Gender-Related Effects of Information Technology Implementation

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In investigating gender-related effects of information technology implementation the contextual factors (e.g. job design, implementation management, external workload) need to be taken into account. In the Vienna Implementation Studies the effects of technology implementation on users’ stress levels and satisfaction were investigated in longitudinal research designs.

In our previous study, the 1st Vienna Implementation Study, negative effects of the technology implementations were shown in more women than men. It was argued that women due to their lower qualified jobs and due to the lack of participation, also experienced more negative consequences. In the 2nd Vienna Implementation Study effects of ‘continuous’ implementation of information technology on 212 clerical workers (n women: 142; n men: 70) were investigated. No gender-related effects of information technology implementation were found, nor did women and men differ in job characteristics and in participation in the implementation process.

It can be concluded from the two studies that potential differences between women and men are caused by differences in the contextual factors of job design and participation. Further, it emerged from our studies that women — at least in the field of clerical jobs — have benefited from the introduction of technology.

Introduction

During the last decades women have been entering the paid workforce at an accelerating pace (Haynes 1991), clerical jobs being the job category held by the largest proportion of women (Bevan 1987). Due to the rapid changes in information technologies clerical work is becoming more and more technology-oriented and employees are therefore continuously confronted with change. For longer than a decade research has been concentrating on the differential impact of the new technologies on women and men. Study results focusing on gender-related differences seem to be characterized by a tension between pessimism and an optimistic view of women’s situation.

Earlier studies report that female as compared to male computer users spend more time with visual display unit work and have higher levels of psychosomatic complaints (Bradley 1983). Also, that more monotonous and repetitive work with computers is performed by women (Evans 1987), and/or women receive less skill upgrading by training than men (Gutek and Bikson 1985). Therefore quite a pessimistic picture of women and information technology was drawn, putting an emphasis on the possibility that polarization of qualification due to the technologies could be accompanied by a polarization between the sexes (Greve 1987). It was argued, that women, due to their inferior initial situations with regard to job characteristics, could be forced into the lowest paid and lowest qualified jobs (Knights and Sturdy 1987).

With regard to job characteristics, some of the newer studies support this ‘polarization hypothesis’. In the study by Aronsson, Dallner and Arborg (1994), investigating 1728 computer users, the group of persons performing data entry jobs — 90% of them were women — showed the highest level of psychosomatic complaints. Changes in job characteristics were also rated negatively by this group. On the other hand, programming personnel (mainly men) stated that due to the use of information technologies their jobs had improved; in this group the lowest level of psychosomatic complaints was found. Further studies support the finding that more
negative consequences of work with information technologies for women are to be expected in jobs of lower quality (Cressey 1992; Hackett et al. 1991; Parasuraman and Igbaria 1990).

One important issue, particularly related to the job differences between women and men, is participation. Even in academic settings and after controlling for intervening variables (e.g. hierarchical position, age) women have less opportunity to participate in decision-making (Denton and Zeytinoglu 1993). Based on the division of labour, men in general hold positions on higher hierarchical levels than women and therefore have more possibilities for participation. Barbara Gutek (1994) considers this the explanation why women's needs are ignored. Whereas a number of studies show positive effects of users' participation in the implementation process (Hirschheim 1989; Levi and Slem 1991; Mumford 1983a), participation rarely was investigated in the context of gender-related differences in the effects of information technology implementation. Studies assessing data on this issue indicate that women are not given the possibility of participating in the implementation process and that they feel insufficiently informed (Liff 1990; Murray 1994).

In one of our own studies, the 1st Vienna Implementation Study (Korunka et al. 1993; Korunka et al. 1995) the initial introduction of information technology was investigated. Remarkable differences between women and men concerning the effects of IT implementation on stress and satisfaction were found. As well as a higher level of psychosomatic complaints in general, the effects of IT implementation were a decrease in job satisfaction for women and an increase for men. Furthermore, a significant increase in musculoskeletal complaints in women and no changes in men were observed. We assumed that the reason for these differences were different contextual conditions in terms of job characteristics and participation for women and men. In this study a broad range of jobs (highly qualified CAD-jobs, clerical work, relatively monotonous clerical work and very monotonous, repetitive work) was investigated. Employees performing the latter jobs were not given any possibility of participation in the implementation process and they were the ones who experienced the most negative consequences of IT implementation. This group consisted of almost 100% women. For the CAD-jobs, on the other hand, which were associated with a high amount of participation, increases in job satisfaction were observable. These jobs were almost exclusively performed by men. Therefore in this study the polarization between women and men at both ends of the job range in office work and in participation in the implementation process was accompanied by a polarization in stress and satisfaction.

