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Gender differences in perceptions and relationships among dominants of e-learning acceptance

Chorng-Shyong Ong, Jung-Yu Lai *

Department of Information Management, National Taiwan University, No. 50, Lane 144, Sec. 4, Jilung Rd, Da-an District, Taipei 106, Taiwan

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Abstract

This research attempts to extrapolate the results of education research about computer usage and IS research about technology acceptance to e-learning. Based on the Technology Acceptance Model (TAM), the objectives of this study are to explore gender differences in perceptions and relationships among dominants affecting e-learning acceptance. A survey of 67 female and 89 male employees taken from six international companies at the Hsin-Chu Science-based Industrial Park in Taiwan shows that men's rating of computer self-efficacy, perceived usefulness, perceived ease of use, and behavioral intention to use e-learning are all higher than women's. Additionally, we found that women were more strongly influenced by perceptions of computer self-efficacy and ease of use, and that men's usage decisions were more significantly influenced by their perception of usefulness of e-learning. These findings also suggest that researchers should take into consideration factors of gender in the development and testing of e-learning theories. Managers and co-workers, moreover, should realize that e-learning may be perceived differently by women and men. Based on these findings, implications for theory and practice are discussed.

Keywords: E-learning; Gender differences; Technology Acceptance Model

* Corresponding author. Tel.: +886 935 697 208; fax: +886 223 621 327.
E-mail address: roylai@cm1.hinet.net (J.-Y. Lai).

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1. Introduction

The shift from a product-based economy to a knowledge-based economy results in an increased demand for knowledge workers who are capable of higher-order thinking and reasoning to solve intricate problems in the work place. There is a need to build more cost-effective and efficient workplace learning environments to meet both individual and organizational objectives, requiring organizations to educate and train employees at multiple sites and times (Govindasamy, 2002). For this task, e-learning,[1] defined as instructional content or learning experiences delivered or enabled by electronic technologies, including the Internet, intranets, extranets in this research (Govindasamy, 2002; MacGregor & Whittingham, 2001), successfully breaks limitations of time and space and creates benefits, including reduced costs, regulatory compliance, meeting business needs, retraining of employees, low recurring costs, and customer-support costs (Barron, 2000; Gordon, 2003; Harun, 2002; Ismail, 2002). Furthermore, it is reported to be a means of solving authentic learning and performance problems (Govindasamy, 2002). E-learning has received extensive attention from practitioners and information system (IS) researchers (Barron, 2000; Gordon, 2003; Govindasamy, 2002; Harun, 2002; Ismail, 2002; Ravenscroft & Matheson, 2002), and has become an increasingly critical issue for technology implementation and management.

The gender gap in computers has interested computer and social scholars since the early 1980s and various factors associated with gender differences have been explored in the education research literature. Much, although not all, research finds that males are more experienced with and more positive about computers than females (e.g., Durndell & Thomson, 1997; Whitely, 1997). Research has also included the assessment of the use of computers (Durndell & Thomson, 1997), the measurement of computer anxiety (Maurer, 1994), and particularly the assessment of broadly defined computer-related attitudes (Francis, 1994; Jones & Clark, 1994; Todman & Dick, 1993; Whitely, 1997). A preliminary literature reviewed has shown that providing more detailed information about students' views between gender differences is increasingly important for teachers and learning technology leaders. By understanding better gender differences in students' attitudes towards computers, teachers will know how to encourage and improve learning processes for students against gender. Electronic learners (e-learners) in an e-learning context are like students in schools, conceivably, and gender differences also play an important role in e-learning even though it is a relatively new technology. This implies that efforts should be made to examine gender differences in e-learning.

For organizations, even though computer technology has become pervasive in today's workplace, there is growing evidence of unrealized or less than expected productivity gains due to poor user technology acceptance (Keil, 1995). The Technology Acceptance Model (TAM) (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989), adapted from Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), has been used as the theoretical basis for many empirical studies of user technology acceptance (Adams, Nelson, & Todd, 1992; Chau, 1996; Chau, 2001; Davis, 1989; Davis et al., 1989; Hu, Chau, Liu Sheng, & Tam, 1999; Legris, Ingham, & Collerette, 2003; Mathieson, 1991; Moon & Kim, 2001; Taylor & Todd, 1995; Venkatesh, 2000; Venkatesh & Davis, 1996; Venkatesh & Davis, 2000; Venkatesh & Morris, 2000). This model appears to be perhaps the most

[1] E-learning refers to asynchronous e-learning systems in this study.

promising direction in the attempt to overcome the problem of underutilized systems. Unfortunately, the effect of gender roles on TAM has been investigated only recently (Gefen & Straub, 1997; Venkatesh & Morris, 2000). Based on the technology acceptance model, this study proposes the extended TAM model to explore gender differences in perceptions and relationships among dominants affecting e-learning acceptance. This can help practitioners and researchers to better understand how gender influences learners' attitudes towards e-learning, predicting how learners will respond to it, and then utilizing it.

