

Please cite this paper as follows:

Davoodi, S., Akbarpour, L., & Hadipour, H. (2021). Effect of Psychological Factors on EFL Teachers' Attitude about Technology Use: Perceived ease of use, trialability, and subjective norms in focus. *International Journal of Foreign Language Teaching and Research*, 9 (37), 79-88.

DOI: [10.52547/IJFL.9.37.83](https://doi.org/10.52547/IJFL.9.37.83)

Research Paper

Effect of Psychological Factors on EFL Teachers' Attitude about Technology Use: Perceived ease of use, trialability, and subjective norms in focus

Somaye Davoodi¹, Leila Akbarpour^{2*}, Ehsan Hadipour³

¹Ph.D. Candidate, Department of English Language, Shiraz Branch, Islamic Azad University, Shiraz, Iran
Davodi.2011@gmail.com

²Assistant Professor, Department of English Language, Shiraz Branch, Islamic Azad University, Shiraz, Iran
akbarpourleila@yahoo.com

³Assistant Professor, Department of English Language, Shiraz Branch, Islamic Azad University, Shiraz, Iran
e.hadipour@gmail.com

Received: January 06, 2021

Accepted: May 19, 2021

Abstract

The aim of the present study was to investigate the effect of psychological factors on teachers' attitudes regarding technology use. To this purpose, such factors as 'perceived usefulness', 'perceived ease of use', 'trialability', 'subjective norms', and 'attitude' were investigated. The participants of the study were high school English language teachers in Shiraz, who were selected through stratified sampling as a representative sample of the available population. In order to assess the extent of the effect of each factor, five questionnaires were administered. Then, the elicited data were analyzed by means of path analysis. The obtained results revealed that 'perceived ease of use' was affected by 'subjective norms', and 'trialability' influenced the attitude of teachers about using technology in their teachings. The results also showed that the most influential factor on attitude was 'trialability'. Furthermore, the results displayed that 'perceived usefulness' had a significant effect and subjective norms had an indirect but meaningful effect on the teachers' attitude. The findings of the study have implications for school administrators and teachers to use them in their planning and instruction and, as a result, boost the learning environment.

Keywords: Attitude, perceived usefulness, perceived ease of use, trialability, subjective norm

تأثیر متغیرهای روانشناختی بر نگرش دبیران نسبت به استفاده از تکنولوژی: متغیرهایی نظیر سودمندی ادراک شده، سهولت ادراک شده، هنجار ذهنی، امتحان پذیری

هدف پژوهش حاضر کشف تأثیر متغیرهای روانشناختی بر نگرش دبیران نسبت به استفاده از تکنولوژی است. برای دستیابی به این هدف متغیرهایی نظیر سودمندی ادراک شده، سهولت ادراک شده، هنجار ذهنی، امتحان پذیری گرفته است. جامعه آماری پژوهش حاضر دبیران زبان انگلیسی مدارس متوسطه شهرستان شیراز می باشند. پژوهشگر از روش نمونه گیری خوشه ای به منظور به دست آوردن یک نمونه مناسب استفاده کرده است. پژوهش حاضر از پنج پرسش نامه برای سنجش متغیرها بهره برده است. داده ها با استفاده از روش آماری تحلیل مسیر مورد تجزیه و تحلیل قرار گرفته است. نتایج به دست آمده نشان داد سهولت ادراک شده تحت تأثیر هنجار ذهنی است و امتحان پذیری بر نگرش دبیران نسبت به استفاده از فناوری اطلاعات تأثیر گذار است. نتایج این تحقیق کاربردهای مفیدی برای مدیران و دبیران مدارس دارد که می توانند آن را در برنامه ریزی ها و تدریساتان به منظور بهبود محیط های آموزشی به کار گیرند.

