Exposure to information technology and its relation to burnout

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Abstract. This paper investigates—in a sample of 202 Spanish employees—the hypothesis that the impact of the exposure to technology on burnout is mediated by the appraisal of technology. In addition, the factorial validity of the Maslach Burnout Inventory-General Survey (MGI-GS) is studied. The hypothesized three-factor-model of the MBI-GS (i.e. exhaustion, cynicism and professional efficacy) was *not* replicated; instead a four-factor model (i.e. exhaustion, cynicism, self-confidence and goal-attainment) fitted better to the data. Results from Structural Equation Modelling confirmed the hypothesis that the impact on burnout of the exposure to technology (in terms of time and frequency of use of computer aided technology) is mediated by the appraisal of technology. The higher the exposure, the more positive the appraisal and the lower the burnout levels (i.e. less cynicism, more self-confidence and a greater sense of goal attainment). No such effect was demonstrated for exhaustion. Limitations of the study and future research directions are discussed.

1. Introduction

Recent empirical work on the effects of Computer-Aided Technologies (CAT) (i.e. Enterprise-Integrating Networks and Advanced Manufactured Technology, according to Majchrzak and Borys 1998) has shown that exposure to technology influences users' mental health and well-being in a positive as well as in a negative sense (Kalimo and Lepeenen 1985, Igbaria and Chakrabarti 1990, Jones and Wall 1992, Kay 1990, Okebukola *et al.* 1992, Colley *et al.* 1994, Crable *et al.* 1994, Todman and Managhan 1994, Bohlin and Hunt 1995). However, other studies found that the mere exposure to technology *per se* is not responsible for health consequences in users. Rather, types of exposure and the presence of mediating variables (e.g. job characteristics, appraisal of exposure) seem to influence the effect on users' health and well-being (Woodrow 1991, Leso and Peck 1992, Majchrzak and Borys 1998, Rousseau *et al.* 1998, Chua *et al.* 1999, Korunka and Vitouch in press). Hence, it seems that the relationship between exposure to technology and the worker's health and well-being is rather complex.

The present study takes into account two aspects of this complex relationship: (1) instead of a simple dichotomy—using or not using technology—*types* (i.e. frequency and time) and *levels* of exposure are considered; and (2) the mediating role of cognitions (i.e. the appraisal of technology) is investigated.

Furthermore, to date, studies on information technology and worker's health and well-being use rather general and non-specific indicators such as psychosomatic complaints, anxiety or minor psychiatric morbidity (e.g. as measured by the General Health Questionnaire). Warr (1987) has argued that instead of these context-free measures, work-related indicators of health and well-being should be employed in organisational research. In a similar vein and specifically with respect to information technology, Clegg *et al.* (in press) emphasized the need for including more specific outcomes measures in order to link these differentially with particular predictors. Therefore, in the current study, a multidimensional indicator of worker's well-being (i.e. burnout) is used. To our knowledge this is about the first time that the impact of technology on burnout is examined (see 1.3 for the only exception).

1.1. *Exposure to technologies*

Generally speaking 'exposure to technology' refers to the total time that a user is engaged in activities related

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to technology. Other terms that have been used synonymously are 'technology experience' (Mawhinney and Sarawat 1991, Okebukola *et al.* 1992, Carlson and Wright 1993, Bohlin and Hunt 1995) and 'technology use' (Majchrzak and Borys 1998, Rousseau *et al.* 1998). Examples of technology exposure variables include: time using technology, times used before comfortable, frequency of technology use, participation in computer courses or in computer training, ownership of a computer at work or at home, computer games experience and hands-on computer experience. However, the most frequently used measures of exposure are time and frequency of use (Chua *et al.* 1999). Therefore the length of time and the frequency the user is working with technology are used as indicators of exposure.

