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Organisational Structure and Employee's Job Content: From Job Design to Organisation Design

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Abstract

The influence of new technology, such as microelectronics and information technology, on the job content of employees has been discussed in the discipline of personnel management and human resources management. In this paper, it is shown that the "organisation design approach" instead of the "job design approach" is effective for an explanation of this phenomenon. Organisation design has been one of the main research interests in the discipline of organisation theory since the 1980's, but the concept of organisational design has not been fully applied to the discipline of personnel management and human resources management. Based on data gathered from Japanese companies in 1993, it will be shown empirically that the job content of employees, in terms of both work organisational level and management organisational level, is generally prescribed by the organisational structure in which they are working. Job content will be discussed in terms of both horizontal and vertical perspective in an organisation.

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I. Introduction

Following the development of so-called new technology such as microelectronics and information technology, the influences of new technology on employee's job content have been much discussed from various aspects. For example, firstly, in job design theory, a human-oriented job can be designed under new technology by using such methods as job rotation, job enlargement and job enrichment.[1] Secondly, in the socio-technical systems approach, it is asserted that there remains the opportunity to design a more human-oriented job content without reduction of organisational efficiency by the so-called "joint optimisation" between the social system and the technological system[2]. Thirdly, labour process theorists, criticising these optimistic approaches, insist that new technology, under capitalism, is used by management as the driving force to promote division of labour, with the result that de-skilling and degradation of work are much increased.[3]

The purpose of this paper, however, does not lie in the examination of these three approaches in detail. Instead of that, this paper aims at empirical examination, based on the data collected[4] of the changing nature of an employee's job content under today's new technology. The basic viewpoints of the examination are summarised as the following two points:

First, organisational structure should be used as a medium for analysing the relationship between technology and job content. In other words, we should examine it from the viewpoint of the so-called "organisational design approach" in which job content is thought to be

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1. Cf., Osterman, P.[1991], "Impacts of IT on Jobs and Skills," in Scott Morton, M.S.(ed.), *The Corporation of the 1990's: Information Technology and Organizational Transformation*, Oxford University Press, pp.220-243.
2. Cf., Taylor, J.C. and D.F. Felton [1993], *Performance by Design: Sociotechnical Systems in North America*, Prentice Hall, pp.145-146; Susman, G. I. [1990], "Work Groups : Autonomy, Technology, and Choice", in Goodman, P.S., L.S. Sproull and Associates (eds.), *Technology and Organizations*, Jossey-Bass Publishers, pp.87-108.
3. Cf., Braverman, H.[1974], *Labor and Monopoly Capital : The Degradation of Work in the Twentieth Century*, Monthly Review Press; Knights, D. and H. Willmott (eds.)[1990], *Labour Process Theory*, Macmillan.
4. The data used in this paper were collected in September 1993 by Organisational Structure Research Project consisting of Koji Okubayashi (Professor, Kobe University), Hisashi Shomura (Associate Professor, Tokyo Metropolitan College of Commerce), Masaya Morita (Associate Professor, Kansai University), Hajime Takebayashi (Associate professor, Seinan-Gakuin University) and the author. The project was subsidised by both a Research Grant from the Education Ministry and the Murata Foundation for the Promotion of Science.

prescribed by organisational structure, because the relationship between organisational structure and job content has not yet been clarified in these three approaches. Each approach makes the theoretical assumption implicitly that flexibility of organisational structure leads to that of job content.[5] Besides, by clarifying the relationship between organisational structure and job content, we can share framework of analysis with traditional administration theory, since organisational structure has traditionally been the main analytical subject of administration theory. Under the same framework of analysis, we can still investigate today's new problem in relation to new technology.

Second, we see organisational structure as consisting both of work organisation and of management organisation, because the influences of technology on organisation are different at the two organisational levels. Work organisation refers to the range of hierarchy, from blue-collar workers to supervisors, in which group leaders and team leaders are included; management organisation refers to the range of hierarchy from assistant manager to chief executive officer, in which section chiefs and department managers are included. Each of the above-mentioned approaches does not necessarily pay much attention to the different effects on these two organisational levels. In that sense, new findings could be made which were not examined in previous approaches.

