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**New concepts for a new age:
Information Service Organizations
and Mental Information Work**

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New concepts for a new age:
Information Service Organizations and Mental Information Work

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1. Introduction

In Western countries a number of trends can be discerned that profoundly change the environment of work organizations, and seem to affect the form that organizations take, as well as the nature of the work done. First of all, there is the conspicuous growth of the service sector up to levels of 70-80% of total employment, at the cost of industry and agriculture (Cornetz, 1991). While services have long been considered as insignificant by-effects of production with little or no economic value, they are now seen as vital for the functioning and the development of the economy (Riddle, 1987). The growth comes particularly from the so-called 'intermediary services', that are rendered to other firms. Within this category one finds knowledge-based professional services like accountancy, consultancy, legal advice, which seem to grow most rapidly (Gershuny, 1987). It is important to note that the developments of the service sector can not be completely understood as 'sectoral shift'. To some degree there is a 'mutual penetration' of traditional sectors, in which service organizations are incorporated in the production process of industrial firms, and industrial firms make certain internal services available to other firms (Roe et al., 1992).

Secondly, there is the development and spread of information technology (IT), including so-called 'telematics'. IT is affecting organizations in a variety of ways. On the one hand it is being used to enhance the efficiency and effectiveness of organizational processes by substituting and integrating functions that were formerly fulfilled by other means, based on

written and spoken language. On the other hand it brings numerous innovations of products and services. In this way it adds services like e.g. telebanking, teleshopping, and tele-education to the product mix of traditional organizations, and contributes to the appearance of new organizations engaged in the marketing completely novel services (e.g. tele-information services). Another impact of IT comes from the use of electronic transportation and processing capabilities for shortening, rerouting, or even redesigning organizational processes. So-called tele-homework can be mentioned as an example. Internal innovations of organizations are just one outcome. Through its role in the renewal and expansion of the communication infrastructure, which now ranges from the local to the global level, IT offers opportunities for creating completely new organizational arrangements, based on new types of relationships with customers and suppliers, and new forms of cooperation with business partners, unrestrained by spatial and temporal barriers. Although in the past industry has been slow in fully utilizing the possibilities of IT (Roe, 1989), one now sees a tendency towards a strategic utilization of IT, especially by larger international corporations.

A third development concerns the rise of new principles of business management. This has to do with the globalization of the economy, which has resulted from the liberalization of trade (GATT) and the development of a world-wide logistic infrastructure. It can be observed that the new market situation, with its high level of competition has lead to the emergence of new ideas about how to organize and operate business firms. One sees an increasing market orientation, reflecting itself in shortening of product life cycles, product differentiation, product innovation, quality and speed. Production processes are being accelerated, while stocks are being reduced. At the same time there is a tendency to reduce corporate activities to 'core business' and to 'buy-in' other goods and services. In order to reduce environmental uncertainty and obtain the advantage of economy of scale, several forms of strategic cooperation (e.g. technological agreements, co-makership) emerge.

These developments cannot remain without consequences for work organizations. On the contrary, one may expect old types of organizations to decline, and new types of organizations to develop. Organizations may be hypothesized to become smaller, more flexible, spatially more distributed, more embedded in networks, and so on. Some authors have put forward new concepts of organizations, in order to grasp these features like e.g. 'the network organization' (Miles & Snow, 1986), and the 'post-bureaucratic organization' (Moss

Kanter, 1990). Our own hypothesis is that a new type of organization is emerging, that can be designated as '*Information-Service-Organization*' or *ISO*. An ISO is defined as a service-producing organization that makes intensive use of information technology in its primary process (Roe, Taillieu, Van den Berg, Kersten, & Van der Wielen, 1992). We expect ISO's to differ from other organizations in their architecture and way of operation.

