The use of ICT in the workplace: opening the black box

Bram Steijn & Kea Tijdens

Bram Steijn, Department of Public Administration, Erasmus University Rotterdam
P.O. Box 1738, 3000 DR Rotterdam, The Netherlands
e-mail: steijn@fsw.eur.nl, tel + 31 10 4082634

Kea Tijdens, Amsterdam Institute for Labour Studies (AIAS), University of Amsterdam
Roetersstraat 11, 1018 WB Amsterdam, The Netherlands
e-mail: kea@fee.uva.nl, tel + 31 20 5254347 (Corresponding author)

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1. INTRODUCTION

The use of ICT in work situations is widespread. In fact only few workers do not use any form of ICT in their job. In the Netherlands, the percentage of ICT-users increased from 74% in 1994 to 80% in 2000 and then more rapidly to 84% in 2001 and 89% in 2002 (Tijdens and Steijn, 2002). Other studies – though using slightly different definitions of 'computer work' show similar sharp rising numbers for the number of computer workers. According to Freeman (2002) the percentage of employed using computers at work in the USA rose from 25% in 1984 to 56% in 2001. Similarly, Dolton and Makepeace reported for the UK between 1991 and 2000 a rise in computer work from 60% to 75%, whereas Andries et al. (2002) reported a similar overall increase in computer use in the EU in the 1992-2000 period.

Until now, economic research on ICT use in the workplace has concentrated itself on the consequences of this use for wage differences whereas sociological research has focussed on three distinct dimensions: organizational change, skill changes and power and hierarchy (Burris, 1998).

In most previous studies ICT use is measured by a nominal or dichotomous variable. For example, the diffusion of ICT within organisations is measured by a variable indicating whether or not the respondents use e-mail, Internet, intranet, and extranet. This raises the question how the concept of ICT can be refined as using or not using ICT does not seem to discriminate anymore in a relevant way between various categories of workers.

In our view, a dichotomous variable of ICT-use does not give much insight into the *actual* use of ICT and its consequences: the concept of ICT includes a variety of different hardware (nor only the PC or laptop, but also the pda, the mobile phone and – last but not least – computer guided production facilities or robots) and software programmes (ranging from everyday word-processing or e-mail applications to more complicated statistical programs or applications for production facilities). To get a more detailed understanding of the use of ICT in everyday working life we need therefore to open the black box of the concept of ICT. We will do that in this paper by distinguishing three different dimensions of ICT-use: complexity, diversity, and intensity. *Complexity* refers to the inherent difficulty to understand or operate a distinct ICT hardware or application. *Diversity* refers to the number of different hardware or applications a worker uses in his/her work situation, whereas *intensity* refers to amount of time devoted to the ICT-use (but corrected for actual working time).

This paper aims at a better understanding of the factors driving the ICT-use at work with respect to these three dimensions. More precisely, our research objective aims to investigate *which factors can explain differences in the complexity, diversity and intensity of ICT-use.*

In the next section we will discuss several factors that according to our reading of the literature will influence the ICT use of workers. This is followed by section 3 that contains our hypothesis, the data we have used and the measurement of our main concepts. The results of our analysis are discussed in section 4 and the main conclusions are outlined in the final section 5.

2. FACTORS EXPLAINING DIFFERENCES IN WORKER'S ICT USE

This paper focuses on the effects of two different clusters of variables on computer use: 1) individual characteristics; 2) job and workplace characteristics. Each cluster contains a series of variables, which are described hereafter.

We are interested in three different individual characteristics with a demographic character: age, gender and educational level. We expect that computer use on all three different dimensions will be related to these three variables. Earlier research already indicated that women use computers more frequently compared to men (compare Dolton & Makepeace, 2004, but see also Andries et al., 2002), but we also expect women to have a use of ICT that is less complex and less diverse (compare Falstead et al., 2002: 61 – who reported a similar finding about the UK). In a similar way, we also expect that older workers have an ICT use that is less complex, diverse and also less intense – although Andries et al. showed that older workers were closing the gap in computer use compared to younger workers. Computer use will also be dependent on the cognitive resources of people. Educational level is of course a good indication of these cognitive resources. It seems therefore logical to assume that higher educated workers will have a more complex and diverse use of ICT. It is less certain whether or not it will also be more intense, as higher educated workers will probably have more diverse tasks, including tasks that are not computer related.

