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Organisational innovation in the Danish private business sector

by
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Abstract

This paper reviews the first results from a large Danish survey on organisational innovation within the private business sector. The 1,900 surveyed firms are divided in two groups of an almost equal size according to whether or not they have undertaken organisational innovation during the period of 1993-95, i.e. innovative Y-firms and non-innovative N-firms. It appears that the Y-firms to a larger extent than the N-firms employ various types of work organisational principles that facilitate intraorganisational integration and the delegation of authority. The Y-firms find themselves in more competitive environments and are more focussed on the global market than the N-firms and do, to a larger extent, employ functional flexibility and combine technical and organisational innovation in order to meet this challenge. However, 1/3 of the N-firms display organisational characteristics very similar to the Y-firm, and it is hypothesised that this fraction which amounts to approximately 1/7 of the total sample comprises firms which have innovated organisationally in the past, i.e. before 1993. Finally, Y- and N-firms have in common the fact that they have intensified their cooperative relationships with customers and subcontractors.

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Keywords

Organisational learning, innovation, flexibility

JEL classification

D83, L2, M10, O30

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1. Introduction: The scope of the study

The questionnaire has been undertaken in order to investigate the diffusion of organisational innovation in the Danish private business sector. The questionnaire has been submitted to 4,000 firms during the summer of 1996 and 1,900 firms have responded, 684 of which are manufacturing firms while the remaining 1,216 belongs to the service sector. The analytical results from the questionnaire are supposed to elaborate on previous work undertaken in a Danish context. In 1989, a survey of the diffusion of high technology in the Danish industry during the period of 1984-89 was undertaken as part of a larger project on the Danish productivity growth (Gjerding et al., 1992). The survey comprised 337 manufacturing firms and focused on technical innovation and some aspects of work organisation, and it concluded, among other things, that a successful implementation of high technology was highly sensitive to changes of work organisation and the development of human resources (Gjerding&Lundvall, 1990). In 1994, the Danish welfare commission undertook a survey of 514 manufacturing firms which validated the results from the 1989 survey. Furthermore, the 1994 survey delved into the diffusion of new principles of work organisation and was able to conclude that the implementation of high technology is associated with various types of integrative measures, delegation of authority, and smaller organisational hierarchies.¹

The first question of the questionnaire asks the respondents to assess whether or not their firm has undertaken organisational changes during the period of 1993-95 which the respondents consider as important. The purpose of this question is to divide the responding firms in two groups: Those firms which have engaged in major organisational change (Y-firms) and those firms which have not (N-firms). The responses show that the respondents fall into two categories of almost equal size since 52.1% answer in the affirmative while 46.6% answer “no”.² This paper describes how these two categories of respondents have responded to the remaining questions, and regarding questions 1-3 reference is made to how the responses are distributed across the manufacturing and service sectors.³ Analytical inferences are made, and some questions for further analysis are presented as implications and hypotheses along the way. The results presented are statistically significant at the 95% level (chi-square).

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1. The results from the 1994 survey is documented in Sekretariatet for Kommissionen om fremtidens beskæftigelses- og erhvervsmuligheder (1995). Documentation written in English is found in Nyholm (1995). A comparison between the 1989 and 1994 surveys and other Danish innovation surveys is found in Gjerding (1996), chapter 8.
 2. The remaining 1.3% answer “don’t know”.
 3. The distribution of answers across the manufacturing and service sectors will be treated in a separate preliminary report.

The following description presupposes that the reader is familiar with the questionnaire and the formulation of each question, i.e. the reader is supposed to make his own cross-references to the questionnaire.

2. Executive summary

This preliminary report describes the answers given by two groups of respondents: Those who think that their firm has undertaken important organisational changes during 1993-95 and those who think not. The two groups of firms are referred to as, respectively, Y- and N-firms, an abbreviation which designates the answers “yes” and “no” to question 1.

Organisational changes seem, primarily, to have been associated with the delegation of authority, functional integration and cross-occupational working groups, but 1/2 of the Y-firms do also report on such measures as quality circles/groups, systems for collecting proposals from employees, and planned job rotation. The purpose of the organisational changes are focused on increasing the effectiveness of daily work, cooperation and coordination across the organisation, the ability of the firm to adapt to turbulent environments, and the development of product/services, knowledge and know-how. Organisational change rely most sensitively on the attitudes and qualifications of middle managers and subordinates, while the access to public support is of little importance. The influence of other types of stimuli or barriers to organisational change seems to depend on the characteristics of the firm in question. As compared to N-firms, Y-firms do to a larger extent employ various types of organisational arrangements that facilitate intraorganisational integration and the delegation of authority. However, there exists a fraction of N-firms, presumably 1/3, which have innovated in the past and uses various types of intraorganisational arrangements similarly to the Y-firms. These “innovative” N-firms do employ intraorganisational integrative measures as extensively as Y-firms, measured in terms of the proportion of employees affected.

The organisational changes undertaken are associated with a number of changes in the content of work which is primarily found in Y-firms. The content of work has, primarily, changed in the direction of more autonomy of work, and a stronger emphasis on occupational qualifications and employees' cooperation with colleagues and management. The content of work has been affected by external sources of resources and knowledge, especially in the form of contact between the firm and its customers. At the same time, the group of Y-firms is divided on the issue of specialisation, since 1/5 of the Y-firms indicate that specialisation has decreased while 1/3 respond that specialisation has increased. This observation implies that the increased use of decentralisation and intraorganisational integration has been associated with de-specialisation to a smaller extent than one would expect, or that a substantial part of the Y-firms have aimed at combining flexibility and

specialisation. Among the stimuli for changes in the content of work, increased competition, the development of product/services, flexibility by employees and better contact with customers seem more important to the Y-firms than to the N-firms.

It appears that Y-firms, as compared to N-firms, find themselves in a more competitive environment where flexibility, product/service renewal and user-producer interaction are becoming increasingly important to the survival of the firm, and where changes in the content of work to a considerable extent stem from increased competition through flexible and customised production. Both Y- and N-firms try to accommodate the use and development of human resources to their demand through numerical and functional flexibility, but functional flexibility do, however, play a more important role in the Y-case than in the N-case. Furthermore, Y-firms find, to a larger extent than N-firms, that the continuous development of labour skills is vital to the competitiveness of the firm, and they seem to place more emphasis on social skills such as responsibility and quality consciousness, cooperation and communication, and the ability of employees to readjust. However, although Y-firms appear as more engaged in educational activities, they do not spend more resources on employees than N-firms, measured in terms of the number of days spend for education on a yearly average basis. Instead, the major difference between Y- and N-firms is that the former spend more resources on the education of top and middle management.

Like in the case of organisational change, Y-firms are technically innovative to a larger extent than N-firms, both in terms of product and process innovation. However, the process innovative Y-firms do not differ from the process innovative N-firms in terms of the proportion of employees affected by process innovation. Regarding product innovation, N-firms seem to focus on the domestic market, while Y-firms are to a larger extent globally oriented, an observation which may, partly, be explained by the fact that more than half of the Y-firms are part of a concern, as compared to 1/3 of the N-firms. The tendency towards a global orientation may validate the previous impression that Y-firms, as compared to N-firms, find themselves in a more competitive environment where flexibility and product/service renewal take precedence, and, in fact, Y-firms do to a larger extent than N-firms find that competition has increased. At the same time, both Y- and N-firms have increased their cooperative relationships with customers and subcontractors, and the tendency towards increased extrafirm cooperation is larger in the Y-case than in the N-case.

