Extrinsic and Intrinsic Motivation to Use Computers in the Workplace[1]

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Previous research indicates that perceived usefulness is a major determinant and predictor of intentions to use computers in the workplace. In contrast, the impact of enjoyment on usage intentions has not been examined. Two studies are reported concerning the relative effects of usefulness and enjoyment on intentions to use, and usage of, computers in the workplace. Usefulness had a strong effect on usage intentions in both Study 1, regarding word processing software ($\beta = .68$), and Study 2, regarding business graphics programs ($\beta = .79$). As hypothesized, enjoyment also had a significant effect on intentions in both studies, controlling for perceived usefulness ($\beta = .16$ and .15 for Studies 1 and 2, respectively). Study 1 found that intentions correlated .63 with system usage and that usefulness and enjoyment influenced usage behavior entirely indirectly through their effects on intentions. In both studies, a positive interaction between usefulness and enjoyment was observed. Together, usefulness and enjoyment explained 62% (Study 1) and 75% (Study 2) of the variance in usage intentions. Moreover, usefulness and enjoyment were found to mediate fully the effects on usage intentions of perceived output quality and perceived ease of use. As hypothesized, a measure of task importance moderated the effects of ease of use and output quality on usefulness but not on enjoyment. Several implications are drawn for how to design computer programs to be both more useful and more enjoyable in order to increase their acceptability among potential users.

Do people use computers at work more because they are useful or because they are enjoyable to use? There is growing interest in what motivates people to accept or reject computers in the workplace as organizations accelerate their investments in various computer

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applications such as word processors, electronic mail, spreadsheets, data management, and graphics. The productivity gains offered by such computer tools are often unrealized due to poor acceptance by users (Swanson, 1988). While perceived usefulness has been strongly linked to usage intentions in several studies (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989), research on the role of enjoyment in workplace computing has begun only recently (Webster, 1989). Our purpose here is to compare the influence of perceived usefulness and enjoyment on intentions to use computers in the workplace.

Motivation theorists often distinguish between two broad classes of motivation to perform an activity: extrinsic motivation and intrinsic motivation (e.g., Calder & Staw, 1975; Deci, 1971, 1972; Pinder, 1976; Porac & Meindl, 1982; Pritchard, Campbell, & Campbell, 1977; Scott, Farh, & Podsakoff, 1988). Extrinsic motivation refers to the performance of an activity because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions (e.g., Lawler & Porter, 1967; Mitchell & Biglan, 1971; Vroom, 1964). While extrinsic motivation influences behavior due to the reinforcement value of outcomes, intrinsic motivation refers to the performance of an activity for no apparent reinforcement other than the process of performing the activity per se (Berlyne, 1966; deCharms, 1968; White, 1959). Within this dichotomy, perceived usefulness is an example of extrinsic motivation, whereas enjoyment is an example of intrinsic motivation.

Perceived usefulness is defined as a person's expectation that using the computer will result in improved job performance (e.g., Davis, 1989; Davis et al., 1989). This definition stems from Robey's (1979) adaptation of Porter and Lawler's (1968) instrumentality model of job performance to the use of computers in the workplace. Research to date indicates that voluntary computer use is driven, to a large extent, by perceived usefulness. Schultz and Slevin (1975) observed a correlation of .60 between managers' anticipated effect of a computerized decision model on their job performance and their intentions to use it. Robey and Zeller (1978) found a significant difference in perceived usefulness between one department within an organization that adopted an information system and another department within the same company that rejected the same system. Robey (1979) observed that the users' expected performance impacts of a computerized sales record-keeping system correlated .79 with a measure of actual system use. Using structural equations, Hill, Smith, and Mann (1987) found that the instrumentality of computers for achieving various performance related consequences was significantly linked to usage intentions, with path coefficients of .53 in their first study

and .39 in a second study. Davis et al. (1989) reported a .76 correlation between perceived usefulness and intentions to use a word processing system. Davis (1989) found that usefulness correlated .63 with system usage in one study and .85 with usage intentions in a second study. He also pointed out that perceived usefulness appears to exhibit a stronger and more consistent relationship with usage behavior and intentions than other variables reported in the literature, including various attitude, satisfaction, and perception measures.

