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Mary Helen Fagan, Stern Neill & Barbara Ross Wooldridge

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EXPLORING THE INTENTION TO USE COMPUTERS: AN EMPIRICAL INVESTIGATION OF THE ROLE OF INTRINSIC MOTIVATION, EXTRINSIC MOTIVATION, AND PERCEIVED EASE OF USE

MARY HELEN FAGAN
University of Texas at Tyler
Tyler, TX 75799

STERN NEILL
University of Washington - Tacoma
Tacoma, WA 98402

BARBARA ROSS WOOLDRIDGE
University of Texas at Tyler
Tyler, TX 75799

ABSTRACT

This research utilizes the Integrated Model of Technology Acceptance (IMTA) to study the intention to use computers among first line managers in a mid-sized manufacturing organization (n=172). As hypothesized, the study found 1) a positive relationship between extrinsic motivation and behavioral intention to use computers, 2) a positive relationship between perceived ease of use and behavioral intention to use computers, 3) a positive relationship between intrinsic motivation and extrinsic motivation, 4) a positive relationship between perceived ease of use and extrinsic motivation, and 5) a positive relationship between intrinsic motivation and perceived ease of use. However, the hypothesis that intrinsic motivation would have a positive relationship to behavioral intention to use computers was not supported. This work makes a needed contribution to the literature by validating the IMTA with a group of real-world users, and suggests that the model may provide a useful foundation for future research in this area.

Keywords: Integrated Model of Technology Acceptance (IMTA), Technology Acceptance Model (TAM), Intrinsic Motivation, Extrinsic Motivation, Perceived Usefulness, Perceived Ease of Use, Perceived Enjoyment

INTRODUCTION

A variety of models have been developed to explain user acceptance of information technology. One stream of research, built upon a motivational model, has focused upon how extrinsic and intrinsic motivation influence computer acceptance and use [6]. Another approach based upon the Technology Acceptance Model has generated an extensive stream of studies exploring the role of two key constructs, perceived usefulness and perceived ease of use, on usage intentions and actual computer usage [5]. In order to help explain the factors that influence technology acceptance, researchers have introduced an Integrated Model of Technology Acceptance that combines key constructs from a motivational model and the Technology Acceptance Model [31].

This research utilizes the Integrated Model of Technology Acceptance to study the intention to use computers among first line managers in a mid-sized manufacturing organization (n=172). By validating the Integrated Model of Technology Acceptance, this research contributes to the development of usable theory. In addition, this work makes a needed contribution to the literature by validating the Integrated Model of Technology Acceptance with a group of real-world users. Most of the study's hypotheses were supported. As hypothesized, the study found

1) a positive relationship between extrinsic motivation and behavioral intention to use computers, 2) a positive relationship between perceived ease of use and behavioral intention to use computers, 3) a positive relationship between intrinsic motivation and extrinsic motivation, 4) a positive relationship between perceived ease of use and extrinsic motivation, and 5) a positive relationship between intrinsic motivation and perceived ease of use. However, the hypothesis that intrinsic motivation would have a positive relationship to behavioral intention to use computers was not supported. Overall, this research suggests that the Integrated Model of Technology Acceptance may provide a useful foundation for future research in this area.

This paper is organized as follows. First, theoretical background is provided on the motivational model, the Theory of Reasoned Action and the associated Technology Acceptance Model, and the Integrated Model of Technology Acceptance. Then the study's conceptual research model is presented along with related hypotheses. Next, the method and measures that were used to conduct the investigation are explained, followed by the results. Finally, the study's findings are discussed and conclusions provided.