However, in some studies positive effects of work with information technology for women were found. In their analysis of 3400 white-collar workers Dunkle, King, Kraemer and Danziger (1994) widely confirmed the 'technological gender empowerment hypothesis' (Giuliano 1982). They showed that among persons in similar categories of white-collar work (managers, staff professionals, clerical workers), both women and men considered the computer's effect upon work to be positive. Women even experienced more favourable impacts from information technology on job satisfaction, job performance and work environment than did men. In the study by Norris (1992) effects of microcomputer use on quality of work were investigated. Experiences were rated more positively by females than by males. Liff (1990) in her study of 191 female clerical workers reported that women felt more skilled and stated that their work was more interesting after technology implementation. However, as generally the technological changes did not open up many new possibilities for the women investigated in this study, she concludes, that 'quite extensive changes can occur in the way the job is done providing what is done remains broadly the same' (1990, p. 53). One can argue that these results mainly represent a rationalization of the status quo, with women pragmatically dealing with their given situation. But there also seems to be reason to argue that the effects could be more substantial and that the technologies provide a resource for women from which they can benefit in the workplace.

It may be summarized from these studies that a fuller understanding of differences between women and men can be gained only by the consideration of contextual factors of the technology implementations (Dunkle et al. 1994; Parry and Wharton 1994). Not only job characteristics and implementation-related factors have to be taken into consideration, but also external workload has to be regarded as a further contextual condition in explaining gender-related differences. Most of the research in this area investigated a 'spillover' from work to the external work sector (Piotrkowski et al. 1987), ignoring the possibility that family demands can also interfere with work (Crouter 1984).

Whereas the percentage of working women has been increasing since the 1970s, changes in role structure in private life have not
changed at the same pace. Women still have the major responsibility for housework and raising children, and traditional gender role patterns still largely persist (Frankenhäuser et al. 1989; Lundberg et al. 1994; Wortman et al. 1991). For example, ‘productive activity’ (Kahn 1984) taking into account both paid and unpaid work, for employed women is 4000 hours and for men about 3400 hours annually (which results in a difference of 2½ hours of leisure per day between men and women!; see Kahn 1991). Despite this striking difference no direct relationship between the amount of work associated with different roles and well-being is to be expected (e.g. ‘healthy worker effect’; La Rosa 1988). Rather, it seems that the subjective experience of one’s multiple roles affects one’s health (Facione 1994).

In reviewing literature on this topic it is noticeable that the vast majority of the studies are cross-sectional, although it is widely agreed that longitudinal studies investigating causal relations between contextual factors and possible effects of the introduction of technology are needed (Carayon 1993; Järvenpää 1991; Lindström 1993). In this paper the results from our second longitudinal study on the effects of information technology on users’ stress levels and satisfaction with special regard to gender-related differences are presented.

As the main hypothesis in explaining gender-related differences in the effects of implementation of new information technology, it was expected that possible differences between women and men are a result of differences in the contextual factors of job design, management of the implementation (participation) and external workload. It was expected that employees performing jobs of low quality, and/or employees not given the possibility of participation in the implementation process, and/or persons with a high amount of external workload would experience more negative consequences of the technology implementations.

The Second Vienna Implementation Study

The 2nd Vienna Implementation Study investigated effects of ‘continuous’ implementation of information technology (e.g. new software, software updates, new user interfaces) on users’ stress levels and satisfaction. The study is based on a ‘contextual factor model’ explaining differences in implementation effects on the users by differences in situational (job design, implementation management) and personal (individual differences, external workload) contextual factors. The study was designed as a longitudinal field study.

Methods

Data collection for the present study took place between October 1994 and March 1997; 12 implementation projects were investigated in ten companies. The companies were located in and around Vienna. Eight of the implementation projects were carried out by the EDP departments of the companies, four by the EDP departments involving external experts. Trade unions were not involved in any of the implementation projects.

Design and time schedule

Seven measurements were taken over a time period of 22 months. Five of these measurements were taken in time intervals of 5.5 months (± two weeks). Between the first and the last of these five measurements the IT implementation took place in the ten companies investigated. Two further measurements, so-called ‘implementation measurements’, were taken depending on the day when the implementation occurred in each company (one measurement two days and the other two weeks after the implementation). Time intervals were derived from expert discussions and experiences from our previous study on first generation introduction of information technology.