2. Theoretical development

Fig. 1 shows the research model. This research model shows that gender differences have effects on computer self-efficacy (CSE), perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention to use (BI) e-learning. Additionally, we investigate the hypotheses that gender will moderate the relationships with respect to CSE-PU, CSE-PEOU, PU-BI, PEOU-PU, and PEOU-BI.

2.1. Computer self-efficacy

There exist evidences indicating that women typically display higher levels of computer anxiety (Durndell & Hagg, 2002; Okebukola, 1993; Whitely, 1997) and lower levels of self-efficacy/computer self-efficacy towards computers or the Internet (Comber, Colley, Hargreaves, & Dorn, 1997; Durndell, Hagg, & Laithwaite, 2000; Durndell & Hagg, 2002; Whitely, 1997). Thus, we expect that men's rating of computer self-efficacy will be higher than women's. As to the relationship between computer self-efficacy and perceived usefulness, significant influences of computer self-efficacy on outcome expectations were empirically examined in previous studies (Compeau & Higgins, 1995; Compeau, Higgins, & Huff, 1999). In an e-learning context, it can be said that perceived usefulness reflects a person's beliefs or expectations about outcome, suggesting that computer self-efficacy may be an important factor affecting perceived usefulness (Chau, 2001). The relationship between computer self-efficacy and perceived ease of use is based on the theoretical arguments by

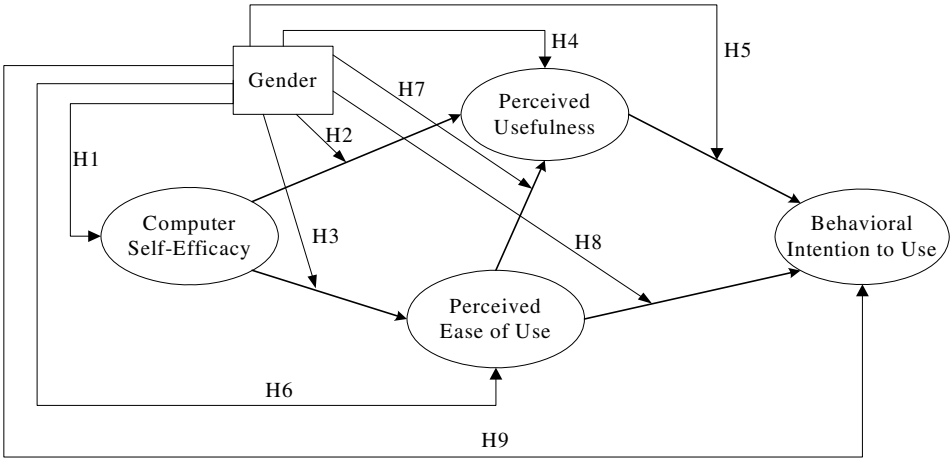

Fig. 1. Research model.

prior researchers (Davis, 1989; Mathieson, 1991) and researchers have empirically examined whether there exists a causal link between computer self-efficacy and perceived ease of use recently (e.g., Agarwal, Sambamurthy, & Stair, 2000; Chau, 2001; Hong, Thong, Wong, & Tam, 2001; Venkatesh & Davis, 1996). These indications suggest that computer self-efficacy has a significant positive effect on perceived ease of use for the e-learning system. Furthermore, researchers have also suggested the existence of gender-based differences in decision-making behavior (e.g., Claes, 1999; Feingold, 1994). There is evidence to support the view that women show a relatively high tendency toward emotion (Fisk & Stevens, 1993). Recently, Venkatesh and Morris (2000) proposed that women are more motivated by process and social factors than men. Therefore, we expect that low evaluation of computer self-efficacy will cause an increase in the salience of perceptions of usefulness and ease of use in an e-learning context. Thus we hypothesize:

H1. Men's rating of computer self-efficacy is higher than women's.
H2. Computer self-efficacy influences perceived usefulness of e-learning more strongly for women than for men.
H3. Computer self-efficacy influences perceived ease of use of e-learning more strongly for women than for men.