Research has shown that exposure to technology is an important variable in the study of employee well-being. However, study results are equivocal. Most studies show that technology exposure decreases unwell-being (e.g. anxiety) or increase well-being (e.g. self-efficacy, satisfaction). For instance, when users are more experienced their anxiety decreases and their perceptions of technology-related self-efficacy increases (Kalimo and Lepeenen 1985, Igbaria and Chakrabarti 1990, Jones and Wall 1990, Kay 1990, Okebukola *et al.* 1992, Colley *et al.* 1994, Crable *et al.* 1994, Todman and Managhan 1994, Bohlin and Hunt 1995). On the other hand, however, some studies show that the effect on well-being depends on the type and level of exposure (Woodrow 1991, Leso and Peck 1992, Rousseau *et al.* 1998). For instance, in a recent meta-analysis Chua *et al.* (1999) showed that computer anxiety is inversely related to computer experience, but that the strength of this relationship varies considerably across studies. Furthermore, they showed that computer anxiety can be reduced by exposing individuals to computers and that the effect depends on the type of exposure. Exposure to a programming course, for example, did not reduce computer anxiety (see also Woodrow 1991, Leso and Peck 1992).

1.2. *The mediating role of appraisal*

At least two theoretical approaches suggest that the effect of exposure to technology on employee's well-being is mediated by cognitive appraisal. First, according to the stress and coping theory of Lazarus and Folkman (1984), an event will not produce any effect on well-being unless it is cognitively appraised as being either negative or positive. Following this reasoning it can be assumed that the relationship between technology and well-being is not direct but indirect: it is mediated by the worker's *appraisal* of technology. Only when technology is considered to be either negative or positive is employee's well-being expected to be affected.

Secondly, since the so-called technological determinism approach (Braverman 1974) that assumes that technology produces *consistent* effects may be *either* positive *or* negative has received only few empirical support, the alternative non-deterministic approach (Salanova and Cifre 1998) has to be taken into account. The latter assumes that technology may have positive *or* negative effects on worker's well-being depending on factors such as employee's evaluation of technology (Wall and Kemp 1987, Clegg *et al.* in press, Korunka and Vitouch in press). In other words, the non-deterministic approach postulates an *in*direct relationship between technology's and particular outcomes. An illustration of the non-deterministic approach is found by Majchrzak and Borys (1998) who argue that, initially, after the introduction of technology, users may have positive attitudes because vendor trainers promise a high and seamless integration. However, over time, as the users' experience increases, their view of the integration may become less positive thereby decreasing their well-being. On the other hand, users may initially have a negative attitude towards technology but may become increasingly positive as the benefits of the technology become more obvious. As a consequence their well-being may increase as well. Following this reasoning, Majchrzak and Borys (1998) conclude that researchers should pay more attention to the user's appraisal of technology.

1.3. *Burnout: a multidimensional construct*

Following Warr (1987) and Clegg *et al.* (in press), the current study uses a specific type of employee well-being—occupational burnout—is used as an outcome measure. This multidimensional construct is supposedly indirectly related to the level of exposure to technology through the evaluation or appraisal of this technology. Occupational burnout was originally almost exclusively studied in the human services (for reviews see Lee and Ashforth 1996, Schaufeli and Enzmann 1998), but recently a shift towards other occupational fields has occurred. An important impulse comes from a recently developed self-report questionnaire that can be used to assess burnout outside the human services: the Maslach Burnout Inventory-General Survey (MBI-GS; Schaufeli *et al.* 1996). Analogously to the original MBI-Human Services Survey (Maslach and Jackson 1986) the MBI-GS contains three subscales: exhaustion (i.e. the draining of energy due to excessive efforts spent at work), cynicism (i.e. an indifferent, detached, and distant attitude towards one's work), and professional efficacy (i.e. a sense of accomplishment and job competence). High levels of exhaustion and cynicism and low levels of professional efficacy are indicative for burnout.

Because of its work-relatedness and its multifaceted nature the burnout construct is particularly useful in research on technology and worker's well-being. Burnout not only includes an affective response (i.e. exhaustion) that is similar to an orthodox job strain variable, but it also includes a cynical and sceptical attitude towards work as well as an evaluation of one's efficacy at the job. Hence, it offers the possibility of studying the relationships with three different aspects of employee's well-being: strain, negative job attitude and perceived level of competence. So far, only one study has been conducted on technology and burnout (Schaufeli *et al.* 1995). In this study among intensive care nurses, a positive relation was found between burnout and the use of technology (i.e. complex mechanical ventilation equipment). However, this study did not assume a mediating process of cognitive appraisal and burnout was treated as a latent variable so that differential effects on the three dimensions could not be investigated.