واژگان کلیدی: نگرش، سودمندی ادراک شده، سهولت ادراک شده، هنجار ذهنی، امتحان پذیری

Introduction

Advances in technology, especially information technology, is quickly changing the world and has a significant effect on many dimensions of human life such as education. Educational technology restyles the way teachers communicate and teach. In fact, new technological tools enable teachers at any time to access new ways of teaching in multifold content areas and in numerous formats. However, the accessibility of these technological resources does not imply they will be applied. To boost the effective use of technology in teaching, English language teachers should concentrate on such strategies as combining previous methods of teaching with new techniques, utilizing suitable software, and generating an interacting learning environment. According to Davis (1989), the essential motivation for technology acceptance and use is the adopter's belief about the usefulness of the technology or the consequences of usage. Therefore, a positive attitude towards the sequences or outcomes of technology use invokes a higher rate of usage. It is to be noted here that many prior studies have investigated various aspects of technological developments in English language teaching, solely from the point of view of the learners. The present research, however, examined technology acceptance from teachers' viewpoint. Although in various pieces of research, the relations between technology acceptance variables had been considered, the present study tried to add some other variables to the technology acceptance model (TAM) and extend this model.

Based on the above-mentioned points, the current research attempted to evaluate the situation that exists in Iranian schools concerning teachers' attitude towards using a computer in teaching, to clarify the related problems, and to identify the factors influencing teachers' technology adoption and technology acceptance. To this purpose, Davis's (1989) Technology Acceptance Model (TAM) and Fishbein and Ajzen's (1977) Theory of Reasoned Action (TRA) were utilized, and the following research questions are addressed:

Q1) Do perceived usefulness, perceived ease of use, and trialability affect Iranian EFL teachers' attitude concerning technology use?

Q2) Do trialability, subjective norm, and perceived ease of use affect the perceived usefulness of technology among Iranian EFL teachers.

Literature Review

To properly describe and predict technology acceptance manners, Davis (1989) designed a theoretically justified model. He selected the Theory of Reasoned Action as the basis of his model (technology acceptance model), since it was working in diverse research fields like teaching, health, and social science. The Technology Acceptance Model was first proposed to detect the extent of technology adoption or use by individuals and organizations (Davis, 1989). TAM is widely considered to be one of the most practical models in various fields. It has manifested great capability in explaining and forecasting user behavior regarding information technology. This feature has turned it to the most preferable model to examine the acceptance of e-learning (Park, 2009). There are four factors explaining technology usage in the original TAM: perceived ease of use (PEOU), perceived usefulness (PU), attitude, and intention to use (Davis, 1989). Perceived ease of use involves the degree to which a person assumes that utilizing a particular system would be free of attempt, whereas perceived usefulness is demonstrated as the degree to which a person postulates that utilizing a specific system enhances his or her property (Davis, 1989). In the primary formulation of TAM, attitude performs a moderating role between the two mentioned variables (PEOU, PU) and the intention to use.

Another influential model in the field of technology acceptance is innovation diffusion theory. Innovation Diffusion Theory (IDT) is the foundation of most contemporary studies on

innovation adoption and diffusion. This theory is generally used to explain and foresee adoption and diffusion behavior (Agarwal & Prasad, 1997). It is the most popular theory about technical adjustment. IDT has been vastly used in a variety of fields like science, psychology, communication, shopping, the internet, and technology (Rogers, 2010). IDT contains five prominent innovation characteristics: compatibility (CPT), relative advantage (RAD), complexity (CPX), trialability, and observability. Compatibility is described as the level of correspondence between an innovation and users' accounts, experiences, and needs (Isaac, Abdullah, Ramayah, Mutahar, & Alrajawy, 2016). Relative advantage is outlined as the degree to which an innovation is believed as being predominant to the idea it substituted (Rogers, 2010). Complexity refers to the recognition of how formidable the innovation is to perceive. It is conversely correlated with the rate of adoption of an innovation (Rogers, 2010). Trialability is the extent to which an innovation can be examined within a certain limitation. Trialability can also be described as the degree to which an innovation may be investigated within a restricted foundation (Shiau, Huang, Yang, & Juang, 2018). Observability is the degree to which the influence of innovations can be perceived obviously by other people. These characteristics are used to illustrate end-user adoption of novel technologies and the procedure of making decisions (Lee, Hsieh, & Hsu, 2011).