Changes in the nature of work can be inferred as well. Traditional service work is very different from production work, as services are intangible, produced in interaction with a client, and consumed instantaneously. Modern technology, however, has changed the nature of service work. Nowadays services, or at least components, can be produced beforehand and stored electronically. In fact, the information component of services has increased considerably (Rada, 1987). As a result there is a growing number of occupations that deal with gathering, producing, processing, modifying, and distributing information. The handling of information with computers, and the increased importance of knowledge in many occupations, are likely to affect work in number of ways. First, by causing an increasing 'mentalization' of work, in the sense that physical components in work activity are reduced in favour of an increase of mental operations (cf Zuboff, 1988) and related to this, a change of work objects: tangible, material objects are being replaced by information objects and information systems. Changes in work tools and working conditions are likely as well. Our hypothesis is that a new class of work is developing, called '*Mental Information Work*' or *MIW*, which can be defined as work with information and information objects in which mental activities predominate (Roe & Meijer, 1990). Our expectation is that MIW differs from other types of work both in content and setting. MIW might be more prevalent in ISO's, but it might also be found to be distributed across different types organizations.

We consider the developments outlined above as being of utmost importance for Work & Organizational (W&O) Psychology. If the reported trends do indeed take place, and the expected the organizational landscape does change as expected, our discipline will be confronted with formidable challenges. At the theoretical level we will have to question the validity of concepts and theories that were developed in the past, especially those relating to organizational structures and processes, personnel management, and working conditions. In fact, we might find ourselves stuck with theoretical knowledge about a reality that no longer exists, and be forced to start developing new theories from the very beginning. At the level

of professional activity, we might, similarly, discover a need of new methods of assessment and intervention. Before drawing such conclusions, there is, in our view, a need to study the ecology of work in a descriptive way, taking an inventory of types of organizations and types of work that presently exist and find out what is actually happening.

2. Aim and method of the study

Aim. This paper summarizes some results of two survey studies that were performed with the aim of describing the situation with regard to work and organization in the Netherlands in the year 1991. The first study (Roe et al., 1992) pertains to work organizations in the Dutch service sector, which accounts for 70% of the total employment, and 85% of all companies. The aim of this study is to describe organizations in a number of respects, to establish whether ISO's do in fact exist, and, if so, to identify in what way they differ from other organizations. The second study deals with the work activities and work settings of individual workers in all sectors of the Dutch economy. Its aim is to describe the work, to identify MIW as a separate category of work, and to compare it to other forms of work.

Apart from obtaining a description of the empirical reality, our studies aim at the development of new concepts by which new types of organization and work can be identified. They try to assign a more precise meaning to the heuristic concepts of ISO and MIW, and look for a refinement by searching for concepts for particular sub-types of organization and work. The relationship of these new concepts to those of the traditional classification systems used in economical statistics have been explored as well. Here we will report only major findings.

Instruments. Two questionnaires, with a similar content, were used. The first questionnaire was administered by mail among firms. It included questions on: the Organization, i.e. services/products, activities, business aim; Environment, i.e. market relationships, environmental uncertainty, contacts with customers, suppliers and other firms, number of establishments; Personnel, i.e. work force composition, types of employment, frequent jobs and vacancies, recruitment and selection methods, absenteeism and turnover; Time, i.e. working-hours, shift system, 24-hours service; Location, i.e. place of work, several aspects of home-work; Information technology, i.e. types of computer hardware and software, in- and output devices, networks, and communication tools. The second questionnaire served as the basis

for a telephone interview among people doing paid work. The questions pertain to the Job, i.e. job title, type of firm, tasks and activities, and aspects of Environment, Time, Place and Information technology mentioned before.

Sample. For the first study we drew a stratified sample of 5568 Dutch firms, equally divided over the 27 branches in the service sector. Only 845 questionnaires were usable for analysis, which comes down to a response rate of 15,6% (158 were sent back as undeliverable). A phone call to 20 organizations revealed as most frequent reasons for non-participation a lack of time or interest. Certain branches, including Religious organizations, Public administration, Railroad companies and Other service organizations, are somewhat underrepresented in the final sample. The same is true for very small organizations with four or less employees. It should be stressed here, that most service organizations are very small: the median number of employees is only 2.

