New Concepts for a New Age: Information Service Organizations and Mental Information Work

Robert A. Roe, Peter T. Van den Berg, Fred R.H. Zijlstra, René J.D. Schalk, Tharsi C.B. Taillieu, and Jos M.M. Van der Wielen
Tilburg University, The Netherlands

To describe and conceptualize new forms of work and organization a questionnaire survey in service organizations (n = 845), and a telephone survey among workers (n = 1168) were held. New concepts are introduced to identify the types of work and organization found, i.e. "Information Service Organization" (ISO) and "Mental Information Work" (MIW). ISOs are characterized by activities such as collecting, storing, and processing data; advising people; and informing people. They also make a lot of use of IT (computers, programs) and electronic network connections. Most ISOs appear to be traditional in terms of working hours and places of work. MIW is a form of knowledge work characterized by mental manipulations of information; IT is often used. Flexi-time is relatively frequent in MIW, but most people work on a fixed place of work.

INTRODUCTION

Several trends, which 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, can be discerned in Western countries.

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). Where services have long been considered as insignificant by-effects of production, with little or no economic value, they are seen now 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, and legal advice, which seem to grow most rapidly.

Requests for reprints should be addressed to Robert A. Roe. Work and Organization Research Centre, Tilburg University, P.O. Box 90153, 5000 LE Tilburg, The Netherlands.

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(Gershuny, 1987). It is important to note that the developments of the service sector cannot be explained completely by "sectoral shift". 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, Taillieu, Van den Berg, Kersten, & Van der Wielen, 1992).

Second, 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 many innovations of products and services. In this way it adds services like, for example, telebanking, teleshopping, and tele-education to the product mix of traditional organizations, and contributes to the appearance of new organizations engaged in the marketing of 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 telehomework 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 co-operation 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 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 led 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 speeded up, while stocks are being reduced. Simultaneously there is a tendency to reduce corporate activities to "core business" and to "buy-in" other goods and services. To reduce environmental uncertainty and obtain the advantage of economy of scale, several forms of strategic co-operation (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. As a result, organizations may
be expected to become smaller, more flexible, spatially more distributed, more embedded in networks, and so on. Some authors have put forward new concepts of organizations to grasp these features, 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, which can be designated as "Information Service Organization" or ISO. We define an ISO as a service-producing organization that makes intensive use of information technology in its primary process (Roe et al., 1992). We expect ISOs to differ from other organizations in their architecture and mode of operation.

Changes in the nature of work can also be inferred. 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, a growing number of occupations 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 (e.g. 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 also likely. 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 ISOs, but it might also be distributed across different types of 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 organizational landscape does change as expected, our discipline will be confronted with formidable challenges. At the theoretical level we must 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.
AIM AND METHOD OF THE STUDY

Aim

This paper summarizes some of the results of two survey studies that were done with the aim of describing the situation concerning work and organization in the Netherlands in 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 some respects, to establish whether ISOs 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 subtypes 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 only report major findings.

Instruments

Two questionnaires, with a similar content, were used. The first questionnaire was administered by mail among firms. It included questions on: (1) the organization, i.e. services/products, activities, business aim; (2) environment, i.e. market relationships, environmental uncertainty, contacts with customers, suppliers and other firms, number of establishments; (3) personnel, i.e. work force composition, types of employment, frequent jobs and vacancies, recruitment and selection methods, absenteeism and turnover; (4) time, i.e. working-hours, shift system, 24-hours service; (5) location, i.e. place of work, several aspects of home-work; (6) 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 as mentioned before. In both studies the “activities” were described with reference to Fine’s (1955) classification system.

Sample

For the first study we drew a stratified sample of 5568 Dutch firms, divided equally over the 27 branches in the service sector. Only 845 questionnaires were usable for
analysis, which comes to a response rate of 15.6% after subtraction of 158 questionnaires sent back as undeliverable. A phone call to 20 organizations revealed lack of time or interest to be the most frequent reasons for non-participation. Certain branches, including religious organizations, public administration, railway companies, and other service organizations, are somewhat under-represented in the final sample. The same is true for very small organizations with four or fewer employees. It should be stressed here, that most service organizations are very small: the median number of employees is only two.