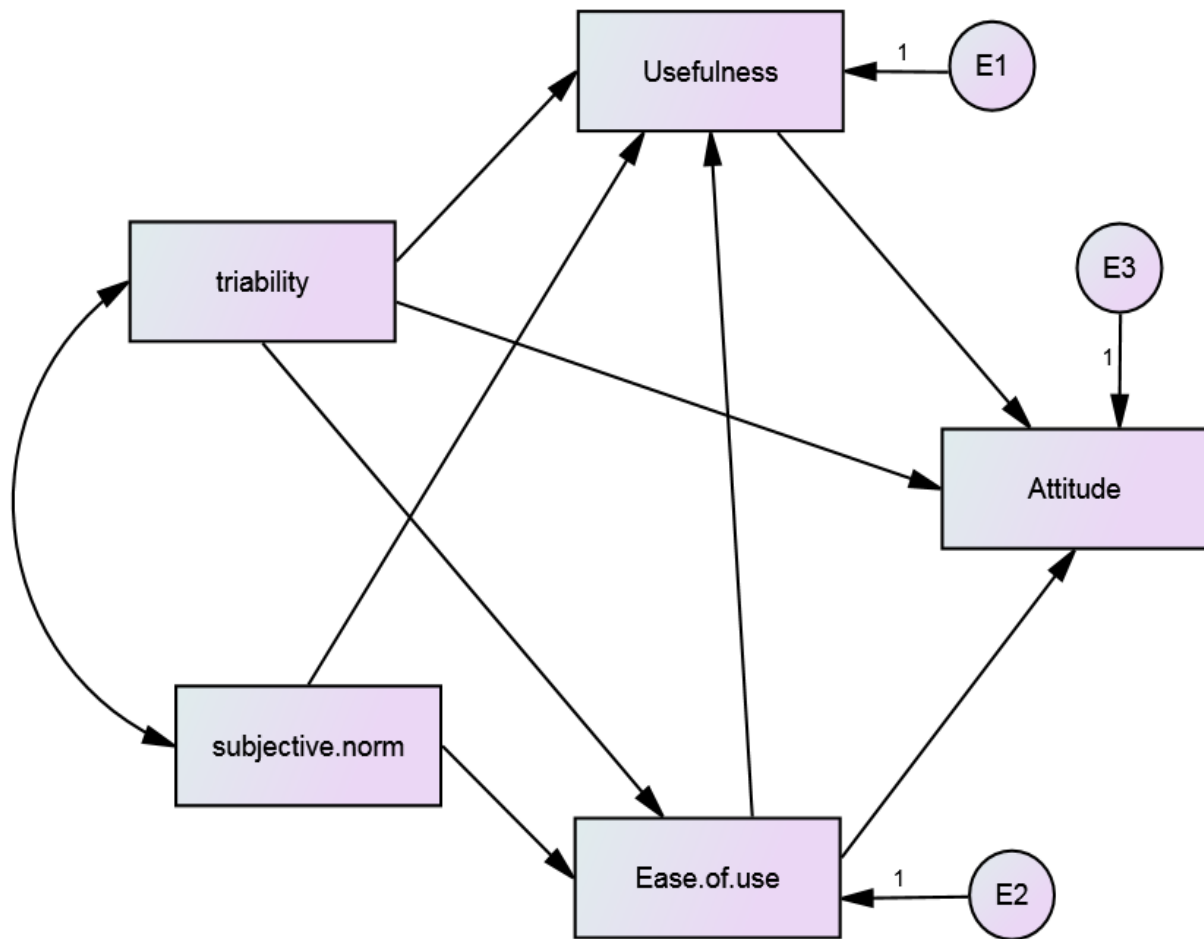
Anni (2018), who investigated the school teachers' intention to use technology, discovered that perceived ease of use and perceived usefulness had a positive impact on attitude regarding using technology. This finding is asserted in the work of researchers like Rabaa'i, (2016), Wingo, Ivankova, and Moss (2017), and Arpacı (2016). Dastorani and Khoshneshin, (2017) did a study on Iranian university teachers' intention to use technology for educational purposes and found that the impact of perceived ease of use and perceived usefulness on attitude was significant. Yunus (2014), in a study about intention to utilize technology, discovered that compatibility and trialability had a salient effect on intention to use via attitude. Contrary to these researchers, Ntemana and Olatokun (2012) considered lecturers' attitude toward technology use and found that from among the five components of innovation diffusion theory, compatibility and trialability showed no relationship with attitude.