Computer use will not only be influenced by demographic variables, but also the motivation of workers to use computers can play an important role. Several studies even show that some people are afraid of computers (Beckers, 2003). People who suffer from so called 'computer anxiety' will clearly be less motivated to use computers in their work. Of course, in a job one often has not much to choose: to a certain extend people have to use the instruments that are provided to them. However, often they also have some possibilities to influence their own ICT usage. We expect that a highly computer-motivated worker will be more inclined to use more complex, more diverse ICT applications in a more intense way.

The job and workplace characteristics can be divided into job characteristics on the one hand and workplace characteristics on the other hand. We included two job characteristics: a) supervisory position; b) type of labour contract. With respect to supervisory position, we expect that workers in such positions will have a more diverse task as they have by definition 'to manage'. This will not have much effect on the complexity of their computer use, but we expect a lesser diversity and especially a less intense computer usage. With respect to the labour contract we expect a difference in ICT usage between workers with a permanent and a fixed term employment contract (compare Falstead and Gallie, 2004). Temporary workers will be hired for more specific tasks. This could be a complex or simple task, so we do not expect differences with respect to the complexity of their ICT usage. However, given the specificity of their tasks (and moreover the fact that employers will less likely invest in temporary workers – compare Nollen, 1996) it is likely, temporary workers will have a less diverse ICT usage. Finally, given their more specific tasks, we expect them to also have a more intense computer usage.

We are also interested in workplace characteristics. In this respect we have are interested in four variables. In the first place firm size and economic sector. With respect to size, we expect workers in smaller companies to have a more diverse and less intense ICT-usage. Earlier research (compare Andries et al. 2002) has shown a relation between computer use and economic sector. This is not surprising, as jobs within one sector (for instance white collar workers in banking) will be more prone to computer use, than jobs in another sector (for instance teachers and nurses). We therefore expect that especially workers in the social service sector will have a less complex and diverse computer use and will also use them less intense compared to workers in typical white collar sectors as finance.

We are especially interested in variables that can be manipulated by the organization. This type of variables is relevant, because if a relation with computer usage can be determined, it will also mean that organisations can manipulate the complexity, diversity and intensity of the computer usage of their workers. If that is indeed the case, this opens possibilities for several kinds of organizational or societal policies – especially if some kind

of computer usage is seen as undesirable. In earlier research we have looked at the effect of HRM-practices and the production concept implemented within the organisation on the willingness of workers to acquire ICT-competences and the actual level of these competences (Steijn and Tijdens, 2005; Tijdens and Steijn, 2005). Our results showed these factor variables indeed had some (weak) effect on these dependent variables. We expect the same with respect to our dimensions of computer usage. Within organisations with a tayloristic production structure and with a less well-developed HRM-strategy, the ICT usage will be less complex, less diverse and more intense.

3. HYPOTHESES, DATA AND OPERATIONALISATION

3.1 Hypotheses

This study investigates firstly the measurement of ICT-use at work and secondly the determinants of ICT-use at work. How can ICT-use at work be characterised? Which factors are determining the ICT-use of employees? Definitely, the measurement of ICT-use has to go beyond the survey question 'Do you use a computer at work', because more than 90% of the workforce most likely says 'yes'. Moreover, this question solely enables a comparison of those who use a computer at work to those who don't. It does not touch the variety of ICT-use at work, being an issue of growing importance given the fast increasing share of ICT-users at work in the Netherlands. Therefore, it is assumed that ICT-use is best measured taking into account the diversity of hardware and software used, the activities performed with the hardware and software, and the time spend on these activities. One hypothesis will be tested:

- The heterogeneity of ICT-use at work can be best divided into proxies for the complexity of ICT-use, for the diversity of ICT-use and for the intensity of ICT-use.