3. Principles of organisation and management

Questions 1-9 delve into the principles of organisation and management adopted by the responding firms. As explained previously, question 1 aims at separating the respondents into two groups, i.e. those firms which have undertaken major organisational change and those firms which have not,

and the resulting groups are of an almost equal size since 52.1% answer “yes” (Y-firms) while 46.6% answer “no” (N-firms).⁴ While questions 2-3 can be answered by only Y-firms, questions 4-9 are truly comparative since they may be answered by all respondents.

Table 1 depicts the responses regarding the purpose of the organisational changes undertaken by Y-firms. Regarding those respondents who have used the category “to an important extent”, it appears that 2/3 have aimed at increasing the efficiency of the daily operations, while 1/2 point to cooperation and coordination across functional lines, and to the ability of the firm to adapt to changing economic environments. The ability to develop, continuously, the product and knowledge base of the firm is pointed out by 1/4 of the firms. If we consider the category “to some extent”, no distinctive differences among the various purposes appear. The answers are more unanimous in the case of efficiency, cooperation and coordination, and adjustability when we compare the spread of the answers given across the various categories, e.g. while only 4.9% of the respondents answer “to a very small extent” or “not at all” in the case of efficiency, the same figure is as high as 28.9% in the case of developing products and services. If we sum the answers in the categories of “important” and “some”, the purposes seem to fall into three groups: Efficiency, which turns out to be the most important purpose as 9 out of 10 firms are responding affirmative (92.5%); cooperation, coordination and adaptability (80-83%); and the development of product/services, knowledge and know-how (65%).

4. That is, 989 of the 1,900 respondents answer “yes”. These are divided into 462 of the 684 manufacturing firms and 527 of the 1,216 service firms. Thus, organisational innovation takes place to a larger extent in manufacturing than in service, i.e. 68% as compared to 43%. Manufacturing firms are more innovative in the technical dimension as well, i.e. 64% as compared to 45% in the case of product innovation, 71% vs. 60% in the case of IT-related process innovation, and 46% vs. 39% in the case of other forms of process innovation.

Table 1. The purpose of the organisational changes

Extent	Important	Some	Very small	Not at all
The purpose was to strengthen.....				
...the effectiveness of daily work	63.3	29.2	2.4	2.5
...cooperation and coordination across the organisation	50.5	32.7	6.5	5.5
...the ability to adapt to more turbulent surroundings	49.2	31.0	10.3	4.9
...the ability to develop, continuously, new products and services	28.8	36.5	17.4	11.5
...the ability to strengthen and renew, continuously, knowledge and know-how	27.7	37.8	17.3	11.3
...other purposes	14.7	10.0	4.4	15.5

The distribution of answers revealed by table 1 indicates that organisational change is, in many cases, aimed at both efficiency and flexibility issues or even aimed at reconciling efficiency and flexibility, e.g. by increasing efficiency in daily operations through more flexible forms of intra-organisational coordination - or it may indicate that efficiency and flexibility are pursued at different levels of the organisation. Furthermore, the distribution of answers seems to indicate that organisational changes are, in many cases, undertaken in order to develop the product, service and knowledge base of the firm.

Regarding the distribution of answers across the manufacturing and service sectors, the distribution of answers across purposes is rather similar to the distribution revealed in table 1 and there are no important differences between the manufacturing and service sectors. This may, to some extent, be surprising since the issue of efficiency is often regarded as a manufacturing issue, while the issue of adaptability *vis-à-vis* volatile environments often is regarded as a contingency facing the service sector. However, the results from the questionnaire suggest that the strategic issues and contingencies facing the modern firm are becoming similar across the manufacturing and service sectors.⁵ On the other hand, there do exist an important difference between the manufacturing and service sectors regarding the extent to which the firms in these two sectors have undertaken organisational changes or not. In response to question 1, 67.5% of the 684 manufacturing firms answer “yes” while the corresponding figure in the case of the 1,216 service firms is only

5. Or may be described in the same terms.

43.3%. This observation indicates that the manufacturing firms engage in organisational change to a larger degree than the service firms; or it may indicate that the respondents from the manufacturing and service sectors perceive organisational change differently, e.g. that a service sector respondent may have a higher tolerance for organisational change so that organisational change have to be rather pervasive before he/she considers it as “important”; or, finally, it may reflect that the service firms in the sample are smaller than the manufacturing firms, measured in terms of employees.

Considering question 3 on whether or not some of the employees were engaged in education as a consequence of organisational change, 59% of the respondents answer in the affirmative. These answers are almost equally distributed across the manufacturing and service sectors.

To what extent have changes in the structure of management taken place in those firms which have undertaken important organisational changes, and to what extent are changes in the management structure dissociated from important organisational change? These questions may be illuminated by the answers given to question 4 on whether or not the responding firm has changed its management structure during 1993-95. In total, 43.6% or 826 firms respond affirmative, and it appears that important organisational changes are closely related to changes in the management structure, since 717 or 86,8% are Y-firms. This reflect that 72.2% of the Y-firms have changed their management structure during 1993-95 as compared to 11.5% of the N-firms.

Table 2 investigates the nature of the management structure to the extent that this is reflected in the type of coordination which can be inferred from question 5 on the planning and control of subordinate work load. Table 2 compares the number of answers in Y- and N-firms by calculating the ratio of affirmative Y-firm answers to affirmative N-firm answers. In Y-firms as compared to N-firms, employees are to a larger extent involved in planning and control, and that middle managers assume a more important role at higher levels of planning and control. Contrary, top management is to a smaller degree involved in operational and tactical planning and control, and top management seems to play a more important role in N-firms at all levels.

Consequently, one should expect that Y-firms to a higher degree employ various types of organisational arrangements that facilitates intraorganisational integration and the delegation of authority. This pattern should, furthermore, be expected when one contemplates the importance attached to efficiency and flexibility in relation to organisational change, as described previously. These expectations are confirmed by table 3 which depicts the frequency of answers to question 6 on various work organisation arrangements (“Yes” and “No” columns). As can be seen, delegation of authority and integrative measures at the interdepartmental and team levels exhibit high scores, and even planned job rotation is being used to an extent which may seem surprising at first hand.

