opens up possibilities for various kinds of research. For example, given that the appropriate movement of personnel from declining industries to growing industries is an important national issue, research can quantitatively show unexpected similarities and differences on occupations among industries in terms of ability and orientation. Additionally, although wage differences that occur after changes in occupation are already a topic of study, researchers will also be able to use the numerical criteria to quantitatively identify any changes that occur in terms of knowledge or skills.

III. Data-Gathering and Analysis: Multidimensional Quantification for a Broad Range of Occupations

1. Purpose and Method

As can be seen from the discussion above, although descriptive occupational information have been prepared for individual occupations in Japan, no systematic studies have been undertaken based on the establishment of multidimensional occupational measures and subsequent objective data-gathering. This study was executed to gather data from approximately 24,000 people through a “web-based job analysis system” that was developed specifically for the study, examine the various dimensions that comprise occupations, quantify occupations in accordance with these dimensions, and develop multidimensional numerical criteria for a broad range of occupations.

The study collected numerical data on occupations using an Internet survey that targeted a total of 3.31 million web survey panels registered with three Internet research companies. The numerical data covered a total of 94 categories that concerned knowledge, skills, work environment, occupational interests, and occupational values. Moreover, the study presented specific tasks that were assumed to be included in each occupation and then collected data on whether or not those tasks were actually performed. Data collection took place from 2003 until 2006. The study collected survey responses, making an effort to receive responses from 30 people in each of the 725 occupations. Responses from at least 30 people were received in many cases. In the end, data were obtained from a total of 24,041 respondents. For the 601 occupations for which data were obtained for at least 30 people, the study prepared a matrix (601 occupations × 94 items) and then conducted the numerical analysis described below based on the statistical mean of each occupation.

Actual data collection was made using a “web-based job analysis system” that was developed for the study. The system’s first page provided an overall explanation of the response method. The survey began on the following page. First was a page for selection of occupation. The respondent selected his or her occupation field and then selected a specific

Table 1. Collected Data (Sex × Age Group)

(%)

	Less than 20	20–29	30–39	40–49	50–59	60 or older	No response	Total
Men	35 (0.2)	2,850 (18.0)	7,202 (45.4)	4,299 (27.1)	1,271 (8.0)	208 (1.3)	0 (0.0)	15,865 (100.0)
Women	17 (0.3)	2,069 (31.8)	2,947 (45.3)	1,200 (18.5)	238 (3.7)	30 (0.5)	0 (0.0)	6,501 (100.0)
No response	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1,675 (100.0)	1,675 (100.0)
Total	52 (0.2)	4,919 (20.5)	10,149 (42.2)	5,499 (22.9)	1,509 (6.3)	238 (1.0)	1,675 (7.0)	24,041 (100.0)

occupation within that field. The respondent then entered his or her length of employment in that occupation, and his or her personal attributes on successive pages before a task response page appeared. Various tasks that were prepared for the selected occupation thenappeared; the respondent selected those that he or she actually performed. If the respondent performed a task that was not displayed, he or she was permitted to describe it freely on the page. Subsequent pages were response pages for numerical evaluation. Here, rating pages covering a total of 94 categories concerning knowledge, skills, work environment, occupational interests, and occupational values were displayed. Respondents were asked to provide responses based on each five-point scale.

2. Results and Discussion

The study used the "web-based job analysis system" in the way described above to collect data from a total of 24,041 people. In terms of sex, more men responded to the survey than women. And in terms of age group, the 30 to 39 age group was the largest for both men and women. For men, the next largest group following 30 to 39 was 40 to 49, while for women, the next largest was 20 to 29 (Table 1).

A table showing the number of persons that supplied data per occupation would be very large and is thus not provided here. The survey aimed to collect data from 30 people in each occupation, and this condition was met in many of the surveyed occupations. The number of occupations surveyed with at least 30 respondents was 601. The total number of respondents was 21,033. Accordingly, the following analysis of these 21,033 respondents was conducted based on aggregated results for each occupation.

(1) Knowledge and Skills: The Structures of Abilities Needed for Job Execution

Knowledge and skills play important roles when seeking employment, changing occupations, or engaging in career development. Individuals thinking about taking on a job or

changing to a new job must consider the knowledge and skills that the job requires. Similarly, companies must recognize the knowledge and skills they require when recruiting or implementing skill development.

When it comes to the structures of knowledge and skills needed to perform jobs, it has traditionally been the case in Japan that each industry collects and arranges relevant information with the cooperation of trade associations, etc.

In the case of knowledge, one structure is the "Life-long Career Development System (LCDS)" implemented by the Japan Organization for Employment of the Elderly, and the Persons with Disabilities and Job Seekers (JEED), which studied job-related abilities based on a major survey. This survey is positioned as a "clarification of the vocational abilities (knowledge, skills, and technologies) needed to perform jobs and a phased and systematic arrangement of contents for promoting education and training for the purpose of developing and improving those abilities." The Japan Vocational Ability Development Association (JAVADA) similarly provides detailed lists of abilities needed for each industry and job category as "vocational ability evaluation standards."

As for occupation-related skills, the Ministry of Economy, Trade and Industry prepared "Fundamental Competencies for Working Persons." These competencies are skills needed to apply in real society what one has learned in schools or other institutions. It is comprised of three competencies and 12 elements. The three competencies are (i) ability to step forward (identity, ability to work with others, and ability to take actual actions), (ii) ability to think well (ability to find problems, ability to plan, and ability to create), and (iii) ability to work in a team (ability to communicate, ability to listen carefully, flexibility, ability to understand situations, submission to discipline, and ability to control stress). One structure concerning job-related skills was the Ministry of Health, Labour and Welfare's "YES Program." "YES Program" stands for Youth Employability Support Program. It was an undertaking designed to help young people acquire the basic employment skills that companies demand. Basic employment skills are classified into seven fields; these are (i) communication skills, (ii) professional attitude, (iii) basic scholastic ability (reading and writing), (iv) basic scholastic ability (calculation, counting, and ability to think mathematically), (v) basic scholastic ability (social etiquette), (vi) business etiquette, and (vii) acquiring licenses or qualifications for employment. Although the Fundamental Competencies for Working Persons and YES Program contain well prepared contents that are thought to be valid, neither is based on empirical data.