The discussion in Section 2 shows that a large number of factors can influence ICT-use. These factors have been divided into two clusters of explanatory variables, notably individual characteristics and job and workplace characteristics. Two 'general' main hypotheses are that both types of variables are relevant in explaining differences with respect to the complexity, diversity and intensity of ICT usage. More specifically, we will test the following hypothesis:

- The ICT-usage of men is more complex and diverse, but less intense than women;
- Older workers have a less complex, less diverse and less intense ICT usage compared to younger workers;
- Higher educated workers have a more complex and diverse, but a less intense ICT-usage compared to lower educated workers.
- Highly computer-motivated worker will be more inclined to use more complex, more diverse ICT applications in a more intense way;
- Workers in a supervisory position will have a less diverse and a less intense ICT usage;
- Flexible workers will have a less diverse and more intense ICT usage;
- Workers in smaller organisations will have a more diverse and less intense ICT-usage;
- The ICT-usage in the financial sector will be more complex, diverse and intense, especially compared to the social services.
- Within organisations with a well-developed HRM-strategy, the ICT usage will be more complex, more diverse and less intense.
- Within tayloristic organisations the ICT usage will be less complex, less diverse and more intense.

3.2 Dataset

In order to investigate this research objective, we used the *Telepanel,* which is a database with more than 2,000 households that are surveyed weekly with the aid of computers (see also Tijdens and Steijn, 2005). The sample is not biased in favour of computer users, because non-computer users in the panel either receive a computer or use their television screen for completing the questionnaire. The panel is managed by CenERdata Panel at the University of Tilburg, The Netherlands. Although *Telepanel* itself emphasises the representative character of the panel, the respondents' average educational level and job level also appears to be relatively high (cf. Tijdens and Steijn, 2002: 6). Although this will have no impact on the scope of the effects of different factors, we nevertheless used weight factors to make the dataset representative for the Dutch working population. Using labour force data from Statistics Netherlands, the weighting was based on age, education and industry. The statistical department of the Dutch Social and Cultural Planning Office did the actual weighting[1].

The survey was conducted in January 2002. The respondents – individuals in paid employment aged between 15 and 64 – were asked approximately 50 questions. In total, 938 respondents (597 men and 341 women) answered the questions about ICT use at work and their competencies, their jobs, the HRM policy and other characteristics of their workplace.

In total, 89% used a computer or other computerised equipment at work. This concerned 834 observations, of whom 819 had valid values for all variables used in the analysis. The men are on average 41.3 years of age and the women 38.0. Almost three-quarters live with a partner, slightly more men than women (75% vs. 69%). As regard family phase, relatively more men live in a family with young children, and more women live in a family in which the children have already left home. On average, the men work 37.7 hours per week and the women 29.3 hours.

3.3 Measurement of the dependent variables

The dependent variables are the three dimensions of ICT-use in the workplace. In the survey the respondents were asked with which 'automated systems', such as PC's, pda's, but also cad-cam or robots, they used at work. Respondents could chose from a list of eleven categories automated systems. A textbox allowed respondents to add other equipment. Then, they were asked to tick the three systems they most frequently used at work. Next, the respondents were asked to tick which computer programs they used at work, from a list of twenty categories of software applications, ranging from word processing through e-mail applications and ERP-packages. Here, also an open text box for not mentioned programs was included.

The *complexity* of ICT-use at work is a composite variable, based on our judgement regarding the complexity of the ICT equipments and programs reported by the respondents. Initially, this variable divided the sample into four categories:

a) no ICT-users (13.4%);
b) users of simple ICT, defined as users who only use simple automated hardware such as scanners or automated box offices, and who do not use any software applications – 6% of the respondents;
c) users of basic ICT, defined as users who use 'ordinary applications' such as word processing, programs for simple book keeping, internet applications etcetera – represented by 50.4% of the respondents;
d) users of complex ICT, defined as users of more advanced hard ware such as robots and software such as statistical packages – represented by 30.3% of the respondents.

[1] We of course thank them for having done that.

As the analyses have been limited to computer users only, we excluded the group of non-users. Moreover, our analyses revealed that a binary variable, taking group b and c together, was a good proxy for *complexity* of ICT-use at work.