For the second study we used a sample of 3713 randomized phone numbers of private households. In total 1168 respondents were interviewed. (After three trials 542 numbers gave no answer; the number of refusals was 714; in 1289 cases nobody doing paid work was available.) The response rate is 66,2%. The resulting sample can be considered to be representative of the Dutch working population with respect to sex and branch of work. Highly educated people are slightly overrepresented.

Analysis. The search for ISO's and MIW was carried out by means of cluster analyses (SPSS-X; Quick Cluster). This program selects a number of well-separated cases. The other cases are joined in order to provide the classification cluster centres. The final clusters are formed by assigning each case to the nearest cluster centre. Descriptions are given by means of cross-tabulation of types of organizations and types of work on the one hand, and other variables on the other hand. Differences between groups have been analyzed by one-way analyses of variance. Most dependent variables are dichotomous.

3. Results on organizations

3.1. Identifying Information Service Organizations

Cluster analysis on the most important activities with a solution of 10 clusters resulted in 4 large clusters of organizations and 6 very small ones. Figure 1 shows the mean scores of the large clusters on the activity scales. The first cluster shows a majority of activities related to information. Nearly all organizations gather, enter, process and store information (> 85%). Besides, most of them are advising and informing people (> 75%). Because they provide services by means of information processing, we identify these organizations as *Information Service Organizations (ISO's)*. Their typical activities, as revealed by open question, are: editing newspapers and journals, giving financial information, doing research, mediating in insurance, organizing of auctions, administering, etc. Remarkably enough, ISO's are represented in nearly all of the 27 branches, except in the branches Retail trade, Catering services, Renting movables and Religious organizations. The information service that characterizes ISO's is not bound up with specific services or products. 50% of the ISO's have 10 or less employees. Although this number is not very high, it should be remarked that it is above the median.

Most of the organizations in the second cluster have as activities advising and informing people. For that reason we call them Advisory Organizations. They are frequently found in the branches Business services, Employers' organizations and unions and Insurance. These branches belong to the sector of intermediary services. The median number of employees is 6.

All of the organizations in the third cluster display as activity the transportation of goods. Nearly half of them distribute goods, and more than one third carry people as well. The name chosen is Transport Organizations. These organizations are strongly represented in the branches Inland and sea shipping, Railroad companies, Road haulage, Communication companies, Aviation and Auxiliary transport concerns. Having a median of 20 employees they are relatively large.

Figure 1. Profiles of activities in clusters of organizations.

The profile of the fourth cluster is less clear. The activities mentioned most frequently are selling goods (43%) and advising people (21%). But these activities do not differentiate this cluster from the others. Hence the name Mixed Organizations. Many of these organizations belong to the branches: Catering services, Renting movables, Retail trade, Sports and recreation, Education and Religious organizations. A special characteristic of this cluster is, that half of the organizations have only 2 employees or less.

3.2. Characteristics of ISO's

We will compare the ISO-category with group on the variables relating to time, place and IT. The results for time are summarized in Table 1.

In ISO's fixed working-hours are more frequent than in other service organizations (63%), while flexi-time (variable beginning and end of work), shift system and 24-hours service are less frequent (14%, 11% and 14%). These results suggest that ISO's have rather regular working-hours.

Table 1. Mean number of opening hours and percentages of organizations in ISO and total group with several time arrangements.

	mean hours open	fixed working-hours	variable working-hours	flexi-time	shift-system	24-hours service
ISO	8.88	63*	23	14	11	14
total	9.47	53	27	20	10	13

* difference with the other groups is significant at $p < .05$

Table 2 gives an overview of the places people work in the ISO-category.