In Section II, we will explain our survey, focusing in particular on the design of the questionnaire and the characteristics of the respondent companies. Then in Section III, we will examine empirically the relationship between the hierarchical structure of work organisation and workers' job content. Then in Section IV, the relationship between the hierarchical structure of management organisation and middle managers' job content will be examined empirically. After that, in Section V, we will summarise the results and their implications for organisation theory focusing especially on the difference between the two levels, that is, the work organisational level and the management organisational level.

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5. See, for example, Woodward, J.(ed.)[1970], *Industrial Organisation : Behaviour and Control*, Clarendon Press; Scarbrough, H. and J.M. Corbett [1992], *Technology and Organization : Power, Meaning and Design*, Routledge.

II. The Design of the Questionnaire and the Characteristics of the Respondent Companies

II.1. Method of the Survey

The purpose of this empirical research was to ascertain the influences of the introduction of new technology on organisational structure (both work organisation and management organisation), job content and the firm's labour management system. At first, for the purposes of the survey, we defined "new technology" as the following:

1. Automated production systems employing electronic automatic control devices (i.e.: microcomputers, electronic circuits, etc.); for example, industrial robots, NC/CNC machines, MC (machining centres), FMS (production systems using NC, MC, robots, or automatic transportation devices that are linked to and controlled by a computer), CAD/CAM (computer-aided design or manufacturing system), process automation, CIM (computer-integrated manufacturing), etc.

2. Information systems employing computers and/or other information and telecommunications technology; for example, main-frame computers, terminals connected to a main-frame system, micro- or personal computers, LAN (local-area networks), VAN (value-added networks), WAN (wide-area networks), or other telecommunications systems, POS (point-of-sale information management systems), SIS (strategic information systems), etc.

Two methods were used for this survey: questionnaires and interviews of people at a number of factories. One of the advantages of methodological triangulation lay in that we could gather information both on general trends by means of the questionnaire and on the specific contents by interviews of people at their factories.

Seven-hundred and eighty six manufacturing companies and 609 non-manufacturing companies, which had more than 1,000 employees according to the *KAISHA-SHOKUINROKU* (Annual book of Japanese

companies in 1993), were selected as the subject of the questionnaire survey.[6] We sent the questionnaire by mail to the individual factory or office which we judged the most important in the company. As summarised in Table 1, we obtained responses from 183 manufacturing companies (23.3 percent) and 110 non-manufacturing companies (18.1 percent). The deadline for responding by mail was established as 20th September 1993, and the date of the survey was established as 31st August 1993. In comparison with other research, this survey collected a large number of samples, which produced a relatively high degree of reliability of the data.

Table 1 Outline of the Survey

	Manufacturing company	Non-manufacturing company
Total number of questionnaires sent	786	609
Valid responses	183	110
Percentage of valid responses	23.3%	18.1%
Date of survey	31st August, 1993	
Deadline	20th September, 1993	

II.2. Characteristics of the Respondent Companies

As shown in Table 2 and Table 3, the respondent companies are distributed throughout various kinds of industries, but there are many, in particular, in the industry of electrical equipment/machinery, transportation equipment, machinery and chemicals among manufacturing companies, and in the field of banking, warehouse/transportation, wholesaling and services among non-

6. In Kambayashi, N.[1995], the same data as this paper were used, but the analysis was mainly based upon the data of manufacturing companies.

manufacturing companies.[7] It is inferred that in those industries the adoption of new technology progressed at a higher speed than in other types of industry.

Table 2 Distribution of Respondent Companies (Manufacturing Companies)

Type of Industry	Number of Responses	Percentage of Total Valid Responses
Food	13	7.3
Textiles	5	2.8
Pulp/Paper	3	1.7
Chemicals	19	10.7
Pharmaceuticals	12	6.8
Oil/Coal	3	1.7
Rubber products	1	0.6
Glass	10	5.6
Iron ore	1	0.6
Non-ferrous metals	5	2.8
Metal goods	7	4.0
Machinery	21	11.9
Electrical equipment/machinery	32	18.1
Transportation equipment	25	14.1
Precision instruments	9	5.1
Other manufacturing products	11	6.2
NA	6	—
Total	183	100.0

7. The classification of type of industry used in this survey is based upon the revised version established by the Japanese stock exchanges on and after 1st July, 1994.

