Faculty Online Technology Adoption: The Role of Management Support and Organizational Climate

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Abstract

Although there is a plethora of online learning studies, relatively few studies have probed into teachers' online technology adoption. It is suggested that faculty resistance to technology be one of the key hindrances to the future development of distance learning. Several studies have argued that teachers' resistance to technology, one of the key issues and challenges, could remain a difficult problem in educational field. Thus, the primary purpose of this study is to understand the key factors that influence teachers' intention to adopt online technology.

Introduction

The advances and changes in online technology make online learning gradually become one of the critical learning alternatives to people at individual, group, and organizational level (Ellis, Goodyear, Calvo, Prosser, 2008; Hogan & McKnight, 2007; Park, Lee, & Cheong, 2007). In order to offer people another convenient learning channel, many teachers were suggested to implement online teaching innovations or integrate new online technology into instructions. Nevertheless, prior studies further revealed that teaching online was not easy to teachers, mainly because of challenges and pressures from new online teaching environment (Guasch, Alvarez, & Espasa, 2010). For example, compared to traditional instructors, online instructors should always spend more time and endeavor in online teaching jobs (Chang, Chou, Chen, & Chan, 2004; Collis & Nijhuis, 2000; Guasch et al., 2010; Hogan & McKnight, 2007; Mullen & Tallent-Runnels, 2006). For another example, the challenges and pressures could also result from unfamiliarities with new online technology and teaching strategies (Georgina & Olson, 2008; Patrick & Yick, 2005).

As for educational institutions and organizations, implementation of teaching innovations, introduction of new teaching initiatives, or integration of new technology into instructions, akin to the concept of organizational changes (Gibson, Harris, & Colaric, 2008), were very likely to bring inescapable challenges and pressures to faculty and staff (Al-Taneiji & McLeod, 2008), and subsequently lead to faculty resistance to change (Könings, Brand-Gruwel, & Merriënboer, 2007; Stigmar, 2008; Peck, Gallucci, Sloan, & Lippincott, 2009; Zilwa, 2007). It was suggested that faculty resistance to technology be one of the key hindrances to the future development of online learning (Al-Senaidi, Lin, & Poirot, 2009; Gerlich, 2005; Gong, Xu, & Yu, 2004; Myers, Bennett, Brown, & Henderson, 2004; Walker & Johnson, 2008). Several studies argued that teachers' resistance to technology, one of the key issues and challenges, remained a difficult problem in educational field (Hu, Clark, & Ma, 2003; Keengwe, Kidd, & Kyei-Blankson, 2009; Saleh, 2008). In teacher education studies, Könings et al. (2007) revealed that it was not easy to change teachers' attitude and beliefs toward teachings mainly because teachers already established their own "conceptions and beliefs about teachings" based on their previous experiences (p.995). Although there is a plethora of online learning studies, relatively few studies probed into teachers' online technology adoption (Park et al., 2007; Wang & Wang, 2009). Accordingly, it is important and meaningful that teachers' online technology adoption should be one of the central issues in this study.

In educational context, a teacher is not only one of the critical propellants in the implementation of teaching innovations, introduction of new initiatives, and integration of new online technology into instruction (Bakkenes, Vermunt, & Wubbels, 2010; Chen, 2008; Könings et al., 2007; Tabata & Johnsrud, 2008), but also highly associated with the final success of online learning (Wang & Wang, 2009). In order to further enhance the effectiveness and efficiency of distance learning, and facilitate educational institutions and organizations to minimize possible resistance to technology change, thus, the primary purpose of this study was to understand the key factors that influence teachers' intention to adopt online technology.

The contributions of this study lay not only in offering the empirical evidence that the perceived usefulness, ease of use, and subjective norm were positively connected with college teachers' intention to adopt online technology, but also in confirming the key effects of subjective norm and perceived ease of use on college teachers' perception of usefulness toward online technology. More importantly, the study findings further proved the central role of management support in fostering more positive perception of usefulness, ease of use, and organizational climate toward using online technology in the educational context.