This kind of arrangement and systematization of knowledge structures for individual industries will be useful in specific vocational training and skill development. Such structures provide useful information on the types of knowledge and skills needed to perform particular jobs for both individuals and enterprises.

At the same time, however, the study of knowledge and skill structures that are shared broadly among industries and occupations is also required. For example, if a person who has acquired knowledge and skills in a particular occupation wishes to change occupations,

he will most likely consider new occupations in which he can utilize said knowledge and skills. If that person wishes to find a similar occupation within the same industry, then a system of knowledge and skills needed for that particular industrial category should prove useful. However, in reality this is not always the case, as sometimes people must find new occupations in other industrial categories. At such times, a system of knowledge and skills that is shared among occupations and that crosscuts industries is required. One such approach that has examined knowledge and skills that are common to various occupations and crosscut industries is the US Department of Labor's O*NET (Occupational Information Network) program. O*NET publicizes knowledge and skills that are needed to perform jobs as components of occupational information. The knowledge and skills contained in O*NET are examined as required knowledge and skills that are shared across various industries and occupations, rather than belonging to a specific industry or occupation (Peterson, Mumford, Borman, Jeanneret, and Fleishman 1995).

Based on the above, this study sought to examine the knowledge and skills needed to perform jobs in order to identify their structures, and then prepare numerical criteria for a broad range of occupations. Specifically, it prepared a Japanese translation of 33 knowledge items and 35 skills needed to execute jobs that were prepared in O*NET, gathered data via an Internet survey, and conducted an examination to identify their structure through factor analysis. As was mentioned before, survey respondents were asked to rate the necessity of each knowledge and skill in their current occupation using a five-point scale.

The study then conducted a factor analysis targeting all 33 knowledge items using the principal factor method/Promax rotation (Table 2).

Factor 1 has high loadings for such items as engineering and technology, design, and computers and electronics; thus, it can be termed "science and technology." Factor 2 has high loadings for such items as art, history/archeology, philosophy/theology, and mass communication and media, and thus it can be termed "arts and humanities." Factor 3 has high loadings for such factors as therapy and counseling, medicine/dentistry, and psychology, and thus it can be termed "medical care." Factor 4 has high loadings for such factors as sales/marketing, business management, and economics/accounting, and thus it can be termed "business and management." Factor 5 has high loadings for foreign language and native language, and thus it can be termed "language." Factor 6 has relatively high loadings for geography, security, architecture/construction, and transport, and thus it can be termed "civil engineering and security." And Factor 7 has relatively high loadings for biology, chemistry, and food production, and thus it can be termed "chemistry and biology."

Looking at occupations with high factor scores in each factor in order to verify the factors, in "science and technology," mechatronics researcher, general machinery technician, electronics technician, precision instruments technician, and information technology researcher have high scores. The following occupations similarly had high factor scores in their respective factors. In "arts and humanities": novelist, historian, singer, theater director, and scenario writer. In "medical care": psychiatrist, occupational therapist, law instructor,

Table 2. Results of Factor Analysis of Knowledge Needed to Execute Jobs (601 Occupations, 21,033 People)

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Q11 Engineering and technology	0.954	-0.024	-0.056	0.034	0.111	-0.066	0.039
Q12 Design	0.919	0.174	-0.021	0.044	-0.167	0.021	-0.103
Q10 Computers and electronics	0.800	0.073	-0.084	0.062	0.385	-0.129	-0.170
Q16 Physics	0.794	-0.048	0.148	-0.181	0.061	0.075	0.256
Q14 Machinery	0.782	0.094	0.015	-0.134	-0.459	0.209	-0.050
Q15 Mathematics	0.714	-0.178	0.028	-0.026	0.190	0.099	0.193
Q32 Communications technology	0.614	0.078	-0.054	-0.040	0.390	0.204	-0.260
Q8 Production and processing	0.413	0.085	-0.214	0.331	-0.408	0.017	0.330
Q27 Art	0.130	0.955	0.098	0.038	-0.174	-0.094	-0.090
Q28 History, archeology	-0.104	0.826	-0.056	-0.081	0.143	0.279	0.088
Q29 Philosophy, theology	-0.052	0.729	0.293	-0.056	0.055	0.127	0.061
Q33 Mass communication and media	0.167	0.678	-0.067	0.135	0.358	-0.043	-0.141
Q20 Sociology, anthropology	-0.105	0.523	0.509	0.076	0.070	0.136	-0.025
Q23 Therapy and counseling	-0.034	0.136	0.992	0.034	-0.128	-0.107	0.091
Q22 Medicine, dentistry	-0.067	-0.050	0.815	-0.040	0.022	-0.150	0.384
Q19 Psychology	-0.076	0.325	0.790	0.136	-0.011	-0.058	-0.064
Q24 Education and training	0.194	-0.018	0.753	-0.019	0.045	0.098	-0.029
Q4 Sales, marketing	-0.067	0.176	-0.175	0.906	0.018	-0.190	0.060
Q1 Business management	0.174	-0.003	0.128	0.858	0.108	-0.006	0.135
Q3 Economics, accounting	-0.045	-0.059	-0.057	0.787	0.237	0.134	0.063
Q5 Customer services, inter-personal services	-0.215	0.025	0.062	0.756	0.017	-0.106	-0.093
Q6 Human resources and labor management	-0.005	-0.153	0.285	0.662	-0.023	0.337	0.004
Q26 Foreign language	0.140	0.324	-0.121	-0.045	0.794	-0.118	0.196
Q25 Native language	0.007	0.371	0.022	-0.004	0.782	-0.098	0.035
Q2 Clerical work	0.106	-0.175	-0.002	0.415	0.684	0.011	-0.031
Q31 Legal science, political science	-0.060	-0.163	0.177	0.114	0.511	0.433	0.000
Q21 Geography	-0.156	0.351	-0.213	-0.181	0.202	0.784	0.273
Q30 Security	0.216	-0.115	0.212	0.010	0.112	0.574	-0.117
Q13 Architecture, construction	0.344	0.046	0.052	-0.017	-0.291	0.555	-0.035
Q7 Transport	0.008	0.103	-0.353	0.209	-0.145	0.497	0.100
Q18 Biology	-0.019	-0.008	0.345	-0.006	0.119	-0.001	0.765
Q17 Chemistry	0.493	-0.130	0.184	-0.070	0.067	-0.067	0.644
Q9 Food production	-0.142	0.043	-0.121	0.267	-0.113	0.299	0.517
Inter-factor correlations	Factor 1	-.11	-.15	.00	.04	.29	.23
	Factor 2		.31	.24	.29	.20	.08
	Factor 3			.09	.57	.30	.10
	Factor 4				.12	.34	-.06
	Factor 5					.27	-.08
	Factor 6						.12