Table 3 Distribution of Respondent Companies (Non-manufacturing Companies)

Type of Industry	Number of Responses	Percentage of Total Valid Responses
Electricity/Gas	5	4.8
Land transport	3	2.9
Marine transport	2	1.9
Air transport	1	1.0
Warehouse/transportation	12	11.4
Telecommunications	1	1.0
Wholesaling	12	11.4
Retailing	6	5.7
Banking	23	21.9
Securities	0	0.0
Insurance	6	5.7
Other financial services	0	0.0
Real estate	3	2.9
Services	21	20.0
Other services	10	9.5
NA	5	—
Total	110	100.0

The distribution of the size of respondent companies in terms of the number of employees is shown in Table 4. Seventy and point five percent of manufacturing companies and 78.7 percent of non-manufacturing companies were distributed within the range of 1,000 - 4,999. Therefore we can say that the influence of new technology on business organisation is most conspicuously shown in the companies which have 1,000 - 4,999 employees. These are the data of the company

to which every individual factory or office belongs. The average number of employees of individual factory or office to which we sent the questionnaire was 1,185 for manufacturing companies and 1,806 for non-manufacturing companies. The average value of the annual net sales of the respondent companies was 458.14 million yen for manufacturing companies and 7.8 billion yen for non-manufacturing companies.

Table 4 Size of Respondent Companies (in terms of the number of employees)

Range	Manufacturing firms		Non-manufacturing firms	
	Number	Percentage of total valid responses	Number	Percentage of total valid responses
0-999	20	10.9	4	3.7
1,000-4,999	129	70.5	85	78.7
5,000-9,999	20	10.9	8	7.4
10,000-14,999	3	1.6	6	5.6
15,000-19,999	3	1.6	0	0.0
20,000-	8	4.4	5	4.6
NA	0	—	2	—
Total	183	100.0	110	100.0

II.3. Construction of the Questionnaire

Our questionnaire consisted of five parts: the company's perception of its business environment; the purpose of the introduction of new technology; the influence of new technology on work organisation; its influence on management organisation; changes in the personnel /labour management system. Each part consisted of about 10 questions. With regard to most of the questions, we designed them for an assessment of the change in a five year period using the so-called Likert type seven-point-scale.[8] The full questions are available in the

8. For example, 1: Greatly increased; 4: No change; 7: Greatly decreased.

appendix of Okubayashi, K. et al.[1994].[9]

III. Hierarchical Structure and Worker's Job Content

It has been stated, theoretically, with regard to the structure of work organisation, that job boundaries will be blurred and the job content of every worker will be more flexible with the development of new technology.[10] Such flexible work organisation is called the teamwork system in the sense that each job is allocated to workers not on the basis of a Tayloristic, one-man one-job method, but to teams composed of a few workers. Therefore one of the most important indicators of the nature of work organisation under new technology is whether or not a such teamwork system is introduced in the work organisation.

For instance, Gerald I. Susman [1990] maintains that teamwork is appropriate as the method of job allocation under new technology because interdependence is needed more at the workplace under new technology than under the conditions of older, mass-production technology; Don Tapscott and Art Caston [1993] also claim that a new method of job allocation becomes possible under new technology, and the possibility of the choice of teamwork is greatly increased. Besides these, we can enumerate several views which indicate the effectiveness of the teamwork system under today's new technology.[11]

Quantitative examination on teamwork system, however, does not seem to have conducted yet especially in Japan because work organisation in Japanese factory is implicitly thought to be a teamwork system. In order to examine this assumption, we asked how are tasks and responsibilities divided among workers in each workplace