In contrast with usefulness, enjoyment refers to the extent to which the activity of using the computer is perceived to be enjoyable in it's own right, apart from any performance consequences that may be anticipated (Carroll & Thomas, 1988; Deci, 1971; Malone, 1981). Much of the work to date on the role of enjoyment in computer use has been done in the context of computer games (Holbrook, Chestnut, Oliva, & Greenleaf, 1984; Malone, 1981a, 1981b). As Carroll and Thomas (1988) point out, however, it isn't clear to what extent these findings carry over to the use of the computer as a tool in the workplace. Carroll and Thomas (1988) suggest that enjoyment was a key factor underlying user acceptance of the Apple Lisa computer, a forerunner of the Macintosh. One industry survey is consistent with this claim, finding the Macintosh to be rated more enjoyable to use than MS-DOS (or IBM PC-compatible) computers (Diagnostic Research, 1988). Webster (1989; see also Webster & Martocchio, in press) found evidence that computer use in the workplace encourages playfulness. Given the intrinsically motivating ability of computer-based games (e.g., Malone, 1981a), this should not be too surprising. Thus, while the importance of enjoyment as a determinant of computer use in the workplace is being increasingly suggested, the effect of enjoyment on usage intentions and behaviors, and the relative effects of enjoyment versus usefulness, have not been addressed empirically.

We expect that, while usefulness will once again emerge as a major determinant of intentions to use a computer in the workplace, enjoyment will explain significant variance in usage intentions beyond that accounted for by usefulness alone. Furthermore, following Fishbein and Ajzen (1975) and Triandis (1977), we expect behavioral intentions to mediate the effect of expectations (such as expected usefulness and expected enjoyment) on behavior.

Hypothesis 1. Both usefulness and enjoyment will have significant effects on peoples' intentions to use computers in the workplace.

Hypothesis 2. Usage intentions will mediate the effect of usefulness and enjoyment on usage behavior.

Are usefulness and enjoyment additive or interactive in their effects

on intentions? Deci (1971, 1972, 1975) and others have often found that introducing an extrinsic reward can diminish the effect of intrinsic motivation on tasks which were originally purely intrinsically motivating, such as puzzle solving (see also Hamner & Foster, 1975; Lepper & Greene, 1975; Lepper, Greene, & Nisbett, 1973; Pinder, 1976; Pritchard et al., 1977; Ryan, Mims, & Koestner, 1983). This negative interaction has been explained within the context of Deci's cognitive evaluation theory, which argues that the introduction of an extrinsic reward causes a shift in locus of causality for the activity from internal to external and that locus of causality, along with feelings of competence and self-determination, are key determinants of intrinsic motivation (Deci, 1975, pp. 139-142). For behaviors that are not purely intrinsic in the first place, the negative interaction between extrinsic rewards and intrinsic motivation is often diminished, apparently because the shift in locus of causality from internal to external has been reduced (e.g., Calder & Staw, 1975; Hirst, 1988; Mossholder, 1980). Recent work demonstrates that the cognitive relabeling of tasks as work versus play partially accounts for the undermining effects of extrinsic rewards on intrinsically motivated tasks (Cellar & Barrett, 1987; Cellar & Wade, 1988; Porac & Meindl, 1982). Given the prominent effect of perceived usefulness on the use of computer tools in the workplace, we do not consider such behavior to be purely intrinsic. Instead, we hypothesize that computer use will be primarily extrinsically motivated and that intrinsic motivation will have a smaller but still significant direct effect on intentions. The presence of intrinsic motivation is not incompatible with behaviors cognitively regarded as work (e.g., Bailyn, 1989; Csikszentmihalyi, 1975; Webster, 1989). Consistent with findings related to other types of organizational behaviors (e.g., Boal & Cummings, 1981; Staw, Calder, Hess, & Sandelands, 1980), we do not expect the variations in intrinsic versus extrinsic motivation in workplace computing to be large enough to cause a fundamental shift in locus of causality or to generate a cognitive recategorization from work to play. Thus, we do not expect the often found negative interaction between extrinsic and intrinsic motivation in the present study. We expect usefulness and enjoyment principally to combine additively in their effect on intentions in the present context. A positive interaction effect, where enjoyment has a greater effect on intentions if usefulness is high (and vice versa), is also consistent with the above theoretical considerations.

Two additional variables have been studied as determinants of computer adoption in the workplace: perceived ease of use (Davis, 1989; Davis et al., 1989) and perceived output quality (Lucas, 1975; O'Reilly, 1982; Swanson, 1987). Ease of use may be inferred by the effort one

experiences in the process of carrying out tasks using a given system; quality is judged by observing intermediate or end products of using the system, such as documents, graphs, calculations, and the like. We hypothesize that ease of use and output quality will function as antecedents of both usefulness and enjoyment.