THEORETICAL BACKGROUND

Motivational Model

There are a number of theories that seek to explain human motivation. One well known theory, Deci and Ryan's [8] Self-Determination theory (SDT), distinguishes between intrinsic motivation, which "refers to doing something because it is inherently interesting or enjoyable" and extrinsic motivation, which "refers to doing something because it leads to a separable outcome" [21, p. 55]. A subset of SDT, Cognitive Evaluation Theory (CET), was put forth by Deci and Ryan [8] to explain the factors that result in variations in intrinsic motivation. CET holds that feelings of competence (self-efficacy) during the performance of an action can catalyze intrinsic motivation because basic human needs for competence are being satisfied, but that this effect only occurs when the experience also provides for feelings of autonomy as well [21]. CET applies when activities are intrinsically motivating — when they hold the "appeal of novelty, challenge, or aesthetic value" for a particular individual [21, p. 60]. Research findings in this area suggest that educators and designers can create tasks to incorporate rewards and feedback in such a way that needs for competency and autonomy are met, and thus intrinsic motivation is enhanced [20, 26].

One stream of IS research stream has used motivation theory

to explore the factors that influence technology acceptance. Much of the research has been concerned with extrinsic motivation, and explores what instrumental outcomes outside the activity itself influence the performance of an activity [5, 12, 13]. Some studies have focused primarily on the role of intrinsic motivation, which involves performing an activity because it is inherently enjoyable or challenging [11, 15, 29, 33, 34]. Researchers have called for additional work on the role intrinsic motivation plays in IT acceptance and use. Davis pointed out, for example, that intrinsic motivation “has received inadequate attention in MIS theories” [5, p. 334].

Theory of Reasoned Action and the Technology Acceptance Model

The Theory of Reasoned Action (TRA) is a frequently used model from social psychology that posits that behavior is predicted by the behavioral intention to perform a behavior, and that behavioral intention is predicted by attitude and subjective norm [1]. The TRA was adapted by Davis et al. [7] in the development of the Technology Acceptance Model (TAM). TAM suggests that two factors, perceived use of use and perceived usefulness, are significant determinants of behavioral intention to use a computer system, and it omits subjective norm, which TRA also considers a determinant of behavioral intention. TAM’s validated measurement scales have facilitated research into IT acceptance, and thus TAM has gained tremendous acceptance within the IS research community [16, 24]. Researchers have proposed modifications in order to improve TAM’s predictive capability (TAM2) and have worked to better understand the factors that underlie its key constructs [14].

An extensive stream of IS research has been based upon the Technology Acceptance Model. The Technology Acceptance Model (TAM) posits that perceived usefulness and perceived ease of use are key factors that influence computer usage intentions and actual computer usage [5]. Perceived usefulness, defined as “as a person’s expectation that using a computer will result in improved job performance” [6, p. 1112], has been found to have a significant influence on intentions to use computers in the workplace. TAM studies have covered a wide range of adoption contexts ranging from the adoption of e-commerce shopping [17], to the adoption of e-government [10], to software developer tool use [19]. Extrinsic motivation is involved in studies that make use of Technology Acceptance Model since “perceived usefulness is an example of extrinsic motivation” [6, p. 1112]. Perceived ease of use, defined as “the degree to which a person believes that using a particular system would be free of effort” [5, p. 320], has also been shown to be a significant influence on intentions to use computers. In addition, perceived ease of use has been found to be an antecedent of perceived usefulness.

Integrated Model of Technology Acceptance

Since researchers have called for more research on the role that intrinsic motivation plays in information systems theories [5], a number of studies have investigated how intrinsic and extrinsic motivation, along with other key factors, have influenced acceptance and usage of information technology applications. One example is the Integrated Model of Technology Acceptance which integrates previous work using a motivational model of user acceptance and the Technology Acceptance Model into one model. Research found that the Integrated Model of Technology

Acceptance “emerged as a better predictor of user behavior when compared to the existing models” [31, p. 297].