Table 2. The planning and control of work done by subordinates

Y: % of Y-firms N: % of N-firms	Employee			Middle manager			Top management		
	Y	N	Y/N	Y	N	Y/N	Y	N	Y/N
Dayly planning	58.3	41.8	1.39	61.4	58.8	1.04	12.9	32.5	0.40
Weekly planning	31.5	24.5	1.29	74.2	62.6	1.19	20.0	39.4	0.51
Follow-up	24.1	19.1	1.26	83.3	67.9	1.23	25.4	42.4	0.60
New working areas	11.0	10.3	1.07	53.0	42.4	1.25	68.5	74.3	0.92

Table 3. Work organisation arrangements

Y: % of Y-firms N: % of N-firms	Yes		No		Coefficient	
	Y	N	Y	N	Y	N
Cross-occupational working groups	66.0	31.7	30.2	62.1	0.47	0.51
Quality circles/groups	49.8	24.7	43.6	67.8	0.51	0.56
Systems for employee proposals	53.1	34.8	39.0	57.6	0.62	0.64
Planned job rotation	45.2	25.6	50.0	68.2	0.44	0.51
Delegation of responsibility	91.9	77.6	5.4	18.6	0.70	0.67
Integration of functions	68.5	44.3	24.6	46.3	0.51	0.51
Wages based upon quality or results (not piece work)	50.2	27.4	44.6	65.8	0.61	0.62

In any case, the Y-firm percentage score is higher than the N-firm score. This may lead to the expectation that the principles of work organisation reported in table 3 may be used more extensively in Y-firms than in N-firms, measured in terms of the number of employees affected. Question 6 does permit an illumination of the issue of the extent to which the various work organisation principles are used throughout the organisation, as the respondents are asked to assess the number of employees affected in each case in three intervals, i.e. less than 25%, 25-50% and more than 50% of the employees. The coefficient showed in table 3 is a weighted average of these assess-

ments, and the assumption is that the larger the coefficient, the larger the number of employees affected by the organisational principle in question.⁶

The coefficients show that although more Y-firms employ the work organisation principles mentioned in question 6, they do not employ them more extensively than the corresponding N-firms, and, actually, the use by N-firms seems more extensive in some cases, such as planned job rotation and quality circles/groups. This observation has two important implications. First, a number of N-firms may have engaged in organisational changes but the respondents do not assess these changes as “important” and thus figure in the “no”-group in question 1. Second, a number of N-firms may

have engaged in organisational changes previously to the period of 1993-95 and are now preoccupied with sustained implementation and thus figure in the “no-group”. In any case, the group of N-firms contains a number of highly innovative firms which are not identified by the questionnaire.⁷

Questions 7-8 delve into the extent to which the use of work organisation arrangements has increased during the period 1993-95 and the degree to which it is going to increase. Table 4 summarises the results regarding those firms which answer question 8 in the affirmative⁸, and it appears that Y-firms score higher in all cases, as could be expected. However, 27-39% of the N-firms have increased the use of the various work organisation arrangements, and 18-28% plan to do so. In accordance with table 3, this observation indicates that part of the N-group is actually innovative and that the number of firms within the N-group is going to diminish in the near future.⁹

Finally, question 9 investigates the stimuli and barriers to organisational development, and table 5 summarises the results without attempting to distinguish between “more” and “less” in the cases of stimuli and barriers. Similarly, those who refuse to answer or who answer “don’t know” have been omitted. The Y- and N-group differ according to the size of the percentage scores, as could

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6. The total weight is 1, where the number of respondents in the 25% interval carry the weight of 0.15, while the weights attached to the 25-50% and >50% intervals are, respectively, 0.3 and 0.55. The result is divided by 0.55N, where N is the total number of respondents who have reported that they use the work organisation principle in question. Consequently, if all respondents assess that the principle in question affects more than 50%, the coefficient will take the value of 1. Similarly, if all respondents assess that the principle in question affect less than 25%, the coefficient will take the value of 0.273 (0.15/0.55), and if all the respondents are found in the 25-50% range, the coefficient will take the value of 0.545 (0.3/0.55).
 7. This is a conclusion which is important to how the distribution of answers to the remaining questions are interpreted.
 8. The affirmative answers to question 7 within both groups of Y- and N-firms are found in the range of 4-27% of the firms. Recall that question 7 is answered only by those firms which answer “no” to question 6.
 9. Future computer runs have to determine the size of the innovative N-group and trace the innovative N-group answers.

be expected, but are, actually, similar in the sense that the stimuli and barriers to organisational development may be categorised into three groups according to the response rate attached to each entry: A “high-score” group comprising the attitudes and qualifications of middle managers and sub-

Table 4. The increase of the use of work organisation arrangements

Y: % of Y-firms N: % of N-firms	The use has increased		We plan to increase the use	
	Y	N	Y	N
Cross-occupational working groups	63.6	29.8	34.1	18.7
Quality circles/groups	57.3	30.3	30.9	20.6
Systems for employee proposals	49.5	27.5	29.9	21.0
Planned job rotation	50.7	27.1	34.6	21.7
Delegation of responsibility	71.4	38.9	44.5	27.8
Integration of functions	57.8	27.5	38.5	22.0
Wages based upon quality or results	52.2	27.4	35.3	19.1

ordinates; a “low-score” group which contains only the entry of “public support”; and a “middle-score” group which comprises the remaining stimuli and barriers. The attitudes and qualifications of middle managers and subordinates appear to be the most important stimuli and barriers, not only because they receive the highest frequencies as stimuli and barriers, but also because they receive the lowest frequencies in the “not relevant” category. Regarding the other types of stimuli and barriers, the picture is less clear since the answers are dispersed across the choice categories and rather large response rates can be observed in the “not relevant” category. Thus, it can be argued that organisational development is, generally, sensitive to the qualifications and attitudes of middle managers and subordinates while the importance of the remaining stimuli and barriers to a larger extent differ from case to case, i.e. while the attitudes and qualifications of the employees are basic prerequisites for organisational development, the importance of the remaining stimuli and barriers depend on the firm in question.

This conclusion is, tentatively, validated by table 6 which shows a number of “discretion coefficients”. The discretion coefficient is, simply, calculated as the response rate in the “not relevant” category” divided by the sum of the response rates in the stimuli and barrier categories. Small values of the coefficients indicate that a relatively small number of the respondents is found in the “not relevant” category, i.e. we are dealing with a general phenomenon, as in the case of attitudes and qualifications. High values indicate that a relatively large number of the respondents is found

in the “not relevant” category, i.e. we are dealing with a phenomenon that is less general and more discretionary in the sense that its occurrence depends on the organisational circumstances in question.¹⁰

10. Hence the notion “discretion” coefficient. Observe that some firms may be counted twice, since they are allowed to respond that a certain phenomenon acted both as a stimuli and a barrier. Subsequent computer runs will clarify the extent to which this is a problem.

Table 5. Stimuli and barriers to organisational development

Y: % of Y-firms N: % of N-firms	Stimuli		Barrier		Neither nor		Not relevant	
	Y	N	Y	N	Y	N	Y	N
Middle managers/supervisors' attitudes	56.3	39.6	23.5	8.7	12.5	25.5	4.0	13.4
Middle managers/supervisors' qualifications	46.2	35.6	26.8	10.5	18.3	26.6	4.1	14.1
Subordinates' attitudes	53.1	38.5	21.3	11.7	17.9	28.3	2.2	9.0
Subordinates' qualifications	45.1	35.9	17.6	8.6	27.4	32.5	3.2	9.2
Cooperation committee	32.0	20.1	3.0	1.2	24.2	21.5	32.6	43.5
Shop stewards	29.4	18.2	7.7	3.0	23.8	25.3	30.6	39.2
Consultants' qualifications	30.6	14.5	2.6	1.5	15.5	13.8	42.3	55.3
Public support	17.4	7.9	1.6	1.6	19.6	16.9	52.7	59.3
Access to knowledge about initiatives in other firms	39.4	26.1	2.0	1.0	26.1	26.4	20.8	28.9
Cooperation with educational institutions	33.7	24.8	1.5	1.7	24.4	25.2	30.9	33.6

Table 6.
The generality of stimuli and barriers to organisational change

Discretion coefficient	Y firms	N firms	Coefficient calculated as the sum of response rates at stimuli and barriers divided by the response rate in the "not relevant" category, cf. table 5
High score group	21.5	4.1	
Middle score group	1.2	0.6	
Low score group	0.4	0.2	

4. Qualifications and tasks

Questions 10-19 delve into the development of qualifications and tasks in the responding firms. While questions 10-11 investigate the changes in the content of work, questions 12-13 and 15-18 illuminate the way in which the firm accommodates its human resources to these changes, i.e. through various types of numerical and functional flexibility internally and externally¹¹, work organisation arrangements, and education and training. Finally, questions 14 and 19 aim at investigating the importance of human resources and industrial relations at the level of the firm.