For the second study we used a sample of 3713 randomized phone numbers of private households. After three trials 542 numbers gave no answer; in 1289 cases nobody doing paid work was available. In the resulting group of 1882 cases, 714 people refused co-operation, and 1168 respondents were interviewed, thus yielding a response rate of 66.2%. The resulting sample can be considered as representative of the Dutch working population with respect to sex and branch of work. Highly educated people are slightly over-represented.

**Analysis**

The search for ISOs was carried out by means of cluster analyses (SPSS-X; Quick Cluster). This program selects some well-separated cases. The other cases are joined to provide the classification cluster centres. The final clusters are formed by assigning each case to the nearest cluster centre. Descriptions are given in tabulations of types of organizations and types of work on the one hand, and other variables on the other hand. In the case of categorical dependent variables ("yes" or "no") the differences between groups have been analysed by the chi-square test. On continuous variables ANOVAs have been done.

**RESULTS ON ORGANIZATIONS**

**Identifying Information Service Organizations**

Cluster analysis on the most important activities with a solution of ten clusters resulted in four large clusters of organizations and six very small ones. Figure 1 shows the mean scores of the large clusters on the activity scales.

The first cluster shows most activities being related to information. Nearly all organizations gather, enter, process, and store information (85%). Most of them are also advising and informing people (75%). Because they provide services by information processing, we identify these organizations as ISOs. 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, ISOs are represented in nearly all the 27 branches, except in the branches retail trade, catering services, renting movables and religious organizations. The information service that characterizes
FIG. 1. Profiles of activities in clusters 1 and 2.
Fig. 1 (cont). Profiles of activities in clusters 3 and 4.
ISOs is not bound up with specific services or products. Fifty per cent of the ISOs have ten or fewer employees. Although this number is not very high, it should be noted that it is above the median.

All the organizations in the second cluster display as their 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, railway companies, road haulage, communication companies, aviation and auxiliary transport concerns. Having a median of 20 employees they are relatively large.

Most of the organizations in the third cluster have as their 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 six.

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 moveables, retail trade, sports and recreation, education and religious organizations. A special characteristic of this cluster is that half of the organizations have only two (or fewer) employees.

Characteristics of ISOs

We compared the ISOs with the other organizations on the variables relating to time, place and IT. The results for time are summarized in Table 1. Fixed working-hours are more frequent in ISOs than in other service organizations (63%), while flexi-time (variable beginning and end of work), shift work and 24-hour service are less frequent (11%, 11%, and 14% respectively). Although the differences between ISOs and non-ISOs are not significant, these results suggest that ISOs have regular working-hours.

<table>
<thead>
<tr>
<th></th>
<th>Mean hours open</th>
<th>Fixed working-hours</th>
<th>Variable working-hours</th>
<th>Flexi-time</th>
<th>Shift system</th>
<th>24-hour service</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO</td>
<td>8.88</td>
<td>63</td>
<td>25</td>
<td>11</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Non-ISO</td>
<td>9.47</td>
<td>51</td>
<td>34</td>
<td>15</td>
<td>11</td>
<td>14</td>
</tr>
</tbody>
</table>

1 In each group the percentages of the second, the third and the fourth add up to 100%.
TABLE 2
Mean Percentage of Employees in ISO and non-ISO Group with Several Places of Work\(^1\) and Mean Hours of Homework per Week

<table>
<thead>
<tr>
<th></th>
<th>Fixed place of work inside organization</th>
<th>Changing places of work</th>
<th>Fixed places of work outside organization</th>
<th>Working at home sometimes</th>
<th>Mean hours homework per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO</td>
<td>71</td>
<td>25</td>
<td>4</td>
<td>12</td>
<td>1.04</td>
</tr>
<tr>
<td>Non-ISO</td>
<td>64</td>
<td>31</td>
<td>4</td>
<td>9</td>
<td>1.09</td>
</tr>
</tbody>
</table>

\(^1\) In each group the percentages in the first three columns add up to 100%.

Table 2 gives an overview of the places where people work in the ISO category. Typically, employees of ISOs 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 ISOs are offices with workers "sitting on a chair from nine to five". The percentage of employees sometimes working at home (12%) is only slightly higher than in the other organizations. The mean duration of home work 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 IT into the category of ISOs is relatively high. To get an index that is independent of the size of the organization, personal computer (PC) ratio has been computed. This is the number of PCs in the organization divided by the number of employees. In the category of ISOs the mean PC ratio is 0.54 and in the other category it is 0.42 (t = 2; P < 0.05).