Lee et al. (2011), in a study, showed the significant effect of perceived ease of use and trialability on perceived usefulness. The results of the study by Mutahar et al. (2017) were in line with Lee et al. (2011) and Bourgonjon et al. (2013) did research in the field of game-based learning and asserted the strong effect of subjective norm on perceived usefulness. The result of this study was in line with Wingo et al. (2017), who did a research about faculty perception of teaching online. In another research by Isaac et al. (2016) among employees in Yemen, the influential effect of perceived ease of use on perceived usefulness was confirmed. Dastorani and Khoshneshin (2017), in a review article, confirmed the effect of subjective norm on perceived usefulness.

According to Zhang, Guo, and Chen (2008), the effect of trialability on perceived ease of use is significant. Lee et al. (2011) conducted a research about the intention to use e-learning systems. In this study, perceived ease of use was indicated to be affected strongly by trialability. The results of the study by Tran and Cheng (2017) confirmed the impact of trialability on perceived ease of use. Park (2009) did a study on students' intention to use e-learning, and reported the salient effect of subjective norms on perceived ease of use. Rabaa'i (2016) also found the strong effect of subjective norm on perceived ease of use.

Based on the theoretical and practical frameworks presented above, the conceptual framework was developed by the researchers for the purposes of the current study. Figure 1 illustrates this primary model.

Figure 1
Conceptual framework of the study



Methodology

Participants

The participants of the study were selected through stratified sampling from among 641 urban high school English teachers of 4 regions in Shiraz, Iran. These schools include both public and private schools. Krejcie and Morgan (1970) formula was used to assess the sample size. Thus, the representative sample came to be 242 teachers.

Instrument

Five questionnaires were used for the purposes of this study. All of them were standard questionnaires with a number of items. The items were put together to make a hybrid questionnaire with the following sections.

Fifteen attitude-related statements comprised section I--teachers' attitude towards technology use. Teacher's attitudes towards the ICT scale was first developed by Albirini (2006). This scale measured teachers' attitude from "strongly disagree" (1) to "strongly agree" (5). Liu (2009) reported that the Cronbach's alpha reliability coefficients of Albirini's attitude scale was (0.90). Al-Zaidiyeen, Mei, and Fook (2010) too used this scale and reported the Cronbach's alpha reliability coefficients above 0.80.

The second section of the hybrid questionnaire measured perceived ease of use, by means of five-point Likert-type scale (strongly disagree" (1) to "strongly agree" (5)). It comprised four items, adopted from Davis (1989) who it as a five-point Likert-type scale. This scale was used by Adam and Wood (1999) who found it was valid and reliable. Other researchers like (Doll, Hendrickson and Deng 1998; Subramanian, 1994; Venkatesh, 2000) used this scale in their studies and reported its reliability coefficients above 0.70.

The third section included twelve items that measured subjective norms, adopted from a questionnaire developed by Marcinkiewicz and Regstad (1996). In this questionnaire, the important people who might influence teacher's attitude had been classified into administrators, colleagues, and students. A set of four items was made for each referent group. Responses were scored on a five-point Likert-type scale from (A) not at all, (B) seldom, (C) not sure, (D) frequently, to (E) to a large extent. Delice (2009) used this scale in his work and reported a reliability coefficient of ($r=.85$).

The fourth section consisted of 5 items related to trialability and adopted from a study by Ntemana and Olatokun (2012). This had been used in many previous works. In answering these items, the participants used such options as Strongly Disagree (SD) = 1, Disagree (D) = 2, Agree (A) = 3, and Strongly Agree (SA) = 4. Yunus (2014) used this scale in his work which focused on a component of innovation diffusion theory and found it reliable and valid.