In developing their Integrated Model of Technology Acceptance, Venkatesh et al. [31] built upon the work of Davis et al. [6], Venkatesh [29] and Venkatesh and Speier [30]. Davis et al. [6] found extrinsic motivation (operationalized as perceived usefulness) and intrinsic motivation (operationalized as enjoyment) accounted for 62% of the variance in user intentions in one study and 75% in another. The study’s findings suggest “usefulness [extrinsic motivation] and enjoyment [intrinsic motivation] together represent a simple yet powerful explanation of what influences usage intentions” [6, p. 1125]. Venkatesh [29] found that the use of an intrinsic motivator during training could help create positive user perceptions of IS applications. Venkatesh and Speier [31] found that mood treatments during training only had short-term effects on intrinsic motivation. The Integrated Model of Technology Acceptance integrates prior work into one model which explores how various training and pre-training interventions affect user perceptions of IS applications.

A better understanding of intrinsic motivation and its relationship with other important constructs such as extrinsic motivation and perceived ease of use could add to theoretical understanding of why individuals make use of IT. Furthermore, a more complete theoretical understanding of the role played by intrinsic motivation could have practical implications as developers, educators and managers look to design interventions that will help further user acceptance of IT.

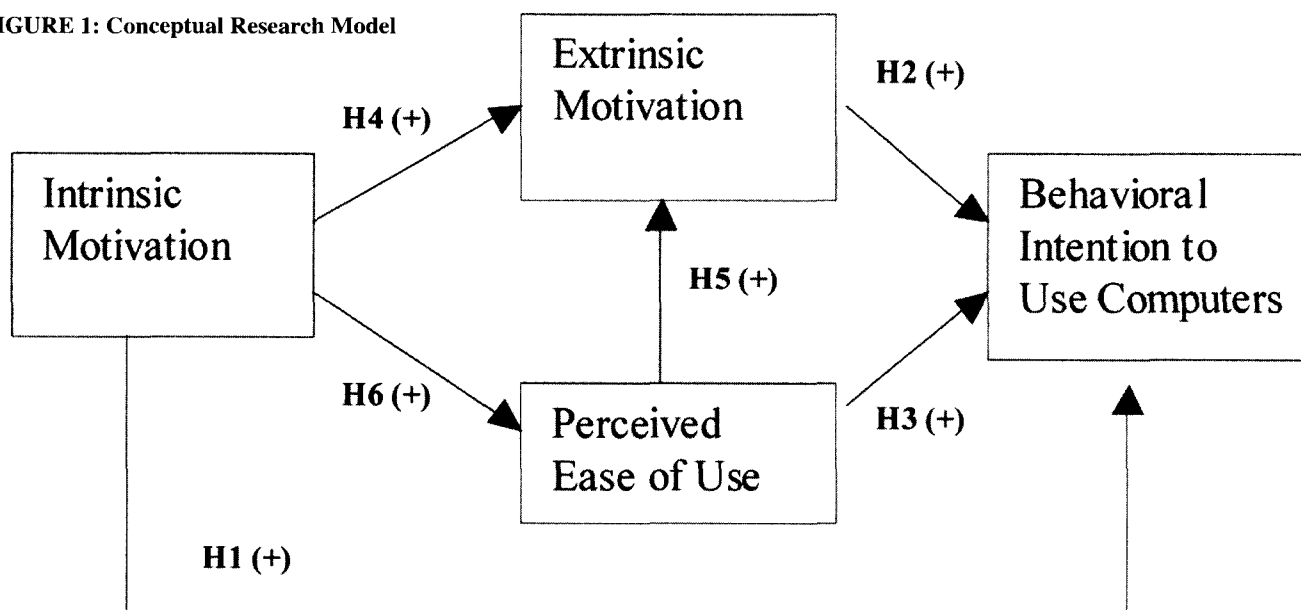
CONCEPTUAL MODEL AND RESEARCH HYPOTHESES

The study’s conceptual model (Figure 1) is a subset of the Integrated Technology Acceptance Model that integrates recent research on the role of intrinsic motivation, extrinsic motivation, perceived ease of use and behavioral intention to use computers [31]. The authors expect that extrinsic motivation, intrinsic motivation and perceived ease of use will be positively related to behavioral intention to use computers, that intrinsic motivation and perceived ease of use will be positively related to extrinsic motivation, and that perceived ease of use will be positively related to extrinsic motivation. The remainder of this section provides an overview of the study’s hypotheses and the related literature.

