



# The Role of Perceived Ease of Use and Perceived Usefulness on Personality Traits among Adults

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**RESEARCH ARTICLE**

## ABSTRACT

It has been suggested that individuals' technology acceptance are affected by personality traits. This paper aims to emphasise the importance of personality traits beyond BIG 5 on the acceptance and individual usage of Cloud Computing Systems (CCSs) with Perceived Ease of Use (PEU) and Perceived Usefulness (PU). Based on this, a quantitative cross-sectional survey research was designed, and 722 students studying at Sakarya University, Pedagogical Training Certification Program in the academic year of 2016–2017 were involved to the study. A path analysis which is a structural equation model was performed to examine the direct and indirect effects of the variables that are theoretically interrelated in the study. According to the results, while Extroversion (EXT), Agreeableness (AGR), Conscientiousness (CONS), and OE are not predictors of PEU and PU components, Nervousness (NEUR), is a significant predictor of PEU in the model. In addition to this, behavioural intention (BI) is significantly predicted by both PU and PEU, and PEU is a significant predictor of PU and BI on the individual usage of CCSs.

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inter-disciplinarily (Klein, 2010) with the improvement of technology although it was studied only psychologically (McCrae & Costa, 1997) before. However, this situation has shown that there is a gap in cloud computing systems in terms of personal traits in literature. As it is known, today's business have more horizontal organization structure types such as hybrid, network, joint ventures, loan, clustered, self-managing working groups (Aksay, 2015). Rivers (2021) examines the role of personality and online academic self-efficacy in acceptance, actual use and achievement in Moodle and founded that agreeableness and conscientious have positive and positive indirect effects on the acceptance of Moodle. The common feature of these organization types is that the workflow runs horizontally rather than vertically. This situation creates a more dynamic and speed workflow. Therefore, the technological improvements which facilitate and speed up work processes are preferred densely. At this point, it can be said that cloud computing system is a very facilitator and dynamic work tool. Because some companies such as Google, Microsoft, etc. have network structure and many employees work in different places separately. The systems of these companies based on cloud computing systems which enable to employees work on the same document and share it with collaborators. Based on these, it is possible to assert that these companies have different working areas and their working environments are structured by taking into account the different personality structures. In Turkey, most of the institutions move their systems into cloud computing systems, and Turkey is among the countries that consider the employees' personality differences since interacting with Google, Azure, Amazon, 365 etc. such cloud systems in educational environment. Apart from these profit companies, it can be said that non-profit companies do not look for money-based, but also not for pedagogy. Therefore, the pedagogical part of the section that is important for companies is missing. Imagine that the teacher has an extroverted structure, preferring to use technology that allows interaction within the classroom, and may prefer to apply technology that reduces the interaction of an inward-oriented teacher to one-to-one. This suggests that the type of personality of the teacher may affect the use and acceptance of technology. Therefore, in this study, it was found appropriate to work with teacher candidates in the opinion that the teacher will shape the students' educational life. In this context, it can be thought that having these different personality traits has an effect on the use and adoption of developing technology. In other words, it is possible that a technological development which is not suitable for the personality type of teacher will not be preferred by individuals. In this context, it is claimed that this study is suitable for a modern work understanding. It is seen that CCSs are not made in the order in which the network organizations spread in the developing and changing world order especially when the universities in a non-profit company, and from a pedagogical point of view, and working through cloud systems. Therefore the problems of the study is as following:

1. What is the direct and indirect effects of principle factors of BIG 5 on PEU, PU, and BI in assessing the use of CCSs in education?
2. What is the direct and indirect effects of PEU on PU and BI assessing the use of CCSs in education?
3. What is the effect of PU on BI assessing the use of CCSs in education?

## CHARACTERISTICS OF DIFFERENT PERSONALITY TRAITS

In this section, personality traits are discussed to highlight the differences among extroversion, conscientiousness, agreeableness, nervousness, and openness to experience.

### EXTROVERSION

Extroverts are more likely to be in a crowded environment and keen on willing to take risks (Eysenck, 1991). They are more positive and optimistic, and they are more involved in social activities, and tend to look for amusement. Moreover, extroverts are more assertive, social and demonstrative (Goldberg, 1992). They are more around and keen on manoeuvring the new technologies. Extroverts do not only care about their images, but also their behaviour in the social consequences (Devaraj et al., 2008). Self-efficacy and high energy makes them join self-managed working groups more easily than others (Thoms et al., 1996). Individuals with high level of this trait are energetic, grave, friendly, outgoing and enjoy being with others (Costa & McCrae, 1992; McCrae & John, 1992; Sanders, 2008).