To check the reliability of the hybrid questionnaire, Cronbach's reliability coefficient alpha test was used. This test which provides a measure of the internal consistency of the items, was piloted with 30 teachers. The reliability index was above 0.75, as shown in Table 1 below.

Table 1

Cronbach's alpha reliability

| Variable | Cronbach's alpha reliability |
|-----------------------|------------------------------|
| Perceived ease of use | 0.84 |
| Perceived usefulness | 0.76 |
| Attitude | 0.80 |
| Subjective norm | 0.78 |
| Trialability | 0.82 |

The construct validity of the questionnaire had to investigated too. It was established by consulting two experts in the field of communication and information technology. Their comments were very conducive in clarifying the instrument to arrive at the final version. They confirmed the content and the relatedness of each item with what was predicted to evaluate.

Data Collection Procedure

First, the participants were given enough time to complete the questionnaire. Second, the recorded data were coded and fed into SPSS software (version 18). A random sample of five percent of the entered data was checked for coding accuracy.

Data Analysis Procedure

In the data analysis step, the proposed research model was tested. This involved using a model which could assess the contribution and significance of the factors. Also, path analysis was utilized as the statistical procedure for examining the relationship between teacher perceptions and the use of instructional technology. Causal modeling techniques examine whether a pattern

of Interco-relations among variables “fits” the underlying theory regarding which variables are influencing other variables (Byrne, 2013).

Results

As mentioned above, path analysis was used to inspect the relationship between teacher perceptions and the use of instructional technology. The first step in path analysis is to examine the Goodness of Fit, which means how well the proposed model fits the real data. Tables 2 below shows the results for this step.

Table 2

Modification index

| Modification index | Value |
|--------------------|-------|
| GFI | 0.991 |
| AGFI | 0.869 |
| NFI | 0.968 |
| CFI | 0.975 |
| RMSEA | 0.086 |
| X ² | 2.529 |
| DF | 1 |
| P | 0.060 |

In Table 2, the ratio of χ^2/df is less than 3, which indicates the global fit of the data. The reported root means square residual of approximation (RMSEA) is 0.086, i.e., less than 0.1, which indicates a good fit. Other indications that the model fits well are the comparative fit index (CFI), which is 0.975, the goodness of fit index (GFI), which is 0.991, the adjusted goodness of fit index (AGFI), which is 0.869, and the null fit index which is 0.964. Values are much larger than the common target of 0.9 for reflecting a good fit. Thus, it can be concluded that the proposed model fits well and represents a reasonably close approximation in the population.

The second step in a path analysis is to evaluate the relationship among the variables. Table 3 below shows the statistical results related to the factors under study in the current research.

Table 3

Path analysis result

| Dependent variables | Independent variables | Path coefficient (β) | T-values | Finding |
|---------------------|-----------------------|------------------------------|----------|-----------|
| PEU | Tri | 0.21 | 2.815 | supported |
| PEU | SN | 0.32 | 4.208 | supported |
| PU | Tri | 0.19 | 2.546 | supported |
| PU | SN | 0.26 | 3.447 | supported |
| ATT | Tri | 0.38 | 5.442 | supported |
| ATT | PU | 0.26 | 3.666 | supported |
| ATT | PEU | 0.16 | 2.199 | Supported |
| PU | PEU | 0.22 | 2.805 | Supported |

In Table 3, the first row indicates the direct effect of trialability on perceived ease of use ($\beta=0.21$, $T=2.815$). Because the value of T is equal to 2.815, which is greater than 1.96, the direct effect of trialability on perceived ease of use (0.21) is significant at 0.05 level. The second row indicates the direct effect of subjective norm on perceived ease of use ($\beta=0.32$, $T=4.208$). Because the value of T is equal to 4.208, which is greater than 1.96, the direct effect of subjective norm on perceived ease of use (0.32) is significant at 0.05. The third row indicates the direct effect of trialability on perceived usefulness ($\beta=0.19$, $T=2.546$). Because the value of T is equal to 2.546, which is greater than 1.96, the direct effect of trialability (0.19) on perceived usefulness is significant at 0.05 level. The fourth row indicates the direct effect of subjective norm on perceived usefulness ($\beta=0.26$, $T=3.447$). Because the value of T is equal to 3.447, which is greater than 1.96, the direct effect of the subjective norm (0.26) on perceived usefulness is significant at 0.05 level.