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9. With regard to the questions on the questionnaire, see bellow: Okubayashi, K., H. Shomura, H. Takebayashi, M. Morita and N. Kambayashi [1994], *Jukouzou Soshiki Paradaimu Josetsu* (*An Introduction to the Paradigm of Loose Structured Organisation*), Bunshindou (in Japanese).
10. Not only job design theorists and socio-technical systems theorists but also labour process theorists recognise that job structure under new technology is more flexible. See, for example, Kato, T. and R. Steven [1989], "Is Japanese Capitalism Post-Fordist?", Paper presented to the 8th New Zealand Asian Studies Conference, Christchurch, August 1989.
11. Cf., Orsburn, J.D. et al.[1990], *Self-Directed Work Teams : The New American Challenge*, Business One Irwin ; James, H.S.[1992], *Team-Based Organizations : Developing a Successful Team Environment*, Business One Irwin ; Fisher, K.[1993], *Leading Self-Directed Work Teams*, McGraw-Hill ; Joy III, L.W. et al.[1994], *Frontline Teamwork*, Business One Irwin ; Zenger, A.H. et al.[1994], *Leading Teams : Mastering The New Role*, Business One Irwin.

Table 5 Method of job allocation in each workplace (N=265)

	Teamwork system			Individual allocation
Answer No.	1	2	3	4
Number	17(6.4)	79(29.8)	140(52.8)	
Total	236 (89.1)			29 (10.9)

Note: Percentage of valid responses is shown in parentheses.
1: Work is distributed equally among independently functioning teams.
2: Work is divided into categories (based on similarity of tasks) and distributed to independently functioning teams.
3: Work is divided into categories (based on similarity of tasks) and distributed to teams, but teams work together and/or team members are rotated.
4: Work is assigned on an individual basis, rotation is not practised.

of individual firm in which new technology is thought to be most developed. The results are shown in Table 5.[12]

According to Table 5, 89.1 percent of all companies have adopted the teamwork system though the type of teamwork is different. Only 10.9 percent adopt the Tayloristic method of job allocation based on the *one-man, one-job* concept.

Table 6 and Table 7 show how job content at the work organisational level has been changed with the introduction of new technology to the workplace. Here job content refers to: 1) the degree of social contact at work between workers (decreased vs. increased); 2) the frequency of job rotation (decreased vs. increased); 3) the number of tasks involving co-ordination with other divisions (decreased vs. increased); 4) the degree of complication of work (simplified vs. complicated); 5) the amount of latitude for personal judgement at work (decreased vs. increased); 6) the number of technicians[13] (decreased vs.

12. All of the figures from Table 5 include both data for manufacturing companies and non-manufacturing companies.
13. Here 'technician' is defined as a highly-skilled employee capable of production line operation/adjustment/maintenance/improvement, and/or engaged as a production line maintenance programming specialist.

increased). Based on the theories developed in previous research, the expected changes when new technology is introduced to a workplace are the latter in each item, i.e., an increase in social contact at work, an increase in the frequency of job rotation, increase in the number of tasks involving co-ordination with other divisions, an increase in the degree of complication of each job, an increase in the amount of latitude for personal judgement at work and an increase in the number of technicians.

The first three items (i.e. the degree of social contact at work between workers, the frequency of job rotation and the number of tasks involving co-ordination with other divisions) concern the horizontal changes in job content while the last three items mean the vertical ones. Here *horizontal* change refers to that of the job boundary at the same hierarchical level, corresponding to so-called "job enlargement" and "job rotation," while *vertical* change refers to that at a different hierarchical level, corresponding to so-called "job enrichment." The items such as "job complexity" and "latitude of personal judgement" are included in vertical relations in the sense that they cannot be found under the Tayloristic job design, as they are what the planning department, located in the upper part of the organisational hierarchy, should be engaged in. Similarly, the item of the "number of technicians" is dealt with as one of the vertical relations because a technician is defined in the questionnaire as a highly-skilled employee capable of production line operation, adjustment, maintenance, improvement, and/or engaged as a production line maintenance programming specialist.