Compared to the other organizations, ISOs use more networks. ISOs have more internal networks (38%) and more computer connections with clients, partners and other establishments (19%, 15%, and 31%, respectively). The same kind of data is available about computer software and communication technologies. Nearly all kinds of software, except financial-administrative programs, are used more frequently by ISOs. The use of electronic mail (E-mail) and electronic data interchange (EDI) is also relatively high in ISOs (19% and 9%).

RESULTS ON WORK

Identifying Mental Information Work

In identifying MIW we have used data on the primary work object of the respondents, i.e. "data", "people" or "things", and answers from the question whether the person's work can be considered as "brainwork, handwork, or both". Table 5 gives the results The \(\chi^2\) of this table is 276 (df = 1; P < 0.01), showing that the work object is not independent of the categories "brainwork", "handwork", and
TABLE 3
Percentages of Organizations in ISO and non-ISO group Using Serval Kinds of Computer Hardware and In/Output Devices, and $\chi^2$

<table>
<thead>
<tr>
<th></th>
<th>Mainframe</th>
<th>Mini-comp.</th>
<th>Terminal</th>
<th>PC</th>
<th>Mob. PC</th>
<th>Modem</th>
<th>Printer</th>
<th>Scanner</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO</td>
<td>23</td>
<td>24</td>
<td>38</td>
<td>69</td>
<td>37</td>
<td>48</td>
<td>74</td>
<td>7</td>
</tr>
<tr>
<td>Non-ISO</td>
<td>8</td>
<td>13</td>
<td>20</td>
<td>62</td>
<td>17</td>
<td>32</td>
<td>51</td>
<td>6</td>
</tr>
</tbody>
</table>

$\chi^2$ 22.6** 7.7** 15.8** 1.9 22.0** 10.2** 16.2** 0.0

** $P < 0.01$.

Mini-comp, mini-computer; Mob. PC, mobile personal computer; PC, personal computer.

TABLE 4
Percentages of Organizations in ISO and non-ISO group Using Serval Kinds of Networks, and $\chi^2$

<table>
<thead>
<tr>
<th></th>
<th>Internal network</th>
<th>External network</th>
<th>Computer connection clients</th>
<th>Computer connection suppliers</th>
<th>Computer connection partners</th>
<th>Computer connection establishments</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO</td>
<td>38</td>
<td>15</td>
<td>19</td>
<td>16</td>
<td>15</td>
<td>31</td>
</tr>
<tr>
<td>Non-ISO</td>
<td>28</td>
<td>14</td>
<td>9</td>
<td>14</td>
<td>8</td>
<td>16</td>
</tr>
</tbody>
</table>

$\chi^2$ 5.2* 0.2 13.3** 0.6 4.5* 11.7**

* $P < 0.05$;  ** $P < 0.01$.

"both". As expected, brainwork is done more frequently with data and people, and handwork is more frequently done with things. It appears that four distinct types of work can be discerned.

**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%), and business service (7%). The other groups are small and spread over many occupations. A large part of the MIW is done in large banks and in insurance companies.

TABLE 5
Numbers of People "Working Mainly with Things, People, or Data" and doing "Brainwork, Handwork, or Both"

<table>
<thead>
<tr>
<th></th>
<th>Things</th>
<th>People</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brainwork</td>
<td>17</td>
<td>222</td>
<td>198</td>
</tr>
<tr>
<td>Handwork</td>
<td>155</td>
<td>101</td>
<td>30</td>
</tr>
<tr>
<td>Both</td>
<td>59</td>
<td>151</td>
<td>71</td>
</tr>
</tbody>
</table>
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%).

Handwork with people This represents the following occupational groups: nursing and caring jobs (34%), sales and business service (10%), (para-)medical (8%), and production (7%). Of the people doing this work 63.5% are employed in the branch “other services”.

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%).

Characteristics of MIW

The following tables give the results for variables relating to time, place, and IT. Table 6 presents the results of the question relating to working hours. The $\chi^2$ is 33.9 ($df = 3; P < 0.01$) showing that the groups differ in their answers. It appears that in the MIW group the percentage with flexible working hours is higher than in other group.

Table 7 presents the results of the question about the location of the respondents’ work. The table clearly shows that most workers doing MIW have a fixed place of work. This percentage is higher than in the non-MIW group, $\chi^2 = 9.8$ ($df = 1; P < 0.01$).