Behavioral Intentions to Use Computers

Davis et al. [6] hypothesized that intrinsic motivation would have a significant direct effect on intentions to use computers in the workplace. Intrinsic motivation was operationalized as perceived enjoyment and defined as “the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated” [6, p. 1113]. Using a three item measure of enjoyment, Davis et al. [6] found a small, significant influence on intentions and usage in two studies. Teo et al. [25], using a seven point scale to measure perceived enjoyment, also found support for a positive relationship between perceived enjoyment and Internet usage. However, Venkatesh et al. [31] did not find support for this hypothesized relationship using the Davis et al. [6] scales. Based upon the findings of Davis et al. [6] and Teo et al. [25], we hypothesize:

FIGURE 1: Conceptual Research Model



(+) indicates a positive hypothesized relationship

H1: Intrinsic motivation (operationalized as perceived enjoyment) will have a significant positive relationship with behavioral intention to use computers in the workplace.

Prior research indicates that perceived usefulness is a significant determinant of behavioral intentions to use information technology [5, 6, 7, 9, 22, 23]. Perceived usefulness is defined as “the degree to which a person believes that using a particular system would enhance his or her job performance” [5, p. 320]. Since “perceived usefulness is an example of extrinsic motivation” [7, p. 320], the following is proposed:

H2: Extrinsic motivation (operationalized as perceived usefulness) will have a significant positive relationship with behavioral intention to use computers in the workplace.

Extensive prior research indicates that perceived ease of use is also a significant determinant of behavioral intentions to use information technology [5, 6, 7]. Perceived ease of use is defined as “the degree to which a person believes that using a particular system would be free of effort” [5, p. 320]. Thus, the following is proposed:

H3: Perceived ease of use will have a significant positive relationship with behavioral intention to use computers in the workplace.

Extrinsic Motivation

Very little IT research has explored the relationship of intrinsic motivation with extrinsic motivation (operationalized as perceived usefulness). This study replicates Venkatesh et al. [31] who posited a linkage between intrinsic motivation and extrinsic motivation based upon literature that shows intrinsic motivation can increase time spent on tasks, result in more productive work,

increase cognitive processing, and enhance extrinsic motivation perceptions [3, 4, 18, 23]. Venkatesh, et al. [31] found support for their hypothesis that intrinsic motivation had a positive significant relationship with extrinsic motivation. Thus, the following is proposed:

H4: Intrinsic motivation (operationalized as perceived enjoyment) will have a significant positive relationship with extrinsic motivation (operationalized as perceived usefulness).

Furthermore, significant prior research has found that perceived ease of use and extrinsic motivation (operationalized as perceived usefulness) are related [5, 6, 7]. Thus, the following is proposed:

H5: Perceived ease of use will have a significant positive relationship with extrinsic motivation (operationalized as perceived usefulness).

Perceived Ease of Use

Intrinsic motivation is expected to influence perceived ease of use. Venkatesh et al. [31] posited that individuals who are more intrinsically motivated may use a new technology for the enjoyment they find in the activity and, since they enjoy the process, they may tend to underestimate its difficulty and find it easier to use. Venkatesh et al. [31] operationalized intrinsic motivation as perceived enjoyment, and found support for their hypothesis. Venkatesh [29] also found that intrinsic motivation, operationalized as computer playfulness and perceived enjoyment, had a significant relationship with perceived ease of use after one month of using a new system. Thus we propose the following:

H6: Intrinsic motivation (operationalized as perceived enjoyment) will have a significant positive relationship with perceived ease of use.