Table 6 Change in the Job Content at the Work Organisational Level

Items of Job Content	Directions of Change					
	Decrease		No change		Increase	
Horizontal relations						
Frequencies of mutual contact among workers	55	(20.9)	101	(38.4)	107	(40.7)
Frequencies of job rotation	11	(4.0)	130	(44.4)	133	(48.5)
Number of co-ordination tasks	36	(13.6)	98	(37.3)	129	(49.0)
Vertical relations						
Complexity of job	127	(48.1)	37	(14.1)	100	(37.9)
Latitude of personal judgement	99	(37.5)	58	(22.0)	107	(40.6)
Number of technicians	21	(10.8)	112	(57.7)	61	(31.4)

Note: Percentage of valid responses is shown in parentheses.

Table 7 Descriptive Statistics of Job Content at the Work Organisational Level

Items of Job Content	mean	sd	N	t-value
Horizontal relations				
Frequencies of mutual contact among workers	4.2662	.936	263	4.61***
Frequencies of job rotation	4.4891	.664	274	12.19***
Number of co-ordination tasks	4.4411	.947	263	7.56***
Vertical relations				
Complexity of job	3.8295	1.214	264	-2.28**
Latitude of personal judgement	4.0379	1.143	264	.54
Number of technicians	4.3454	.992	194	4.85***

Note: Each item is measured by the following Likert type of 7-point-scale: 1(greatly decreased)-2(moderately decreased)-3(a little decreased)-4(no change)-5(a little increased)-6(moderately increased)-7(greatly increased). Each item is reconstructed to show that the higher the point, the better consistent with the change expected theoretically. T-value is shown as the result of the t-test concerning the null hypothesis that the mean value is 4, that is, there is no change in direction. The significant level is ** $p<.05$ and *** $p<.01$.

Judging from Table 6 and Table 7, firstly, the changes are, in general, consistent with those expected theoretically. Judging by the sizes of the t-values, new technology has an influence upon "frequencies of job rotation," "number of co-ordination tasks," "number of technicians" and "frequencies of mutual contact among workers" in descending order. Above all, the t-values of "frequencies of job rotation" and "number of co-ordination tasks" are extremely high, which indicates the companies' tendency to design work organisation to blur the boundary between units and to switch every worker's job frequently.

Secondly, the items "latitude of personal judgement" and "complexity of job" do not necessarily indicate the same changes as predicted by theory. Especially, the degree of "job complexity" indicates a decrease though the theory would have predicted an increase. Although a detailed examination is needed to clarify the reason why such results were obtained for the two items, we might guess that, before the introduction of new technology to the workplace, the blue-collar workers in the context of Japanese work organisation had already experienced quite complex jobs to some degree, which might explain such unexpected results being produced.[14]

Thirdly, when we see the changing nature of each job, each job has changed in both the horizontal and vertical directions, though the t-values of the horizontal changes can be seen to be a little bigger than those of the vertical ones. It should be noted especially that the item "number of technicians," who never exist under Tayloristic work organisation, shows a significant tendency to increase under today's new technology. As indicated by Minoru Itoh [1988], highly-skilled workers who engage in not only operations but also maintenance and programming exist in Japanese work organisation under new technology.[15]

Table 8 shows the relationship between work organisation and

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14. According to this table, the item of "job complexity" indicates rather the tendency of simplification. But we should not interpret this result as the increase in the so-called Taylaristic jobs such as simple, repeated and inhuman jobs, since the number of technicians increase. It seems that the meaning of the increase in 'simplification' is that the jobs needed physical laborious strength has been decreasing.
15. Cf., Itoh, M.[1988], *Gijutsu-kakushin to Human Network-gata soshiki (Technological Innovation and Human-network-type Organisation)*, Nihonroudoukyoukai (in Japanese), pp.94-98.