This design assured high flexibility in meeting organizational conditions (e.g. delays in implementation, changes in time schedules) by guaranteeing at least one measurement before and at least one after the implementations (further measurements before and after implementations also allowed the evaluation of the relative importance of the implementations in the economic and organizational context). Furthermore, the design allows a differentiation of the three clearly defined conditions used for analyses presented here:

1. Measurement 1 (m1; 3.5 ± 2 months before the implementation) represents the phase widely uninfluenced by the planned implementations. Therefore it had to be taken sufficiently long before implementation in order to exclude anticipatory effects. At the same time threats to internal validity by external factors, demanding a measurement shortly before implementation, had to be considered.
2. Measurement 2 (m2; 2 weeks after the implementations) reflecting short-term
effects of the technology implementation. In this phase maximum stress due to the implementation is to be expected.

3. Measurement 3 (m3; 4.5 ± 1.5 months after the implementation) reflecting long-term effects, i.e. the use of the new technology in daily routine, of the implementation. Depending on the adaptational demands of the implementation (e.g. duration of training) measurements taken three to six months after the implementations were used.

Sample

Employees of ten companies (sales and production: n=7; insurance: n=1; bank: n=1; public organization: n=1) participated in the study (see Table 1). In the planning phase of the longitudinal study it was expected that all employees would be affected by the implementation. As can be seen in Table 1, in some cases employees were not included in the implementation as previously planned. In other cases, implementation was delayed and therefore not realized during the observation period. These cases were due mainly to two companies and it is to be expected that a delay or failure of a previously planned implementation would have uncontrollable effects on the employees. Therefore they were excluded from the analyses.

The data sets of the 212 employees, who experienced an IT implementation, were included in the analyses. The employees performed clerical work on different qualification levels (e.g. secretarial work, accountancy, department manager).

Measures

Dependent variables

Subjective appraisal of stress was measured by the German adaptation of the ‘Work Environment Scales’ (SBUS-B; Weyer and Hodapp 1978; Weyer et al. 1980). The two scales included in the statistical analyses were ‘subjectively experienced stress’ and ‘dissatisfaction’. Subjective appraisals as measured by the SBUS scales are indicators of perceived stress at work (Hodapp et al. 1988).

Job satisfaction (satisfaction with activity per se, colleagues, organization, working conditions, superiors, career prospects, salary, job security, time schedule of work) was measured with nine items (Kunin-scales) of the ‘Work Description Scale’ (ABB; Neuberger 1976; Oegerli 1984). As compared to the SBUS-scale ‘dissatisfaction’, which in our earlier studies has proved high sensitivity in the measurement of change, this scale is a more integrative measure of job satisfaction.

Psychosomatic complaints were assessed with 12 items. The instrument is a further development of a scale used in the 1st Vienna Implementation Study (Korunka et al. 1995).

The four dependent variables were assessed at each measurement (see Table 2).

Table 1: Complete data sets at m3; age, sex and characteristics of the implementations