Table 7 shows the distribution of responses to question 10, omitting the "not relevant" and "don't know" categories since their response rates are extremely low. As could be expected from table 3 on work organisation arrangements, the importance of subordinate autonomy and occupational qualifications has increased in many Y-firms, and likewise the degree of employees' cooperation with colleagues and management. These changes in the content of work are in accordance with the importance of decentralisation and integrative measures that can be observed from tables 3-4. In accordance with tables 3-4, 1/4-1/3 of the N-firms respond in the same manner as the majority of the Y-firms, and it may be expected that an important amount of the 1/4-1/3 of the N-firms responding in the "more" category belong to the group of innovative N-firms discussed previously.

Two other observations can be derived from the response rates depicted in table 7.

First, it appears that the contact with external sources of productive resources and knowledge has had an important impact on the content of work, especially in the case of contact to customers. However, the general picture is somewhat unclear, since the response rates in the "unchanged" category are high, especially in the cases of contact with subcontractors and contact with other firms. This observation may be interpreted as if changes in the content of work has been more sensitive to contact with customers than to contact with subcontractors and other firms, signifying that contact between the firm and its customers, or user-producer interaction (Lundvall, 1985,

11. OECD (1996, chapter 6) provides a discussion of the various types of flexibility.

1988), is increasing in importance, not only in relation to technical innovation but in relation to organisational innovation as well.

Table 7. The direction of changes in the content of work during 1993-95

Y: % of Y-firms N: % of N-firms	More		Less		Unchanged	
	Y	N	Y	N	Y	N
Work autonomy	72.2	36.9	4.2	2.6	21.3	56.2
Occupational qualifications	56.3	36.1	7.6	5.2	33.2	53.6
Specialisation	34.0	25.9	20.9	7.6	39.1	58.3
Routine content of work	5.5	8.3	41.7	15.3	45.1	66.7
Contact with customers	51.6	29.3	5.2	3.0	36.9	59.5
Contact with subcontractors	35.1	18.0	7.1	4.3	46.3	61.7
Contact with other firms	24.4	14.0	5.3	4.3	57.4	68.4
Cooperation with colleagues	58.8	27.0	5.8	4.4	32.0	63.0
Cooperation with management	64.5	28.3	6.0	4.1	26.2	62.0

Second, only 1/5 of the Y-firms report that specialisation has decreased, while 1/3 respond that specialisation has been growing. This may indicate that the increased use of the various work organisation arrangements reported in tables 3-4 has been associated with de-specialisation to a smaller extent than one would expect; or it may indicate that a number of Y-firms have aimed at organisational configurations which combine flexibility and specialisation; or, finally, it may reflect that a number of Y-firms have undertaken types of organisational change in the direction of increased specialisation of the labour force which are not captured by the entries mentioned in tables 3-4.

Question 11 examines the importance of various sources of change in the content of work, and table 8 depicts the response rates in the categories of “high” and “some” extent.

The right column shows the proportion of respondents in the “high extent” group to the “some extent” group, and the higher the ratio, the more the respondents found in the “high extent” group. Comparing Y- and N-firms, the ratios of respondents in the “high extent” category to the respondents in the “some extent” category are quite similar in the cases of the introduction of new technology, contact with subcontractors, stimulating the development of labour qualifications, and

demand and wishes from the employees. This observation indicates that the importance of these sources do not differ across the Y- and the N-firms, since the proportion of respondents in the “high extent” group to the number of respondents in the “some extent” group do not differ to any considerable extent. However, the Y-ratios are higher in the cases of competition, product/service development, flexibility by employees and the need for better contact with customers, reflecting that a higher proportion of Y-firms than N-firms respond in the “high extent” category. This implies that the Y-firms, as compared to the N-firms, find themselves in a more competitive environment where flexibility, product/service renewal and user-producer interaction are becoming increasingly important to the survival of the firm, and, consequently, where changes in the content of work to a considerable extent stem from increased competition through flexible and customised production.¹² This is in accordance with the observation made above in relation to table 7, i.e. that changes in the content of work has been more sensitive to contact with customers than to contact with subcontractors and other firms.

Table 8. The importance of sources of change in the content of work

Y: % of Y-firms N: % of N-firms	Degree of importance	High or some extent		High extent/some extent	
		Y	N	Y	N
	Sharper competition	81.7	56.4	0.9	0.6
	Development of new products and services	58.6	36.4	0.5	0.2
	Introduction of new technology	75.6	50.8	0.8	0.7
	Need for greater flexibility by employees	81.9	53.9	1.1	0.5
	Need for better contact with customers	68.7	43.0	0.9	0.5
	Need for better contact with subcontractors	45.6	23.1	0.4	0.3
	Stimulating the development of qualifications	68.7	39.6	0.4	0.2
	Demands and wishes from the employees	61.8	36.8	0.3	0.2

12. In order to validate this argument, it is necessary to investigate how the firms in the “specialisation” entry in table 7 have responded in table 8. Furthermore, it is necessary to trace the answers of the innovative N-firms mentioned earlier in relation to table 3.

Sections 5-6, which deal with questions 20-26, return to the observations made from table 8 and make some inferences regarding product and process innovation, market approaches and competitive conditions.

Questions 12-13 and 15-18 investigate how the firms have accommodated its human resources to the changes in work content. It appears from the distribution of answers to question 12 that recruitment is the most important way of securing the development of skills, i.e. 1/2 of both the Y- and N-firms respond in the “great” category, while 1/3 in both groups respond in the “some” category. However, dismissals do also play a role, since 15.1% and 37.8% of the Y-firms respond, respectively, in the “great” and “some” category, while the corresponding figures of the N-firms are 13.6% and 24.7%. Moving people around between different functions is reported by approximately 61% of the Y-firms and 39% of the N-firms, with the majority of firms found in the “some” category, and an equivalent picture is found in the case of working time regulation and continued vocational training. Finally, cooperation on outsourcing is of minor importance. These answers show that recruitment is the most important source to the development of intra-firm skills, and that this method of developing the firm’s skills base is, to an important extent, supplemented by various measures related to functional and numerical flexibility. Taking the importance of recruitment into consideration, it seems as if numerical flexibility, i.e. changing the quantity of labour input, is used more extensively than functional flexibility, both in the Y- and N-firms, however, with a larger emphasis on functional flexibility in the Y case.