Corresponding to Table 3, perceived usefulness ($\beta=0.26$, $T=3.666$), and perceived ease of use ($\beta=0.16$, $T=2.199$) have a meaningful and direct effect on attitude toward the use of technology. In this table, the biggest direct effect relates to trialability on attitude ($\beta=0.38$, $T=5.442$). Because the value of T is equal to 5.442, which is greater than 1.96, the direct effect of trialability (0.38) on attitude is significant at 0.05 level.

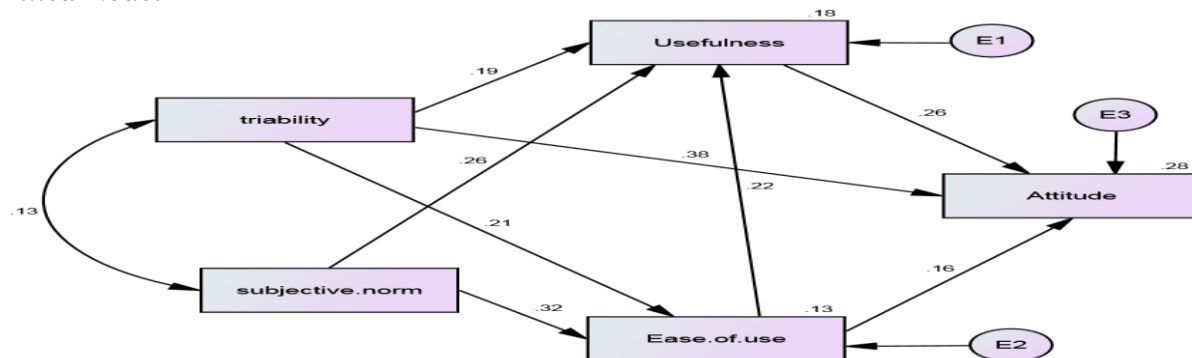
Table 4 illustrates the correlation among variables. The correlation of all variables under study with the predisposition of technology acceptance is validated by meaningful significance ($P < 0.05$).

Table 4
Correlation matrix

| | Attitude | trialability | Ease of use | Usefulness | Subjective. Norm |
|------------------|----------|--------------|-------------|------------|------------------|
| Attitude | 1 | | | | |
| trialability | .406** | 1 | | | |
| Ease.of.use | .161* | .170* | 1 | | |
| Usefulness | .377** | .187* | .260** | 1 | |
| Subjective. Norm | .302** | .130 | .288** | .350** | 1 |

As shown in Table 4, the highest amount of correlation belongs to attitude and trialability (0.406), while the lowest amount goes with subjective norm and trialability (0.130). Figure 2 below represents the model of relationships among all variables (factors) investigated in this study.

Figure 2
Fitted model



Discussion

The results of the present study showed that trialability has a significant direct effect on perceived ease of use. This supports Yang (2007) and Yunus (2014) who assert that if teachers try to use technology then they may find it easy to use. Also, the results revealed that subjective norms have a significant and direct effect on perceived ease of use. This is in line with the findings of Yuen and Ma (2008), Teo (2011), Wingo et al. (2017) and Jaber (2016). They have all indicated that when teachers feel any pressure concerning the use of technology from their colleagues or administrators, their frequency of technology usage is influenced positively.

According to the obtained results, compatibility too had a direct effect on perceived usefulness. This is in line with the finding of Jung (2015), who investigated the influential factors on class enrichment and the significant and meaningful effect of compatibility, instant connectivity and self-efficacy on perceived usefulness. Other researchers like Shiau et al. (2017), Kanchanatane et al. (2014), and Arpaci (2015) have reported the same effect.