Table 2. Mean percentages of employees in ISO and total group with several places of work and mean hours of homework per week.

	fixed place of work inside organization	changing places of work	fixed place of work outside organization	working at home sometimes	mean hours homework per week
ISO	71	25	4	12	1.04
total	65	30	4	10	1.10

Typically, employees of ISO's work on a fixed place inside the organization (71%). Changing places of work are relatively scarce (25%). Although the differences are not large, the data suggest that many ISO's are offices with workers 'sitting on a chair from nine to five'.

The percentage of employees working sometimes at home (12%) is only slightly higher than in the total group. The mean duration of homework is 1 hour per week.

Data on IT are given in tables 3 (hardware) and 4 (networks). It appears that, in general, the penetration of the IT in the category of ISO's is relatively high.

Table 3. Percentages of organizations in ISO and total group using several kinds of computer hardware and in/output devices and PC-ratio.

	main-frame	mini-comp.	terminal	PC	mob. PC	modem	printer	scanner	PC-ratio
ISO	23**	24*	38**	69	37**	48**	74**	7	54*
total	10	15	22	63	19	34	53	6	44

* difference with the other groups is significant at $p < .05$

** difference with the other groups is significant at $p < .01$

In comparison to the total group ISO's use more networks. ISO's have more internal networks (38%) and more computer connections with partners and clients (both 19%). The same kind of data are available about computer software and communication technologies. Nearly all kinds of software, except financial-administrative programs are used more frequently by ISO's. The use of E-mail and EDI is also relatively high in ISO's (19% and 9%).

Table 4. Percentages of organizations in ISO and total group using several kinds of networks.

	internal network	external network	computer connection clients	computer connection suppliers	computer connection partners	computer connection establishments
ISO	38*	15	19**	16	19**	31*
total	28	14	9	14	9	17

* difference with the other groups is significant at $p < .05$

** difference with the other groups is significant at $p < .01$

4. Results on work

4.1. Identifying Mental Information Work

In identifying MIW we have used data on the work object of the respondents, i.e. 'working mainly with 'things, people, or data', and answers from the question whether the person's work can be considered as 'brainwork, handwork, or both'. Table 5 gives the results in the form of a cross-table.

Table 5. Cross-table with numbers of people 'working mainly with things, people, or data' and doing 'brainwork, handwork, or both'.

	things	people	data
brainwork	17	222	198
handwork	155	101	30
both	59	151	71

It appears that four distinct types of work can be discerned.

I. Brainwork with data

We recognize this type of work as Mental Information Work (MIW). This category comprises the work of clerks (26,5%), managers (13,5%), R & D (11,5%), logistic planners (7,5%), secretaries (7%), business service and other occupations (7%). A large part of the MIW is done in large banks and in insurance companies.

II. Brainwork with people

This category comprises managers (31,5 %), teachers and trainers (22%), sales and business service (13,5%), social workers (7%). Most of them work in the branch Other Services (56%).

III. Handwork with people

This is represented among the following occupational groups: nursing and caring jobs (34%), sales and business service (10%), (para-)medical (8%), production (7%). Of the people doing this work 63,5% is employed in the branch Other Services.

IV. Handwork with things

Occupational groups represented here are: production workers (44%), cleaning and civil service jobs (11,5%), transport (11,5%) and agriculture (11,5%). This work is mainly done in industry (26,5%).

4.2. Characteristics of MIW

The following tables give the results for variables relating to time, place and IT. Table 6 presents the results of the questions relating to working hours.

Table 6. Percentages of workers in MIW and total group with several time arrangements.

	fixed working-hours	shiftwork	flexi-time	variable working-hours
MIW	58.9	3.1*	17.2*	20.8
total	67.4	5.9	8.1	18.6

* difference with the other groups is significant at $p < .05$

** difference with the other groups is significant at $p < .01$

This table indicates that two third of the working people still has fixed working hours and a full-time job. It appears that in the group MIW the percentage with flexible working hours is significantly higher than in other groups.

Table 7 presents some results with respect to the location of the respondents' work.