The major aim is to test the hypothesis that *the impact of the exposure to technology on burnout is mediated by the appraisal of technology*. More particularly, it is expected that the more intense the exposure to technology—in terms of the frequency and the time of using it—and the more positive the appraisal of technology, then it is expected to be related with lower levels of burnout, that is, less exhaustion and cynicism and higher professional efficacy. Technically speaking, the mediating role of the appraisal of technology is investigated. The hypothesis will be tested twice using Structural Equations Modeling (SEM), first with burnout as a latent variable and next with its separate dimensions as manifest variables in order to assess differential effects on each of the separate burnout dimensions.

The second aim is to test the factorial validity of the MBI-GS since it is the first time that this instrument is used in a Spanish sample. It is expected that the original three-factor structure is replicated (Schaufeli *et al.* 1996, Schutte *et al.* 2000).

2. Method

2.1. *Participants and procedure*

The sample consists of 202 Spanish workers who used Computer-Aided Technologies in their jobs. According to the classification of Majchrzak and Borys (1998) in our sample, 83% used Enterprise-integrating Networks (i.e. computerized tools, communication tools, SAP, and executive information systems) and the remaining 17% used Advanced Manufacturing Technologies (i.e. Computer-Aided Design (CAD), Computer-Aided Manufacturing (CAM), Computer-Numerically Controlled Machining (CNC). Participants were 54% men and 46% women. The average age was 34 years and 7 months (S.D. = 7.9).

Employees were asked to complete self-report questionnaires. Officials from the Human Resources Departments were responsible for the distribution of the questionnaires, which were delivered in an envelope. A cover letter explained the purpose of the study, its voluntary nature, and guaranteed confidentiality.

2.2. *Measures*

Exposure to technology was operationalized by: (1) the *length of time* the employee had been working with technology in years and months (TIME); (2) the *frequency of use* of technology in percentage of time per week (FREQUENCY). The mean value for TIME was 3 years and 3 months (S.D. = 2.9 years/months) and for FREQUENCY 60% per week (S.D. = 30%).

Burnout was measured by the 16-items MBI-GS (Schaufeli *et al.* 1996) that consists of three subscales Exhaustion (EXH–5 items), Cynicism (CYN–5 items) and Professional Efficacy (PEF–6 items). Sample items are: 'I feel used up at the end of the workday' (EXH); 'I have become more cynical about whether my work contributes anything' (CYN); 'I have accomplished many worthwhile things in this job' (PEF). All items were scored on a seven-point rating scale, ranging from (0) 'never' to (6) 'every day'. High levels of EXH and CYN, and a low level of PEF indicate burnout.

Appraisal of technology was assessed by one question ('How do you value your experiences with technological innovation in your job?') which was assessed by using a 6-point rating scale that ranged from (1) 'very negative' to (6) 'very positive'.

2.3. *Data analysis*

Data analysis was done using the AMOS computer program (Arbuckle 1997). Maximum likelihood estimation methods were used and the input for each analysis was the covariance matrix of the variables. The goodness-of-fit of the models to the data was evaluated using relative and absolute indices. The absolute goodness-of-fit indices calculated were the χ^2 goodness-of-fit statistic, the Adjusted Goodness of Fit Index (AGFI) and the Root Mean Square Error of Approximation (RMSEA). According to Browne and Cudeck (1993), values of AGFI greater than 0.90 indicate a reasonable fit of the model, whereas values equal to or greater than 0.95 indicate a close fit. In addition, they argue that values of RMSEA smaller than 0.08 are indicative of an acceptable fit and values greater than 0.1 should lead to model rejection. As recommended by Marsh *et al.* (1996), we computed two relative goodness-of-fit indices: the Non-Normed Fit Index (NNFI) and the Comparative Fit Index (CFI). These two indices are largely independent of sample size and values close to 0.90 indicate a good fit (Bentler 1990).