Theoretical Background and Hypothesis Development

In information technology (IT) domains, earlier studies indicated that users' perceived usefulness and ease of use toward new technology were two critical factors that could positively affect users' technology acceptance and usage (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). Bakkenes et al. (2010) added that timely assistances from institutions and organizations were very important to the final success of educational innovations. That is probably because management supports could play a key role in decreasing teacher resistance to technology (Franklin, 2007; Rogers & Finlayson, 2004; Wang & Wang, 2009). More noteworthy, several studies indicated that the subjective norm, referred to the social influences form important people or close friends, could have potential effects on users' behavioral intention and perceived usefulness (Hu et. al., 2003; Kim, Kim, & Shin, 2009; Lee, Kang, & Kim, 2007; Raaij & Schepers, 2008). Consequently, the perceived usefulness, ease of use, management supports, and subjective norm should be four focal points in this study.

Perception of Usefulness and Ease of Use

The Technology Acceptance Model (TAM), proposed by Davis (1989), was broadly applied to IT-related studies to examine users' technology acceptance and usage (Devaraj, Ming & Kohli, 2002; Luarn & Lin, 2005; Roca, Chiu, & Martíne, 2006). TAM presumed that users' awareness of usefulness and feeling of ease of use toward an IT system were highly linked to users' attitude toward the utilization of an IT system (Davis, 1989). Prior IT-related studies further demonstrated that the users' awareness of usefulness and feeling of ease of use toward an IT were positively connected with users' behavioral intention toward using an IT (Gu, Lee, & Suh, 2009; Hasan, & Ahmed, 2007; Luarn & Lin, 2005). Based on previous suggestions and works by Davis (1989), in online learning context, a teacher's perception of usefulness toward online technology is described as the extent to which a teacher believes that using online technology would enhance his or her teaching performance (Davis, 1989). A teacher's perception of ease of use toward the online technology is described as the extent to which a teacher believes that using online technology would be free of effort (Davis, 1989). Moreover, the positive association among perceived usefulness, ease of use and teachers' behavioral intention to utilize online technology was also well documented in the previous distance learning studies (Gibson et al., 2008; Park et al., 2007; Walker & Johnson, 2008).Similarly, it is possible that teachers with better perception of usefulness and awareness of ease of use toward online technology could have more positive behavioral intention to adopt online technology. Consequently, this study hypothesizes:

H1: The perceived usefulness has a positive effect on teachers' intention to adopt online technology.

H2: The perceived ease of use has a positive effect on teachers' intention to adopt online technology.

H3: The perceived ease of use has a positive effect on the perceived usefulness.

Subjective Norm

Subjective norm, described as "the perceived social pressure to perform or not to perform the behavior" (Ajzen, 1991, p.188), was shown to be positively associated with users' perceived usefulness in previous IT studies (Aggelidis & Chatzoglou, 2009). That is probably because the social influences from those people that are important to us could play a key role in influencing our perceptions toward new technology and behavioral intentions (Aggelidis & Chatzoglou, 2009; Schepers & Wetzels, 2007; Venkatesh & Davis, 2000). Several IT studies also revealed that subjective norm had a positive effect on users' behavioral intention and perceived usefulness (Hu et. al., 2003; Kim et al., 2009; Lee at al., 2007; Raaij & Schepers, 2008). Similarly, in online learning context, it is very likely that opinions and suggestions from important people in life could exert a positive influence on college teachers' perceived usefulness, ease of use, and behavioral intention to adopt online technology. Consequently, this study hypothesizes:

H4: Subjective norm has a positive effect on teachers' intention to adopt online technology.

H5: Subjective norm has a positive effect on teachers' perceived usefulness.

Management Supports

The close interdependence between the management supports and final success of IT implementations, showed in previous IT studies, indicated that supporting interventions from organizations could potentially enhance users' technology acceptance and utilization (Amoako-Gyampah & Salam 2004; Bhattacherjee & Hikmet, 2008; Lee & Kim, 2009). Earlier studies further pointed out a positive relationship among management supports, users' awareness of usefulness and feeling of ease of use toward a new technology system (Igbaria, Zinatelli, Cragg, & Cavaye, 1997; Kim, Park & Lee, 2007; Magni & Pennarola, 2008). Besides, relevant IT studies suggested that management supports played a critical role in influencing subjective norm (Kim at al., 2007; Tsai, Zhu, Ho, & Wu, 2010). That is, the supporting interventions and resources from organizations were considered one of the key extrinsic motivations in helping organizations cultivate more favorable organizational climate (Schepers & Wetzels, 2007).