The *diversity* of ICT-use at work is measured by the total number of reported hardware and software applications. Theoretically, the respondents could indicate 23 applications, i.e. 20 software packages and 3 hardware applications. Using the weighted data, the use of on average 5.4 applications were reported, with however a wide distribution (SD 3.7). Only 4% applied only one ICT application, 30% applied 5 to 7 applications and almost 10% applied 10 or more application in their work.

The *intensity* was measured by the relative part of a working day involving ICT use. We measured this by adding up the total number of hours spend on the three most used ICT hard ware applications divided by the number of working hours (per day). The results suggested a very high intensity of the ICT-use. Excluding workers who do not use ICT at work, the average relative proportion of ICT use during the workday was no less than 70% (SD .33). Moreover, 53% of the workers indicated they worked more than 80% of their time with computers, only 24% indicated a percentage of 40% or less.

So far, the data has been summarized for the whole sample. However, the analyses have been limited to ICT users only. Therefore, from now on, only the 819 ICT users with valid values for all variables will be used in our analysis.

3.4 Measurement of the independent variables

Based on the literature, discussed in the previous section, four individual characteristics have been included in the analyses. The measurement of *age* and *gender* is of course straightforward. *Educational level* is measured as a five category quasi-interval variable, using the international ISCED classification, in this dataset ranging from category 1 'basic education' to category 5 'first stage of tertiary education'). In addition, a composite variable was included, notably *motivation* (see Table 1). *Motivation* is based on three items indicating 'I am eager to work with computers at work' (77% agrees), 'I am willing to learn more about computers and software programs' (52% agrees), 'I find computers fascinating' (46% agrees). The respondents have not unqualified positive opinions about computers in general. Although a large majority states they are eager to work with computers, only half of them wants to learn more about computers or is fascinated by computers. The three items form a scale that can be considered a measure for interest in using computers at work (Cronbach's alpha = 0.76). The scale runs from 1 to 20, and the average score is 10.8, showing a reasonable interest in using computers at work when set against the theoretical mean of 9. A small group shows little interest in using computers: less than 8% of the respondents scored on or below the theoretical mean.

Table 1 Distribution for the composing variables of 'motivation' (N=819)

	1 fully disagree	2 disagree	3 neutral	4 agree	5 fully agree	total
I am eager to work with computers at work	0.6	4.8	18.0	46.3	30.3	100.0
I am willing to learn more about computers and software programs	0.9	13.8	33.1	43.1	9.2	100.0
I find computers fascinating	2.6	18.2	33.7	34.5	11.0	100.0

Source: AIAS/EUR 2002

For the job and workplace characteristics, six variables were used in the analyses. Two job characteristics have been included. *Supervisory position* is a dichotomous variable, and so is

type of employment contract. The latter indicates a dichotomy between a permanent contract and other contracts. Four characteristics of the workplace have been used. *Economic Sector* is included as dummy variables for construction, wholesale and retail trade, commercial services, public administration, education and health and social work, with manufacturing as the reference category. The variable *HRM-practices* is based on two assumptions about HRM-policies. In the first place we started from the 'bundle hypothesis' of MacDuffie (1995) which states that HRM practices works best when used in bundles or as Guest (2000, 12) has put it that 'the greater the number of practices, the greater the impact on workers'. In the second place we followed research findings that have found that workers perform better when the feedback on their work is better (compare Boxall and Purcell, 2003). Combining both findings we asked the respondents whether or not they discussed – formally or informally – five separate practices with their supervisors (performance, salary, career possibilities, schooling and the functioning of the supervisor him/herself). Our assumption is that HRM-practices are better used when more of these practices are discussed between supervisors and workers. These five aspects together formed a scale (Cronbach's alpha 0.74), ranging from 0 to 5, when all five aspects are discussed. On average the respondents scored 3,4, which compared to a theoretical mean of 3 indicates that Dutch employees experience a relative active use of HRM-practices by their employer. With respect to the *production concept* a measure was used derived from Steijn (2001b). Three dummy variables were included to indicate various types of work organisation or production concepts: a) the traditional tayloristic organisation, b) a professional organization (characterized by a high degree of individual autonomy), c) a sociotechnic team organization (characterized by both teamwork and a high degree of autonomy) and d) a lean team organization (characterized by teamwork but a relatively low degree of autonomy). Finally, *firm size* was included. Table 2 presents the descriptive statistics of the dependent and the independent variables.