health nurse, and speech therapist. In “business and management”: certified small- and medium-sized enterprise management consultant, restaurant manager, business consultant, bank branch manager, and owner of insurance agency. In “language”: patent attorney, legal scholar, translator, marine safety officer, and police officer. In “civil engineering and security”: marine safety officer, tunnel engineer, navigator, tunnel excavation worker, and anthropologist. And in “chemistry and biology”: botanist, pharmaceuticals researcher, bacteriologist, agriculturalist, and biotechnology researcher.

The study analyzed skills by broadly dividing them into two categories. The first category is “basic skills.” In today’s rapidly changing society, people must possess skills that allow them to constantly acquire and communicate information and to scrutinize that infor-

Table 3. Results of Factor Analysis of Basic Skills (601 Occupations, 21,033 People)

	Factor 1	Factor 2
Q2 Active listening	1.037	-0.292
Q4 Speaking skills	0.965	-0.283
Q9 Learning strategy	0.880	0.010
Q8 Active learning	0.858	0.115
Q1 Reading comprehension	0.806	0.102
Q3 Writing skills	0.665	0.233
Q10 Monitoring	0.663	0.138
Q6 Science	-0.098	0.896
Q5 Mathematics	-0.164	0.707
Q7 Logic and analysis	0.488	0.638
	Inter-factor correlation	.49

mation logically and mathematically. Put another way, these are skills for learning and adapting to change. Such skills are summed up as "basic skills." The other category is "cross-functional skills." Here, the study used sociotechnical systems theory, which studies human behaviors in an industrial society, as a reference to establish generalized skills for each field, such as problem-solving and technical, social, resource management. The survey was conducted using 10 basic skill items and 25 cross-functional skill items.

Table 3 shows the results of factor analysis of basic skills. Factor 1 covers skills that form the foundation for performing an occupation, such as the ability to absorb knowledge—namely, active listening, speaking skills, learning strategy, active learning, and reading comprehension. Consequently, it is termed "base skills." Factor 2 has high loadings for science, mathematics, and logic and analysis; thus, it is termed "math and science skills." The existence of a factor loading in excess of 1.000 is attributable to the use of oblique rotation.

Looking at occupations with high factors scores in order to verify the factors, speech therapist, psychiatrist, attorney, pediatrician, and practitioner of acupuncture or moxibustion scored high in "base skills," while physiologist, botanist, biotechnology researcher, engineering researcher, and mathematician scored high in "math and science skills."

Table 4 shows the results of factor analysis of cross-functional skills. Factor 1 has high loadings for instrument monitoring for facility operation, operation and control, equipment maintenance, trouble-shooting, and machinery and system repair. Consequently, it is termed "technical skills." Factor 2 has high loadings for working with others, understanding others, persuasive ability, negotiation, service orientation, and leadership; thus, it is termed "human skills." Factor 3 has high loadings for requirements analysis, computer

Table 4. Results of Factor Analysis of Cross-Functional Skills
(601 Occupations, 21,033 People)

	Factor 1	Factor 2	Factor 3	Factor 4
Q23 Instrument monitoring for facility operation	1.034	0.104	-0.058	-0.113
Q24 Operation and control	1.012	0.017	-0.071	-0.079
Q25 Equipment maintenance	0.967	-0.014	-0.091	0.125
Q26 Trouble-shooting	0.884	0.000	0.197	-0.085
Q27 Machinery and system repair	0.881	-0.068	0.007	0.088
Q28 Quality control inspection	0.580	-0.219	0.336	0.129
Q12 Working with others	0.153	0.919	-0.281	0.022
Q11 Understanding others	-0.085	0.877	-0.166	0.062
Q13 Persuasive ability	-0.088	0.858	0.211	-0.074
Q14 Negotiation	-0.117	0.821	0.284	-0.084
Q16 Service orientation	-0.034	0.814	-0.216	0.029
Q15 Leadership	0.327	0.808	-0.151	0.061
Q17 Ability to solve complex problems	-0.146	0.639	0.531	-0.171
Q35 Human resource management	0.091	0.521	0.117	0.458
Q32 Time management	-0.173	0.516	-0.004	0.249
Q18 Requirements analysis	-0.285	-0.087	0.885	0.234
Q22 Computer programming	0.149	0.028	0.808	-0.214
Q19 Technical development/improvement	0.107	-0.120	0.663	0.272
Q31 System evaluation	0.515	0.075	0.646	-0.085
Q30 System analysis	0.564	0.072	0.611	-0.113
Q21 Installation	0.324	-0.032	0.590	0.084
Q29 Judgment and decision-making	0.217	0.000	0.569	0.346
Q34 Materials management	0.219	-0.015	-0.135	0.963
Q33 Money management	-0.447	0.063	0.239	0.744
Q20 Selection of tools, equipment, & facilities	0.369	0.049	0.124	0.557
Inter-factor correlations	Factor 1	-.30	.47	.32
	Factor 2		.13	.11
	Factor 3			.50

programming, technical development/improvement, system evaluation, system analysis, and installation; thus, it is termed “computer skills.” And finally, Factor 4 has high loadings for materials management and money management, and thus it is termed “objects management skills.”