<table>
<thead>
<tr>
<th>Company</th>
<th>N implementation women/men</th>
<th>Age mean (SD)</th>
<th>Kind of implementation</th>
<th>Training (hours)</th>
<th>N no implementation women/men</th>
</tr>
</thead>
<tbody>
<tr>
<td>STADM</td>
<td>16/4</td>
<td>34.6 (9.8)</td>
<td>self-developed SW c</td>
<td>8</td>
<td>33/20</td>
</tr>
<tr>
<td>GAS</td>
<td>8/5</td>
<td>38.5 (10.4)</td>
<td>self-developed SW c</td>
<td>12</td>
<td>0/2</td>
</tr>
<tr>
<td>INF</td>
<td>0/0</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>6/6</td>
</tr>
<tr>
<td>COMM1 a</td>
<td>10/2</td>
<td>35.3 (10.1)</td>
<td>SAP-R3-FI</td>
<td>32</td>
<td>0/0</td>
</tr>
<tr>
<td>COMM2 a</td>
<td>6/2</td>
<td>38.1 (8.4)</td>
<td>SAP-R3-HR</td>
<td>16</td>
<td>0/0</td>
</tr>
<tr>
<td>INS1 b</td>
<td>10/2</td>
<td>34.8 (9.7)</td>
<td>Word for Windows 6.0</td>
<td>16</td>
<td>2/3</td>
</tr>
<tr>
<td>INS2 b</td>
<td>29/20</td>
<td>36.4 (10.3)</td>
<td>OS2</td>
<td>12</td>
<td>0/0</td>
</tr>
<tr>
<td>AUFOOD</td>
<td>6/0</td>
<td>26.6 (6.0)</td>
<td>SAP-R3</td>
<td>8</td>
<td>3/4</td>
</tr>
<tr>
<td>INTFOOD</td>
<td>36/24</td>
<td>36.6 (9.9)</td>
<td>self-developed SW c</td>
<td>32</td>
<td>1/0</td>
</tr>
<tr>
<td>BANK</td>
<td>15/4</td>
<td>33.3 (11.2)</td>
<td>self-developed SW c</td>
<td>32</td>
<td>1/0</td>
</tr>
<tr>
<td>OIL</td>
<td>6/7</td>
<td>42.4 (7.5)</td>
<td>SAP-R2</td>
<td>24</td>
<td>3/3</td>
</tr>
<tr>
<td>COOL</td>
<td>0</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>11/21</td>
</tr>
<tr>
<td></td>
<td>142/70 (N=212)</td>
<td>36.1 (10.0)</td>
<td></td>
<td>60/59 (N=119)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: a: Two different implementation projects were investigated in these companies; b: There were no significant differences between women and men in the amount of training (t=.328; p=.385); c: SW: Software
Job characteristics

Based on observations and discussions with the implementation managers, 71 ‘representative jobs’ describing each company’s work division were defined. Each of the ‘representative jobs’ stands for a number of employees performing the same tasks. Similar to the 1st Vienna Implementation Study, job profiles of the ‘representative jobs’ were evaluated by one subscale of the ‘Job Evaluation System for Mental Work’ (‘TBS-GA’, subscale: ‘comprehensiveness-wholeness’, Rudolph et al. 1987) and the FAUST instrument (subscases: ‘variability’, ‘concentration efforts’, ‘decision latitude’, ‘work complexity’, Zapf et al. 1989). These measures are widely used in German-speaking countries and provide sufficient test criteria. Further, descriptive data on ‘employee qualifications’ and the ‘amount of VDU-work’ (hours per day) were assessed.

For each of the ‘representative jobs’ one interview with one employee was conducted within the first two months of the longitudinal study in each company. Each answer was discussed with two investigators serving as interview partners. The classification was done by the investigators, who also observed the job activities of the employee. In this way, subjective appraisals of the employees could be excluded.

Participation

A subscale of the ‘Interview Guide for the Evaluation of Continuous Implementations’ (Korunka et al. 1996; Korunka et al. 1997) was used to evaluate the degree of employee participation during the implementation process. The instrument is a structured interview guide consisting mostly of multiple-choice questions. To exclude subjective answers, questions and possible answers were formulated as objectively as possible. Single characteristics assess active (e.g. participation in decision-making, team membership) and passive (e.g. quality of information, measures to enhance acceptance of the new system) involvement in the implementation. For statistical analysis, a score of the single items was calculated. Interviews with the implementation managers (before and after the implementation) and a group of three to five users (after the implementation) in each company were carried out.

External workload

A questionnaire based on the TWL (‘Total Workload Scale’, Mardberg et al. 1991) was developed. Some 12 outside work activities (e.g. child care, household, private responsibilities, work in voluntary organizations) were evaluated. Time spent on these activities and subjective perceptions of workload (on a 5-point Likert scale) were assessed. For the following analyses subjective perceptions of external workload were used (mean: 1.56; SD: .46; Cronbach α=.72).

Results

Statistical analyses on the effects of gender, external workload, job characteristics and participation were performed by multivariate analyses of variance (repeated measures design). Post-hoc tests were done by unequal honest significant difference (HSD) tests (Spojtvoll and Stoline 1973; Tukey 1949).

The relative impact of gender, external workload, job characteristics and participation was evaluated by hierarchical stepwise regression analyses. The dependent variables ‘subjectively experienced stress’, ‘dissatisfaction’, ‘psychosomatic complaints’ and ‘job satisfaction’ were normally distributed (Kolmogoroff-Smirnov test, p>.05). Level of significance was set to p< .05.

General effects of the implementation

Table 2 shows raw scores of the dependent variables at the three measurements (m1 – m3).