Regarding usefulness, the easier a system is to use, the less effort required to carry out a given task. Since effort is a finite resource, the less effort that goes toward the use of a system, the more that can be allocated to other job tasks, which should benefit overall job performance (Davis et al., 1989). Similarly, all else being equal, the better the output quality, the better one's job performance. This assumes, however, that the kind of task being supported by the computer system in question is relevant to the user's job. In the extreme, if the task being supported is unimportant to a given person's job, ease of use and output quality should have no effect on usefulness. For example, the fact that a statistical forecasting program is easy to operate and produces highly accurate output would not imply that the program is useful to an employee who never needs to perform statistical forecasts. More generally, a measure of how important the computer-supported task is to a person's job should moderate the effect of ease of use and output quality on usefulness. For highly important tasks, the effects should be larger; for less important tasks, the effects should be smaller. This hypothesized positive interaction of task importance with ease of use and quality is addressed in Study 2, below.

We hypothesize that perceived ease of use and output quality will also have a positive effect on enjoyment, since they represent two distinct sources of information relevant to feelings of self-efficacy, competence, and self-determination, which are theorized to influence intrinsic motivation (Bandura, 1982; Bandura & Schunk, 1981; deCharms, 1968; Deci, 1975; Fisher, 1978; Harackiewicz, 1979; Hill et al., 1987; Lepper, 1985; Maddux, Norton, & Stoltenberg, 1986; White, 1959; Zuckerman, Porac, Latham, Smith, & Deci, 1978). The effects of ease of use and quality on enjoyment are expected to be positive, as opposed to negative, since, as sources of feedback to the user, they are informational about task performance but not controlling in nature, the latter of which could undermine intrinsic motivation according to cognitive evaluation theory (Deci, 1975, p. 142). Unlike our hypothesis for the determinants of usefulness, we do not expect task importance to moderate the effects of ease of use and output quality on enjoyment, since ease of use and quality should continue to function as sources of information relevant to judgments of mastery and self-determination and, hence, as determinants of intrinsic motivation, irrespective of

whether the task is instrumental to improved job performance.

Hypothesis 3. Usefulness and enjoyment will mediate the effects of ease of use and output quality on usage intentions.

Hypothesis 4. Task importance will moderate the effects of ease of use and output quality on usefulness but will not moderate the effects of ease of use and output quality on enjoyment.

Study 1

Method

The participants were 200 MBA students, 120 male and 80 female, at a midwestern university. A word processing program, WriteOne, was available for voluntary use by these students in two public computer laboratories. WriteOne is a typical personal-computer-based word processing program similar to many others in use today. The majority of the participants indicated having none, little, or moderate experience with computers in general (77%), personal computers (72%), and word processing programs (76%), with the rest of the participants indicating moderately extensive or extensive experience in these categories. None of the subjects reported being familiar with WriteOne at the beginning of the MBA program. A questionnaire concerning WriteOne was administered at the end of the students' first 14-week semester.

Perceived usefulness was measured with the following four 7-point likely/unlikely items: "Using WriteOne would improve my performance in the MBA program," "Using WriteOne in the MBA program would increase my productivity," "Using WriteOne would enhance my effectiveness in the MBA program," and "I would find WriteOne useful in the MBA program." The usefulness items were selected from an original scale developed and validated by Davis (1989). Enjoyment was measured with the following three 7-point items: "I find using WriteOne to be enjoyable (likely/unlikely)"; "The actual process of using WriteOne is (unpleasant/pleasant)," and "I have fun using WriteOne (likely/unlikely)." Perceived ease of use was measured with the following four 7-point likely/unlikely scales: "Learning to operate WriteOne would be easy for me," "I would find it easy to get WriteOne to do what I want it to do," "It would be easy for me to become skillful at using WriteOne," and "I would find WriteOne easy to use." All of the above 7-point items used the following descriptors for each response alternative: extremely, quite, slightly, neither, slightly, quite, and extremely. The ease of use items were selected from an original scale developed and validated by Davis (1989).

Perceived output quality was measured using four 7-point scales that asked subjects to rate the quality of each of the following types of documents if they were created using WriteOne: resumes, cover letters for job applications, class papers and reports, and personal correspondence. These categories were based on pretest interviews with participants. Scale position one was labeled low, scale position four was labeled medium, and scale position seven was labeled high. Usage intentions were measured using the statement: "I presently intend to actually use WriteOne regularly in the MBA Program," followed by two response scales. The first was a 7-point likely/unlikely format with anchoring adverbs: extremely, quite, slightly, neither, slightly, quite, and extremely. The second was an 11-point scale with endpoints labeled definitely no and definitely yes. Usage of WriteOne was measured with two 7-point items. The first item stated: "At the present time, I consider myself to be a (frequent/infrequent) user of WriteOne." The seven response positions were labeled: extremely, quite, slightly, neither, slightly, quite, and extremely. The second usage item stated: "I currently use WriteOne not at all, less than once a week, about once a week, 2 or 3 times a week, 4 to 6 times a week, about once a day, or several times a day."