Looking at occupations with high factors scores in order to verify the factors, the following scored high in their respective factors. In “technical skills”: clinical engineer, marine engineer, sound engineer, electrical discharge machine engineer, and building manager. In “human skills”: law instructor, attorney, speech therapist, social welfare organization officer, and psychiatrist. In “computer skills”: systems engineer (IT architect), systems engineer (project management), systems engineer (software development), systems engineer (application specialist), and information technology researcher. And in “objects management skills”: flower designer, craft designer, nail artist, restaurant manager, and fast-food shop manager.

(2) Work Environment: Environmental Structuring of Jobs and Workplaces

Work environment has become a focus of attention as a factor regulating a person's performance in his or her job. First, it was physical environment (e.g., lighting, temperature, humidity, air current, sound, vibration, work space, posture, etc.) that drew attention, and then, following the famous Hawthorne studies, it was psychosocial work environment (e.g., human relationships in the workplace, etc.). In addition, the structural characteristics of jobs in themselves attracted attention as a factor influencing performance.

A study on the classification of such work environments by Strong et al. (1999) is well known. According to Strong et al. (1999), based on analysis of previous research, the work context taxonomy that consists of the work environment variables is defined by a hierarchical structure comprised of three higher order dimensions, and a number of second-order dimensions. The three higher order dimensions include interpersonal relationships, physical work conditions, and structural job characteristics. Moreover, these dimensions are divided into second-order dimensions from which specific item-level constructs are generated. A factor analysis of the results of data gathering based on the work environment that were established in this way identified seven factors; namely, Environmental Conditions, Physical Activity and Manual Work, Managerial and Interpersonal Relations, Structured and Machine Operations, Business or Office Environments, Health and Safety Conditions, and Interacting with the Public. However, the factors Business or Office Environments, Health and Safety Conditions, and Interacting with the Public have low contribution ratios of 6%, 4%, and 3%, respectively, and contain items that are difficult to interpret. Thus, these factors can be eliminated, leaving the first to fourth factors as main factors.

Here, this study used the items identified in the study by Strong et al. (1999) and O*NET project as references to prepare items like those presented below after excluding items that overlap with knowledge, skills, and other items. It then asked actually employed workers to rate each using a five-point scale. The items are as follows: Association with others (none – always); responsibility for work outcomes and results (no responsibility whatsoever – extremely large responsibility); impact of errors (not serious – extremely serious); contact with outside clients, etc. (no importance whatsoever – extremely high importance); coordination (no importance whatsoever – extremely high importance); accuracy/exactness (no importance whatsoever – extremely high importance); repetitive activities (no importance whatsoever – extremely high importance); machine driven work pace (no importance whatsoever – extremely high importance): confrontation with others during work (almost none – every workday); indoor work (almost none – every workday); outdoor work (almost none – every workday); exposure to hazards (almost none – every workday); seated work (never – continually or almost continually); standing work (never – continually or almost continually).

The study conducted a factor analysis of the obtained mean ratings for each occupation on each work environment using the principal factor method/Promax rotation (Table 5). Factor 1 has a high negative loading for standing work and high positive loading on seated

Table 5. Results of Factor Analysis of Work Environment
(601 Occupations, 21,033 People)

		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Q14	Standing work*	-1.015	0.030	-0.036	0.010	0.011
Q13	Seated work	0.983	-0.025	0.018	0.039	0.018
Q5	Coordination	-0.003	0.857	0.011	-0.018	0.078
Q1	Association with others	-0.272	0.727	-0.145	0.031	-0.181
Q9	Confrontation with others during work	0.095	0.650	0.249	-0.174	0.207
Q4	Contact with outside clients, etc.	0.093	0.580	0.120	0.156	-0.200
Q10	Indoor work*	-0.096	-0.007	-0.935	0.002	0.093
Q11	Outdoor work	0.003	0.191	0.859	0.016	-0.084
Q12	Exposure to hazards	-0.288	-0.112	0.433	0.170	0.375
Q3	Impact of errors	-0.022	-0.024	0.134	0.941	0.094
Q2	Responsibility for work outcomes and results	0.011	-0.080	-0.032	0.891	-0.239
Q6	Accuracy/exactness	0.138	0.230	-0.227	0.441	0.296
Q8	Machine driven work pace	-0.047	-0.053	-0.004	-0.091	0.923
Q7	Repetitive activities	0.135	0.157	-0.244	0.021	0.492
Inter-factor correlations	Factor 1		.18	-.36	.16	.10
	Factor 2			-.16	.53	-.17
	Factor 3				-.06	.01
	Factor 4					.05

Note: Items marked with an asterisk (*) were reverse-scored items.

work, and thus it is termed “seated work.” Factor 2 has a high loading for items connected with association with others, and thus it is termed “association with others.” Factor 3 has a high negative loading for indoor work and high positive loading for outdoor work, and thus it is termed “outdoor work.” Factor 4 has a high loading for items connected with impact of errors and responsibility for results, and thus it is termed “degree of impact/responsibility.” And Factor 5 has a high loading for machine driven work pace and repetitive work, and thus it is termed “machine driven work pace.”

Looking at occupations with high factor scores in order to verify the validity of the factors, the following occupations scored high in their respective environment factors. In “seated work”: translator, cartoonist, stenographer, taxi driver, and Japanese dressmaker. In “association with others”: attorney, bank branch manager, medical social worker, sommelier, and flight attendant. In “outdoor work”: taxi driver, reinforcing bar worker, garbage collector, scaffold worker, and forestry worker. In “degree of impact/responsibility”: surgeon, physician, train driver, judge, and judicial scrivener. And in “machine driven work pace”: airport passenger service agent, stenographer, customs officer, radiological technologist, and data input worker.

The factors that were obtained here were roughly similar to the factors of Strong *et al.* (1999). It is believed that the factors “seated work,” “association with others,” “outdoor

work," "degree of impact/responsibility," and "machine driven work pace" that were obtained in the study are indeed necessary conditions that influence work environment.

(3) Occupational Interests and Occupational Values: A Study of Orientations for Jobs

Holland's hexagonal model of occupational interests (Holland 1985, 1997) is one of the best known occupational interest models. The Vocational Preference Inventory (VPI), which is an occupational interest test, and Self-Directed Search (SDS) that Holland developed are widely used in career counseling and career education. According to Holland's theoretical model, both the personality types and the environments in which people work can be classified into one of six types; namely, realistic, investigative, artistic, social, enterprising, and conventional. When these six types are arranged so that those with higher correlations are placed nearer to each other, the well-known hexagon is formed.