**TABLE 6**

<table>
<thead>
<tr>
<th>Percentage of Workers in MIW and non-MIW Groups with Several Time Arrangements¹</th>
<th>Fixed working-hours</th>
<th>Shiftwork</th>
<th>Flexitime</th>
<th>Variable working-hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIW</td>
<td>58.9</td>
<td>3.1</td>
<td>17.2</td>
<td>20.8</td>
</tr>
<tr>
<td>Non-MIW</td>
<td>68.3</td>
<td>7.2</td>
<td>5.7</td>
<td>18.8</td>
</tr>
</tbody>
</table>

¹ In each group the percentages add up to 100%.

**TABLE 7**

<table>
<thead>
<tr>
<th>Percentage of Workers in MIW and non-MIW Groups with a Fixed Place of Work or More than One Place¹</th>
<th>More than one place of work</th>
<th>Fixed place of work</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIW</td>
<td>34.8</td>
<td>65.2</td>
</tr>
<tr>
<td>Non-MIW</td>
<td>47.0</td>
<td>53.0</td>
</tr>
</tbody>
</table>

¹ In each group the percentages add up to 100%.
TABLE 8

Percentages of Workers in MIW and non-MIW group Using Several Kinds of Hardware and \( \chi^2 \)

<table>
<thead>
<tr>
<th></th>
<th>Computer</th>
<th>PC</th>
<th>Mini-computer</th>
<th>Mainframe</th>
<th>Modem</th>
<th>Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIW</td>
<td>88</td>
<td>73</td>
<td>17</td>
<td>32</td>
<td>23</td>
<td>57</td>
</tr>
<tr>
<td>Non-MIW</td>
<td>48</td>
<td>41</td>
<td>5</td>
<td>9</td>
<td>11</td>
<td>26</td>
</tr>
<tr>
<td>( \chi^2 )</td>
<td>105**</td>
<td>69**</td>
<td>32*</td>
<td>80**</td>
<td>19**</td>
<td>73**</td>
</tr>
</tbody>
</table>

** \( P < 0.01 \).

Table 8 presents information with respect to the use of IT. It can be seen from this that 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 the workers doing MIW work with networks.

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 being production work done in a group of colleagues, do not seem to hold any more. The typical organization of today is engaged in services, which to a considerable part consist of information processing. The "Information Service Organization" identified by 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, and to some degree for the interaction with other firms and establishments. But it also appears that this type of organization lacks the characteristics of flexibility and dispersion that we expected from the reports in the literature. Most of the work is still being done in fixed working hours and at fixed places of work. While, in principle, IT enables flexible arrangements in time and space, organizations have not yet grasped these possibilities. However, it is possible that these flexible arrangements are reserved for specific jobs and management levels in organizations. A more detailed study on this should be done in the future.

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 "brainwork" and activities involving information. Most of MIW is done in fixed places, but working hours are less frequently fixed than in 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 seen more frequently in ISOs, it is represented in industrial organizations as well (17%). And ISOs, 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 broad. Further analyses have shown that they can be broken down into more homogeneous subcategories, some of which are more flexible in terms of time and place of work. Cluster analysis on the ISOs revealed 16 subclusters. The three largest clusters are consulting, sales, and mediation. They consist of 49, 18, and 7 organizations respectively (see Roe et al., 1992). The activities of the mediating group bear on valuations, auctions, and interim-management. In this group, only 25% of the employees has a fixed place of work and 68% has changing places of work. The differences between the ISO groups are significant: $F(60,2) = 5.4, P < 0.01, F(60,2) = 4, P < 0.05$, respectively.

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 be pointed out. First of all, W&O psychology has little to say about small organizations, i.e. the firms with self-employed directors and fewer than ten people, that are dominating the service sector. And much of what has been said, for example about managerial decision making, worker participation, recruitment and selection, career development, etc. seems of limited relevance, as it in fact refers to behaviour patterns in large bureaucratic firms. Second, 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, 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 (e.g. Roe, 1989). In the third place, little is yet known about the work, called MIW, in which mental activities dominate over physical activity, tasks are being executed with computers, and contacts with others are mediated electronically. A proper understanding of this work calls for new methods of analysis and design (Wall, Corbett, Clegg, Jackson, & Martin, 1990), and for new studies on the demands and the impacts experienced by the workers.

Further research, including longitudinal comparisons, must 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 can already be observed in the field where services, information technology, and new business philosophies come together.
REFERENCES