Results

Table 1 gives the reliability and validity of the measurement scales. Using principal components analysis with varimax rotation, four factors were extracted which accounted for 74.1% of the variance in the items. The principal components analysis suggested that usefulness, enjoyment, ease of use, and quality were distinct unidimensional scales. Items used to operationalize a given variable loaded on a single factor, as indicated by high loadings on the common factor (generally above .80) and small loadings on the other factors (generally below .25). Cronbach alpha reliability coefficients were .91 for usefulness, .81 for enjoyment, .88 for ease of use, and .78 for output quality. The 2-item measure of intention had a Cronbach alpha reliability of .88.

Consistent with Hypothesis 1, usefulness ($t_{197} = 13.28$, $p < .001$) and enjoyment ($t_{197} = 3.08$, $p < .01$) had significant effects on intentions to use the word processing program (Table 2). There was a significant positive interaction between usefulness and enjoyment ($t_{196} = 5.23$, $p < .001$). Taking the interaction effect into account, the effect of enjoyment on intentions is $-.07 + .16 \times$ usefulness, and the effect of usefulness on intentions is $.55 + .16 \times$ enjoyment. Consistent with Hypothesis 2, intentions fully mediated the effect of usefulness and enjoyment on self-reported usage behavior. The regression analyses in Table 2 show that

Table 1

Scale Reliability and Factorial Validity—Study 1

Scale item	Scale reliability (Cronbach α)	Principal components with varimax			
		Factor 1	Factor 2	Factor 3	Factor 4
USF1		.83	.12	.03	.20
USF2		.87	.10	.17	.07
USF3		.88	.07	.07	.17
USF4	.91	.83	.22	.20	.10
ENJ1		.29	.23	.08	.81
ENJ2		.10	.06	.02	.83
ENJ3	.81	.10	.14	.14	.82
EOU1		-.01	.88	.04	.11
EOU2		.18	.80	.16	.09
EOU3		.07	.86	.02	.11
EOU4	.88	.30	.81	.14	.17
QUL1		-.21	.08	.54	.17
QUL2		.18	.04	.87	.07
QUL3		.26	.14	.84	-.02
QUL4	.78	.21	.07	.81	.04
Eigenvalue		5.32	2.24	1.96	1.59
% Variance explained		35.5	14.9	13.1	10.6
Cumulative %		35.5	50.4	63.5	74.1

Note. USF1 to USF4: Perceived Usefulness items; ENJ1 to ENJ3: Enjoyment items; EOU1 to EOU4: Perceived Ease of Use items; QUL1 to QUL4. Perceived Output Quality items; $n = 200$.

intention was a significant determinant of usage ($t_{198} = 5.96$, $p < .001$), and the significant effects of usefulness and enjoyment on usage ($t_{197} = 6.92$, $p < .001$ for usefulness and $t_{197} = 2.15$, $p < .05$ for enjoyment) became nonsignificant when intention was controlled for ($t_{196} = 1.44$, n.s. for usefulness and $t_{196} = 1.02$, n.s. for enjoyment). This implies that

Table 2

Regression Results—Study 1

Dependent variable	R^2	Independent variable	β	SE_β	Significance level
Hypothesis 1. Intentions are jointly determined by usefulness and enjoyment:					
BI	.56	USF***	.68	.05	.000
		ENJ**	.16	.05	.002
BI	.62	USF***	.55	.05	.000
		ENJ	-.07	.06	.279
		USF × ENJ***	.16	.05	.002
Hypothesis 2. Intentions mediate the effect of usefulness and enjoyment on usage behavior:					
USAGE	.40	BI***	.63	.05	.000
USAGE	.28	USF***	.46	.07	.000
		ENJ*	.14	.07	.033
USAGE	.38	BI***	.49	.09	.000
		USF	.13	.08	.137
		ENJ	.06	.06	.335
Hypothesis 3. Usefulness and enjoyment mediate the effects of ease of use and output quality on intentions:					
BI	.08	EOU	.12	.07	.094
		QUL***	.23	.07	.001
BI	.57	USF***	.69	.05	.000
		ENJ***	.18	.05	.001
		EOU	-.06	.05	.234
		QUL	-.02	.05	.738
USF	.15	EOU**	.19	.07	.005
		QUL***	.30	.07	.000
ENJ	.13	EOU***	.26	.07	.000
		QUL**	.21	.07	.002

Note. USF: Perceived Usefulness; ENJ: Enjoyment; EOU: Perceived Ease of Use; QUL: Perceived Output Quality; BI: Behavioral Intentions.