2.2. Perceived usefulness

Perceived usefulness is defined as the degree to which a person believes that using a particular technology would enhance his or her job performance (Davis, 1989). Prior studies in education research have examined the gender differences in perception of usefulness (closely correlated with and described herein as "perceived usefulness") of computer technologies and found that male college students evaluated computers as more useful than female students (Koohang, 1989; Shashaani & Khalili, 2001). E-learners completed learning processes via electronic technologies including computers in e-learning are like students in schools, implying that men's rating of perceived usefulness is higher than women's. On the other hand, users are generally reinforced for good performance by raises, promotions, bonuses and other rewards within an organization. This implies that an e-learning system with a high level of perceived usefulness is one for which a user believes that there is a positive user-performance relationship. A significant body of prior research has shown that perceived usefulness has a positive effect on behavioral intention to use (Davis et al., 1989; Venkatesh, 1999, 2000; Venkatesh & Davis, 1996, 2000; Venkatesh & Morris, 2000). Additionally, Venkatesh and Morris (2000) indicated that men consider perceived usefulness to a greater extent than women in making their decisions considering usefulness or productivity-related factors of a new technology, and that men are more driven by instrumental factors than women. Therefore, we hypothesize:

H4. Men's rating of perceived usefulness of e-learning is higher than women's.
H5. Perceived usefulness influences behavioral intention to use e-learning more strongly for men than for women.

2.3. Perceived ease of use

Perceived ease of use is defined as the degree to which a person believes that using the system would be free of effort (Davis, 1989). Previous research has shown that men's rating

of self-efficacy/computer self-efficacy is higher than women's (Comber et al., 1997; Durndell et al., 2000; Durndell & Hagg, 2002; Whitely, 1997). Meanwhile, Moon and Kim (2001) pointed out ITs that are easier to use will be less threatening to the individual, implying that men will rate perceived ease of use of e-learning more highly than women. Furthermore, perceived ease of use is expected to influence perceived usefulness and behavioral intention to use, either directly or indirectly, through its effect on perceived usefulness (Agarwal & Prasad, 1999; Davis et al., 1989; Hu et al., 1999; Venkatesh, 1999, 2000; Venkatesh & Davis, 1996). On the other hand, Venkatesh and Morris (2000) found that low evaluation of perceived ease of use caused an increase in the salience of such perception in determining perceived usefulness and user acceptance decisions. These findings let us to assume that perceived ease of use was more salient in determining perceived usefulness and behavioral intention to use for women, compared to its salience for men. Thus we hypothesize:

H6. Men rate the perceived ease of use of e-learning more highly than do women.
H7. Perceived ease of use influences perceived usefulness of e-learning more strongly for women than for men.
H8. Perceived ease of use influences behavioral intention to use e-learning more strongly for women than for men.

2.4. Behavioral intention to use

Given the difficulties in interpreting the multidimensional aspects of use – mandatory versus voluntary, informed versus uninformed, effective versus ineffective, and so on. DeLone and McLean (2003) suggested intention to use may be a worthwhile alternative. Intention to use is an attitude, whereas use is a behavior. Substituting the former for the latter may resolve some of the process versus causal concerns that Seddon (1997) has raised. A significant body of research also finds that males are more experienced with and have more positive attitudes about computers than do females (e.g., Durndell & Thomson, 1997; Whitely, 1997). It can be said that men are more willing to use computers in the stage of learning. Furthermore, Reda and Dennis (1992) investigated gender-based attitude toward using computer-assisted learning (CAL) among university students and the results revealed that male students preferred using CAL significantly to females. Thus we hypothesize:

H9. Men's rating of behavioral intention to use e-learning is higher than women's.

3. Methodology

3.1. Subjects

The data used to test the research model were obtained mainly from six international companies: Taiwan Semiconductor Manufacturing Corporation (TSMC), United Microelectronics Corporation (UMC), Compal Electronics, Inc., MiTAC International Corporation, Dell Taiwan, and AU Optronics Corporation (AUO). Each company had implemented their own e-learning and each participant had experiences of using it. The respondents self-administered a 14-item questionnaire. For each question, respondents

were asked to circle the response which best described their level of agreement with the statements. Of the 200 surveys, a 78% response rate was achieved (156 usable responses including 89 men and 67 women). The respondents averaged 30.8 years in age and had average 9.7 years of experience in computer; the male-to-female ratio was approximately 1.3:1. Thirty percent had completed only one college or university degree; a further 27% had completed post-graduate degrees.