This difference on the nature of flexibility is reflected in the response rates on the demand for labour qualifications in relation to recruitment (question 13) and the importance of the continuous development of skills to the competitiveness of the firm (question 14). First, 34.6% of the Y-firms find the development of skills decisive to competitiveness, while 42.7% find it of great importance. The corresponding figures of the N-firms are 21.1% and 35.9%. Second, it appears from the answers to question 12 that while 1/2-2/3 of the Y-firms display larger demands on all types of skills and qualifications, the corresponding figures are only 1/3-1/2 in the N-firm case. Furthermore, the distributions of answers in the “larger” category are dissimilar. While “responsibility and quality consciousness” receives the highest number of respondents in both the Y and the N case (73.2% and 48.9%, respectively), the Y-firms tend to place more emphasis on the ability “of cooperation and communication” (64.2%) and “readjustment” (64.8%) than on “vocational qualifications” (55.1%). The corresponding figures from the group of N-firms are 36.2%, 37.9% and 35.1%. These observations indicate that social qualifications take precedence over vocational qualifications to a larger extent in the Y-firms than in the N-firms.

The importance of social qualifications is, to some extent, reflected in question 15 which delves into various arrangements for stimulating the continuous development of labour skills. Table 9 reports on the answers, applying the same method as in table 8 and omitting “other measures”

which receives very low response rates. Table 9 shows that the development of skills through planned job rotation, standardised education and long-term educational planning are less important than developing skills through various organisational measures that require the delegation of authority and types of integrative arrangements. This might have been expected from the previous answers reported in table 3. Task-solving, sparring with managers and/or other employees, and functional cooperation and the prompting of cooperation and networks across divisions and groups receive greater importance in the case of Y-firms than in the case of N-firms, which is in accordance with the greater emphasis on social skills in Y-firms reported above.

Regarding the issue of training and education, firm-specific activities are utilised to a larger extent than (more or less) standardised educational schemes, and Y-firms seem to engage in educational activities to a larger extent than N-firms. The answers to questions 16 and 18 validate this conclusion. Regarding question 16, only 4.9% of the Y-firms report that none of their employees were engaged in education during 1995 or 1996 as compared to 17.2% of the N-firms. Furthermore, while 48.6% of the Y-firms respond that more than half of their employees were involved, the corresponding figure in the case of the N-firms is 29.4%. Regarding question 18, it appears that the Y-firm personnel spend more time on education than N-firm personnel, cf. table 10. However, it also appears that this is especially true in the case of managers. In the case of subordinates, the ratio of long-term to short-term education is approximately the same in Y- and N-firms.¹³

13. Regarding question 17 on which subjects the courses and training schemes have dealt with, and which institutions arranged the courses and training, recomputation have to be made in order to derive the accurate frequencies. This has not been done yet at present.

Table 9. The importance of various conditions for the development of labour skills

Y: % of Y-firms N: % of N-firms	Degree of importance	Great and some importance		Great/some	
		Y	N	Y	N
	Task-solving	92.3	87.3	1.3	1.0
	Sparring with management/other employees	83.0	65.1	0.7	0.4
	Planned job rotation	38.7	22.4	0.3	0.3
	Team-working	70.9	46.4	0.8	0.6
	Functional cooperation and networking	70.8	44.3	0.9	0.6
	Standard courses/educational schemes	47.1	40.5	0.3	0.4
	Firm-specific educational activities	63.7	48.8	0.8	0.7
	Long-term educational planning	59.7	39.8	0.6	0.5

Table 10. Working days per year spend for education, on average

Y: % of Y-firms N: % of N-firms	1-5 days		More than 5 days		<5days/1-5days	
	Y	N	Y	N	Y	N
	53.9	61.0	39.1	26.5	0.7	0.4
	50.2	59.2	44.5	27.6	0.9	0.5
	64.5	60.7	27.9	22.3	0.4	0.4

Finally, the purpose of question 19 is to allow an analysis of how the human resource activities of the firms fit into the expectations of the employees, although subjected to the qualification that employee expectations have been interpreted by the respondents who, presumably, assume management positions. Table 11 reveals the extent to which the respondents have assessed that the employees attach “much” or “some” importance to the conditions mentioned in the right column.

Table 11. The importance of various conditions, as seen by employees

Y: % of Y-firms N: % of N-firms	Much or some		Much/some	
	Y	N	Y	N
More knowledge about the management's strategy and vision	86.4	67.3	1.0	0.5
More challenging work	87.7	70.2	0.8	0.6
Better wage conditions	83.1	77.8	0.5	0.7
More flexible working time	57.0	43.9	0.4	0.4
Greater influence upon planning of work	78.5	58.0	0.6	0.3
More time for education	62.5	39.8	0.3	0.2
Possibilities for working at home	13.4	7.8	0.2	0.3

Generally, the Y-firm respondents attach more importance to the various conditions than the N firm respondents.¹⁴ This is especially true in the cases of employees' knowledge about the management's strategy and vision, and employees' wishes to have greater influence upon the planning of work. The distribution of answers is in accordance with the previous observations that Y-firms employ more flexible and decentralised organisational arrangements, and that Y-firm subordinates and middle managers are more engaged in the planning and control of work done by subordinates.¹⁵

5. Product and process innovation

Questions 20-23 illuminate the extent to which the firms have engaged in product and process innovation apart from minor improvements of existing products and services during 1993-95. Regarding the first of these questions, 67.7% of the Y-firms report that they have introduced new products/services as compared to only 33.9% of the N-firms, i.e. 661 Y-firms and 294 N-firms.

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14. The response rates in the "not relevant" category are very small, except from the case of possibilities for working at home, where 27.6% of the Y-firms and 47.7% of the N-firms respond "not relevant".
 15. However, one might hypothesise that the group of innovative N-firms described previously display a distribution of answers which is similar to the distribution of answers displayed by Y-firms. This hypothesis is still to be tested.

Only these 661 Y-firms and 294 N-firms are required to answer questions 21-22, and table 12 displays these answers.

Table 12. New products and services 1993-95, apart from minor improvements

Y: % of Y-firms N: % of N-firms	% of total Y- and N-group		% of "yes"-respondents	
	Y	N	Y	N
New products/services	67.7	33.9	100.0	100.0
<i>Similar products/services are found...</i>				
...at the Danish market	50.1	28.1	74.0	83.0
...at the world market	52.7	26.6	77.9	78.6
<i>The new products/services are used to conquer new customers...</i>				
...at the Danish market?	51.0	23.7	75.3	70.1
...at the world market?	36.1	12.8	53.4	37.8

In general, more Y-firms than N-firms are engaged in product innovation, and 1/4-1/5 of them manages to create new products/services which are not found at the market. Product innovation do, to a considerable extent, take place in order to get new customers, not only at the domestic market but also abroad, and Y-firms seem more globally oriented than N-firms which tend to focus at the domestic market.¹⁶

Similarly, the answers to question 23 show that the Y-firms to a larger extent than the N-firms have engaged in process innovation, especially in relation to new technology based upon information and communication technology. Table 13 reveals the answers to question 23, employing the type of coefficient previously adopted in table 3 (see footnote 6). In this case the coefficient is

16. The product innovative N-firms report that their new products/services to a larger extent are found at the domestic market than at the world market, but it appears that product innovation in order to capture new customers are more focused at the home market than at the world market. However, these observations should be treated with some caution since the distribution of answers to questions 21b ("similar products/services found at the world market") and 22a ("conquer *new* customer groups at the Danish market") do not meet the requirement of statistical significance mentioned in section 1. On the other hand, the overall distribution of frequencies in questions 21-22 fits in with the impression that the Y-firms, as compared to the N-firms, find themselves in a more competitive environment where flexibility and product/service renewal are becoming increasingly important to the survival of the firm, as argued in the previous section.

assumed to show the extent to which the labour force is affected by process innovation, i.e. the larger the coefficient the larger the number of employees affected. It appears that although a larger amount of Y-firms engage in process innovation, the Y-firm process innovation does not, on average, affect more employees than in the case of N-firm process innovation.