*$p < .05$; **$p < .01$; ***$p < .001$.

usefulness and enjoyment achieve their effects on usage indirectly via intentions, as expected.

Consistent with Hypothesis 3, usefulness and enjoyment mediated the effects of ease of use and output quality on intention (Table 2). When intention was regressed on ease of use and quality, quality had a significant effect ($t_{197} = 3.30$, $p < .01$) but ease of use did not ($t_{197} = 1.69$, n.s.). When usefulness and enjoyment were brought into the equation, quality became non-significant ($t_{195} = -.298$, n.s.). The last two regressions in Table 2 show that both ease of use and quality had significant effects on both usefulness ($t_{197} = 2.85$, $p < .005$ for ease of use and $t_{197} = 4.52$, $p < .001$ for quality) and enjoyment ($t_{197} = 3.84$, $p < .001$ for ease of use and $t_{197} = 3.08$, $p < .01$ for quality). Together these imply that ease of use and quality influenced intention entirely indirectly via their significant effects on usefulness and enjoyment, as predicted.

Study 2

Method

Forty evening MBA students at an eastern university participated in a 2-hour laboratory session for which they were paid $25. The participants had a range of prior experience with computers in general (35% none or limited, 48% moderate, and 17% extensive) and personal computers in particular (35% none or limited, 48% moderate, and 15% extensive) but were unfamiliar with the two programs used in the study.

The subjects used and evaluated two IBM-PC based graphics systems: Chartmaster, by Decision Resources, Inc. of Westport, Connecticut, and Pendraw, by Pencept, Inc. of Waltham, Massachusetts. Chartmaster is a menu-driven program that creates numerical business graphs such as bar charts, line charts, and pie charts based on parameters defined by the user. Through the keyboard and menus, the user inputs the data for, and defines the desired characteristics of, the chart to be made. Pendraw is a graphics program with which users draw desired shapes using a digitizer tablet and an electronic stylus. By drawing on the tablet, the user manipulates the image, which is visible on the screen as it is being created, and can use freehand drawing or select from among geometric shapes such as boxes, lines, and circles.

The participants were given one hour of hands-on experience creating numerical business charts with Chartmaster and Pendraw, using workbooks that were designed to follow the same instructional sequence as the user manuals for the two products, while equalizing the style of writing. Half of the participants tried Chartmaster first and half tried

Pendraw first. After using each program, a questionnaire was completed. Observations were pooled, yielding a sample size of 80.

Perceived usefulness was measured with the following four 7-point likely/unlikely items: "Using Chart-Master (Pendraw) would improve my job performance," "Using Chart-Master (Pendraw) in my job would increase my productivity," "Using Chart-Master (Pendraw) would enhance my effectiveness on the job," and "I would find Chart-Master (Pendraw) useful in my job." The usefulness items were selected from an original scale developed and validated by Davis (1989). Enjoyment was measured with the following three 7-point items: "I would find using Chart-Master (Pendraw) to be enjoyable (likely/unlikely)," "Using Chart-Master (Pendraw) would be (unpleasant/pleasant)," and "I would have fun using Chart-Master (Pendraw) (likely/unlikely)." Perceived ease of use was measured with the following four 7-point likely/unlikely scales: "Learning to operate Chart-Master (Pendraw) would be easy for me," "I would find it easy to get Chart-Master (Pendraw) to do what I want it to do," "It would be easy for me to become skillful at using Chart-Master (Pendraw)," and "I would find Chart-Master (Pendraw) easy to use." The ease of use items were selected from an original scale developed and validated by Davis (1989).

Perceived output quality was measured using three 7-point scales: "Assuming I were to use Chartmaster (Pendraw), the quality of the output I would get would be high (likely/unlikely)," Using Chart-Master (Pendraw), the effectiveness of the finished product would be: "low/high," and "The charts and graphs I would make with Chart-Master (Pendraw) would be professional looking (likely/unlikely)." Task importance was measured using two 7-point responses to the statement: "Numeric charts are charts or graphs that are used to present numerical information in a visual format and include pie charts, bar graphs, line charts, and scatter charts. In my job, numeric charts are: unimportant/important and relevant/irrelevant." Usage intentions were measured using the statement: "Assuming Chartmaster (Pendraw) would be available on my job, I predict that I would use it on a regular basis in the future." This statement was rated on two 7-point scales with endpoints likely/unlikely and improbable/probable. This is the behavioral expectation form of intention questioning, which Sheppard, Warshaw, and Hartwick (1989) and Warshaw and Davis (1985) have shown is more predictive of future behavior than a pure intention format, as used in Study 1. All of the 7-point items used in Study 2 employed the following descriptors for the seven response alternatives: extremely, quite, slightly, neither, slightly, quite, and extremely.