METHOD

Sampling and Data Collection

The sample consists of 172 first line managers for a mid-sized manufacturing firm located in the southwest United States. Data was collected over a one month period when the survey instrument was mailed to all first line managers, who were asked to return it anonymously via mail to the authors. Managers were asked voluntarily participate in order to assist with gathering data that could be used to tailor future computer training classes. The sample is 78% males with an average age of 44 years and 14 years of employment experience. The response rate was 54%.

Measures

A questionnaire was developed for this research study. Measures were taken from existing scales and adapted for this study's purpose from the items used by Venkatesh [28]. The scales used in this study to measure intrinsic motivation were those used to measure intrinsic motivation/computer enjoyment. Since perceived usefulness is a measure of extrinsic motivation [6], scales for perceived usefulness were used to measure extrinsic motivation. The scales to measure perceived ease of use and behavioral intention to use a computer are likewise derived from Venkatesh [28], and are the same as those used in a multitude of studies utilizing the Technology Acceptance Model. These scales are all included in the Appendix.

RESULTS

Structural equation modeling was used to test the proposed model. This technique allows for the simultaneous examination of a series of interrelated dependence relationships. This necessitates obtaining accurate measures of fairly unobservable phenomenon. To control for error in measurement, the measurement aspect is fixed prior to estimating the relationships in the structural model. This method, recommended by Anderson and Gerbing [2], avoids the interaction of measurement and structural models. Using this procedure, the reliability and validity of each construct is assessed. The path estimates are used to test the model's hypotheses.

Measurement Model Results

To assess internal and external consistency, confirmatory factor analysis (CFA) was performed using the covariance matrix of a four-factor model — *perceived enjoyment*, *perceived usefulness*, *perceived ease of use*, and *behavioral intention to use*. The measurement model fit is adequate as indicated by the CFA results reported in Table 1. Additionally, all items have significant loadings. The internal consistency measures and descriptive statistics are also reported in Table 1. The composite reliability estimates range from .91 to .95. All measures achieve an AVE estimate of .68 or higher offering further support as to the internal consistency of each construct.

To ensure distinct constructs, a test of discriminant validity was performed by confirming that the square of the parameter estimate between two constructs is less than the average AVE between any two constructs. For each case, discriminant validity was confirmed. In sum, the measurement aspect is supported (i.e., acceptable fit indices, high composite alpha and average variance extracted, and evidence of unidimensionality).

Structural Model Results

Three criteria were used to assess the structural model: (1) the fit indices, (2) the significance of the completely standardized path estimates, and (3) the amount of variance explained in each of the endogenous constructs. Table 2 reports the correlations among the four latent constructs in the structural aspect of the model.

Structural equation modeling, using LISREL VIII, was employed to test the hypothesized relationships. The results in Table 3 indicate acceptable fit for the four-factor model. Four of the five paths are significant ($p < .05$ or better) and account for 25% of the variance in *perceived usefulness*, 39% of the variance in *perceived ease of use*, and 38% of the variance in *behavioral intention to use*.

DISCUSSION

This study developed a conceptual model based upon the IT literature on intrinsic motivation, extrinsic motivation, perceived ease of use, and behavioral intentions to use computers. Five of the six hypotheses were supported. The results are summarized in Table 4.

Davis et al. [6] hypothesized that "computer use will be primarily extrinsically motivated and that intrinsic motivation will have a smaller but still significant direct effect on intentions" (p. 1114). Extrinsic motivation, as measured by perceived usefulness, did have a large significant effect on behavioral intentions to use computers (H2). However, in this study, the results for intrinsic motivation were not as Davis et al. [6] hypothesized. Intrinsic motivation did not have a significant effect on behavioral intention to use computers (H1). These results for H1 correspond with the findings of Venkatesh et al. [31] where this hypothesis was also not supported. Venkatesh et al. [32, p. 445] suggest that any relationship between attitude (e.g., an intrinsic motivator