Table 2: Scale characteristics, means and standard deviations of the dependent variables

<table>
<thead>
<tr>
<th>Dimension / Scale</th>
<th>N Items</th>
<th>Range</th>
<th>Mean (SD) m1</th>
<th>Mean (SD) m2</th>
<th>Mean (SD) m3</th>
<th>Cronbach Alpha (m1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>subjectively exp. stress</td>
<td>26</td>
<td>0–26</td>
<td>8.85 (5.48)</td>
<td>9.37 (5.70)</td>
<td>9.45 (5.70)</td>
<td>0.86</td>
</tr>
<tr>
<td>dissatisfaction</td>
<td>28</td>
<td>0–28</td>
<td>8.30 (5.53)</td>
<td>8.18 (6.16)</td>
<td>8.50 (6.29)</td>
<td>0.86</td>
</tr>
<tr>
<td>psychosomatic complaints</td>
<td>12</td>
<td>0–12</td>
<td>7.46 (2.68)</td>
<td>7.11 (2.93)</td>
<td>7.10 (2.78)</td>
<td>0.74</td>
</tr>
<tr>
<td>job satisfaction</td>
<td>9</td>
<td>1–7</td>
<td>4.95 (0.92)</td>
<td>4.88 (0.97)</td>
<td>4.89 (0.86)</td>
<td>0.82</td>
</tr>
</tbody>
</table>

Note: SD: standard deviations
The MANOVA revealed a statistical trend of an effect of the factor ‘time’ (Raos’ R=1.87; p=.07).³

**Gender**

Figure 1 shows means and standard deviations for the dependent variables according to gender. Multiple analyses of variance (factors: gender, repeated measures: m1, m2, m3) showed a significant effect of the factor ‘gender’ (R=3.25, p=.01), no effect of time (R=1.26, p=.27) and no significant interaction (R=0.95, p=.47). Post-hoc tests confirmed a significantly higher general level of psychosomatic complaints in women as compared to men (p=.00; see Figure 1).

**External workload**

For these analyses the implementation sample was dichotomized by median split into a group of persons low in external workload (n=88) and one group high in external workload (n=124). Figure 2 shows means and standard deviations of the dependent variables in the two subsamples. The MANOVA (factors: external workload, repeated measures m1, m2, m3) revealed a significant effect of external workload (Raos’ R=2.54; p=.00), no effect of time (Raos’ R=1.69; p=.10) and no significant interaction (Raos’ R=1.04; p=.40). High external workload was accompanied by significantly higher subjectively experienced stress (p=.00), less job satisfaction (p=.01) and a statistical trend towards more psychosomatic complaints (p=.06).

**Job characteristics**

Job profiles of the 71 representative jobs were put into cluster analysis (‘average-linkage’ method). Criteria for the cluster solution were discriminative potential (minimal variance within the groups and maximal variance between the groups) and interpretability (Everitt 1977). A two cluster solution met these criteria best: Cluster A (n=101) represents clerical jobs of lower quality according to the dimensions measured. These jobs are characterized by lower qualification demands, variability, concentration efforts, decision latitude, complexity and comprehensiveness as compared to Cluster B (n=111). Both clusters were

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**Figure 1: Effects of gender**

![Graph showing effects of gender on different variables](image)
similar in the amount of VDU work per day (about 2.5 hours).

Means and standard deviations of the dependent variables in the two job clusters are shown in Figure 3. Multiple analyses of variance (factors: clusters, repeated measures m1, m2, m3) showed a significant effect of cluster membership ($R=2.43; p=.05$), a significant effect of time ($R=2.00; p=.05$) and a significant interaction ($R=2.45; p=.01$).

Dissatisfaction was significantly higher in Cluster A ($p=.01$). A decrease in psychosomatic complaints over time (m1/m2: $p=.05$; m1/m3: $p=.03$) was observable in both clusters. Further a significant increase in subjectively experienced stress in Cluster A from m1 to m2 ($p=.01$) was confirmed in the post-hoc tests, whereas there were no changes in Cluster B over time.

**Participation**

The score of the participation-scale was dichotomized by median split (low participation: 5 companies, $n=119$; high participation: 4 companies, $n=93$). Means and standard deviations of the dependent variables are shown in Figure 4.

In the MANOVA (factors: participation, repeated measures m1, m2, m3) both a statistical trend of an effect of participation ($R=2.03; p=.09$) and time ($R=1.75, p=.09$), and a significant interaction ($R=2.69; p=.01$) were confirmed. Post-hoc tests revealed that low participation was accompanied by an increase in subjectively experienced stress from m1 to m3 ($p=.00$) and a decrease in job satisfaction from m1 to m3 ($p=.05$), whereas for high participation a statistical trend towards a decrease in psychosomatic complaints from m1 to m2 ($p=.07$) was observable.