3.2. Measures

To ensure the content validity of the scales, the items selected must represent the concept about which generalizations are to be made. Therefore, validated items adapted from prior studies were used to measure computer self-efficacy, perceived usefulness, perceived ease of use, and behavioral intention to use (Compeau & Higgins, 1995; Davis, 1989; Venkatesh & Davis, 1996). The respondents indicated their agreement or disagreement with the survey instruments using a seven-point Likert-type scale. The items were modified to make them relevant to the e-learning usage context. Consistent with prior research on social and organization behavior, we measured demographic variables: gender, income, education, and organization position. Appendix A presents a list of the items used in this study.

4. Data analysis and results

4.1. Analysis of measurement validity

Reliability and validity of measurement were evaluated. Reliability of the instrument was evaluated using Cronbach's α. All the values were above 0.8 (see Table 2), exceeding the common threshold value recommended by Nunnally (1978). The correlation matrix approach and factor analysis were both applied to examine the convergent and discriminant validity (Doll & Torkzadeh, 1988; Hu et al., 1999). As summarized in Table 1, the result of correlation analysis shows that the smallest within-factor correlations are:

Table 1
Correlation matrix of measures

	CSE				PU				PEOU				BI	
	1	2	3	4	1	2	3	4	1	2	3	4	1	2
CSE1	**1.00**													
CSE2	**0.68**	**1.00**												
CSE3	**0.66**	**0.73**	**1.00**											
CSE4	**0.73**	**0.74**	**0.76**	**1.00**										
PU1	0.38	0.39	0.45	0.50	**1.00**									
PU2	0.36	0.33	0.44	0.50	**0.82**	**1.00**								
PU3	0.33	0.38	0.42	0.48	**0.73**	**0.81**	**1.00**							
PU4	0.45	0.46	0.55	0.49	**0.66**	**0.71**	**0.71**	**1.00**						
PEOU1	0.32	0.41	0.42	0.43	0.44	0.47	0.50	0.49	**1.00**					
PEOU2	0.42	0.42	0.45	0.43	0.38	0.42	0.44	0.43	**0.54**	**1.00**				
PEOU3	0.50	0.48	0.53	0.55	0.43	0.46	0.51	0.45	**0.66**	**0.77**	**1.00**			
PEOU4	0.48	0.49	0.51	0.51	0.43	0.44	0.50	0.56	**0.53**	**0.73**	**0.75**	**1.00**		
BI1	0.45	0.44	0.52	0.51	0.52	0.52	0.48	0.54	0.40	0.47	0.50	0.46	**1.00**	
BI2	0.52	0.58	0.51	0.51	0.52	0.51	0.48	0.58	0.44	0.51	0.50	0.55	**0.78**	**1.00**

computer self-efficacy = 0.66; perceived usefulness = 0.66; perceived ease of use = 0.53; and behavioral intention to use = 0.78. Meanwhile, each smallest within-factor correlation was considerably higher among items intended for the same construct than among those designed to measure different constructs. This suggests adequate convergent and discriminant validity of the measurement.

Also, a principal component factor analysis was performed and four constructs were extracted, exactly matching the number of constructs included in this model. The results showed that items intended to measure the same construct exhibited prominently and distinctly higher factor loadings on a single construct than on other constructs, suggesting adequate convergent and discriminant validity (see Table 2). Conceivably, the observed reliability and validity suggested adequacy of the measurements used in the study.

The hypothesized relationships were tested using the CALIS procedure of SAS 8.1, a procedure that provides estimates of parameters and tests of fit for linear structural equation model, similar to LISREL. All goodness-of-fit indexes are summarized in Table 3. As shown, even though the goodness-of-fit index (GFI) failed to meet the recommended minimum level, it was close enough to suggest that the model fit was reasonably adequate to assess the results for the structural model.