Table 8 Work Organisation and Job Content

Items of Job Content	Tayloristic			Team			t-value
	mean	sd	N	mean	sd	N	
Horizontal relations							
Frequencies of mutual contact among workers	4.3704	.884	27	4.2675	.950	228	.54
Frequencies of job rotation	4.2000	.577	25	4.5330	.667	227	-2.40**
Number of co-ordination tasks	4.6667	.832	27	4.4211	.956	228	1.28
Vertical relations							
Complexity of job	3.5926	1.152	27	3.8472	1.228	229	-1.03
Latitude of personal judgement	3.9630	1.018	27	4.0306	1.160	229	- .29
Number of technicians	3.8750	1.147	16	4.3829	.951	175	-2.01**

Note: Each item is measured by the following Likert type of 7-point-scale: 1(greatly decreased)-2(moderately decreased)-3(a little decreased)-4(no change)-5(a little increased)-6(moderately increased)-7(greatly increased). Each item is reconstructed to show that the higher the result, the better consistent with the change expected theoretically. T-value is shown as the result of the t-test concerning the mean difference between 'Tayloristic' and 'team.' The significant level is ** $p<.05$.

worker's job content.

According to this table, first, in terms of all items except "frequencies of mutual contact among workers" and "number of co-ordination tasks," the mean value is higher in team type work organisation than in the Tayloristic work organisation. Therefore, the theoretical hypothesis that job flexibility is higher in the team type of work organisation than in the Tayloristic type of work organisation is empirically supported.[16]

Second, we can state that the items "frequencies of job rotation" among horizontal relations and "number of technicians" among vertical

16. The item "number of co-ordination tasks" shows an increase under Tayloristic type organisation which is different from theoretical expectation. Although more examination is needed to clarify the reason for this, it seems to have a relation with the fact that Japanese work organisation traditionally has had a flexibility in its environment by nature.

relations show a significant difference between the Tayloristic type of work organisation and the team type. This means that, in a team-based work organisation, workers have a chance to switch their jobs with each other quite often and, also, they have an opportunity to participate in the jobs which higher level employees, such as group leaders and supervisors, are engaged in. This fact suggests that the job content of blue-collar workers has been changing in both horizontal and vertical directions under team-based work organisation.

IV. Management Hierarchy and Job Content of Middle Managers

Introduction of new technology to the workplace is predicted to lead some modification in management hierarchy. Many of the studies on the change in the management hierarchy caused by the introduction of new technology seem to expect the elimination of the hierarchical ladder: Peter F. Drucker [1989] predicts that organisational structure will be greatly flattened under the influence of the information technology revolution;[17] John F. Rockert and James E. Short [1990] discuss this problem in the context of the appearance of the Networked Organisation under information technology;[18] Richard J. Long [1987] insists that "all other things being equal, we should see.....some flattening of the structure, as some hierarchical workers are eliminated."[19] Therefore one of the most important dimensions of the change of management organisation is the extent of the flattening of hierarchy.

Table 9 shows the change in management hierarchy after the introduction of new technology.

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17. Cf., Drucker, P.F.[1989], *The New Realities*, Harper & Row Publishers, Inc.
18. Cf., Rockart, J.F. and J.E. Short [1990], "The Networked Organisation and the Management of Interdependence," in Scott Morton, M.S.[1990], *The Corporation of the 1990's: Information Technology and Organizational Transformation*, Oxford University Press, pp.189-219.
19. Cf., Long, R.J.[1987], *New Office Information Technology : Human and Managerial Implication*, Croom Helm, p.208.

Table 9 Changes in the Management Hierarchy

	Has become steeper			No change	Has become flatter		
Degree	greatly	partly	a little		a little	partly	greatly
Number	1	3	44	136	54	10	1
(Percent)	(0.4%)	(1.2%)	(17.7%)	(54.6%)	(21.7%)	(4.0%)	(0.4%)
Total	48 (19.3%)				65 (26.1%)		

Note: 1: Has become much steeper; 2: Has become steeper; 3: Has become a little steeper; 4: No change; 5: Has become a little flatter; 6: Has become flatter; 7: Has become much flatter, based on the so-called Likert type of 7-point-scale.

From this table, we cannot state that new technology promotes the elimination of hierarchical ladders since more than half of the companies (54.6 percent) have still no modification in their management hierarchy. However, judging from the result of the T-test carried out the same way as the process demonstrated in Table 7, we can see the tendency of the organisational hierarchy to be flattened.[20] Therefore we can conclude that management hierarchy would be flattened under new technology although the degree of the flattening is smaller than in work organisation.