**Gender effects in the context of job characteristics, participation and external workload**

As a final measure we tried to analyse the relative importance of the single predictors. Relations between the predictors were analysed by Chi$^2$-tests and tetrachoric correlations (see Table 3). Quite similar distributions of women and men were found in the two.
participation subsamples and in the two job clusters. Women were found mainly in the subsample with high external load, whereas most of the men had low external load. Furthermore, a low amount of participation was associated with jobs of lower quality, whereas for Cluster B there was a rather similar distribution into high and low participation.

Multiple hierarchical regression analyses separately for the four dependent variables at measurement m3 were calculated. In the first step the respective value of m1 was included to control for personal influences. Next, job characteristics and participation were included en bloc. In the last two steps external workload and gender were included in the model. Potential violations of the linear model were controlled carefully (linearity and homoscedasticity: optical control of the residual plots; autocorrelation: Durbin-Watson’s D between 1.72 and 1.93).

Table 4 shows the correlations between predictors and dependent variables and the main results from the regression analyses. Job characteristics and participation explain up to (additional) 5% of variance. Considering the fact that job characteristics and participation were assessed objectively, it has to be stated that these estimations represent the lower limit of ‘true’ relations (Frese 1985). The inclusion of the variables external workload and gender contributes nothing to the explanation of variance in any of the analyses.

Discussion

In the present study no gender-related effects of information technology implementations were found. Women and men differed neither in job characteristics nor in participation in the implementation process. However, women reported a higher amount of psychosomatic complaints. As expected, stress experienced by external work activities was significantly higher in women than in men. High external workload was accompanied by higher levels of stress and less job satisfaction, although external workload showed no additional effects considering the technology implementation process. Consistent with our expectations, job characteristics and participation in the implementation process influenced both stress and satisfaction in general and changes in the dependent variables due to the implementations.
The situational context factors explained up to 5% of variance of long-term technology effects.

Before interpreting these results methodological considerations need to be taken into account. Most importantly the absence of a true control group has to be mentioned. Considering the rapid changes in the field of information technology we did not expect to find a sample of employees, comparable in jobs, age and gender, working with information technologies and not going to be affected by IT implementation in the observation period. Furthermore, the criterion for

Table 3: Relations between the single predictors

<table>
<thead>
<tr>
<th>Cluster A (n)</th>
<th>Cluster B (n)</th>
<th>participation low (n)</th>
<th>participation high (n)</th>
<th>ext. workload low (n)</th>
<th>ext. workload high (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>women (n)</td>
<td>69</td>
<td>73</td>
<td>79</td>
<td>63</td>
<td>47***</td>
</tr>
<tr>
<td>men (n)</td>
<td>32</td>
<td>38</td>
<td>40</td>
<td>30</td>
<td>52***</td>
</tr>
<tr>
<td>job char.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster A</td>
<td>71***</td>
<td>30***</td>
<td>53</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>Cluster B</td>
<td>48***</td>
<td>63***</td>
<td>46</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>participation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>low</td>
<td>53</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>high</td>
<td>46</td>
<td>46</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: Tetrachoric correlations: a: r=.03, b: r=–.01, c: r=–.38, d: .27, e: .11, f: –.05; ***: p<.001
participation in the study was each company’s consent and the employees’ willingness. Therefore, we are not dealing with a random or quota sample and generalizations have to be discussed with care. As data collection for the present study occurred in a period of high economic pressure in Austria, external influences on the employees were controlled carefully. As well as information on external influences derived from interviews and informal discussions with the employees and the management in each company, print media reports were analysed. The three measurements used for the present analyses were found to be widely unaffected by external influences. Due to the study design and the use of appropriate instruments for repeated measures, internal validity of the present study is assumed to be sufficiently high. Additionally, multivariate analyses, appropriate post-hoc tests, and the careful control of potential violations of the linear model enhance validity.

Consistent with several studies (Dunkle et al. 1994; Liff 1990; Norris 1992), it was found that ‘continuous’ implementations of information technology as investigated in the present study did not have more negative effects on women than men. No gender-related differences in changes in stress and satisfaction due to the technology implementations were found in the sample investigated.