Table 1: Measurement Model Estimates

χ^2	Df	Fit Statistics			
		RMSEA	SRMR	TLI	CFI
171.18	71	.09	.05	.94	.95
Internal Consistency Measures					
		Comp. α	AVE	Mean (SD)	
Perceived Enjoyment		.95	.85	3.84 (.95)	
Perceived Usefulness		.94	.80	4.45 (.81)	
Perceived Ease of Use		.91	.68	3.44 (.90)	
Behavioral Intention to Use		.92	.86	4.61 (.64)	

Note: df = degrees of freedom; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual; TLI = Tucker-Lewis index; CFI = comparative fit index; Comp. α = composite alpha; AVE = average variance extracted; SD = standard deviation

TABLE 2: Correlations Among Constructs

Construct	1	2	3	4
(1) Perceived Enjoyment	1.00			
(2) Perceived Usefulness	0.46	1.00		
(3) Perceived Ease of Use	0.57	0.38	1.00	
(4) Behavioral Intention to Use	0.40	0.49	0.48	1.00

like enjoyment) and intention can be spurious and may be due to omitted predictors like effort and performance expectations.

An alternative explanation for why hypothesis H1 was not supported is provided by work on user acceptance of hedonic vs. utilitarian information systems [27]. This research suggests that further study would be useful to ascertain whether an information system has a hedonic or utilitarian nature because this may affect the relative importance of perceived usefulness, perceived ease of use and perceived enjoyment in predicting behavioral intention to use the information system. Perhaps, as van der Heijden suggests, "findings of existing TAM studies are reconciled by focusing on the hedonic or utilitarian nature of the systems under study" [27, p. 696]. In the case of this study, users were being asked about their intentions to use computers in a work environment where the emphasis was on increasing task performance and efficiency. Thus, according to van der Heijden's work, it would be reasonable to expect that perceived enjoyment would play little or no role in

behavioral intention to use the system [27]. This research stream and our findings suggest that intrinsic motivation has a direct effect on behavioral intentions to use a computer and when the influence of intrinsic motivation is mediated by factors such as extrinsic motivation and perceived ease of use.

The findings provide support for other hypotheses that have been replicated in numerous studies using the Technology Acceptance Model: 1) perceived ease of use was positively related to behavioral intention (H3), 2) intrinsic motivation was positively related to extrinsic motivation (H4) and, 3) perceived ease of use was positively related to extrinsic motivation (perceived usefulness) (H5). In addition, intrinsic motivation was positively related to perceived ease of use, as hypothesized (H6). Intrinsic motivation was found to be associated with increased perceptions that computer systems in the workplace were easy to use. These findings suggest that if computer tasks can be made to be more intrinsically motivating, that users may view

TABLE 3: Structural Model Results

Fit Statistics					
χ^2	Df	RMSEA	SRMR	TLI	CFI
171.18	71	.09	.05	.94	.95
Explained Variance in Endogenous Constructs					
Endogenous Construct		Explained Variance			
Perceived Usefulness		.25			
Perceived Ease of Use		.39			
Behavioral Intention to Use		.38			
Completely Standardized Path Estimates					
Path		Estimate			
H1: Perceived Enjoyment → Behavioral Intention to Use		.01 (0.09)			
H2: Perceived Usefulness → Behavioral Intention to Use		.38 (4.71)			
H3: Perceived Ease of Use → Behavioral Intention to Use		.35 (3.79)			
H4: Perceived Enjoyment → Perceived Usefulness		.34 (3.62)			
H5: Perceived Ease of Use → Perceived Usefulness		.21 (2.21)			
H6: Perceived Enjoyment → Perceived Ease of Use		.62 (8.65)			

NOTE: T-values (in parentheses) of 1.96 or greater are significant at the .05 level.