Table 3

Scale Reliability and Factorial Validity—Study 2

Scale item	Scale reliability (Cronbach α)	Principal components with varimax			
		Factor 1	Factor 2	Factor 3	Factor 4
USF1		.93	.17	.15	.20
USF2		.91	.19	.08	.25
USF3		.89	.23	.17	.25
USF4	.97	.85	.27	.16	.28
ENJ1		.05	.34	.84	.12
ENJ2		.25	.32	.84	.20
ENJ3	.92	.14	.09	.94	.05
EOU1		.08	.91	.20	.01
EOU2		.34	.75	.25	.38
EOU3		.28	.85	.23	.22
EOU4	.95	.29	.82	.30	.26
QUL1		.26	.15	.08	.83
QUL2		.26	.12	.20	.67
QUL3	.69	.28	.43	.03	.57
Eigenvalue		7.59	2.10	1.36	.87
% Variance explained		54.3	15.1	9.7	6.2
Cumulative %		54.3	69.3	79.0	85.2

Note. USF1 to USF4: Perceived Usefulness items; ENJ1 to ENJ3: Enjoyment items; EOU1 to EOU4: Perceived Ease of Use items; QUL1 to QUL3: Perceived Output Quality items; $n = 80$.

Results

Table 3 gives the reliability and validity of the measurement scales used. As in Study 1, a principal components analysis was used to extract four factors which were varimax rotated. The scales for usefulness, enjoyment, ease of use, and quality accounted for 85.2% of the variance in the items and were found to be unidimensional and factorially

Table 4

Regression Results—Study 2

Dependent variable	R^2	Independent variable	β	SE_β	Significance level
Hypothesis 1. Intention is jointly determined by usefulness and enjoyment:					
BI	.74	USF***	.79	.06	.000
		ENJ*	.15	.06	.016
BI	.75	USF	.37	.23	.119
		ENJ	-.08	.13	.537
		USF × ENJ*	.58	.29	.049
Hypothesis 3. Usefulness and enjoyment mediate the effects of ease of use and output quality on intentions:					
BI	.47	EOU**	.31	.10	.004
		QUL***	.45	.10	.000
BI	.74	USF***	.68	.08	.000
		ENJ	.12	.07	.093
		EOU	.06	.08	.467
		QUL	.13	.08	.108
USF	.44	EOU*	.27	.11	.013
		QUL***	.46	.11	.000
ENJ	.30	EOU***	.52	.12	.000
		QUL	.05	.12	.674
Hypothesis 4. Task importance moderates the effect of output quality and ease of use on usefulness but not on enjoyment:					
USF	.65	QUL***	-1.68	.46	.000
		EOU***	1.89	.43	.000
		IMP	.16	.38	.681
		QUL × IMP***	2.73	.58	.000
		EOU × IMP***	-2.15	.56	.000
ENJ	.32	QUL	-.41	.64	.524
		EOU	.83	.60	.169
		IMP	-.01	.53	.990
		QUL × IMP	.60	.81	.457
		EOU × IMP	-.41	.78	.597

Note. Perceived Usefulness; ENJ: Enjoyment; EOU: Perceived Ease of Use; QUL: Perceived Output Quality; IMP: Task Importance; BI: Behavioral Intentions.

*$p < .05$; **$p < .01$; ***$p < .001$.

distinct. Cronbach alpha reliability was .97 for usefulness, .92 for enjoyment, .95 for ease of use, and .69 for output quality.