Holland's theory is supported by a large volume of research. In the United States, studies targeting high school students (Day and Rounds 1998; Ryan, Tracey, and Rounds 1996), college students (Fouad 2002; Fouad and Mohler 2004; Hansen, Sarma, and Collins 1999; Hansen, Scullard, and Haviland 2000), and professionals (Fouad, Harmon, and Borgen 1997) are known to support Holland's hexagonal model. The hexagonal model has also come to be largely supported in Japan. Given this, the authors prepared items and collected data in line with Holland's hexagonal model.

In collecting data, the authors asked people who are actually employed in specific occupations to estimate the fitness of 6 typical persons to their own occupation. Responses were given using a five-point scale that reached from "does not apply to my occupation" to "applies to my occupation." The 6 items were as follows: R (realistic): A person who prefers concrete and practical work and activities that entail the manipulation of machines, tools, and objects including animals and plants. I (investigative): A person who prefers inquiring and scholarly work and activities, such as research or survey. A (artistic): A person who prefers artistic work or activity, such as music, design, painting, or writing, etc. S (social): A person who prefers work or activity that involves contact with people or serving people. E (enterprising): A person who prefers work or activity involving planning or operation/management of an organization, etc. And C (conventional): A person who prefers stereotyped work and activities that emphasize and follow standard methods, rules, or customs.

Ginzberg et al. (1951) identified occupational values as an important factor in the selection of occupation. However, the research undertaken by Ginzberg et al. (1951) was qualitative based on the interview technique, and did not identify occupational values in an objectively verifiable manner. The first to introduce an objectively verifiable approach into the measurement of occupational values was D. E. Super. Super (1970) established the Work Values Inventory (WVI) to operationally define and measure occupational values. In later years, WVI was sweepingly revised into what is called the Values Scale (VS) by incorporating more ordinary values that are outside occupational values (Nevill and Super 1989; Super and Nevill 1985).

Another main scale for occupational values is the Minnesota Importance Questionnaire (MIQ) devised by Rounds et al. (1981). Dawis (1991) compared 21 content areas measured by MIQ with other scales for measuring occupational values. This comparison showed that MIQ's 21 content areas covered all of the content areas measured by the other scales, and that none of the other scales covered all of the content areas demonstrated by MIQ. Rounds et al. (1981) conducted a factor analysis of MIQ that revealed six second-order factors. Bolton (1980) also obtained six second-order factors by applying factor analysis to WVI. This result partially reproduced the results of Rounds et al. (1981).

All of the scales for measuring occupational values that were mentioned above are comprised of items that focus on people rather than occupations. As an exception, Sager (1999) mentions the Minnesota Job Description Questionnaire (MJDQ: Borgen et al. 1968; Dawis 1991). This scale is comprised of the same 21 content areas used in MIQ and asks respondents to describe their own occupations.

Based on the above, the authors established six items for measuring occupational values. We then asked people who are actually employed in specific occupations to estimate the fitness of 6 items to their own occupation. Responses were given using a five-point scale that reached from "does not apply to my occupation" to "applies to my occupation." These six items were prepared by using the six factors of MIQ and MJDQ as a reference and then eliminating items that overlap with other items, such as occupational interests and work environment. The resulting items are as follows. Sense of achievement: An occupation that, when compared to other occupations, produces a clear link between the results of effort and a sense of achievement. Growth: An occupation that, when compared to other occupations, allows opportunities to learn new things and grow through working. Social status: An occupation that, when compared to other occupations, provides recognition and prestige. Human relationship: An occupation that, when compared to other occupations, brings joy to other people or a feeling of friendship and harmony with colleagues, etc. Autonomy: An occupation that, when compared to other occupations, allows autonomous decision-making or execution of jobs based on personal initiative. Working conditions: An occupation that, when compared to other occupations, offers employment or compensation security and a safe work environment.

Table 6 shows the means and standard deviations of the mean ratings for occupations on occupational interests. Looking at overall means, they ranked in descending order of interests as follows: R→S→I→E→C→A. This indicates that, as a general tendency for occupations, there are many occupations of the R category or the S category. It is also a result that supports the view that the first dimension in classifying occupations is "people vs. things" (Prediger 1982; Tracey and Rounds 1996). At the same time, while A had the smallest mean, it also had the largest standard deviation. This suggests that some occupations perfectly fit people of the A category, while other occupations hardly fit them at all.

The authors also obtained correlations among the ratings at the occupation level (Table 7). The positive correlation between S and E was the largest, followed by the large

Table 6. Means and Standard Deviations of Occupational Interests in 601 Occupations (601 Occupations, 21,033 People)

	R (realistic)	I (investigative)	A (artistic)	S (social)	E (enterprising)	C (conventional)
Mean	3.65	3.32	2.90	3.55	3.15	3.05
SD	0.46	0.54	0.75	0.66	0.48	0.35

Table 7. Correlation Matrix of Occupational Interests in 601 Occupations (601 Occupations, 21,033 People)

n=601

	R (realistic)	I (investigative)	A (artistic)	S (social)	E (enterprising)	C (conventional)
R (realistic)	-	.235 ***	-.016	-.436 ***	-.268 ***	-.080 *
I (investigative)		-	.215 ***	-.081 *	.292 ***	-.325 ***
A (artistic)			-	.271 ***	.436 ***	-.482 ***
S (social)				-	.531 ***	-.041
E (enterprising)					-	-.253 ***
C (conventional)						-

Note: *** $p < .001$, * $p < .05$.

negative correlation between A and C. This suggests a tendency for occupational interests of S and E to be necessary in both cases. Conversely, in the case of A and C, one occupational interest is necessary to an occupation but the other interest is not. Within the hexagonal model for occupational interests, adjacent categories are more similar to each other, while opposing categories (i.e., categories on diagonal lines) are the least similar to each other. Thus, the results achieved by the study agree with the model.