Another influential factor investigated in this study was subjective norm. Based on the obtained results, subjective norm has a significant and direct effect on perceived usefulness. Moreover, it was found that has an indirect effect on perceived usefulness too. This implies that teachers perceive their own behavior to be highly affected by their important referents. In fact, majority of secondary school teachers in urban schools are self-directed in pursuing and acquiring knowledge and skills needed for them to use technology, and they perceive that the use of technology in school is important for their self-development. In this connection, the results of the present study support the those of Dastorani and Khoshneshin (2017), Yuen and Ma (2008), Park (2009), and Teo (2011).

Finally, the obtained results revealed that perceived usefulness has a significant and direct effect on teachers' attitude towards using technology, meaning that when teachers believe that the use of technology will improve their work effectiveness, they are more likely to use technology in their teachings. This finding supports the findings of Teo (2011), Arpaci (2015), and Wingo et al (2017).

Conclusion

The main goal of this study was to investigate what factors affect technology adoption in high schools from teachers' point of view. Based on the obtained results, the correlation between variables was established. It indicates a significant and positive relationship among variables, meaning that technology and technology-based environments may have a great potential in promoting socio-economic changes. In fact, in the Iranian high school context, they boost educational systems. It is, thus, desirable to establish some such environments, both physically and practically, for students and teachers in high schools.

The research results indicated that perceived ease of use was influential within the proposed research model, perceived usefulness has a direct effect on attitude, and subjective norms have indirect but important effects on teachers' attitude-- all signifying that when teachers perceive that the use of computers is easy, they are motivated to apply it in teaching. It is, therefore, recommended that the benefits of using technology in teaching in terms of students' achievement in comparison with traditional tools, are explained to teachers, and they are encouraged financially.

Another point which needs attention and restatement here is that many prior studies have investigated various aspects of technological developments in English language teaching, solely from the point of view of the learners, but the current research examined technology acceptance from teachers' viewpoint. In fact, while in various pieces of research, relations between technology acceptance variables had been considered, the present study tried to add some other variables to the technology acceptance model (TAM) in order to expand this model. Therefore,

the proposed modified model was based on TAM plus some famous models like the 'theory of reasoned action'. The proposed model aims at examining English language teachers' acceptance and attitude at the same time.

Finally, in connection with the implications of the study, it should be stated that the findings can provide practical benefits to schools and other educational organizations in utilizing technology for the purposes of education, that is, assisting them to incorporate technology in their programs to achieve pedagogical ambitions, institutional ideals, and language learning in its entirety.

References

- Adam, L., & Wood, F. (1999). An investigation of the impact of information and communication technologies in sub-Saharan Africa. *Journal of information Science*, 25(4), 307-318.
- Agarwal, R., & Prasad, J. (1997). The role of innovation characteristics and perceived voluntariness in the acceptance of information technologies. *Decision sciences*, 28(3), 557-582.
- Al-Zaidiyeen, N. J., Mei, L. L., & Fook, F. S. (2010). Teachers' Attitudes and Levels of Technology Use in Classrooms: The Case of Jordan Schools. *International education studies*, 3(2), 211-218.
- Albirini, A. (2006). Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers. *Computers & Education*, 47(4), 373-398.
- Anni, C. T. (2018). School Counselors' Intention to Use Technology: The Technology Acceptance Model. *Turkish Online Journal of Educational Technology-TOJET*, 17(2), 120-124.
- Arpaci, I. (2016). Understanding and predicting students' intention to use mobile cloud storage services. *Computers in Human Behavior*, 58, 150-157.
- Bourgonjon, J., De Grove, F., De Smet, C., Van Looy, J., Soetaert, R., & Valcke, M. (2013). Acceptance of game-based learning by secondary school teachers. *Computers & Education*, 67, 21-35.
- Byrne, B. M. (2013). *Structural equation modeling with Mplus: Basic concepts, applications, and programming*: routledge.
- Dastorani, M., & Khoshneshin, Z. (2017). An analytic review on the factors that affect Technology Acceptance Model (TAM) in Iranian universities. *Interdisciplinary Journal of Virtual Learning in Medical Sciences*, 8(2).
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340.
- Delice, M. (2009). *Explanation of police officers' information technology acceptance using the technology acceptance model and social cognitive theory*: University of Louisville.
- Doll, W. J., Hendrickson, A., & Deng, X. (1998). Using Davis's perceived usefulness and ease-of-use instruments for decision making: a confirmatory and multigroup invariance analysis. *Decision sciences*, 29(4), 839-869.
- Fishbein, M., & Ajzen, I. (1977). Belief, attitude, intention, and behavior: An introduction to theory and research.
- Hair, J., Anderson, R., Babin, B., & Black, W. (2010). Multivariate data analysis: A global perspective (Vol. 7): Pearson Upper Saddle River. In: NJ.
- Isaac, O., Abdullah, Z., Ramayah, T., Mutahar, A., & Alrajawy, I. (2016). *Perceived Usefulness, Perceived Ease of Use, Perceived Compatibility, and Net Benefits: an empirical study of internet usage among employees in Yemen*. Paper presented at the The 7th International Conference Postgraduate Education (ICPE7).