In education domains, Bakkenes et al. (2010) stated that timely assistances from institutions and organizations were very critical to the final success of educational innovations. Meyer & Barefield (2010) further stressed that the administrative supports played a central role in the effectiveness and efficiency of faculty members' technology utilization and final success of distance education. That is probably because management supports could be highly related to lessening teacher resistance to technology changes (Franklin, 2007; Rogers & Finlayson, 2004; Wang & Wang, 2009). Similarly, it is very likely that the better management supports not only could lead to more positive perceived usefulness, and ease of use, but also could positively cultivate more preferable organizational climate. Based on previous studies and suggestions, consequently, this study hypothesizes:

H6: The management support has a positive effect on teachers' perceived usefulness.

H7: The management support has a positive effect on teachers' perceived ease of use.

H8: The management support has a positive effect on subjective norm.

To sum up, prior studies showed that the perceived usefulness, ease of use, subjective norm, and management supports were closely associated with college teachers' intention to adopt online technology. Based on previous studies, this study proposed the following theoretical framework to investigate key factors that influence college teachers' intention to adopt online technology (see figure 1).
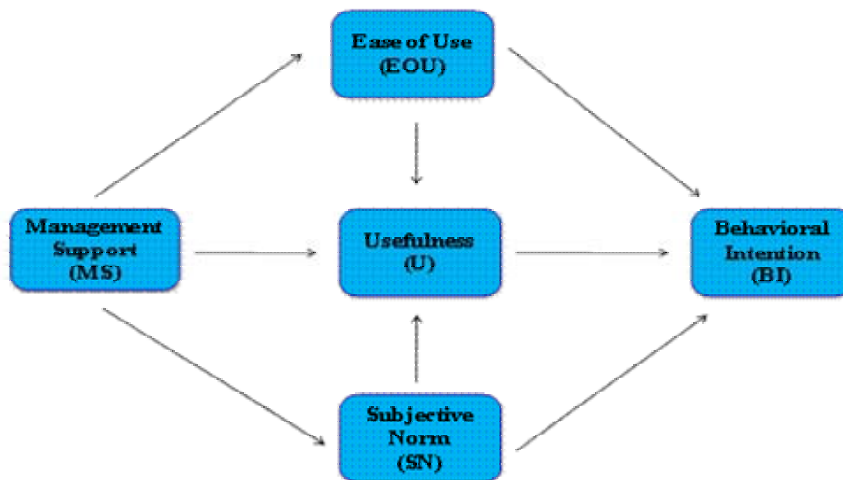
Fig 1. The theoretical framework.

Research Methodology
Subjects

The target population of this study was the full-time college teachers in Taiwan. The accessible population was the full-time teachers at two colleges in Southern Taiwan in the fall semester of 2009. The part-time college teachers were not the participants in this study.

Measures

Eleven items, related to teachers' perceived usefulness, ease of use, subjective norm, and behavioral intention to adopt online technology, were selected from Roca et al. (2006), and from Venkatesh and Davis (2000). Four items, related to management supports, were chosen from Igbaria et al. (1997). Except the measurement of demographic items, a seven-point Likert-type scale, ranging from "strongly disagree" to "strongly agree", was used to measure all constructs in this study.

Data Collection

This study collected the data from two colleges in Southern Taiwan. The survey was sent to individual teacher through teaching evaluation center at the beginning of fall semester of 2009. All teachers were free to participate in the survey. At the end of fall semester of 2009, the teaching evaluation center at both colleges informed each teacher of finishing the survey within two weeks. The final response rate was 43 % (169 out of 385).

Data analysis and results
Convergent and Discriminant Validity

This study adopted structural equation modelling (SEM) technique, and the LISREL software to analyze the data. According to table 1, the acceptable internal consistency was demonstrated because factor loadings of all variables were all higher than the suggested value of 0.7 (Roca et al., 2006). According to the table 2, the average variance extracted (AVE) of each variable, ranging from 0.641 to 0.899, and the composite reliability (CR) of each variable, ranging from 0.878 to 0.947, demonstrated the acceptable convergent validity because the values of AVE were all higher than 0.5, and the values of CR were above or close to the suggested criteria of 0.9 (Fornell & Larcker, 1981). Moreover, the values on the diagonal in the Table 2, indicating the square root of AVE of each construct, displayed the acceptable discriminant validity because the square root of AVE was all higher than the correlations of the inter-construct (Fornell & Larcker, 1981).