3. Results

3.1. *Preliminary analysis*

In order to test whether or not employees who used different types of technology differed on the study variables, a MANOVA was carried out that compared scores of those who worked with Enterprise-Integrating Networks ($n=169$) with scores of those who worked with Advanced Manufacturing Technologies ($n=33$). All seven dependent study variables were included: time and frequency of use, appraisal of technology and the four burnout dimensions (see 3.2.). Multivariate results indicated that both groups did *not* differ significantly on these seven study variables ($F(1,177)=0.065$, n s.). Therefore, it was decided to use the entire sample for testing the hypothesis.

3.2. *Factorial validity of the burnout inventory*

Table 1 shows the summary of model fit indices of three Confirmative Factor Analytical models of the MBI-GS. Initially, only the 1-factor and 3-factor models were tested. It appeared that item 13 ('I just want to do my job and not be bothered') did not load significantly on the expected CY dimension and therefore it was excluded from further analysis (see discussion). The 3-factor model fitted significantly better to the data compared to the 1-factor model ($\Delta\chi^2=65.39$, df=3; $p<0.001$). However, based on the Modification Indices, the 3-factor model could be stepwise improved so that finally a 4-factor model resulted that showed a superior fit to the previous 3-factor model ($\Delta\chi^2=22.06$, df=4; $p<0.001$). All items loaded significant beyond the $t=1.96$ criterion on the respective factors. Although the RMSEA of the 4-factor model satisfies the criterion of 0.05, values of NFI, NNFI and CFI do not reach the criterion of 0.90. Hence, not all indices agree on the acceptability of the 4-factor model. Nevertheless, we decided to continue with this model because its factors can be interpreted straightforwardly: the original EXH and CYN dimensions were reproduced, whereas PEF splitted into two dimensions: Goal Attainment (GOAL; 3 items) and Self-Confidence (SELF; 3 items). Sample items are 'I feel I am making an effective contribution to what the organisation does' and 'At my work, I feel confident that I am effective at getting things done', respectively.

Table 2 shows the means, standard deviations, internal consistencies (Cronbach's α) and the correlations of the study variables.

Table 1. Summary of model fit indices of MBI-GS (without item 13).

	χ^2	df	p	AGFI	RMSEA	NNFI	CFI
1-factor	209.70	90	0.00	0.81	0.08	0 29	0.39
3-factors	144.41	87	0.00	0.87	0.06	0 65	0.71
4-factors	122.35	83	0.00	0 88	0.05	0.75	0.80

Table 2. Means, standard deviations, internal consistencies (Conbach's α) and correlation (Pearson r) ($n=202$).

Variables	Mean	SD	α	1	2	3	4	5	6	7
1. EXH	2.12	1.49	0.87	–	–	–	–	–	–	–
2. CYN	1.20	1.47	0.87	0.53***	–	–	–	–	–	–
3. SELF	5.40	0.79	0.72	−0.13	−0.36	–	–	–	–	–
4. GOAL	5 10	1.01	0.56	−0.24***	−0.51***	0.37***	–	–	–	–
5 Time	3.37	2.92	–	−0.00	−0.07	0 13	0.05	–	–	–
6. Frequency	50.92	30.23	–	−0.02	−0.08	0 04	0.00	0.19**	–	–
7. Appraisal	4.31	0.62	–	−0.13	−0.27	0.15*	0 28**	0.18**	0.18**	–

*$p<0.05$, **$p<0.01$; ***$p<0$ 001; EXH = Exhaustion; CYN = Cynicism; SELF = self confidence, GOAL = Goal attainment

The EXH, CYN and SELF subscales are sufficiently internally consistent since Conbach's α meets the criterion of 0.70 (Nunnaly 1978). However, GOAL shows a value for α slightly below that criterion. As other studies show, the correlation between EXH and CYN is highest (0.53) and correlations with the scales that originally constituted the PEF-scale are negative (Schaufeli *et al.* 1996). SELF and GOAL are only moderately correlated (0.37), which corroborates the splitting of PEF into two factors.