4.2. Model estimation and hypotheses testing

The effects of gender upon CSE, PU, PEOU, and BI were examined using ANOVAs. The mean scores, standard deviations, together with significant F ratios, are shown in

Table 2
Results of factor analysis: principal component extraction

	Factor			
	1	2	3	4
Computer self-efficacy (CSE)				
CSE1	**0.80**	0.12	0.21	0.24
CSE2	**0.82**	0.15	0.23	0.23
CSE3	**0.79**	0.25	0.25	0.20
CSE4	**0.82**	0.31	0.23	0.15
Perceived usefulness (PU)				
PU1	0.22	**0.83**	0.14	0.23
PU2	0.17	**0.88**	0.19	0.21
PU3	0.16	**0.84**	0.29	0.15
PU4	0.30	**0.70**	0.23	0.30
Perceived ease of use (PEOU)				
PEOU1	0.19	0.38	**0.67**	0.05
PEOU2	0.18	0.16	**0.82**	0.27
PEOU3	0.31	0.23	**0.83**	0.17
PEOU4	0.29	0.24	**0.75**	0.24
Behavioral intention to use (BI)				
BI1	0.24	0.30	0.22	**0.82**
BI2	0.31	0.28	0.27	**0.80**
Eigenvalue	7.74	1.51	1.21	0.79
Cumulative variance explained (%)	55.32	66.12	74.74	80.35
Cronbach's α	0.91	0.92	0.89	0.87

Table 3
Goodness-of-fit measures of the research model

Goodness-of-fit measure	Recommended value	Entire sample
χ^2/degree of freedom	$\leqslant 3.00$	2.05
Goodness-of-fit index (GFI)	$\geqslant 0.90$	0.89
Adjusted goodness-of-fit index (AGFI)	$\geqslant 0.80$	0.82
Normed fit index (NFI)	$\geqslant 0.90$	0.92
Non-normed fit index (NNFI)	$\geqslant 0.90$	0.94
Comparative fit index (CFI)	$\geqslant 0.90$	0.96
Root mean square residual (RMSR)	$\leqslant 0.10$	0.06

Table 4. Significant gender differences were founded for CSE, PU, PEOU, and BI. These indicate that men's ratings of computer self-efficacy, perceived usefulness, perceived ease of use, and behavioral intention to use e-learning were higher than women's. Hence H1, H4, H6, and H9 are supported.

The structural model was tested with the data from entire data sample (i.e., women and men pooled together) and each of the subsamples (i.e., women taken separately and men taken separately). Properties of the causal paths, including standardized path coefficients, the significance of difference, and variance explained for behavioral intention to use in the hypothesized model, are presented in Table 5. Following the model test, we also conducted a test of the differences in path coefficients between women and men.

Compared to men, women had a greater salient effect on CSE in determining PU (H2 was supported) and PEOU (H3 was supported) in addition to placing a greater emphasis on PEOU in determining PU (H7 was supported). However, men weighted PU more strongly in determining BI than women did (H5 was supported). Contrary to H8, the direct effect of perceived ease of use on behavioral intention to use between women and men was not significant. Table 6 summarizes the testing results of hypotheses.

Within the male sub-sample, perceived usefulness exhibited the strongest "direct" effect on behavioral intention to use. Perceived ease of use, although it showed a slightly weaker direct effect than perceived usefulness on behavioral intention to use, exhibited a stronger "total" effect on behavioral intention to use than that of perceived usefulness. The direct, indirect, and total effects of computer self-efficacy, perceived usefulness, and perceived ease of use on behavioral intention to use are summarized in Table 7.

Table 4
Descriptive statistics and ANOVAs testing results

	Women ($n = 67$)		Men ($n = 89$)		Significance of difference between women and men (F ratios)
	Mean	SD	Mean	SD	
CSE	5.17	1.12	5.79	0.94	14.41***
PU	4.83	1.13	5.32	0.87	9.49**
PEOU	4.6	1.04	5.19	0.90	14.10***
BI	5.16	1.28	5.55	0.85	5.32*

ns, not significant.
* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$.

Table 5
Gender differences in relationships of CSE-PU, CSE-PEOU, PU-BI, PEOU-PU, and PEOU-BI

	Entire sample		Women ($n = 67$)		Men ($n = 89$)		Difference between women and men
	R^2	β	R^2_w	β_w	R^2_m	β_m	
BI	0.55		0.53		0.54		
CSE-PU		0.33^{***}		0.47^{***}		0.14^{ns}	***
CSE-PEOU		0.67^{***}		0.72^{***}		0.56^{***}	***
PU-BI		0.42^{***}		0.33^{ns}		0.47^{***}	***
PEOU-PU		0.39^{***}		0.45^{***}		0.27^{*}	***
PEOU-BI		0.41^{***}		0.44^{**}		0.43^{***}	ns

Notes: 1. The R^2 reported corresponds to the structure equation: BI = PEOU + PU.
2. The significance of difference was calculated using the procedure described in Cohen and Cohen (1988, pp. 55–56).
ns, not significant.
* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$.