On the premise of this flattening of management hierarchy, the job content of middle managers is, based on theory, expected, in horizontal terms, to become more complex in general and to show: an increase in job rotation, an increase in the number of tasks involving co-ordination with other divisions, an increase in the amount of exchange of information between sections. In terms of the vertical levels it would be expected to show an increase in the extent of decentralisation of decision-making, an increase in the number of strategic tasks which used to be handled by top management such as the planning of new business and new product development, a decrease in the number of managerial tasks such as giving instructions and performing checks on subordinates.

Table 10 and Table 11 indicate these changes in the job content of middle managers.

20. T-value is 1.86 (probability $< .10$).

Table 10 Change in the Job Content at Management Organisation

Items of Job Content	Directions of Change					
	Decrease		No change		Increase	
Horizontal relations						
Number of information exchanges among sections	14	(4.8)	89	(31.1)	184	(64.0)
Frequencies of job rotation	10	(3.7)	108	(39.1)	158	(57.2)
Variety of job content in general	6	(2.2)	51	(18.0)	227	(79.9)
Number of co-ordination tasks	9	(3.2)	87	(30.7)	187	(66.1)
Vertical relations						
Level of discretion	62	(25.0)	101	(40.7)	85	(34.3)
Number of strategic tasks	6	(2.2)	80	(28.3)	197	(69.6)
Degree of reduction in the number of managerial tasks	182	(64.3)	79	(27.9)	22	(7.8)

Note: Percentage of valid responses is shown in parentheses.

Table 11 Descriptive Statistics of Job Content at Management Organisation

Items of Job Content	mean	sd	N	t-value
Horizontal relations				
Number of information exchanges among sections	4.7168	.754	286	16.08***
Frequencies of job rotation	4.6486	.746	276	14.45***
Variety of job content in general	5.0352	.756	284	23.08***
Number of co-ordination tasks	4.7809	.754	283	17.42***
Vertical relations				
Level of discretion	4.0121	.963	248	.20
Number of strategic tasks	4.8445	.751	283	18.91***
Degree of reduction in the number of managerial tasks	3.2686	.850	283	-14.48***

Note: Each item is measured by the following Likert type of 7-point-scale: 1(greatly decreased)-2(moderately decreased)-3(a little decreased)-4(no change)-5(a little increased)-6(moderately increased)-7(greatly increased). Each item is reconstructed to show that the higher the value, the better consistent it is with the change expected theoretically. T-value is shown as the result of the t-test concerning the null hypothesis that the mean value is 4, that is, there is no change in the direction. The significant level is *** $p<.01$.

According to these tables, firstly, the general trends in the job content of middle managers are almost the same as those expected from theory. Judging from the t-value, the influence of new technology on the job of middle managers is the biggest in terms of the variety of job content in general. Arranged in descending order of the size of the t-value regarding other items, we have the number of strategic tasks, the number of co-ordination tasks, the number of the information exchanges among sections and the frequencies of job rotation.

Secondly, however, the item concerning the degree of the reduction of managerial tasks shows a result opposite to that expected from the theory. It was expected that there would be a decrease in the managerial tasks such as supervising and doing checking on subordinates, because of the relative increase in strategic tasks. One possible interpretation of the division between theory and practice might be that more elaborate management of subordinates has become possible through the introduction of information technology, which has led to a dramatic increase in the number of managerial tasks. More examination, however, is needed to explain this phenomenon.

Thirdly, in terms of the changing nature of work, both items concerning horizontal and vertical levels have changed substantially although the item regarding the level of discretion indicates almost no change. The fact that strategic tasks significantly increased means, however, that middle managers are gradually taking part in some of the decision-making in which top management used to engage exclusively.

Table 12 shows the relationship between management structure and a middle manager's job content.[21]

21. We eliminated the response of "increase in hierarchy" here as the respondent might have included the influence of factors other than new technology.