Consistent with Hypothesis 1, both usefulness ($t_{77} = 12.09$, $p < .001$) and enjoyment ($t_{77} = 2.62$, $p < .05$) had significant effects on usage intentions (Table 4). The positive interaction effect observed in Study 1 was found again in Study 2 ($t_{76} = 2.00$, $p < .05$). Taking into account the interaction effect, the impact of enjoyment on intentions was -.08 + .58 × usefulness and the impact of usefulness on intentions was .37 + .58 × enjoyment. Since usage was not measured in Study 2, Hypothesis 2 concerning the mediating role of intentions with respect to behavior could not be examined. Consistent with Hypothesis 3, usefulness and enjoyment mediated the effects of ease of use and output quality on intentions. The significant effects of both ease of use ($t_{77} = 3.09$, $p < .01$) and quality ($t_{77} = 4.28$, $p < .001$) on intentions became nonsignificant when usefulness and enjoyment were included in the equation ($t_{75} = .73$, n.s. for ease of use and $t_{75} = 1.63$, n.s. for quality). Quality had a significant effect on usefulness ($t_{77} = 4.22$, $p < .001$) but not on enjoyment ($t_{77} = .52$, n.s.). Ease of use had a significant effect on both usefulness ($t_{77} = 2.54$, $p < .01$) and enjoyment ($t_{77} = 4.31$, $p < .001$). Consistent with Hypothesis 4, a measure of task importance moderated the effect of ease of use and output quality on usefulness but not on enjoyment. Controlling for any main effect of importance, the interaction between importance and both ease of use ($t_{74} = -3.84$, $p < .001$) and quality ($t_{74} = 4.72$, $p < .001$) were found to be highly significant in explaining usefulness and nonsignificant in explaining enjoyment ($t_{74} = -.53$, n.s., for ease of use and $t_{74} = .75$, n.s., for quality).

Discussion

Our findings indicate that people's intentions to use computers in the workplace are influenced mainly by their perceptions of how useful the computers are for improving their job performance, and secondarily by the degree of enjoyment they experience in using the computers per se. The results were surprisingly consistent between Study 1, a field study of word processor usage, and Study 2, a laboratory study regarding business graphics software. Perceived usefulness had a large significant effect in both Study 1 ($\beta = .68$) and Study 2 ($\beta = .79$). Enjoyment had a small but significant effect in Study 1 ($\beta = .16$) and Study 2 ($\beta = .15$). Thus, usefulness was roughly four to five times more influential than enjoyment in determining intentions.

Do these results suggest that increasing the enjoyability of a system is a sensible avenue for improving user acceptance? On the one hand,

increasing the enjoyment of using a system helps to get a productive system accepted by users. On the other hand, enhancing enjoyability may increase the adoption of marginal or unproductive systems, or encourage unproductive or frivolous overuse of systems where less time spent using the computer would get the job done adequately. A point that is relevant here is the positive interaction between usefulness and enjoyment observed in both studies, which implies that enjoyment has a greater positive effect on intentions when the computer system is perceived to be more useful. That is, for systems that are low in perceived usefulness, enjoyment has a reduced effect on user acceptance; for systems that are high in perceived usefulness, enjoyment has an increased effect on acceptance. Viewed another way, the interaction effect implies that usefulness has a greater effect on intentions for systems that are enjoyable than for those that aren't. This pattern of results should mitigate concerns that making computers more enjoyable to use would encourage inappropriate or wasteful usage habits. To the contrary, our findings suggest that increasing the enjoyability of a system would enhance the acceptability of useful systems but have less of an effect on the acceptance of useless systems.

The positive interaction effect is of theoretical significance as well. While lab studies on intrinsically motivating tasks such as puzzle solving have often observed a negative interaction between extrinsic and intrinsic incentives and field studies in organizational settings have tended only to find main effects, little attention has been paid to the possibility of a positive interaction as found here. Yet, the positive interaction makes intuitive sense. If a shortcoming with respect to either extrinsic or intrinsic motivation is grounds for reduced overall motivation for the behavior in question, then they should combine (at least partly) multiplicatively. More research is needed to delineate the conditions governing the occurrence of independent, mutually reinforcing, or countervailing effects of intrinsic and extrinsic incentives.

Usefulness and enjoyment together represent a simple yet powerful explanation of what influences computer usage intentions. Not only do these two variables account for a high degree of variance in intentions 62% in Study 1 and 75% in Study 2—they also mediate the effects on intentions of perceived ease of use and perceived output quality. Ease of use had significant effects on both usefulness and enjoyment in both studies. Output quality had significant effects on usefulness in both studies and a significant effect on enjoyment in Study 1 only. Hierarchical regression tests indicate that ease of use and quality influence intentions only indirectly through these effects on usefulness and enjoyment. Hence, usefulness, which has to do with the performance outcomes

associated with using a system, and enjoyment, which has to do with the process of using the system, may represent a fairly comprehensive account of the proximal determinants of usage intentions. That is, usefulness and enjoyment may be common causal pathways through which many psychological and environmental factors achieve their influence. Such a conclusion, while consistent with the findings reported here, requires more investigation to clarify which variables operate through enjoyment and usefulness and which have direct influences on intentions or behavior.