Table 8 shows the means and standard deviations of the mean ratings for occupations on occupational values, and Table 9 shows correlations among the ratings at the occupation level. In Table 8, sense of achievement has the highest mean, followed by autonomy. On the other hand, working conditions had the lowest mean, followed by social status. Looking at all occupations, it can be concluded that sense of achievement and autonomy are easily obtained, while working conditions and social status are not. Table 9 suggests that sense of achievement, growth, human relationship, and autonomy have strong positive correlations. It can be concluded that a person in an occupation that provides a sense of achievement has a job that gives a sense of growth, satisfaction with human relationships, and autonomy.

Table 8. Means and Standard Deviations of Occupational Values in 601 Occupations (601 Occupations, 21,033 People)

	Sense of achievement	Growth	Social status	Human relationship	Autonomy	Working conditions
Mean	3.73	3.59	2.84	3.46	3.64	2.78
SD	0.48	0.57	0.55	0.44	0.49	0.53

Table 9. Correlation Matrix of Occupational Values in 601 Occupations (601 Occupations, 21,033 People)

n=601

	Sense of achievement	Growth	Social status	Human relationship	Autonomy	Working conditions
Sense of achievement	-	.764 ***	.500 ***	.464 ***	.799 ***	-.280 ***
Growth		-	.742 ***	.472 ***	.747 ***	.075
Social status			-	.298 ***	.537 ***	.428 ***
Human relationship				-	.407 ***	-.093 *
Autonomy					-	-.140 **
Working conditions						-

Note: *** $p < .001$, ** $p < .01$, * $p < .05$.

Although working conditions has a strong positive correlation with social status, it has statistical significance but small coefficients of correlation with the others (sense of achievement, autonomy, and human relationship); thus, it can be considered relatively independent. Social status shows positive correlations with all of the other occupational values. Thus, it can be concluded that an occupation having high social status can satisfy all values—sense of achievement, growth, human relationship, autonomy, and working conditions.

Table 10 shows the correlations among the previously mentioned occupational interests and occupational values at the occupation level. R shows a weak positive correlation with sense of achievement, but also weak negative correlations with growth, social status, human relationship, and working conditions. This suggests that a sense of achievement can be obtained from an occupation or job in the R category, but satisfying other values is difficult. On the other hand, S and E show positive correlations with all values; S has a particularly strong correlation with human relationship, while E has particularly strong correlations with growth and autonomy. Additionally, I also shows relatively strong positive correlations with all values, with the exception of human relationship. This suggests the possibility that

Table 10. Correlations of Occupational Interests and Occupational Values (601 Occupations, 21,033 People)

	R (realistic)	I (investigative)	A (artistic)	S (social)	E (enterprising)	C (conventional)
Sense of achievement	.133 **	.423 ***	.549 ***	.286 ***	.408 ***	-.474 ***
Growth	-.082 ***	.617 ***	.501 ***	.455 ***	.563 ***	-.469 ***
Social status	-.172 ***	.585 ***	.194 ***	.364 ***	.449 ***	-.156 ***
Human relationship	-.111 **	-.072	.372 ***	.743 ***	.365 ***	-.150 ***
Autonomy	.036	.527 ***	.521 ***	.327 ***	.508 ***	-.491 ***
Working conditions	-.216 ***	.212 ***	-.376 ***	.117 **	.149 ***	.293 ***

Note: ***$p < .001$, **$p < .01$.

occupations and jobs in the S, E, and I categories satisfy values related to self-improvement and values related to lifestyle stability. A shows relatively strong positive correlations with sense of achievement, growth, social status, human relationship, and autonomy, but also a fairly strong negative correlation with working conditions. Conversely, C shows a positive correlation with working conditions only, and relatively strong negative correlations with all other values.

IV. Application of the Results and Possibilities for the Future

1. Multidimensional Numerical Criteria for Occupations and Possibilities for Their Application

As the above discussion has shown, it is possible to organize knowledge into seven factors, skills into six factors, and work environment into five factors. Adding six factors for occupational interests and six factors for occupational values makes a total of 30 factors. It is possible to refer to these factors as numerical criteria seen from 30 occupational aspects. The following provides an examination of these 30 numerical criteria.

Japan Institute for Labour Policy and Training (2012) presents all of these 30 numerical criteria in its Appended Table 1. There, the means are set at 0.0 and standard deviation (SD) at 1.0 for all scores. The authors chose four characteristic occupations from this table and made them into the graphs shown in Figure 1 and Figure 2.

Looking at skills in Figure 1, programmer has a high score for computers. Looking at knowledge, mold design engineer has a high score for science and technology, while ad designer has a high score for arts and humanities. As for work environment of Figure 1, all four occupations show roughly the same scores, with seated work having higher scores and

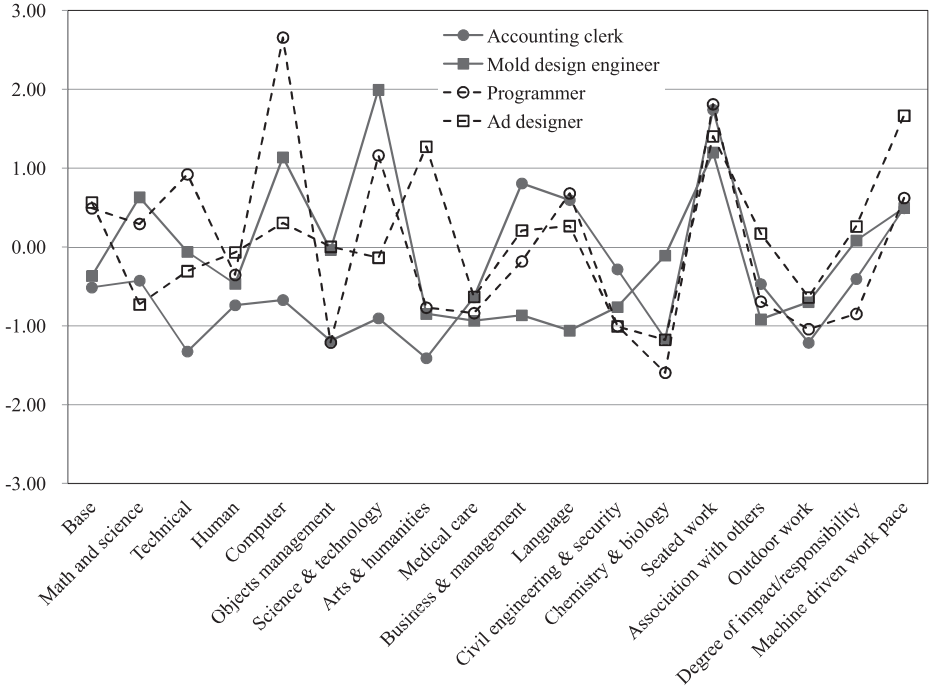

Figure 1. Example of a Numerical Profile (Skills, Knowledge, Work Environment)