Table 12 Management Organisation and Job Content

Items of Job Content	Hierarchical			Flat			t-value
	mean	sd	N	mean	sd	N	
Horizontal relations							
Amount of information exchanges among sections	4.6370	.779	135	4.8000	.689	65	-1.44
Frequencies of job rotation	4.5538	.705	130	4.8906	.715	64	-3.11***
Variety of job content in general	4.9185	.783	135	5.2769	.693	65	-3.14***
Number of co-ordination tasks	4.6642	.704	134	4.8906	.758	64	-2.06**
Vertical relations							
Level of discretion	4.0662	.818	136	4.2000	1.049	65	- .99
Amount of strategic tasks	4.7519	.743	133	4.7937	.765	63	- .36
Degree of the reduction in the number of managerial tasks	3.3284	.882	134	3.2656	.913	64	.46

Note: Each item is measured by the following Likert type of 7-point-scale: 1(greatly decreased)-2(moderately decreased)-3(a little decreased)-4(no change)-5(a little increased)-6(moderately increased)-7(greatly increased). Each item is reconstructed to show that the higher the point, the better consistent with the change theoretically expected. T-value is shown as the result of the t-test concerning the mean difference between 'Hierarchical' and 'Flattening.' 'Hierarchical' here is defined as the group which responded that there has been 'no change in the management hierarchy' in these 5 years (cf., table 9). The significant level is ** $p<.05$, *** $p<.01$.

According to Table 12, first, all of the items except "Degree of the reduction in the number of managerial tasks" indicate higher average for "flat" than for "hierarchical" changes in organisation. Judging from the size of the t-value, the items for which there is a substantial difference between the two are "variety of job content in general," "frequencies of job rotation" and "number of co-ordination tasks." We can support, in general, the theoretical hypothesis that job content changed whether the organisational structure is hierarchical or flat.

Second, however, in regard to the changing nature of jobs, there is almost no difference between the "hierarchical" and the "flat" in the vertical level, whereas a much higher difference between the two is observed in the horizontal level. A middle manager's job content at the vertical level, such as the "level of discretion," "amount of strategic tasks" and "decrease in the amount of managerial tasks," is not

related to whether organisational structure is hierarchical or flat. This result is in a striking contrast to that of the work organisation where a blue-collar worker's job content at the vertical level is substantially changed, especially in terms of the item of "number of technicians," whether the organisational structure is the so-called "Tayloristic" or "team-based." At the level of management organisation, different from that of work organisation, it is clarified that vertical job content is not prescribed by the organisational structure, contrary to the theoretical expectation.

V. Summary and Concluding Remarks

New technology is said, in theoretical terms, to be one of the driving forces which modifies every employee's job content. In this paper, we have discussed empirically the effects of new technology upon each employee's work from the viewpoint of the relationship between the organisational structure and the job content, an area of which few studies have been made.

It is clarified empirically that an employee's job content is generally prescribed by the organisational structure where he/she works. At the level of work organisation, a blue-collar worker's job content changes whether he or she works under the Tayloristic type of work organisation or under the flexible, team-based work organisation, but at the level of management organisation, a middle manager's job content in general depends on whether he/she works under a hierarchical structure or a flatter structure. The more one works under a team-based system at the work organisational level and under a flat structure at the managerial organisational level, one's job can become more flexible. It means that job design should be examined from the viewpoint of organisation design if we are to confirm the real effects of new technology on each employee's work system. Use of the organisational design approach could be effective instead of the so-called job design approach upon which many studies have been based.

At the same time, however, it is also clarified that, in terms of some items, there is almost no difference in spite of the variance of the organisational structure. In concrete terms, such items as "the level of discretion," "number of strategic tasks" and "degree of the reduction in the number of managerial tasks" at the management organisational

level show almost no change whether or not the organisational structure was flattened, a result which is different from that expected by theory.

This finding means that organisational hierarchy still maintains, even if each employee has an increasing opportunity to engage in the strategic type of jobs, and that the vertical type of job content at the level of management organisation is prescribed by some other factors, such as, for example, business strategy, instead of organisational structure. Therefore, we conclude that job content, in general terms, is prescribed by organisational structure except for the vertical jobs at the managerial organisational level. We must examine hereafter what is the real prescribing factor of the job content of middle managers.

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