Table 13. Process innovation and the extent to which the labour force is affected

Y: % of Y-firms N: % of N-firms	Yes		Coefficient	
	Y	N	Y	N
New technology based upon information and communication technology	79.2	47.0	0.6	0.6
Other forms of new technology	54.5	32.3	0.5	0.5

In sum, Y-firms are more product/service innovative than N-firms and are, to a larger extent, focused on the global market. Similarly, they are more process innovative, both in the case of IT-related technology and other forms of process innovation. However, their process innovations do not have a more pervasive effect on the organisation than in the N-firm case. On average, process innovation in both Y- and N-firms affects 25-50% of the employees.

6. Competition and cooperation

Questions 24-27 delve into the competitive and cooperative conditions of the firms. The answers to question 27 reveal that 56.6% of the Y-firms is part of a concern while the corresponding number in the N-firm case is only 30.7%. This may explain why the Y-firms seem more oriented towards the global market than the N-firms. Regarding whether or not the respondent regards the firm as a subcontractor, the distribution of answers across the Y- and N-firm groups are quite similar, since 22,3% and 19,1%, respectively, answer in the affirmative.

Section 4 argued that the Y-firms may find themselves in more competitive circumstances. The previous section made some inferences in order to strengthen this conclusion, and the distribution of answers to questions 24-25 provides further validation. According to the answers to question 24, 84% of the Y-firms find that competition from other firms have changed during the recent years, while the corresponding N-firm figure is 63.6%. The answers to question 25 indicates in which direction the competition has changed. Only 1.6% of the Y-firms and 3.3% of the N-firms

find that competition has decreased¹⁷, while 97.8% of the Y-firms and 96.7% of the N-firms assess that competition has increased. Thus, the Y- and N-firms apparently exhibit quite similar patterns in their way of assessing the direction of competitive change. However, the proportion of firms that report on “much sharper” is larger in the Y-firm case than in the N-firm case, i.e. 57.5% as compared to 47.1%. Thus, we may retain the conclusion that Y-firms find themselves in competitive circumstances more fierce than in the N-firm case.

Finally, while the answers to questions 24-25 point to increased competition, question 26 allows an analysis of whether or not extra-firm cooperation has increased concomitantly. Table 14 depicts the answers.

Table 14. The development of extra-firm cooperative relations

Y: % of Y-firms N: % of N-firms	High or some extent		High/some	
	Y	N	Y	N
Customers	90.1	71.3	1.1	0.6
Subcontractors	72.1	50.2	0.5	0.4
Consultancies	29.9	14.2	0.2	0.1
Knowledge centres	21.9	9.5	0.1	0.1
Educational institutions	32.9	18.4	0.2	0.1
Public authorities	23.6	14.7	0.1	0.1

The extent to which the firms have developed closer cooperation with extra-firm partners has increased during 1993-95 and is particularly marked in the case of customers which is reported by 90.1% of the Y-firms and 71.3% of the N-firms. The importance of customer relations is especially strong in the case of Y-firms where the proportion of respondents in the “high extent” category is a little bit higher than the proportion of respondents in the “some extent” category. Closer cooperation with subcontractors seem to have increased to some degree, especially in the case of Y-firms, but not to the same extent as closer cooperation with customers - not only is the total percentage figure lower, but the majority of firms are also found in the “some extent” category. The remaining entries are reported by 1/5-1/3 of the Y-firms and 1/10-1/5 of the N-firms, and the majority of respondents are found in the “some extent” category. Thus, it appears that

17. In the Y- and N-case, respectively, 1.3% and 3.1% report on “a bit milder”, while 0.2% and 0.2% report on “much milder”.

closer cooperation with customers and to some extent with subcontractors are the most important or pervasive features of extra-firm cooperation during the mid-1990s, especially in the Y-firm case. This observation is in accordance with the argument on the competitive circumstances of Y-firms stated previously.¹⁸

18. Following upon the Danish 1989-survey, Gjerding & Lundvall (1992) observed that innovative Danish manufacturing firms were focused on their near economic environment, both regarding stimuli for innovation and sources of knowledge. This observation is in accordance with the distribution of answers displayed in table 14.

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The DISKO questionnaire.

Total frequencies, per centage numbers of respondents

ORGANISATION AND MANAGEMENT

1. Has the firm carried through important organisational changes during the period 1993-95?

	Yes	No	Don't know
Mark with X	52,1	46,7	1,3

If No or Don't know, go to question 4

2. Have the organisational changes primarily had as their objective to strengthen:

Mark with X	High extent	Some extent	Small extent	Not at all	Don't know
a. The effectiveness of the daily work	63,3	29,2	2,4	2,5	2,5
b. Co-operation and coordination across the organisation	50,5	32,7	6,5	5,5	4,7
c. The ability to adapt to more turbulent surroundings	49,2	31	10,3	4,9	4,6
d. The ability continuously to develop new products/services	28,9	36,4	17,4	11,5	5,9
e. The ability continuously to strengthen and renew knowledge and know-how	27,7	37,8	17,3	11,3	6,0
f. Other objectives	14,7	9,9	4,4	15,5	55,4

3. Have any of the employees got education/continuous education as a consequence of organisational changes?

	Yes	No	Don't know
Mark with X	59.0	40.4	0.6

By "employees" is understood all employed except the top management

4. Have changes of the firm's management structure taken place during the period 1993-95?

	Yes	No	Don't know
Mark with X	43.6	55.8	0.6

5. Who in the firm organise and follow-up upon work done by employees who have no real management responsibility when the question is about:

Mark with X. More answers are allowed	The employee her/himself	Supervisor/ Middle manager	Top management
a. Daily planning of work	50,3	38,5	10,4
b. Weekly planning of work	27,9	54,6	15,2
c. Follow-up upon working tasks	21,5	57,7	18,8
d. New working areas	10,5	34,6	51,8

6. Does the firm use any of the following ways of organising work?

Mark with X	No	Yes			
		Kindly mark how			
		Below 25%	25-50%	Above 50%	Don't know
a. Cross occupational working groups	45,2	27,4	13	9,2	5,1
b. Quality circles/groups	54,9	19,1	9,0	9,9	7,2
c. Systems for the collection of proposals from employees (not quality circles/groups)	47,6	18,1	7,3	19,0	8,0
d. Planned job rotation	58,3	22,2	7,1	6,6	5,7
e. Delegation of responsibility	11,6	22,3	23,3	39,5	3,3
f. Integration of functions (e.g. sales, production/service, finance)	34,7	29,4	14,4	13,2	8,3
g. Wages based upon quality or results (not piece work)	54,3	16,4	7,0	15,6	6,3

By 'planned job rotation' is understood that job rotation which has been planned by the management (in contrast to job rotation introduced on the employees' own initiative).

By 'integration of functions' is understood that some of the functions get closer to each other by information.