Table 1. Factor loadings of each construct

Construct	Item	Factor Loading
Perceived Usefulness	PU1. Using online technology could improve my teaching performance.	0.936
	PU2. Using online technology could enhance my teaching effectiveness.	0.958
	PU3. I find the online technology to be useful to me in my teaching.	0.849
Perceived Ease of Use	PEOU1. Learning to operate online technology is/was easy for me.	0.906
	PEOU2. It is/was easy for me to become skilful at using online technology.	0.935
	PEOU3. I find online technology easy to use.	0.803
Subjective Norm	SN1. My colleagues thought I should use the online technology in my teaching works.	0.784
	SN2. My students thought I should use the online technology in my teaching works.	0.902
	SN3. People who are important to me would think that I should use online technology in my teaching works.	0.927
Management Support	MS1. Management is really keen to see that teachers are happy with using online technology.	0.708
	MS2. Management has provided most of the necessary help and resources to enable teachers to use online technology.	0.890
	MS3. Management always supports and encourages the use of online technology for teaching works.	0.854
	MS4. Management is aware of the benefits that can be achieved with the use of online technology.	0.744
Behavioral Intention to Adopt Online Technology	IT1. I will use online technology for my teaching works in the future.	0.942
	IT2. I intend to regularly use online technology in my teaching works.	0.955

Table 2.The correlation of each construct

| Construct	AVE	CR	PU	PEOU	SN	BI	MS
PU	0.838	0.940	**0.915**				
PEOU	0.780	0.914	0.418	**0.883**			
SN	0.762	0.905	0.563	0.162	**0.873**		
BI	0.899	0.947	0.606	0.571	0.470	**0.948**	
MS	0.641	0.878	0.506	0.384	0.422	0.408	**0.800**

Note: Diagonal elements are the square root of Average Variance Extracted. PU, perceived usefulness; PEOU, perceived ease of use; SN, subjective norm; MS, management support; BI, behavioral intention to adopt online technology; AVE, average variance extracted; CR, composite reliability.

Table 3. Fit Indices for structural models

Fit Indices	Results	Recommended value	Reference
$\chi^2/$ df	2.14	$\leqq 3$	(Wang & Wang, 2009)
Normed Fit Index (NFI)	0.950	$\geqq 0.9$	(Roca et al., 2006; Wang & Wang, 2009)
Non-Normed Fit Index(NNFI)	0.962	$\geqq 0.9$	(Roca et al., 2006; Wang & Wang, 2009)
Comparative Fit Index (CFI)	0.970	$\geqq 0.9$	(Roca et al., 2006; Wang & Wang, 2009)
Relative fit index (RFI)	0.935	$\geqq 0.9$	(Roca et al., 2006; Wang & Wang, 2009)
Goodness Of Fit Index (GFI)	0.877	$\geqq 0.8$	(Bogozzi & Yi, 1988; Sharma, 1996; Wang & Wang, 2009)

Table 4.The summary of hypotheses testing results

Hypothesis	Result
H1: The perceived usefulness has a positive effect on teachers' intention to adopt online technology.	Supported
H2: The perceived ease of use has a positive effect on teachers' intention to adopt online technology.	Supported
H3: The perceived ease of use has a positive effect on the perceived usefulness.	Supported
H4: Subjective norm has a positive effect on teachers' intention to adopt online technology.	Supported
H5: Subjective norm has a positive effect on teachers' perceived usefulness.	Supported
H6: The management support has a positive effect on teachers' perceived usefulness.	Supported
H7: The management support has a positive effect on teachers' perceived ease of use.	Supported
H8: The management support has a positive effect on subjective norm.	Supported
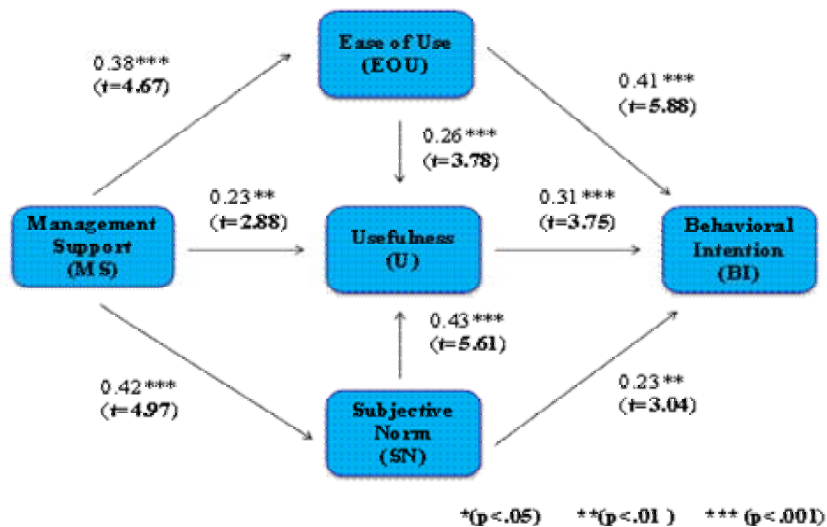
Fig 2. The path coefficient of the research model