## CONSCIENTIOUSNESS

Individuals who are conscientious are more likely to take responsibility and have an authoritative, meticulous and thoughtful approach (Eysenck, 1991). Individuals who possess a high level of this trait are well organized, trustable, comprehensive, and exacting (Goldberg, 1992). Achievement, constancy and regularity are what they need (Costa, McCrae, & Dye 1991). They are highly shifted and intrinsically motivated at their work (Barrick & Mount, 2000). The individuals with that trait obey the rules, take responsibilities, are dependent, well oriented, and detailed and they have a sense of achievement. They also like to plan ahead (Costa & McCrae, 1992; McCrae & John, 1992; Sanders, 2008).

## AGREEABLENESS

Agreeable individuals seem more cordial and enthusiastic (Eysenck, 1991). They tend to help other people and are very keen on sympathizing with others. Costa et al. (1991) indicate that the individuals with this trait are altruistic and adaptable. Additionally, agreeableness is related with humility, docility, and straightforwardness, and these people are guided by feelings, particularly those of sympathy in making judgments and forming attitudes. This trait refers to an individual who has inter-personal relationships and tends to be friendly, helpful, thoughtful, accommodating, tries to avoid conflict, is co-operative, forgiving and trusted (Costa & McCrae, 1992; McCrae & John, 1992; Sanders, 2008).

## NERVOUSNESS

Nervous individuals are more likely to be relatively unstable (Eysenck, 1991). It is easy to fright them, and they easily become rushed, depressive and angry. Theoretical framework of a nervous person is under social pressure, and is likely to develop certain behaviour. The individuals who have low level of neuroticism or high level of emotional stability are self-confident, secure, well audited, not easily disturbed, and resilient. Individuals with this trait apparently finish difficult tasks in less time. Additionally, individuals who score high in neuroticism are likely to feel insecure, discontented, sensitive to ridicule, shy and easily embarrassed (Costa & McCrae, 1992; McCrae & John, 1992; Sanders, 2008). Also, negative events can have a deep emotional effect on them (Heller et al., 2002).

## OPENNESS TO EXPERIENCE

Open individuals have much more imagination than others and more often tend to express one's curiosity. The individuals who have high scores in this trait tend to be cognitively explorative, cognitively flexible, and divergent thinkers (DeYoung et al., 2005). Conversely, people who tend to be conventional in behaviour and conservative in outlook have low traces of this trait. This style of personality traits refers to the abilities to accept various experiences and cultures. As shown in the studies of Saadé et al. (2006), users' acceptance and performance of new information and communication technologies usage depends strongly on behavioural and personality traits such as perceptions, attitudes, openness to experiment, or ones willingness to simply try new things. Additionally, they state that the acceptance of a new technology is dependent on several of constructs; mainly computer skill, beliefs and self-efficacy. Especially in this study, the different personality traits might have an important role in integrating the new technologies in education. This trait refers to persons open to learning, innovation, and change. They also tend to be curious, and intelligent, and like to try new ideas (Costa & McCrae, 1992; McCrae & John, 1992; Sanders, 2008).

## METHOD

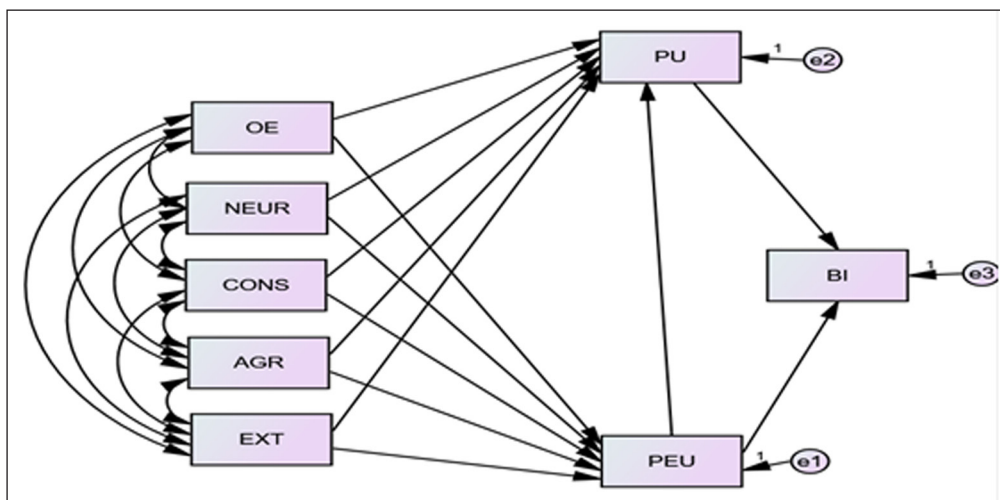
This study was designed with relational survey model which is a quantitative research method. In this context, path analysis technique which is a structural equation model was used. Therefore, a model was formed which addressed the relationships between BIG5 personality types and the components of TAM.