If Yes, go to question 8

7. Are there plans about introducing some of these organisational traits?

Mark with X	Yes	No	Don't know
a. Cross occupational working groups	5,9	84,0	10,0
b. Quality circles/groups	9,3	79,3	11,4
c. Systems for the collection of proposals from employees (not quality)	13,0	74,0	13,0
d. Job rotation	8,6	79,2	12,2
e. Delegation of responsibility	17,0	73,4	9,6
f. Integration of functions (e.g. sales, production/service, finance)	9,7	78,1	12,3
g. Wages based upon quality and results (not piece work)	14,5	71,4	14,1

8. Have the firm extended its use of the above mentioned organisational traits during the period 1993-95, or do you have plans for the near future about an extended use?

Mark with X in both boxes	We have extended the use during 1993-1995			We have plans for an extended use during the near future		
	Yes	No	Don't	Yes	No	Don't
a. Cross occupational working groups	52,1	35,4	12,0	28,9	35,7	35,5
b. Quality circles/groups	47,9	35,5	16,6	27,1	36,3	36,6
c. Systems for the collection of proposals from employees (not						
d. Job rotation	42,0	43,0	15,0	29,7	34,4	36,0
e. Delegation of responsibility	57,1	33,3	9,6	37,0	34,8	28,1
f. Integration of functions (e.g. sales, production/service, fi-	45,8	39,4	14,8	31,8	36,7	31,5
g. Wages based upon quality and results (not piece work)	42,7	41,1	16,2	29,3	37,2	33,6

9. To which extent have the following factors furthered or hampered the organisational development of the firm?

Mark with X Furthering/hampering	Furthered		Hampered		Neither - nor	Not rele-	Don't know
	Much	Little	Much	Little			
a. Attitudes of middle management and supervisors	23,7	24,6	5,5	11,0	18,6	8,3	8,3
b. Qualifications of middle management and supervisors	17,7	23,4	4,8	14,4	22,1	8,7	9,0
c. Attitudes of employees without real management	19,3	26,7	4,2	12,7	22,7	5,3	9,1
d. Qualifications of employees without real management	13,6	27,0	2,6	10,8	29,6	5,9	10,4
e. Co-operation committee	7,7	18,5	0,6	1,5	22,8	37,5	11,4
f. Shop stewards	6,9	17,0	1,8	3,7	24,3	34,6	11,8
g. Qualifications of the firm's consultants	8,0	14,7	0,7	1,3	14,6	48,2	12,4
h. Public support measures	3,8	9,0	0,9	0,7	18,2	55,6	11,7
i. Access to knowledge about initiatives in other firms	7,4	25,5	0,4	1,2	26,2	24,4	14,9
j. Co-operation with educational institutions	7,6	21,8	0,4	1,2	24,6	32,0	12,4

QUALIFICATIONS AND CONTENT OF WORK

10. Is the content of work changed for the employees during the period 1993-95 regarding:

Mark with X Types of tasks and job de-	Changed in the direction of				
	More	Less	Unchanged	Not relevant	Don't
a. Work autonomy	55,4	3,5	37,6	1,0	2,5
b. Weight upon occupational qualifications	46,7	6,4	42,6	1,5	2,8
c. Specialisation	30,2	14,6	47,9	3,2	4,2
d. Routine content of work	6,8	29,2	55,0	4,3	4,6
e. Contact to customers	41,0	4,2	47,4	4,3	3,2
f. Contact to subcontractors	27,0	5,7	53,3	10,2	3,8
g. Contact to other firms	19,4	4,9	64,2	9,6	4,0
h. Co-operation with collea-	43,6	5,2	46,3	1,7	3,2
i. Co-operation with manage- ment	47,3	5,2	42,9	1,2	3,5

By 'subcontractor' is understood another firm/single person who according to an order from your firm deliver a good/service which becomes a part of one the products/services which is produced in your firm.

This definition means that many service firms do not have subcontractors and therefore have to answer 'not relevant'.

11. To which extent have the following conditions contributed to changes in the work content of the employees during the period 1993-95?

Indicate degree of importance. Mark with X	High extent	Some extent	Small extent	Not at all	Don't know
a. Sharper competition	30,2	39,5	12,5	13,0	4,8
b. Better possibilities for the development of new products or services	13,0	35,1	19,7	22,5	9,7
c. Introduction of new technology	28,1	35,7	14,4	16,4	5,5
d. Need for greater flexibility by employees	31,4	37,2	11,5	14,5	5,4
e. Need for better contacts with customers	23,6	32,8	15,8	21,0	6,8
f. Need for better contacts with subcontractors	9,7	25,1	23,5	31,9	9,8
g. Better possibilities for stimulating the development of the employees' qualifications	14,2	40,7	18,1	18,4	8,4
h. Demands and wishes from the employees	9,7	40,3	23,8	18,8	7,4

12. To what extent does the firm use the following possibilities to ensure that the personnel resources are in accordance with the needs of the firm?

Indicate degree of importance. Mark with X	High extent	Some extent	Small extent	Not at all	Don't know
a. By recruitment	51,0	36,0	7,7	2,9	2,5
b. By dismissals	14,3	31,6	33,8	16,0	4,4
c. By moving personnel around between different work functions	12,3	38,3	25,4	19,9	4,2
d. By regulation of working time (overtime, flexitime, distribution of work etc)	13,6	34,6	23,7	24,0	4,1
e. By continued vocational training	18,2	41,5	22,8	14,2	3,3
f. By co-operation with other firms or outsourcing to other firms or individuals	6,6	24,1	24,6	39,0	5,8
g. By other measures	2,0	6,3	9,3	36,4	46,1

13. Have the firm changed the demands when recruiting employees during the period 1993-95 regarding:

Indicate whether the demands have been larger, smaller, unchanged or are of no importance Mark with X	Larger	Unchanged	Smaller	Not important	Don't know
a. Vocational qualifications	46,0	48,4	1,9	1,3	2,4
b. Ability of co-operation and communication	51,1	44,1	1,0	1,1	2,7
c. Ability to readjustment	52,1	42,2	1,2	1,4	3,1
d. Responsibility and quality conscious-	61,8	34,0	0,7	0,8	2,6

14. How important is it for the firm's competitiveness that the employees continuously develop their skills?

Indicate degree of	Decisive	Great	Some	None	Don't know
	28,4	39,4	24,7	4,3	2,6

If 'no importance' or 'don't know' - mark with X and go to question 16.

15. How great importance do the following conditions have for the management's efforts to secure that the employees continuously develop their skills?

Indicate degree of importance. Mark with X	Great	Some	Small	None	Don't know
a. By solving working tasks	48,7	41,3	3,3	1,8	4,4
b. By giving time for sparring with management/other employees	26,7	48,2	13,5	6,0	4,6
c. By planned job rotation	7,2	24,2	22,7	28,1	6,9
d. By organising the work in teams	24,8	35,0	15,2	14,6	6,2
e. By prompting co-operation and network across divisions and groups	26,1	32,8	13,0	15,4	6,8
f. By standard courses/educational schemes (e.g. vocational schools and AMU-centres)	11,7	32,6	24,2	21,4	6,2
g. By educational activities tailored to the firm's needs	24,7	32,3	14,6	16,9	6,6
h. By long term educational planning	18,2	32,8	17,6	18,6	7,2
i. Other measures	2,8	6,2	4,9	18,9	52,1

16. How large a part of the firm's employees has taken part in internal or external courses or educational schemes in 1995 or 1996?