- Jung, H.-J. (2015). Fostering an English teaching environment: Factors influencing English as a foreign language teachers' adoption of mobile learning. *Informatics in Education-An International Journal*, 14(2), 219-241.
- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and psychological measurement*, 30(3), 607-610.
- Lee, Y.-H., Hsieh, Y.-C., & Hsu, C.-N. (2011). Adding innovation diffusion theory to the technology acceptance model: Supporting employees' intentions to use e-learning systems. *Journal of Educational Technology & Society*, 14(4), 124-137.
- Liu, J. (2009). A survey of EFL learners' attitudes toward information and communication technologies. *English Language Teaching*, 2(4), 101-106.
- Marcinkiewicz, H. R., & Regstad, N. G. (1996). Using subjective norms to predict teachers' computer use. *Journal of Computing in Teacher Education*, 13(1), 27-33.
- Mutahar, A. M., Daud, N. M., Ramayah, T., Isaac, O., & Alrajawy, I. (2017). Integration of innovation diffusion theory (IDT) and technology acceptance model (TAM) to understand mobile banking acceptance in Yemen: the moderating effect of income. *International journal of soft computing*, 12(3), 164-177.
- Ntemana, T. J., & Olatokun, W. (2012). Analyzing the influence of diffusion of innovation attributes on lecturers' attitude towards information and communication technologies. *Human Technology: An Interdisciplinary Journal on Humans in ICT Environments*.
- Park, S. Y. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *Journal of Educational Technology & Society*, 12(3), 150-162.
- Rabaa'i, A. A. (2016). Extending the technology acceptance model (TAM) to assess students' behavioural intentions to adopt an e-learning system: The case of moodle as a learning tool. *Journal of emerging trends in engineering and applied sciences*, 7(1), 13-30.
- Rogers, E. M. (2010). *Diffusion of innovations*: Simon and Schuster.
- Shiau, S. J., Huang, C.-Y., Yang, C.-L., & Juang, J.-N. (2018). A derivation of factors influencing the innovation diffusion of the OpenStreetMap in STEM education. *Sustainability*, 10(10), 3447.
- Smith, J. (2006). The effect of social presence on teacher technology acceptance, continuance intention, and performance in an online teacher professional development course.
- Subramanian, G. H. (1994). A replication of perceived usefulness and perceived ease of use measurement. *Decision sciences*, 25(5-6), 863-874.
- Tran, T. C. T., & Cheng, M. S. (2017). Adding Innovation Diffusion Theory to Technology Acceptance Model: Understanding Consumers' Intention to Use Biofuels in Viet Nam. *International review of management and business research*, 6(2), 595.
- Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information systems research*, 11(4), 342-365.
- Wingo, N. P., Ivankova, N. V., & Moss, J. A. (2017). Faculty perceptions about teaching online: Exploring the literature using the technology acceptance model as an organizing framework. *Online Learning*, 21(1), 15-35.
- Yunus, M. (2014). *Diffusion of innovation, consumer attitudes and intentions to use mobile banking*. Paper presented at the Information and knowledge management.
- Zhang, N., Guo, X., & Chen, G. (2008). IDT-TAM integrated model for IT adoption. *Tsinghua science and technology*, 13(3), 306-311.