Table 2 Descriptive Statistics

	Minimum	Maximum	Mean	Std. Deviation
Age	22	62	39.98	9.55
gender [0=female, 1=man]	0	1	0.60	0.49
education [1 - 5]	1	5	3.99	0.99
motivation [1 - 20]	4	15	10.77	2.22
permanent contract [0,1]	0	1	0.94	0.23
supervisory position [0,1]	0	1	0.39	0.49
construction [0,1]	0	1	0.07	0.26
trade [0,1]	0	1	0.22	0.41
commercial services [0,1]	0	1	0.20	0.40
public administration [0,1]	0	1	0.09	0.29
education [0,1]	0	1	0.08	0.27
health and social work [0,1]	0	1	0.17	0.38
HRM policies [0 - 5]	0	5	3.46	1.60
professional [0,1]	0	1	0.39	0.49
team work [0,1]	0	1	0.21	0.41
sociotechnic [0,1]	0	1	0.08	0.28
firmsize work place [0 - 10]	1	10	4.64	2.34
complexity [0,1]	0	1	0.35	0.48
diversity ICT-use [1 - 17]	1	17	6.27	3.28
intensity ICT-use [0 - 1]	0	1	0.70	0.33

Source: AIAS/EUR 2002, weighted data N=790 (unweighted N=819).

4. EXPLAINING ICT-USE AT WORK

4.1 Explaining the complexity of ICT-use

The complexity of ICT-use is a binary variable, indicating basic or complex ICT-use, as was explained in section 3. Therefore a logistic regression analysis has been used. Complexity of ICT-use at work relates strongly to individual characteristics as well as to economic sector. Work organisation hardly matters. The results of the analysis can be found in Table 3, showing that male are more likely to use complex ICT at work. Higher educated are more likely to do so than lower educated. And finally, motivation matters. Those who are more motivated with regard to ICT-use at work are more likely to use complex ICT.

Regarding the job and firm-related characteristics, job related factors such as employment contract or supervisory position have no impact on the complexity of ICT-use. The industry matters strongly, indicating that computer use in especially manufacturing is more complex compared to the other sectors.

Table 3 Explaining the complexity in ICT-use from two clusters of factors (logistic regression)

Complexity 1 'complex' 0 'basic'.	B	Std.Error	Sig.	Exp(B)		Sig.
individual characteristics						
age	-0.009	0.008	ns	-0.003	0.009	ns
gender [0=female, 1=man]	1.084	0.170	***	0.720	0.189	***
education [1 - 5]	0.230	0.086	*	0.305	0.099	**
motivation [1 - 20]	0.143	0.035	***	0.159	0.037	***
Job and firm related characteristics	-0.009	0.008				
permanent contract [0,1]				-0.601	0.364	ns
supervisory position [0,1]				0.181	0.172	ns
construction [0,1]				-0.804	0.362	*
trade [0,1]				-1.336	0.289	***
commercial services [0,1]				-1.286	0.255	***
public administration [0,1]				-1.134	0.278	***
education [0,1]				-1.360	0.327	***
health and social work [0,1]				-1.619	0.301	***
HRM policies [0 - 5]				0.108	0.055	*
professional [0,1]				0.036	0.197	ns
team work [0,1]				0.381	0.224	ns
sociotechnic [0,1]				-0.055	0.322	ns
firm size workplace [0 - 10]				0.098	0.036	**
Constant	-3.388	0.661	***	-3.292	0.808	***
N	819			819		
Chi2 (df) sign	79.790		(4) 0	145.879		(17) 0

Source: AIAS/EUR 2002 (unweighted N=819), significant at 5% (*), 1% (**) and 0,1% (***) level, ns = not sign.