Mark with X	None	More than half	Less than half	Don't know
	10,8	39,5	46,7	3,1

If None or Don't know, go to question 19

17. Which subjects have these courses or training schemes dealt with?

Use only X if the answer is yes.	Who arranged the course/training scheme in question?						
	The firm itself	Vocational schools, AMU-centres and VUC-centres	Universities, business schools etc.	Employer and wage-earner org.	External consultants	Others	Don't know
a. Strategy, market and customer conditions	37,8	6,3	5,8	10,9	31,8	5,9	1,5
b. New technology	31,9	16,0	4,7	7,1	29,4	10,2	0,6
c. Communication, co-operation etc.	34,3	15,1	4,4	10,2	30,2	4,2	1,5
d. Quality management	39,7	18,1	2,1	10,0	25,0	3,5	1,5
e. Working environment	26,9	20,7	1,3	25,3	16,2	6,2	3,4
f. Environmental demands	26,4	14,7	2,4	22,8	20,1	8,7	4,9
g. Leadership development	27,4	4,0	7,5	15,9	38,8	5,1	1,2
h. Subjects custom tailored to the firm's needs	35,6	16,2	2,4	5,6	31,4	7,0	1,8

If the firm is a part of a concern which arranged the above mentioned educational scheme a X is set for 'the firm itself'.

18. At the average, how many working days per year do various employee groups use for education?

Mark with X	1-5 days	More than 5 days	Not relevant
a. Top management	56,9	33,6	7,6
b. Supervisors and middle management	54,1	37,0	7,0
c. Employees without real management responsibility	62,9	25,5	9,9

19. According to your experience how much importance do the employees generally attach to the following conditions?

Mark with X	Much	Some	Small	None	Not relevant	Don't know
a. More knowledge about the management's strategy and visions	34,1	43,0	12,1	5,4	1,6	3,9
b. More challenging work	32,4	46,8	10,8	4,1	2,5	3,4
c. Better wage conditions	30,6	49,8	12,6	2,2	1,6	3,2
d. More flexible working time	14,4	36,1	27,9	13,6	4,1	3,9
e. Greater influence upon planning of work	22,3	46,3	18,7	7,1	2,4	3,2
f. More time for education	10,1	41,5	28,2	12,1	2,9	5,2
g. Possibilities for working at home	2,1	8,6	18,7	26,5	36,9	7,2

NEW PRODUCTS/SERVICES AND NEW TECHNOLOGY

20. Has the firm introduced new products/ services during the period 1993-95 when excepting minor improvements of existing products?

Mark with X	Yes	No
	51,7	47,4

If no - go to question 23

21. Are similar products/services found

Mark with X	Yes	No	Don't know
a. on the Danish market?	76,9	20,2	2,9
b. on the world market?	78,1	10,8	11,2

22. Has the firm used the development of new products/services to conquer *new* customer groups?

Mark with X	Yes	No
a. On the Danish market?	73,8	24,0
b. On the world market?	48,7	48,7

23. Has the firm introduced new technology during the period 1993-95?

Mark with X	No	Yes.		
		Kindly mark how many		
		Below 25%	25-50%	Above 50%
a. New technology based upon information and communication technology	33,7	39,4	24,0	36,3
b. Other forms of new technology	44,8	53,4	23,0	22,9

COMPETITION AND CO-OPERATION

24. Has the competition from other firms changed during recent years?

Mark with X	Yes	No	Don't know
	74,3	22,0	3,7

If No or Don't know, go to question 26

25. In which direction has the competition changed?

Mark with X	The		
Much sharper	A bit sharper	A bit milder	Much milder
53,5	43,9	2,0	0,2

26. To which extent has the firm developed a closer co-operation with the following actors during the period 1993-95?

Mark with X	High extent	Some extent	Small extent	Not at all	Not relevant	Don't know
a. Customers	36,7	44,4	8,1	6,7	2,1	2,0
b. Subcontractors	29,4	41,3	18,2	11,3	5,8	3,0
c. Consultants' firms	4,0	18,4	30,6	30,4	13,2	3,5
d. Knowledge centres such as universities and technological						
e. Educational institutions	3,9	22,2	25,5	34,0	10,3	4,1
f. Public authorities	2,4	17,0	24,5	39,6	11,8	4,8

27. The firm's relationships

Mark with X	Yes	No	Don't know
a. Is the firm a part of a concern?	44,4	54,4	1,2
b. Does the firm primarily see itself as a subcontractor?	20,8	75,5	3,7

Danish **R**esearch **U**nit for **I**ndustrial **D**ynamics

The Research Programme

The DRUID-research programme is organised in 3 different research themes :

- *The firm as a learning organisation*
- *Competence building and inter-firm dynamics*
- *The learning economy and the competitiveness of systems of innovation*

In each of the three areas there is one strategic theoretical and one central empirical and policy oriented orientation.

Theme A: The firm as a learning organisation

The theoretical perspective confronts and combines the resource-based view (Penrose, 1959) with recent approaches where the focus is on learning and the dynamic capabilities of the firm (Dosi, Teece and Winter, 1992). The aim of this theoretical work is to develop an analytical understanding of the firm as a learning organisation.

The empirical and policy issues relate to the nexus technology, productivity, organisational change and human resources. More insight in the dynamic interplay between these factors at the level of the firm is crucial to understand international differences in performance at the macro level in terms of economic growth and employment.

Theme B: Competence building and inter-firm dynamics

The theoretical perspective relates to the dynamics of the inter-firm division of labour and the formation of network relationships between firms. An attempt will be made to develop evolutionary models with Schumpeterian innovations as the motor driving a Marshallian evolution of the division of labour.

The empirical and policy issues relate the formation of knowledge-intensive regional and sectoral networks of firms to competitiveness and structural change. Data on the structure of production will be combined with indicators of knowledge and learning. IO-matrixes which include flows of knowledge and new technologies will be developed and supplemented by data from case-studies and questionnaires.

Theme C: The learning economy and the competitiveness of systems of innovation.

The third theme aims at a stronger conceptual and theoretical base for new concepts such as 'systems of innovation' and 'the learning economy' and to link these concepts to the ecological dimension. The focus is on the interaction between institutional and technical change in a specified geographical space. An attempt will be made to synthesise theories of economic development emphasising the role of science based-sectors with those emphasising learning-by-producing and the growing knowledge-intensity of all economic activities.

The main empirical and policy issues are related to changes in the local dimensions of innovation and learning. What remains of the relative autonomy of national systems of innovation? Is there a tendency towards convergence or divergence in the specialisation in trade, production, innovation and in the knowledge base itself when we compare regions and nations?

The Ph.D.-programme

There are at present more than 10 Ph.D.-students working in close connection to the DRUID research programme. DRUID organises regularly specific Ph.D-activities such as workshops, seminars and courses, often in a co-operation with other Danish or international institutes. Also important is the role of DRUID as an environment which stimulates the Ph.D.-students to become creative and effective. This involves several elements:

- access to the international network in the form of visiting fellows and visits at the sister institutions
- participation in research projects
- access to supervision of theses
- access to databases

Each year DRUID welcomes a limited number of foreign Ph.D.-students who want to work on subjects and projects close to the core of the DRUID-research programme.

External projects

DRUID-members are involved in projects with external support. One major project which covers several of the elements of the research programme is DISKO; a comparative analysis of the Danish Innovation System; and there are several projects involving international co-operation within EU's 4th Framework Programme. DRUID is open to host other projects as far as they fall within its research profile. Special attention is given to the communication of research results from such projects to a wide set of social actors and policy makers.

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