Further research is needed to examine the role of additional constructs within the theoretical structure examined in the present two studies. For example, the availability of a particular software program could influence usage intentions over and above usefulness and enjoyment. In the context of the use of information sources, Culnan (1983) and O'Reilly (1982) found accessibility to be a significant factor. Future research should attempt to tease apart ease of use from ease of learning. Since our studies measured ease of use in the early phases of adoption, our ease of use measure may primarily be tapping ease of learning. However, it is unclear whether ease of use and ease of learning can be empirically distinguished, even long after adoption. Roberts and Moran (1983) found a correlation of .79 between objective measures of ease of use and ease of learning. In an effort to delve deeper into the learning process, Bagozzi, Davis, and Warshaw (in press) tested a model of computer learning which explicitly represents cognitive and affective reactions to success, failure, and the process of learning per se. Social normative influence (e.g., Fishbein & Ajzen, 1975), while found by Davis et al. (1989) not to be significantly linked to usage, may prove significant in contexts where usage is organizationally mandated. The impact of system design characteristics on usefulness, enjoyment, output quality, and ease of use is a promising research direction (e.g., Davis, in press). Future research should also address how widely the present results generalize to other systems and user populations. Whereas Study 1 measured self-reported usage, a study measuring usage behavior objectively could rule out the possible biasing effects of selective recall. Overall, there are numerous avenues for important follow-on research.

What do these findings suggest to those who wish to increase user acceptance? Whatever can be done to increase the output quality and ease of use of a system would be expected to have positive effects on both usefulness and enjoyment. Increasing output quality is largely a technical matter that is influenced by both the software itself and the output device (printer, plotter, etc.) used to generate the final output, and is

constrained to a large degree by technical and economic feasibility. In contrast with output quality, improving ease of use has proven to be a more elusive goal that requires understanding the complexities surrounding the dynamics of interaction between humans and computers. There is a growing science concerning human cognitive, perceptual, and motor abilities and how best to design systems to be compatible with these abilities. Principles derived from this knowledge are offered as a guide to the design of menus, command languages, and display screens (Shneiderman, 1987). Techniques for predicting the ease of using a newly designed system by analyzing sequences of interactions needed to accomplish tasks are being developed and refined (e.g., Card, Moran, & Newell, 1983; Olson, 1987; Polson, 1987). The effect of various sources and styles of training on user acceptance is becoming better understood (Nelson & Cheney, 1987), and recent work has investigated the efficacy of embedding artificial intelligence based training and help features directly in computer systems (Carroll & McKendree, 1987). Repeated testing and redesigning of prototype systems has proven to be a critical avenue for producing final systems that are easy to use (Gould & Lewis, 1985). Overall, much progress has been made toward understanding how to make computer systems easier to use, which has contributed to the rapid proliferation of computer technology throughout organizations.

Many systems are rejected by users because, although easy to use and capable of producing high quality output, they do not address tasks that are important to the users' jobs. Study 2, above, shows that task importance moderates the effect of ease of use and quality on usefulness. Since usefulness appears to be four to five times more influential than enjoyment in determining intentions, task importance is a critical leverage point for increasing user acceptance. Several applied techniques are available for improving the match between a system's capabilities and a person's job content. Shneiderman (1987) emphasizes task analysis for identifying the appropriate functionality of a new computer system. Olson (1987) reviews several representational schemes for analyzing users' tasks within an office environment and identifying opportunities for appropriate computer support. The methods of systems analysis and requirements determination from the information systems literature are intended to document and characterize the tasks for which new computer applications are being developed (e.g., Davis & Olson, 1985). The present research underscores the need to ensure that new computer applications address important tasks in order to achieve high acceptance and productive outcomes.

The diagnostic value of partitioning the motivational determinants of

system acceptance along extrinsic versus intrinsic lines is reinforced by several studies that show inverse relationships between productivity and satisfaction. Kraut, Dumais, and Koch (1989) found that a computerized record-keeping system increased productivity but reduced job satisfaction among customer service representatives at a large utility company. Similarly, Turner (1984) observed increased productivity and reduced satisfaction among 620 claims representatives in the Social Security Administration. Bailyn (1989) reports that employees who telecommute—that is, work at home and interact with the rest of the organization by computer—find more intrinsic value in their jobs compared with their office-based counterparts who view their work more instrumentally and find it interferes with personal satisfaction. Rouse and Morris (1986) point out that the degradation of personal control that often accompanies computerization in aviation and manufacturing contexts often threatens user acceptance. The present studies suggest that insufficient satisfaction and enjoyment can undermine the adoption of otherwise productive computer systems. Quality of work life is more than a secondary concern relative to productivity improvement. Overlooking the degree of intrinsic enjoyment in performing work activities by computer could compromise user acceptance and jeopardize whatever productivity gains the computer has to offer.

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