TABLE 4: Results of Hypotheses Testing

Hypotheses		Result
H1	Intrinsic motivation (operationalized as perceived enjoyment) will have a significant positive relationship with behavioral intention to use computers in the workplace.	Not supported
H2	Extrinsic motivation (operationalized as perceived usefulness) will have a significant positive relationship with behavioral intention to use computers in the workplace.	Supported
H3	Perceived ease of use will have a significant positive relationship with behavioral intention to use computers in the workplace	Supported
H4	Intrinsic motivation (operationalized as perceived enjoyment) will have a significant positive relationship with extrinsic motivation (operationalized as perceived usefulness).	Supported
H5	Perceived ease of use will have a significant positive relationship with extrinsic motivation (operationalized as perceived usefulness).	Supported
H6	Intrinsic motivation (operationalized as perceived enjoyment) will have a significant positive relationship with perceived ease of use.	Supported

the application as potentially easier to use and more useful. In a context like the mid-sized manufacturing organization where this study was conducted, this finding could motivate those providing basic computer training to develop methods to increase the user's perceived enjoyment of the system as a method of increasing perceived ease of use and perceived usefulness, two key predictors of behavioral intention to use the system.

CONCLUSION

The need to better understand the factors that affect user acceptance of technology is underscored by the large investments which organizations make in information systems and associated training. This study's findings indicate that extrinsic motivation (perceived usefulness) and perceived ease of use are both important factors influencing behavioral intention to use computers. The study results provide partial support for the IMTA and for the practical implications this theory supports.

Further research is needed to ascertain whether intrinsic motivation (perceived enjoyment) is consistently found to be significant factors in the behavioral intention to use hedonic information systems and not related to the behavioral intention to use utilitarian information systems. Such findings would support the work of van de Heijden who asserts that the hedonic/utilitarian nature of an information system is "an important boundary condition to the validity of the technology acceptance model" [27, p. 695]. This research suggests that future researchers who make use of TAM and/or the IMTA would need to take into account whether the system under consideration was hedonic or utilitarian prior to formulating their hypotheses.

If the nature of the information system (hedonic vs. utilitarian) is found to be an important boundary condition for acceptance of an information system, it also may have important implications for practice. Cognitive Evaluation Theory, for example, holds that educators and designers can increase intrinsic motivation in the way they create tasks [20, 26]. However, if most business systems are utilitarian in nature, efforts by trainers to increase intrinsic motivation may not be the most successful avenue for increasing an individual's behavioral intention to use predominantly utilitarian workplace systems. Developers of pleasure-oriented hedonic systems, on the other hand, might undertake to develop interventions designed to increase a user's intrinsic motivation (perceived enjoyment). Future research is important to help ascertain the importance of system type in technology acceptance models, and to provide guidance to practitioners who are endeavoring to increase the successful adoption of a wide range of systems types.

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APPENDIX — Scale Items

Intrinsic Motivation — Computer Enjoyment

For each statement, please circle the number that best matches a description of yourself when you interact with a computer.

	Strongly Agree			Strongly Disagree	
I find using a computer to be enjoyable.	1	2	3	4	5
The actual process of using a computer is pleasant.	1	2	3	4	5
I have fun using a computer.	1	2	3	4	5

Extrinsic Motivation (Perceived Usefulness)

	Strongly Agree			Strongly Disagree	
Using a computer improves my performance in my job.	1	2	3	4	5
Using a computer in my job improves my productivity.	1	2	3	4	5
Using a computer enhances my effectiveness in my job.	1	2	3	4	5
Overall, I find a computer to be useful in my job.	1	2	3	4	5

Perceived Ease of Use

	Strongly Agree			Strongly Disagree	
Learning to use a computer is easy for me.	1	2	3	4	5
I find it easy to get a computer to do what I want to do.	1	2	3	4	5
My interaction with a computer is clear and understandable.	1	2	3	4	5
Interacting with a computer does not require a lot of mental effort.	1	2	3	4	5
Overall, I find a computer to be easy to use.	1	2	3	4	5

Behavioral Intention to Use a Computer

	Strongly Agree			Strongly Disagree	
Assuming I had access to a computer, I intend to use it.	1	2	3	4	5
Given that I had access to a computer, I predict I would use it.	1	2	3	4	5