Table 7. Percentages of workers in MIW and total group with a fixed place of work or more places.

	more places of work	a fixed place of work
MIW	34.8**	65.2**
total	46.7	53.3

** difference with the other groups is significant at $p < .01$

The table makes clear that the majority of workers doing MIW has a single, fixed place where the work should be done. This is higher than in the total group.

Other data have shown that MIW is done in small groups, 40% of all persons doing MIW work alone, 14% work with 1 or 2 colleagues only.

Table 8 and 9 presents information with respect to the use of IT.

Table 8. Percentages of workers in MIW and total group using several kinds of hardware.

	computer	P.C.	mini com- puter	mainframe	modem	network
MIW	87.9**	72.7	16.7*	32.3**	23	57*
total	53.6	44.7	7.6	14.2	5	29

* difference with the other groups is significant at $p < .05$

** difference with the other groups is significant at $p < .01$

As one can see from this table nearly all workers (88%) in the MIW category use a computer in their work. The PC is their most common tool. The last column shows, that more than half of the workers doing MIW works with networks.

5. Discussion

The empirical results presented above, although giving only a view of the situation at a single moment (beginning of 1991), confirm that the reality of organization and work differs from the stereotypes inherited from the past. The image of the typical organization as a big industrial company with many hierarchical levels, and the image of work as be production work performed in a group of colleagues, do not seem to hold any more. The typical organization of this moment is engaged in services, which to a considerable part consists of information processing. The 'Information Service Organization' identified on the basis of the profile of activities seems to be different from other service organizations. Our data show that it is characterized by an intensive use of information technology for internal functions, as well as for the interaction with other firms and establishments. But at the same time it

appears that this type of organization lacks the characteristics of flexibility and dispersion that we expected on the basis of trends reported in the literature. Most of the work is still being done at fixed working hours and on fixed places of work. While, in principle, IT enables flexible arrangements in time and space, organizations do not yet have grasped these possibilities.

The results of the survey on work are to some degree similar. We have identified four types of work, one of which appeared to match our concept of Mental Information Work. MIW is characterized by a high incidence of 'brain-work' and activities involving information. Most MIW is performed in fixed places, but working hours are less frequently fixed when compared to other types of work. MIW is done in larger organizations but in small work units. The use of IT is very high indeed.

Although MIW will be more frequently seen in ISO's, it is represented in industrial organizations as well (17%). And ISO's, as they are service oriented, will include other types of work too, like e.g. brainwork with people. The categories of organizations and work that we have dealt with here, are rather broad. Further analyses have shown that they can be broken down into more homogeneous sub-categories, some of which are more flexible in terms of time and place of work.

Although it is too early to draw firm conclusions on the degree to which W&O psychology covers the phenomena occurring in the present-day organizational landscape, some deficiencies of our theories and methods may already be pointed out. First of all, W&O psychology has little to say about the small organizations, i.e. the self-employed and firms with less than ten people that are dominating the service sector. And much of what is has to say, e.g. about managerial decision making, workers participation, recruitment and selection, career development etc. seems to be of limited relevance, as it in fact refers to behaviour patterns in large bureaucratic firms. Secondly, W&O psychology lags behind in its knowledge of firms that make intensive use of information technology. There is an extensive literature on industrial and office automation, to be sure (eg. Roe, 1989), but too much attention has been given to the process of technological change itself, and too little to the actual functioning of firms where IT has been fully incorporated. In the third place, little is yet known about the work, called MIW, in which mental activities dominate over physical activity, and tasks are being executed with computers and contacts with others are electronically mediated. A proper understanding of this work calls for new methods of analysis and

design (cf Wall et al., 1990; Meijer & Roe, 1993), and for new studies on the demands and the impacts experienced by the workers.

Further research, including longitudinal comparisons, will have to show whether the state of affairs that we have observed in our study is a stable one, or whether the changes mentioned in the introduction do in fact occur. W&O psychology, however, should not wait for the results of such research. We see sufficient reason for carrying out in-depth studies on phenomena that already can be observed in the field where services, information technology, and new business philosophies come together.

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