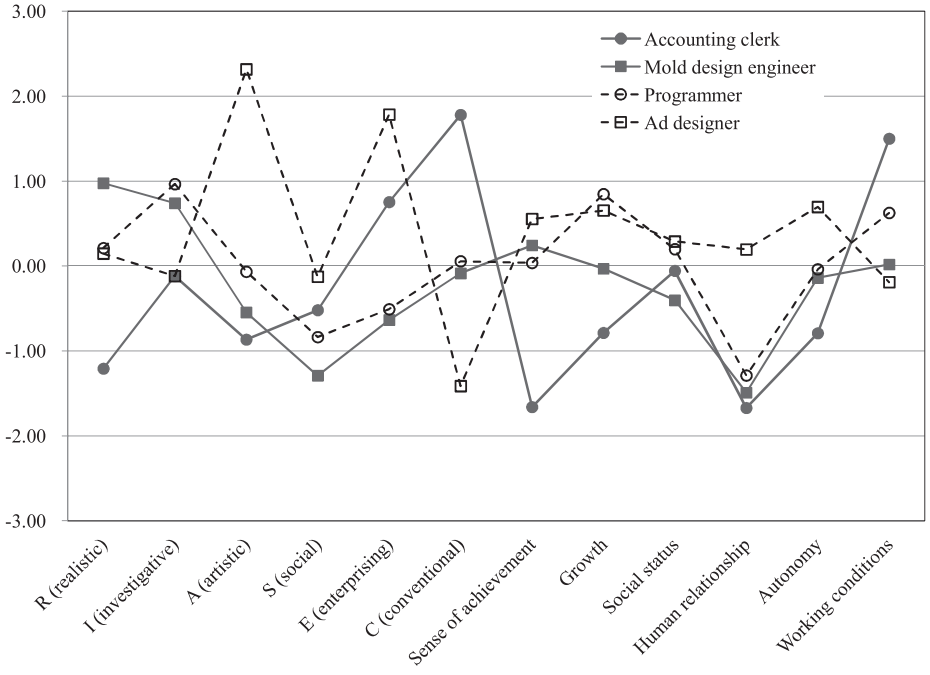

Figure 2. Example of a Numerical Profile (Occupational Interests, Occupational Values)

outdoor work having lower scores. Looking at occupational interests in Figure 2, ad designer has high scores for A (artistic) and E (enterprising), while accounting clerk has a high score for C (conventional). As for occupational values in the same graph, accounting clerk has a low score for sense of achievement, but a high one for working conditions. It is apparent that there is almost no difference among the four occupations for social status.

In the way shown here, the numerical criteria table for 601 occupations can quantifiably show the characteristics of each occupation. As an example of its application, when a person finds employment in an occupation that is outside his or her previous experience, the table could be used to compare the person's previous occupation with the new occupation in order to reveal where differences exist or do not exist. Appended Table 1 of Japan Institute for Labour Policy and Training (2012) standardizes all means at 0.0 and SD at 1.0. This makes it possible to find where the new occupation fits in among all of the various occupations, and learn its relative position. In other words, using the table shows whether the importance of each skill or knowledge factor is average (at a point near 0.0) or how many SDs away it is. If, for example, an occupation has a skill or knowledge factor that is two SDs away, it will stand out among many occupations that are only a few percentage points away stochastically.

Thus, the numerical criteria table showing occupations from 30 aspects that was discussed here can be used for occupation-to-occupation comparisons among all 601 occupations that appear within it. The table can also reveal the relative positions of particular occupations among many.

The availability of such numerical criteria can provide the foundation for various researches. For example, if data on a change from one occupation to another exists, then, as was described above, it becomes possible to see how orientations or abilities were affected by the change. More specifically, it becomes possible to examine whether the new occupation allows the person to demonstrate his or her abilities or not. Moreover, because actual job transfer involve factors that go beyond orientations or abilities (among them changes in pay or whether a particular occupation is available in a particular region), the numerical criteria will make it possible to quantifiably examine various changes in occupation that actually occur in terms of not only wages and employment opportunities, but also orientations or abilities.

These 30 numerical criteria can also be used to find distances among occupations. Japan Institute for Labour Policy and Training (2012) used these numerical criteria to calculate the Euclidean distance between occupations and then highlighted in gray those falling within a 10% range that begins with the closest distance. This occupation-to-occupation distance matrix shows the proximity of occupations to each other from numerical criteria that were discussed heretofore; namely, skills, knowledge, work environment, occupational interests, and occupational values. Because listing all occupations here is not possible, Table 11 shows the first six occupations appearing on Appended Table 2 of Japan Institute for Labour Policy and Training (2012), and arranges them beginning with those that have the