Table 6
Summary of testing results

		Hypothesis	Result
Perception			
H1	CSE	Men > Women	Supported
H4	PU	Men > Women	Supported
H6	PEOU	Men > Women	Supported
H9	BI	Men > Women	Supported
Relationship			
H2	CSE-PU	Women > Men	Supported
H3	CSE-PEOU	Women > Men	Supported
H5	PU-BI	Men > Women	Supported
H7	PEOU-PU	Women > Men	Supported
H8	PEOU-BI	Women > Men	Not significant

Table 7
Gender differences between the direct and indirect effects of CSE, PU, and PEOU on BI

		Entire sample			Women ($n = 67$)			Men ($n = 89$)		
		PU	PEOU	BI	PU	PEOU	BI	PU	PEOU	BI
Direct effects	CSE	0.33	0.67		0.47	0.72		0.14	0.56	
	PU			0.42			0.33			0.47
	PEOU	0.39		0.41	0.45		0.44	0.27		0.43
Indirect effects	CSE	0.26		0.52	0.32		0.58	0.15		0.38
	PU									
	PEOU			0.16			0.15			0.13
Total effects	CSE	0.59	0.67	0.52	0.79	0.72	0.58	0.29	0.56	0.38
	PU			0.42			0.33			0.47
	PEOU	0.39		0.57	0.45		0.59	0.27		0.56

5. Discussion

Within the context of arguing that the exploration of gender issues with respect to e-learning is important, this research not only examines the gender differences in perceptions of computer self-efficacy, perceived usefulness, perceived ease of use, and behavioral intention to use; but it also investigates the relative influences of different dominants (β differences), demonstrating how women and men differ in their decision-making processes regarding acceptance and usage of e-learning. When the data were analyzed by gender, the results supported our predictions. A significant gender variation was found for almost all the measures reported. Our findings showed that men's ratings of perceptions with respect to computer self-efficacy, perceived usefulness, perceived ease of use, and behavioral intention to use e-learning are all higher than women's. Furthermore, they also indicated that perceptions of computer self-efficacy and perceived ease of use were more salient to women. Interestingly, perceived usefulness was a salient factor for men.

Computer self-efficacy appeared to be a significant determinant of perceived usefulness and perceived ease of use for both women and men. Consistent with our hypotheses, users who have higher computer self-efficacy are likely to have more positive usefulness and ease of use beliefs. Interestingly, although the "direct" effect of computer self-efficacy on perceived ease of use is greater than that on perceived usefulness both for women and men, the "total" effects of computer self-efficacy on perceived usefulness are greater than that on perceived ease of use for women only. On the other hand, despite women's rating of computer self-efficacy being lower than men's, their perception of computer self-efficacy was a more salient determinant affecting behavioral intention to use in addition to perceived usefulness and perceived ease of use.

This research also revealed that men's perception of usefulness was the more significantly direct and more salient than women's in determining behavioral intention to use e-learning. This finding suggests that men tend to concentrate on the usefulness of a new technology, and that they appear to be fairly "pragmatic", considering productivity-related factors when using this new technology. This finding seems to be consistent with the results of recent studies and suggests that useful content is an important pragmatic factor attracting male users to use e-learning. Pedagogical principles, including principles of developing and packaging content, could be employed in the development and evaluation of e-learning content (Govindasamy, 2002). On the other hand, perceived ease of use was found to have the most significant total effects on behavioral intention to use for both women and men. Although perceived ease of use was not considered an important 'direct' determinant of men's behavioral intention to use e-learning, it was the most significant determinant of behavioral intention to use for women compared with men. Finally, even the direct effect of perceived ease of use on behavioral intention to use between women and men was not significant, the difference was more obvious after considering the indirect effects (see Table 7).

6. Conclusions and future research

In conclusion, e-learning has the potential to play a critical role in equipping employees with the skills they need to succeed in the knowledge-based economy and is regarded as a mission critical activity for organizations. This study would seem to support the contention that education research about usage of computers and IS research about technology

acceptance probably can be extrapolated to e-learning, and that this will include frequent findings of variations due to gender. Understanding better the gender differences in users' attitudes towards e-learning can help researchers how to take consideration of gender to develop and test e-learning theories in the future. Managers and co-workers, moreover, can realize the same e-learning systems may be perceived differently by gender and then improve user acceptance by enhancing the techniques of e-learning and the processes by which they are implemented.