3.3 *Hypothesis testing*

Figure 1 displays the results of the hypothesis testing. The fit of the model to the data is good; all indices indicate appropriate fix: $\chi^2 = 20.27$, df = 13; $p = 0.08$; RMSA = 0.05; AGFI = 0.94; NNFI = 0.94; CFI = 0.96. The model explains 6% of the variance in technology appraisal and 9% in burnout. Furthermore, all standardized coefficients that are displayed in figure 1 are significantly beyond the $t = 1.96$ criterion. In order to test if a *direct* effect exists from exposure on burnout, paths were introduced from TIME and FREQUENCY to BURNOUT. As expected, these paths were *not* significant and consequently, the fit of this revised model was not better than that of the current model.

Accordingly, the hypothesis that the appraisal of technology plays a mediating role between the exposure to technology (FREQUENCY and TIME) and burnout is confirmed. The more intensive the exposure, the more positive technology are appraised and the lower burnout levels are.

In the next step, instead of one latent burnout variable the four burnout dimensions were included separately in order to study the differential effects of appraisal on each of these dimensions (see figure 2).

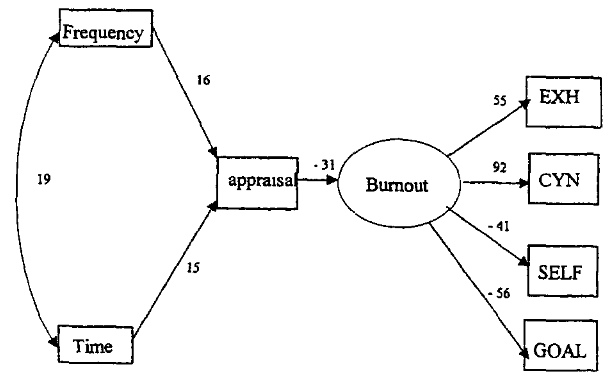

Figure 1. Exposure to technology and burnout

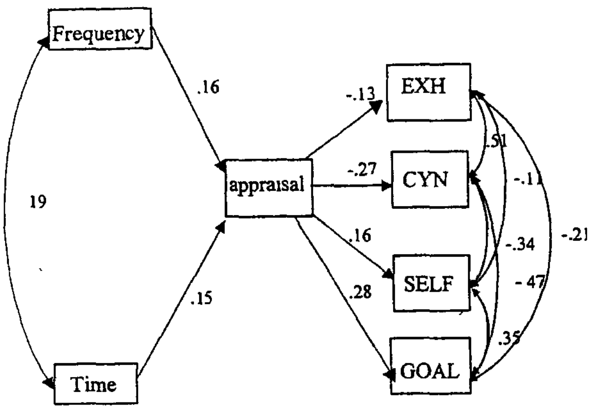

Figure 2 Exposure to technology and different burnout dimensions.

Again the fit of the model was quite satisfactory, with all indices meeting their respective criteria: $\chi^2 = 3.57$, df = 8; $p = 0.89$; RMSA = 0.00; AGFI = 0.98; NNFI = 1.06; CFI = 1.00. The model explains 6% of the variance in technology appraisal and 2%, 7%, 2% and 8% in EXH, CYN, SELF and GOAL, respectively. Except the path from technology appraisal to EXH, all standardized coefficients are significant beyond the $t = 1.96$ criterion. Accordingly, the strongest effects of technology appraisal are on CYN and GOAL, whereas the effect on SELF is somewhat weaker and the effect on EXH is non-significant. Hence, it appears that a positive appraisal of technology is associated with less cynicism and a higher sense of goal attainment and self-confidence.

4. Conclusion and discussion

The prime objective of this study was to test the hypothesis that the effect of exposure to technology on burnout is mediated by the cognitive appraisal of technology. It was found that, according to expectations, more intensive exposure to technology is associated with a more positive appraisal, which, in its turn is associated with lower levels of burnout. Besides, the mediating role of appraisal was furthermore confirmed since no direct relationship between exposure and burnout was observed. Secondly, the factorial validity of the Spanish version of the MBI-GS was tested. However, the original 3-factor structure was *not* replicated and instead a 4-factor solution was found whereby the original dimension that indicated professional efficacy splitted into two sub-dimensions reflecting goal attainment and self-confidence.