4.2 Explaining the diversity of ICT-use

As explained in section 3, diversity in ICT-use is measured on a scale, ranging from 1 to 17, indicating the diversity in software and hardware used at work. This variable allows for an OLS regression analysis. Again, two clusters of explanatory variables have been used.

Table 4 reveals that individual factors matter in case of diversity of ICT-use. A lower age increases the diversity of ICT used at work. Male workers use more divers ICT than female workers do. A higher education level increases the diversity, and so does motivation.

The increase in explained variance from 24% to 35% reveals that job and workplace related characteristics play an important role in the explanation of diversity of ICT-use. Supervisors use more often diverse ICT, and so do workers in firms with sufficient HRM policies. Work organisation matters too. Those who are working in a professional setting are far more likely to us diverse ICT. Team workers use more often diverse ICT, but those working in a socio-technical setting don't. Finally, firm size matters: the larger the firm, the more diverse is ICT use. Industry hardly matters. Only those who are working in health and social work use less diverse ICT.

Table 4 Explaining the diversity in ICT-use from two clusters of factors (OLS regression)

	B	Std. Error	Sig.	B	Std. Error	Sig.
Individual characteristics						
Constant	-2.057	0.829	*	-3.228	0.921	***
age	-0.025	0.011	*	-0.021	0.011	*
gender [0=female, 1=man]	1.258	0.211	***	0.709	0.215	***
education [1 - 5]	0.986	0.108	***	0.880	0.110	***
motivation [1 - 20]	0.445	0.045	***	0.411	0.042	***
job and firm related characteristics						
permanent contract [0,1]				-0.586	0.434	ns
supervisory position [0,1]				0.680	0.201	***
construction [0,1]				0.131	0.440	ns
trade [0,1]				-0.510	0.333	ns
commercial services [0,1]				0.468	0.301	ns
public administration [0,1]				0.003	0.333	ns
education [0,1]				-0.611	0.380	ns
health and social work [0,1]				-0.908	0.339	**
HRM policies [0 - 5]				0.347	0.061	***
professional [0,1]				1.087	0.228	***
team work [0,1]				0.730	0.262	**
sociotechnic [0,1]				0.115	0.364	ns
firm size workplace [0 - 10]				0.169	0.041	***
N	819			819		
R Square	0.238			0.353		

Source: AIAS/EUR 2002 (unweighted N=819), significant at 5% (*), 1% (**) and 0,1% (***) level, ns = not sign.

4.3 Explaining the intensity of ICT-use at work

As explained in section 3, diversity in ICT-use is measured on a scale, ranging from 0 to 1, indicating the proportion of working time spend on ICT use. This allows for an OLS regression analysis. Again, the analysis is performed for the individual factors first, and then jointly with the job and firm related characteristics.

Table 5 shows that age initially matters for intensity of ICT-use, but in the second step its impact is not significant anymore. Gender does have an impact: female workers use ICT more intense that male workers do. Education level hardly matters for intensity of ICT-use. Motivation, however, does affect intensity. A higher motivation leads to a more intense ICT use. Yet, the low explanatory power of the model reveals that although these individual factors matter, other factors to a much larger extent influence intensity of ICT-use.

The increase in explained variance from 4% to 23% reveals that job and firm related characteristics play an important role in the explanation of intensity of ICT-use. Again, job

characteristics do not matter. In some industries, notably education and health and social work, intensity of ICT-use is significantly lower than in other industries, whereas it is significantly higher in the commercial services. Workers in firms with good HRM policies use ICT more intensively than in firms without these policies. Work organization does not affect intensity of ICT-use. Firm size does to a minor extent: in larger firms ICT-use is slightly more intense.