Test of the Structural Model and Hypotheses

According to the table 3, the adequate fit of the overall model was demonstrated because all fit indices were above the suggested criteria (Roca et al., 2006; Wang & Wang, 2009). According to the table 4 and figure 2, Hypothesis 1, 2, 3, 4, 5, 6, 7, and 8, with path coefficients of 0.31, 0.41, 0.26, 0.23, 0.43, 0.23, 0.38, and 0.42, respectively, were all supported. To be brief, the study findings, consistent with previous suggestions, revealed that the subjective norm, perceived usefulness and ease of use toward online technology could have a positive effect on teachers' behavioral intention to adopt online technology. Besides, the study findings not only showed that the subjective norm and perceived ease of use had a positive effect on teachers' perceived usefulness, but also indicated that management supports exerted a positive influence on teachers' perception of usefulness, ease of use, and subjective norm.

Discussion

The primary purpose of this study was to understand the key factors that influence teachers' intention to adopt online technology. The study findings, consistent with previous studies and suggestions, revealed that the subjective norm, perceived usefulness and ease of use had a positive effect on teachers' intention to adopt online technology (Gibson et al., 2008; Park et al., 2007; Walker & Johnson, 2008). As the study results were further examined by the researcher, it was found that the teachers' perception and awareness of ease of use toward online technology played the most important role in influencing teachers' intention to adopt online technology because the t value of the perceived ease of use was the highest one (see figure 2).

It further dropped a hint that as teachers considered whether they would like to adopt online technology, it seemed that the perception of ease of use toward online technology was highly linked to teachers' behavioral intention to adopt online technology in the future. In other words, as educational institutions and organizations would like to carry out online teaching innovations, or integrate new online technology into instructions, it is important that educational institutions and organizations should highly concentrate on how to enhance teachers' perception of ease of use toward new online technology. Based on this study results, the management support appeared to be a strategic way to enhance teachers' perception of ease of use toward online technology because it was showed that the management support was highly related to teachers' perceived ease of use (see figure 2).

In addition, the study outcomes further pointed out the critical influences of perceived ease of use and subjective norm on teachers' perception of usefulness (Hu et. al., 2003; Kim et al., 2009; Lee et al., 2007; Raaij & Schepers, 2008). Especially for the key role of subjective norm in teachers' perception of usefulness, it appeared that the social influences and opinions from import people were closely associated with teachers' awareness of usefulness, because the t value of subjective norm was the largest one as compared to that of perceived ease of use, and management supports (see figure 2).

Last but not least, the study findings indicated that management supports exerted a positive effect not only on teachers' perceived usefulness and ease of use (Igbaria et al., 1997; Kim et al., 2007; Magni & Pennarola, 2008), but also on subjective norm (Kim et al., 2007; Tsai et al., 2010). The study results, related to management supports, not only offered

researchers and professionals in educational administration field the empirical evidence, but also proved the critical role of management supports in the integrations and introductions of new online technology into instructions (Bakkenes et al., 2010). The empirical evidences in this study, coherent to previous studies, further revealed that offering faculty and staff suitable and sufficient management supports could be the crucial managerial strategy to help teachers decrease the challenges and pressures from the future usage of online technology (Chang et al., 2004; Collis & Nijhuis, 2000; Hogan & McKnight, 2007; Mullen & Tallent-Runnels, 2006).

As educational institutions and organizations provided faculty and staff with adequate management supports, the managerial interventions, one of the extrinsic motivations, could enhance teachers' perceived usefulness and ease of use, as well as simultaneously cultivate more favorable organizational climate toward using online technology. That is, management supports could help teachers directly gain necessary resources to perform online teaching works. On the other hand, managerial interventions could also facilitate educational institutions and organizations to foster more favorable organizational climate to positively influence teachers' perception of usefulness and ease of use toward new online technology, and to indirectly enhance teachers' intention to adopt online technology (Schepers & Wetzels, 2007).