According to Dunkle (1994) one could argue that our data represent a positive trend for women, who are benefiting today more from technology than previously. Whereas social and educational differences (Chivers 1987; Shashaani 1994) might have favoured men in the context of first-generation technology introductions, women have become more familiar with the technologies due to their experiences with continuous implementation processes. Considering that no differences in the amount of participation in the implementation process between women and men and no differences in job characteristics were found, one could even argue for a ‘democratization of working life’. The women in this study were also not disadvantaged as compared to men concerning the amount of training they received.

In our earlier study on first-time introductions of new information technology we found more negative effects for women than men (Korunka et al. 1993; 1995). A comparison of the results of our two studies seems to confirm an improvement of the work situation for women in relation to technological change. However, what has to be considered

### Table 4: Main results from the hierarchical regression analyses

<table>
<thead>
<tr>
<th></th>
<th>subj. exp. stress (m3-m1)</th>
<th>dissatisfaction (m3-m1)</th>
<th>psychosomatic complaints (m3-m1)</th>
<th>job satisfaction (m3-m1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDU-work</td>
<td>-.04</td>
<td>-.09</td>
<td>.04</td>
<td>-.09</td>
</tr>
<tr>
<td>qualifications</td>
<td>-.06</td>
<td>.09</td>
<td>.06</td>
<td>.00</td>
</tr>
<tr>
<td>comprehensiveness</td>
<td>-.05</td>
<td>.08</td>
<td>.14*</td>
<td>.06</td>
</tr>
<tr>
<td>variability</td>
<td>.00</td>
<td>.06</td>
<td>.06</td>
<td>.03</td>
</tr>
<tr>
<td>concentration efforts</td>
<td>-.01</td>
<td>.06</td>
<td>.06</td>
<td>-.06</td>
</tr>
<tr>
<td>decision latitude</td>
<td>-.15*</td>
<td>-.02</td>
<td>-.04</td>
<td>.09</td>
</tr>
<tr>
<td>job complexity</td>
<td>.01</td>
<td>.08</td>
<td>.04</td>
<td>.13</td>
</tr>
<tr>
<td>participation</td>
<td>-.19*</td>
<td>-.18*</td>
<td>-.08</td>
<td>.19*</td>
</tr>
<tr>
<td>external workload</td>
<td>.01</td>
<td>-.01</td>
<td>-.04</td>
<td>-.02</td>
</tr>
<tr>
<td>gender</td>
<td>-.07</td>
<td>-.05</td>
<td>.02</td>
<td>.13</td>
</tr>
</tbody>
</table>

**a) correlations**

<table>
<thead>
<tr>
<th></th>
<th>R²-change</th>
<th>R²-change</th>
<th>R²-change</th>
<th>R²-change</th>
</tr>
</thead>
<tbody>
<tr>
<td>step 1: measure at m1</td>
<td>0.50**</td>
<td>0.53**</td>
<td>0.42**</td>
<td>0.47**</td>
</tr>
<tr>
<td>step 2: job characteristics/ participation</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.05*</td>
</tr>
<tr>
<td>step 3: external workload</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>step 4: gender</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**b) results from the hierarchical regression analyses**

| Notes: * p<=.05, ** p<=.01 |

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in comparing the findings of the two studies are differences in job design. A polarization of changes in stress and satisfaction between the genders was found in our earlier study, where a very broad range of clerical jobs with different qualification levels was analysed. Due to their highly monotonous and repetitive jobs and the lack of participation, women experienced more negative consequences of the new technologies than men. In the narrower range of clerical jobs, as investigated in the present study, neither gender-related technology effects nor differences in job characteristics and participation were observable. Therefore it seems that the differences in samples in terms of job design and participation account for the different results concerning the gender-related effects in the two studies.

The view that technology effects on women depend on job design is supported by the studies of Cressey (1992), Hackett et al. (1991), Parasuraman and Igbaria (1990) and — though not mentioned explicitly — by the findings of Seppälä (1995). He performed a cross-sectional study on the experiences of computerization in different occupational groups. As well as research and information personnel, the clerical workers (98% women) investigated in his study experienced the greatest benefits from using technology and were also most satisfied with the training they received. On the other hand, the draftspersons (94% women) due to their routine jobs and insufficient training faced the most problems. Therefore in dealing with gender-related differences consideration of the situational context of technology implementations is an essential prerequisite (see also Parry and Wharton 1994).