4.1. *The mediating role of appraisal*

In the introduction we stated that the relationship between information technology and employee's well-being is more complex than most studies so far have assumed. More particularly, it is argued that instead of using technology or not using technology, the *level* and *types* of use of technology should be taken into consideration. Indeed, it was found that the level of exposure to technology, in terms of time and frequency of its use, is (indirectly) related to burnout. In addition, it was argued in the introduction that it is likely that the effects of exposure are mediated by cognitive appraisal instead of having a direct effect on worker's health and well-being. This assertion was clearly supported by the data (see figures 1 and 2). Finally, we pointed to the fact that the exposure to technology is likely to have differential effects on various components of employee's well-being. By including a multidimensional indicator of well-being (i.e. burnout) we were able to show that the use of technology decreases an employee's cynicism and increases their level of professional efficacy (i.e. their sense of goal attainment and self-confidence) but does not affect levels of strain (i.e. exhaustion). This agrees with the view of Majchrzak and Borys (1998) and Clegg *et al.* (in press) who argue that with time and experience attitudes towards technology change and that in the long run attitudes are more strongly determined by the functionality of the technology-systems. Indeed, in the sample, technology was appraised more positively the longer employees worked with it and this was associated with higher goal attainment, less cynicism, and more self-confidence (but not with strain). In short, the results suggest that it was the initial dysfunctionality of the technology that probably hindered the attainment of work goals and reduced self-confidence as well as inducing initial scepticism, but that this may be overcome when employees are more exposed to the technology.

Interestingly, and against expectations, *no* significant (indirect) relationship was observed between exposure to technology and the affective component of burnout (i.e. exhaustion). Obviously, only attitudes (i.e. cynicism) and perceived competencies (i.e. goal attainment and self-confidence) are related to the exposure of technology, whereas working with technology does not affect the employee's level of mental strain (i.e. exhaustion). This result does not agree with previous research on other affective outcomes regarding exposure to technology. For instance, decreased levels of computer anxiety have found to be associated with more technology exposure (Igbaria and Chakrabarti 1990, Jones and Wall 1990, Okebukola *et al.* 1992, Torzadeh and Angulo 1992, Todman and Managhan 1994, Bohlin and Hunt 1995). Clearly, more research on the causal effect of exposure to technology and exhaustion is needed.

4.2. *Factorial validity of the MBI-GS*

In the current study item 13 ('I just want to do my job and not be bothered') appeared to be an unsound item and was therefore excluded from further analysis. Recently, Schutte *et al.* (2000) also excluded this CYN-item in a comparative cross-national study on the factorial validity of the MBI-GS that included samples from Sweden, Finland and The Netherlands. The authors pointed to the ambivalence of item 13 because on the one hand, a high score may indicate disengagement and social isolation by closing off oneself from contacts with others at work. However, on the other hand, a high score may also indicate strong motivation and engagement: one concentrates on the task and does not want to be interrupted.

Against expectations, the original 3-factor model was *not* replicated. This is quite remarkable since this 3-factor structure has been consistently found across various samples, occupational groups (blue and white collar workers, service employees, managerial and administrative jobs) and countries (Canada, Finland, Sweden and The Netherlands) (Leiter and Schaufeli 1996, Schaufeli *et al.* 1996, Schutte *et al.* 2000). Since this is the first time that the Spanish version of the MBI-GS has been evaluated, it cannot be ruled out that this divergent result is caused by the translation of the questionnaire. It can also be speculated that it is caused by the specific sample under study, i.e. employees who use technology at their jobs. The current employees to pay particular attention to the professional efficacy component since this component is most clearly related to working with information technology. Perhaps it is a special feature of those who work with technology that their professional efficacy consists of two relatively unrelated aspects: the attainment of goals and the level of self-confidence. The former being more specific to the job, whereas the latter is more general and close to the concept of self-efficacy (Bandura 1997).