To summarize, the study findings added to the body of knowledge in distance leaning field by confirming the critical influences of perceived usefulness, ease of use, and subjective norm on teachers' intention to adopt online technology. More importantly, the study results not only probed into the key roles of perceived ease of use and subjective norm in teachers' perceived usefulness, but also verified the key effects of management supports on teachers' perceived usefulness, ease of use, and subjective norm.

Implication

According to the study findings, although the management supports were not directly related to teachers' intention to adopt online technology, the necessary management supports and resources such as compensation, benefit, technical and training supports were indirectly associated with faculty members' online technology adoption. In order to achieve the final success of distance learning, it is notable that each faculty member should be offered relevant rewards and timely supports to ensure the teachers' proficiency of online technology, adequacy of online instructional design, delivery strategies, and evaluation. More importantly, it is necessary that the distance education vision, goal, and policy should be acceptable, clear, and understandable to everyone in the institutions and organizations, mainly because the vision, goal, and policy could be considered key components that drive for distance learning success. That is, the distance learning vision, goal, and policy that is acceptable and clear to everyone could be the key forces to foster more positive organizational climate and culture toward the implementation of distance learning. Besides, the faculty workload (Chang et al., 2004; Collis & Nijhuis, 2000; Guasch et al., 2010; Hogan & McKnight, 2007; Mullen & Tallent-Runnels, 2006), and burnout issues (Hogan & McKnight, 2007), well documented in the previous distance learning studies, were also very important to the sound development of distance learning, mainly because those issues were highly connected with the distance learning quality. It is critical that the institutions and organizations should provide online instructors with adequate teaching assistants, and carefully consider the adequacy of online class size in order to avoid the heavy workload and burnout.

Limitations and Suggestions

Three limitations were found in this study. First of all, the online technology suppliers, one of the important stakeholders in the distance education, were neglected in this study. Accordingly, it is necessary that online technology suppliers should be further addressed in the future studies. Second of all, the variables in this study were only limited to teacher perceived usefulness, ease of use, subjective norm, and management supports. As teachers face implementation of teaching innovations, introduction of new teaching initiatives, or integration of new online technology into instructions, it is very likely that the sufficient communication could play a key role in cultivating more positive attitude and organizational climate toward using new online technology (Amoako-Gyampah, 2007; Georgina & Olson, 2008). Hence, the communication variable should be another focal point in the future studies. Third of all, the generalizabliity of the study findings should be made with caution and deliberation mainly because the subjects of this study were only limited to full-time college teachers in Southern Taiwan. It is recommended that teachers from different area, countries, educational levels, or job status should be further addressed and contained in future online learning studies.

Conclusion

As educational institutions and organizations plan to carry out new online teaching innovations or integrate new online technology into instructions, it is considerable and important that whether faculty and staff already gained adequate and sufficient management supports should be always one of the focal points in the distance learning field. That is not only because a teacher was highly associated with the quality and final success of online learning (Tabata & Johnsrud, 2008; Wang & Wang, 2009), but also because an instructor always played a key role in giving fresh impetus to the implementation of teaching innovations, introduction of new teaching initiatives, and integration of new online technology into instruction (Bakkenes et al., 2010; Chen, 2008; Könings et al., 2007). The study findings, contributed to the body of knowledge in distance learning field, revealed that teacher perceived usefulness, ease of use, subjective norm, and management supports played a key role in teachers' intention to adopt online technology.

Appendix

Operational definition of each construct

Construct	Operational definition	Reference
Perceived Usefulness	The extent to which a teacher believes that using online technology would enhance his or her teaching performance.	(Davis, 1989).
Perceived Ease of Use	The extent to which a teacher believes that using online technology would be free of effort.	(Davis, 1989).
Subjective Norm	The perceived social pressure to adopt or not to adopt online technology in my teaching works.	(Ajzen, 1991)
Management Support	A teacher's feeling and perception of the top management encouragement and allocation of adequate resources to support the usage of online technology.	(Igbaria, Parasuraman, & Baroudi, 1996; Igbaria et al., 1997).
Behavioral Intention to adopt online technology	A teacher's behavioral intention to adopt online technology in his or her teaching works.	(Davis, 1989; Roca et al., 2006).

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