As there were no gender-related differences to be explained, the main hypothesis of the present study could not be confirmed directly, but there is reason to argue that the observed ‘non-differences’ between the genders are a consequence of the equality of women and men in job characteristics and participation in the investigated sample. The above argument for the ‘technological gender empowerment hypothesis’ can be regarded as a valuable guide concerning gender and technology implementations in typical clerical jobs.

The findings of the present study confirm the hypothesis and the results of our earlier study, that more negative consequences of technology implementations are to be expected in jobs of lower quality (e.g. Carayon et al. 1995). Significant increases in subjectively experienced stress were found in the job cluster characterized by low qualification demands, variability, concentration efforts, decision latitude, complexity, and comprehensiveness. Dissatisfaction was also significantly higher in this cluster. What makes this finding even more relevant is the significant relation between jobs of lower quality and low participation. At the level of implementation management, low participation turned out to be related to negative effects of the technology implementations (see also Hirschheim 1989; Levi and Slem 1991; Mumford 1983b).

Despite the positive findings in the present study concerning technology effects on women, one still has to be aware of the inherent dangers of the division of labour between women and men. It is important to consider that, although promotion of equal opportunities for women and men on the labour market has become of public interest, in times of critical economic situations — as experienced at present in Western Europe — accomplishments of women could be at risk (for a detailed discussion see Gattiker 1994). Also concerning participation, one has to bear in mind study results which confirmed that women perceived less participation in decision-making as far as technology acquisition, introduction, and change in the workplace were concerned (e.g. Murray 1994). Furthermore, women were less likely than men to see themselves participating in decision-making in general (Denton and Zeytinoglu 1993; see also Liff 1990).

Consistent with earlier studies (e.g. Evans 1987) women reported a higher amount of psychosomatic complaints than men. It is commonly agreed, that women are more likely than men to express their feelings (Greenglass 1995), male inexpressiveness being explained by a socialization process beginning in early childhood (Balswick 1979). However, the women in the present study also experienced more stress than men due to outside work activities, which in turn was associated with more subjectively experienced stress, a higher amount of psychosomatic complaints and less job satisfaction in general. Therefore, this finding could indicate a ‘spillover’ of external factors into work and even though women’s and men’s experiences of technology introductions may be quite similar, the additional responsibilities may disadvantage women. For example Pazy’s work suggests that women — due to their external responsibilities — may have less time for continuous and recurrent education (Pazy 1994). In turn, this may increase women’s vulnerability as far as the acquisition of new skills required for optimum job performance is concerned.

However, results indicate no impact of stress experienced by external work activities
in the context of technology implementations. One can only speculate on this — somewhat unexpected — finding. It seems that the direct situational context of the implementations, i.e. implementation management (participation) and job design might be of greater importance concerning implementation effects. IT implementations might have become part of the daily routine in the companies, and the effects only become visible when investigating the organizational context.\(^7\)

Conclusion

In conclusion, the data from the present study indicate that women nowadays seem to be taking advantage of the new technologies — at least concerning typical clerical jobs. Considering job segregation, this optimistic view must be revised because more negative consequences for women are to be expected in jobs of low quality, and/or when a low amount of participation in the implementation process is given. Despite the fact that external workload did not influence technology effects, it should be included in further studies as data indicate its importance for stress and satisfaction at the workplace. In implementing new information technology special attention has to be paid to jobs of lower quality. In these workplaces job enrichment seems to be most promising (see also Bevan 1987). For the management of implementation, participation in the implementation process turned out to be the means of preventing negative technology effects. Therefore the adoption of a participatory approach is of great importance when implementing new information technology.

Acknowledgement

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Notes

1. Because of incomplete data sets, this measurement was not included in statistical analyses.
2. For results on the amount of time spent on outside work activities see Zauchner et al. (1997).
3. The statistical trend is caused by a significant decrease in psychosomatic complaints over time and a statistical trend towards an increase in subjectively experienced stress.
4. The statistical trend is caused by a higher general level of subjectively experienced stress in the group with high participation.
5. The decrease in psychosomatic complaints over time in both job clusters (also the decrease in psychosomatic complaints in the analysis of the general effects of the implementations) may be caused by the fact that most of the workplaces were equipped with new visual display units.
6. As a high amount of participation associated with a higher level of subjectively experienced stress in general was also found in this study, in further studies the differential effects of participation causing the positive and the negative consequences should be evaluated.
7. It should not be ignored that the validity of this finding could be limited by the fact that a self-developed questionnaire had to be used for the assessment of stress experienced by outside work activities.

References