4.3. *Limitations and suggestions for further research*

Since the current study is cross-sectional in nature, no causal inferences can be made. Therefore, future longitudinal research should corroborate the positive findings concerning the mediating effect of appraisal. Furthermore, the measures of exposure and appraisal used in this study could be replaced in future studies by more objective indicators and multi-item measures, respectively. For instance, company files can be used to establish the worker's exposure to technology and a more sophisticated measure of appraisal could be included that refers to various aspects of technology (e.g. the way it was implemented, its effect on the content of the job). Finally, in this study, appraisal was used as a mediating variable, but future research could also include alternative mediators such as job design. Last but not least, instead of including burnout as a dependent variable, future researchers might wish to use positive indicators of well-being such as engagement (Maslach and Leiter 1997) or flow—a state of optimal experience (Chen *et al.* 1999)—to specifically document the positive effects of working with technology. Although the results of the present study point in direction that exposure to technology is associated to low levels of burnout, it remains to be seen if employees are more engaged in their jobs or experience more flow the more they are exposed to technology.

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References

ARBUCKLE, J. L. 1997, *Amos Users' Guide Version 3.6* (Chicago, IL: Smallwaters Corporation).

BANDURA, A. 1997, *Self-efficacy the Exercise of Control* (New York, NY: Freeman).

BENTLER, P. 1990, Comparative fit indexes in structural models, *Psychological Bulletin*, **107**, 238–246

BOHLIN, R. M and HUNT, N P. 1995, Course structure effects on student's computer anxiety, *Journal of Educational Computing Research*, **13**(3), 263–270.

BRAVERMAN, H 1974, *Labour and Monopoly Capital: The Degradation of Work in the Twentieth Century* (New York, NY: Monthly Review Press).

BROWNE, M. W. and CUDECK, R. 1993, Alternative ways of assessing model fit. In K A. Bollen and J. S. Long (eds) *Testing Structural Equation Models* (Newbury Park, CA. Sage), 136–162.

CARLSON, R. E and WRIGHT, D. G. 1993, Computer anxiety and communication apprehension relationship and introductory college course effects, *Journal of Educational Computing Research*, **9**(2), 329–338.

CHEN, H., WIGLAND, R. T and NILAN, M. S. 1999, Optimal experience of Web activities, *Computers in Human Behavior*, **15**, 585–608

CHUA, S. L., CHEN, D. T. and WONG, A F. L. 1999, Computer anxiety and its correlates: a meta-analysis, *Computers in Human Behavior*, **15**, 609–623

CLEGG, C. W., CAREY, N , DEAN, G., HORNBY, P and BOLDEN, R. (in press), Users' reactions to Information Technology: some multivariate models and their implications, *Journal of Information Technology*, forthcoming.

COLLEY, E. A., BRODZINSKI, J D., SCHERER, R. F. and JONES, P. D. 1994, The impact of cognitive appraisal, locus of control and level of exposure on the computer anxiety of novice computer users, *Journal of Educational Computing Research*, **10**(4), 329–340

CRABLE, E. A., BRODZINSKI, J. D , SCHERER, R. F. and JONES, P. D. 1994, The impact of cognitive appraisal, locus of control and level of exposure on the computer anxiety of novice computer users, *Journal of Educational Computing Research*, **10**(4), 329–340.

IGBARIA, M. and CHAKRABARTI, A 1990, Computer anxiety and attitudes towards computer use, *Behavior & Information Technology*, **9**(3), 229–241.

JONES, P. E and WALL, R. E. 1990, Components of computer anxiety, *Journal of Educational Technology Systems*, **18**(3), 161–168

KALIMO, R and LEPEENEN, A. 1985, Feedback from video display terminal, performance control and stress in text preparation in printing industry, *Journal of Occupational Psychology*, **58**, 27–38.

KAY, R. H. 1990, Predicting student teacher commitment to the use of computers, *Journal of Educational Computing Research*, **6**(3), 299–309.

KORUNKA, C and VITOUCH, O (in press), Effects of information technology implementations on employees' strain and job satisfaction. testing of an integrative model, *Journal of Organisational Behaviour*, forthcoming.

LAZARUS, R S. and FOLKMAN, S. 1984, *Stress, Appraisal and Coping* (New York, NY: Springer).

LEE, R. T. and ASHFORTH, B. E. 1996, A meta-analytic examination of the correlates of the three dimensions of job burnout, *Journal of Applied Psychology*, **81**, 123–133.