Table 5 Explaining the intensity in ICT-use from two clusters of factors (OLS regression)

	B	Std. Error	Sig.	B	Std. Error	Sig.
Individual characteristics						
Constant	0.601	0.093	***	0.405	0.100	***
age	-0.003	0.001	**	0.001	0.001	ns
gender [0=female, 1=man]	-0.047	0.024	*	-0.107	0.023	***
education [1 - 5]	-0.007	0.012	ns	0.026	0.012	*
motivation [1 - 20]	0.026	0.005	***	0.024	0.005	***
job and firm related characteristics						
permanent contract [0,1]				-0.050	0.047	ns
supervisory position [0,1]				-0.030	0.022	ns
construction [0,1]				-0.064	0.048	ns
trade [0,1]				0.000	0.036	ns
commercial services [0,1]				0.089	0.033	*
public administration [0,1]				0.005	0.036	ns
education [0,1]				-0.359	0.041	***
health and social work [0,1]				-0.196	0.037	***
HRM policies [0 - 5]				0.013	0.007	*
professional [0,1]				-0.038	0.025	ns
team work [0,1]				-0.026	0.029	ns
sociotechnic [0,1]				0.020	0.040	ns
firm size workplace [0 - 10]				0.011	0.004	*
N	819			819		
R Square	0.040			0.232		

Source: AIAS/EUR 2002 (unweighted N=819), significant at 5% (*), 1% (**) and 0,1% (***) level, ns = not sign.

5. CONCLUSIONS

Table 6 summarizes the results of the analyses in section 4 for the three dimensions of ICT-use at work. In Table 6, a (0) indicates the absence of an effect, a (+) indicates a positive effect and a (-) indicates a negative effect.

Table 6 Summary of the factors affecting complexity, diversity and intensity of ICT-use at work

	complexity	diversity	intensity
Individual characteristics			
age	0	-	0
gender [0=female, 1=man]	+	+	+
education [1 - 5]	+	+	-
motivation [1 - 20]	+	+	+
Job and firm related characteristics			
permanent contract [0,1]	0	0	0
supervisory position [0,1]	0	+	0
construction [0,1]	-	0	0
trade [0,1]	-	0	0
commercial services [0,1]	-	0	+
public administration [0,1]	-	0	0
education [0,1]	-	0	-
health and social work [0,1]	-	-	-
HRM policies [0 - 5]	+	+	+
professional [0,1]	0	+	0
team work [0,1]	0	+	0
sociotechnic [0,1]	0	0	0
firm size workplace [0 - 10]	+	+	+

Source: AIAS/EUR 2002, - = negative effect; += positive effect, 0 = no effect.

The results partly support our hypotheses outlined in section 3. In the first place, the diverging effects with respect to our three dimensions of complexity, diversity and intensity support our main hypothesis which states that it makes sense to differentiate between these three different dimensions.

Looking at our ten more specific hypothesis about factors influencing ICT usage outlined in section 3, the following conclusions can be drawn:

- our hypothesis with respect to gender is only partly supported. The ICT-usage of men is indeed more complex and diverse compared to women, but in contrast to the hypothesis, it is also more intense;
- our hypothesis with respect to age is mostly rejected: in line with the expectations however is the finding that older workers have a less diverse ICT-usage;
- our hypothesis with respect to educational level is fully supported by the data;
- the same holds for our hypothesis concerning motivation;
- our hypothesis with respect to supervisory position is rejected by the data. In fact, contrary to our expectation supervisory workers have a more diverse ICT usage;
- our hypothesis with respect to flexible workers is fully rejected: there are no differences in computer usage between permanent and flexible workers;
- our hypothesis with respect to firm size is fully rejected. In fact in larger organisations the ICT usage is more complex, diverse and intense compared to smaller organisations;
- our hypothesis with respect to economic sector is for the most part not supported by the data;
- our hypothesis with respect to HRM-policies are also mostly supported. Contrary to our expectations, however, is the finding that in organisations with such policies the ICT usage is more intense;
- Our hypothesis with respect to the production concept is mostly rejected. For the most part we do not find differences in ICT-use between workers in various production

concepts. With respect to diversity, however, within professional and lean team organisations this usage appears to be more diverse.

Overall, we can conclude that it makes sense to differentiate between complexity, diversity and intensity of ICT usage. It becomes clear that various factors contribute in a different way to the explanation of differences in this usage. It is also clear that the hypothesis we have put forward to explain these differences are only partly supported by the analysis.

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