Table 11. Distance between Six Selected Occupations and Other Occupations

		Actuary		Aroma-thera-pist		General office clerk		General machine technician		Rice farmer		Web creator
1	Actuary	0.000	Aromather-apist	0.000	General office clerk	0.000	General machine technician	0.000	Rice farmer	0.000	Web creator	0.000
2	Product developer	4.882	Industrial counselor	5.405	Accounting clerk	2.617	Semiconduc-tor engineer	2.630	Greenhouse vegetable grower	2.887	Ad designer	2.709
3	International civil servant	4.992	Coffee shop owner	5.589	School clerk	3.210	Mold design engineer	2.678	Aquaculture worker	3.464	Graphic designer	3.239
4	Patent attorney	5.126	Cosmetics salesperson	5.634	Administra-tive clerk (national)	3.508	Electronics technician	3.101	Form carpenter	4.121	Book editor	4.157
5	Systems engineer (application specialist)	5.187	Talent manager	5.870	Administra-tive clerk (prefectural/ municipal)	3.989	Production & quality control technician	3.338	Plasterer	4.393	Magazine editor	4.319
6	Systems engineer (IT architect)	5.241	Life insurance underwriter	6.151	Stationery shop clerk	4.235	Mold builder	3.851	Agricultural engineer	4.468	Systems engineer (software develop-ment)	4.586
7	Administra-tive clerk (national)	5.257	Chinese food cook	6.238	Goods purchaser	4.268	Programmer	4.021	Stable attendant	4.865	Technical illustrator	4.680
8	Systems engineer (software development)	5.295	Social education supervisor	6.246	Taxi dispatcher	4.422	PC installer	4.233	Machine woodwork-er	5.183	Systems engineer (application specialist)	4.693
9	Production & quality control technician	5.298	Car salesperson	6.379	Data input worker	4.468	Machine repairer	4.266	Dry cleaner	5.343	Product developer	4.739
10	Taxation worker	5.694	Funeral director	6.570	Parking lot manager	4.583	Engineering researcher	4.439	Shipbuilder	5.641	Systems engineer (IT specialist)	4.757
11	Systems engineer (IT specialist)	5.794	Ad director	6.661	Computer maintenance worker (IT maintenance worker)	4.610	Computer maintenance worker (IT maintenance worker)	4.464	Dye worker	5.649	Magazine reporter	4.817
12	Trading company sales representative	5.809	Tour conductor	6.704	Product manager	4.626	Customer engineer	4.486	Janitor	5.838	Customer engineer	4.863

Note: The matrix shows occupation-to-occupation distance between the first six occupations appearing in Appended Table 2 of Japan Institute for Labour Policy and Training (2012) and 12 other occupations (including that occupation) that are ranked beginning with those having the closest proximity. In Appended Table 2, the 10% of occupations having closest proximity among all occupations are colored; in this table, corresponding locations are similarly shown in gray.

closest distance to others. The first occupations, actuary and aromatherapist, do not have a single occupation in gray outside of themselves, which indicates that there is some distance between them and the other occupations. For the next occupation, general office clerk,

nearby occupations include accounting clerk, school clerk, administrative clerk (national), administrative clerk (prefectural/municipal), and stationery shop clerk, etc. For general machinery technician, occupations in proximity include semiconductor engineer, mold design engineer, electronics technician, production and quality control technician, and mold builder, etc. For rice farmer, occupations in proximity include greenhouse vegetable grower, aquaculture worker, form carpenter, plasterer, and agricultural engineer. And for web creator, nearby occupations include ad designer, graphic designer, book editor, magazine editor, and systems engineer (software development) , etc.

Heretofore, most people considering a change in occupation have tended to search for openings in occupations that are proximate to their occupation of experience. In such cases, they have had to judge proximity subjectively. However, the availability of these data makes it possible to list proximate occupations based on numerical criteria. Of course, the relationships among occupations cannot be identified from this appended table alone. Even if proximity is shown based on numerical criteria calculations, changing occupations is not easy when special licenses, qualifications, education, or training are required. Thus, users of the data will need to bear this point in mind as they search for actual possibilities for occupational change using the occupation-to-occupation distance discussed here as a reference.

2. Study Results and Future Application

"Occupation" is a concept familiar to all adult workers. Everyone has some image of the world of occupations and how they fit into it. We have all heard people speak of their personal experiences or feelings concerning their occupations. However, few of us have an accurate understanding when it comes to the occupations that are not around us. Moreover, with the exception of the United States' O*NET project, no effort has been made to objectively identify and quantify the multidimensional aspects of occupations. Amid such circumstances, this study sought to quantify occupations in a multidimensional manner in terms of abilities, orientations, etc., and present the results as numerical criteria for Japan. The following is an examination of the study's results and implications.

First, it must be mentioned that continuous gathering of information on all occupations, whether in the United States or Japan, through conventional occupational surveys—in other words, collecting information by visiting worksites to conduct observations and interviews—is a difficult endeavor. The United States closed all of the occupational analysis field centers that had been located throughout the country around ten years ago. And the job analyses that Japan's Ministry of Labour vigorously conducted nationwide until the 1950s are no longer being implemented on a national scale. Thus, the Internet-based data-gathering technique conducted by this study is looked to as a promising new method. The study conducted an Internet survey of 24,000 people to gather data on detailed and various numerical criteria for 601 occupations. Although this paper does not provide the results of content analysis, it does bring together information on the kinds of specific tasks performed in each occupation. Other studies have also analyzed and examined acquired data using

various methods; however, they almost indicated positions of occupations properly on numerical dimensions. Moreover, as can be seen in Figures 1 and 2 and Table 11, the occupation-to-occupation relationships that are identified from the data are proper for the most part. These results suggest that Internet-based gathering of occupational data is effective and will be applicable to data-gathering for a broad range of occupations. To repeat what was mentioned at the beginning of this paper, the speed at which the occupational world is changing is making data-gathering increasingly difficult. However, data-gathering via the Internet has broadened possibilities for gathering data on wide-ranging and diverse occupations.

One means for resolving labor policy-related issues is to steer society in a better direction by establishing laws or setting up subsidy schemes. However, another effective means for carrying out a policy agenda is to supply objective information. This study presents the various aspects of occupations in the form of numerical criteria that can serve as occupational data, in addition to conventional descriptive contents. Moreover, use of the Internet as described here will allow data-gathering in a broader and timelier manner.

Career consulting is being promoted in Japan as a government policy, and there are many career consultants in business. Even so, objective information on occupations and careers are surprisingly scarce. Thus, there is a need for objectively gleaned and organized information on the wide spectrum of occupations that was presented here. In addition, if use of the 30 numerical criteria for occupations described here is expanded, they can be expected to become shared throughout society, where they will serve as a common language and common standards for occupations and careers in recruiting, job-seeking, skills development, and other endeavors.

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