LEITER, M. P. and SCHAUFELI, W. B 1996, Consistency of the burnout construct across occupations, *Anxiety, Stress and Coping*, **9**, 229–243.

LESO, R. and PECK, K. L 1992, Computer anxiety and different types of computer courses, *Journal of Educational Computing Research*, **8**(4), 469–478.

MAJCHRZAK, A. and BORYS, B. 1998, Computer-aided technology and work. moving the field forward. In C. L. Cooper and I. T Robertson (eds) *International Review of Industrial and Organizational Psychology*, **13**, 305–354

MARSH, H. W., BALLA, J. R. and HAU, K. T. 1996, An evaluation of Incremental Fit Indices: a clarification of mathematical and empirical properties. In G. A Marcoulides and R. E Schumacker (eds) *Advanced Structural Equation Modeling, Issues and Techniques* (Mahwah, NJ: Lawrence Erlbaum Associates, Publishers), 315–353.

MASLACH, C. and JACKSON, S. E. 1986, *MBI. Maslach Burnout Inventory: Manual Research Edition* (Palo Alto, CA. Consulting Psychologists Press).

MASLACH, C and LEITER, M. P. 1997, *The Truth About Burnout How Organizations Cause Personal Stress and What To Do About It* (San Francisco, CA: Jossey-Bass).

MAWHINNEY, C. H. and SARAWAT, S. P. 1991, Personality type, computer anxiety and student performance: an empirical indicator, *Journal of Educational Computing Research*, **13**, 101–103

NUNNALY, J C 1978, *Psychometric Theory* (New York, NY. McGraw-Hill)

Okebukola, P A., Sumampouw, W and Jegede, O. J. 1992, The experience factor in computer anxiety and interest, *Journal Educational Technology Systems*, **20**(3), 221–229.

Rousseau, G K., Jamieson, B. A., Rogers, W A., Mead, S E and Sit, R A. 1998, Assessing the usability of on-line library systems, *Behavior & Information Technology*, **17**(5), 274–281.

Salanova, M. and Cifre, E. 1998, New technologies and psychosocial factors at work: A non-deterministic approach. Paper presented in the First International ICOH Conference on Psychosocial Factors at Work, Copenhagen, 24–26 August.

Schaufeli, W. B. and Enzmann, D. 1998, *The Burnout Companion to Study and Practice. a Critical Analysis* (London: Taylor & Francis).

Schaufeli, W. B., Keijsers, G. J. and Reis Miranda, D. 1995, Burnout, technology use, and ICU-performance. In S L. Sauter and L R. Murphy (eds) *Organizational risk factors for job stress* (Washington, DC· APA Books), 259–271.

Schaufeli, W. B., Leiter, M. P., Maslach, C. and Jackson, S. E. 1996, Maslach Burnout Inventory-General Survey In C. Maslach, S E. Jackson and M. P. Leiter (eds) *The Maslach Burnout Inventory*, 3rd edn, *Test Manual*, (Palo Alto, CA· Consulting Psychologists Press), 19–26.

Schutte, N., Toppinen, S , Kalimo, R and Schaufeli, W B. 2000, The factorial validity of the Maslach Burnout Inventory—General Survey across occupational groups and nations, *Journal of Occupational and Organizational Psychology*, **73**, 53–66.

Todman, J. and Monaghan, E. 1994, Qualitative differences in computer experience, computer anxiety and students' use of computers: a path model, *Computers in Human Behavior*, **10**(4), 529–539

Torzadeh, G. and Angulo, I. E. 1992, The concept and correlates of computer anxiety, *Behavior and Information Technology*, **11**, 99–108

Wall, R. and Kemp, N. 1987, The nature and implications of advanced manufacturing technology: introduction. In T. D. Wall, C. W. Clegg and N. Kemp, (eds) *The human side of advanced manufacturing technology* (New York, NY: Wiley), 173–195.

Warr, P. 1987, *Work, unemployment and mental health* (Oxford: Oxford University Press).

Woodrow, J. 1991, A comparison of four computer attitude scales, *Journal of Educational Computing Research*, **7**, 165–187.