The main contributions of this study are fourfold. First, it successfully uses TAM to examine the impact of gender in the perceptions and decision-making processes for e-learning. This is a new contribution to IS/IT literature. Our findings successfully explain that both perceived usefulness and perceived ease of use have significant positive influences on behavioral intention to use e-learning. Second, this research reveals that men's perception of perceived usefulness was more significant and more salient than women's in determining behavioral intention to use e-learning. Third, men's rating of perceptions with respect to computer self-efficacy, perceived usefulness, perceived ease of use, and behavioral intention to use e-learning are higher than women's. Fourth, we found that computer self-efficacy and perceived ease of use were more salient to women. In contrast, perceived usefulness was a salient factor for men.

Before considering implications for practitioners and researchers, three limitations of this study should be noted. First, investigating the use of e-learning is a relatively new topic for IS/IT researchers. The findings and their implications presented here were obtained from a single study that targeted a specific user group in Taiwan. Thus, caution needs to be taken when generalizing our findings to other user groups or different organizational contexts. Second, responses to this study were voluntary and thus inevitably subject to self-selection biases. Conceivably, users who were interested in, had used, or were currently using e-learning may have been more likely to respond to the survey. To remedy this, future research efforts should be conducted to test the proposed model using a random sampling approach. Third, this study was conducted with a snapshot research approach, so additional research efforts are needed to evaluate the validity of the proposed model and our findings. Longitudinal evidences might enhance our understanding of the causality and interrelationships between variables, factors which could be important to user acceptance of e-learning.

In our findings there are several implications for e-learning management. First, to increase effectiveness of e-learning, it is important for men to perceive that the system is useful to enhance their job performance or productivity: they must provide useful content to attract 'pragmatic' male users to use. Pedagogical principles, including principles of developing and packaging content, could be employed in the development and evaluation of e-learning content. Second, perceived usefulness has the most significant direct effect on behavioral intention to use for men only. However, perceived ease of use has even stronger total effects than perceived usefulness both for women and men. Therefore, besides being a good system with useful content both for women and men, user-friendliness is also important for the success of e-learning. Third, for women, computer self-efficacy is a salient factor affecting perceived usefulness and perceived ease of use, in addition to perceived ease of use being a salient factor affecting behavioral intention to use. Managers and developers can increase women's usage intentions through computer self-efficacy and the mediating variables proposed in this research. In businesses, human resource managers can provide training courses to increase employees' familiarity with computing technologies to let the

organization's members gradually develop their level of computer self-efficacy, a tactic which is also effective for men. Even if these measures are not directly related to e-learning itself, they can still help the employees to more easily develop positive beliefs towards the usefulness and ease of use of the new technology.

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Appendix A. Questionnaire items

Computer self-efficacy (CSE)

I could complete my learning activities using the e-learning systems...

CSE1	...if I had never used a system like it before.
CSE2	...if I had only the system manuals for reference.
CSE3	...if I had seen someone else using it before trying it myself.
CSE4	...if I had just the built-in-help facility for assistance.

Perceived usefulness (PU)

PU1	Using the e-learning system improves my job performance.
PU2	Using the e-learning system enhances my effectiveness in my job.
PU3	Using the e-learning system in my job improves my productivity.
PU4	I find the e-learning system to be useful in my job.

Perceived ease of use (PEOU)

PEOU1	My intention with the e-learning system is clear and understandable.
PEOU2	Interacting with the e-learning system does not require a lot of my mental effort.
PEOU3	I find the e-learning system to be easy to use.
PEOU4	I found it easy to get the e-learning system to do what I want it to do.

Behavioral intention to use (BI)

BI1	Assuming that I had access to the e-learning system, I intend to use it.
BI2	Given that I had access to the e-learning system, I predict that I would use it.

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Chorng-Shyong Ong is an associate professor of Information Management at National Taiwan University, Taiwan. His research interests include IS service quality, web-based services, electronic commerce and strategic management of e-business.

Jung-Yu Lai is a doctoral student of Information Management at National Taiwan University, Taiwan. His current research interests include enterprise resource planning, e-business, e-learning, service marketing, and knowledge management.