## PARTICIPANTS AND PROCEDURES

Participants were 722 students studying at Sakarya University, Pedagogical Training Certification Program in the academic year of 2016–2017, of whom five hundred and eighty-four were female (80.9%). This certification program aims to strength life-long learning tendency for the university students who are already studying in a program or graduated a faculty, and have already a job, and their jobs are completely related with computers. The certification program included pedagogical courses in the parallel of education faculties' program and includes 10 theoretical and practical course related with education pedagogy. Although the sample was a convenience sample, considering the dynamic of the universities and local placed of the university -which is on the west south part of the most crowded city in Turkey- it is possible to say the sample represents the universe regarding the data come from the participants.

## PROCESS

The aim of this study is to investigate the effect of the BIG5 personality types on the components of TAM, PEU and PU. In order to investigate this issue, the valid variables obtained were prepared to get results. A path analysis which is a structural equation model was performed to examine direct and indirect effects of the variables that are theoretically interrelated in the study. Mahalanobis distance, Variance Inflation Factor (VIF) and Tolerance values and multicollinearities of the independent variables are checked. Mahalanobis distance values were determined by taken the Chi-Square table into account, with the degree of six independent variables freedom ( $p < 0.01$ , 16.812). All the statistical analyses were administered using the AMOS 20 and SPSS 20 software. The tested model is shown in Figure 1.



**Figure 1** The path analysis based on personality traits and PU, PEU, and BI.

## INSTRUMENTS

### Technology Acceptance Model 3: The Components of PEU and PU

The TAM3 was developed by Venkatesh and Bala (2008). The whole scale includes 50 items rated on a 7-point scale ranging from 1 “Strongly Disagree” to 7 “Strongly Agree” (4- Neutral), and an open-ended question. The scale is adapted to Turkish by Hamutoglu (2018) and the results of adaptation (EFA, CFA, Invariances design) show good psychometric properties and convergent validity and reliability as reported in the study. Turkish adaptation of TAM3 scale has 45 items with 7 Likert type-scale and 11 dimensions. In this study only PEU, PU and BI components were used to determine the effects of personality traits. While PEU and PU component consist four items, BI comprise with three items. Therefore, while the lowest score that can be obtained from the dimension of PEU and PU is 4, and the highest score is 28, and for the BI dimension is 3 and 21, respectively.

### BIG 5

The BIG 5 inventory is a 5-point Likert scale, comprising 10 items within the 5 dimensions as follow: extroversion, agreeableness, conscientiousness, neuroticism, and openness to experience, each of whom includes two items. BIG 5 was developed by Gosling et al. (2003),

and adapted to Turkish by Gunel (2010). The internal consistency of the extroversion is .89, agreeableness is .80, conscientiousness is .76, neuroticism .71, and openness to experience is .69 as indicated in Gunel’s research (2010). Therefore, the lowest score that can be obtained from each of the dimension of BIG 5 is 2, and the highest score is 10.

For the purposes of the study, the descriptive statistics and the fit indices results and are given in Tables 1 and 2, respectively.

VARIABLES	N	MIN	MAX	MEAN	STD. DEVIATION	SKEWNESS	KURTOSIS
PU	722	4	28	21.13	5.62	-0.784	0.264
PEU	722	4	28	19.84	5.20	-0.410	-0.184
BI	722	3	21	15.89	4.01	-0.622	0.026
EXT	722	2	10	7.54	1.76	-0.297	-0.614
AGR	722	4	10	7.99	1.43	-0.481	-0.364
CONS	722	4	10	7.90	1.60	-0.359	-0.679
NEUR	722	2	10	5.70	1.76	0.140	-0.378
OE	722	3	10	6.98	1.71	-0.021	-0.658

**Table 1** Descriptive Statistics of the Variables.

PU: Perceived usefulness, PEU: Perceived ease of use, BI: Behavioural intention, EXT: Extroversion, AGR: Agreeableness, CONS: Conscientiousness, NEUR: Neuroticism, and OE: Openness to Experience.

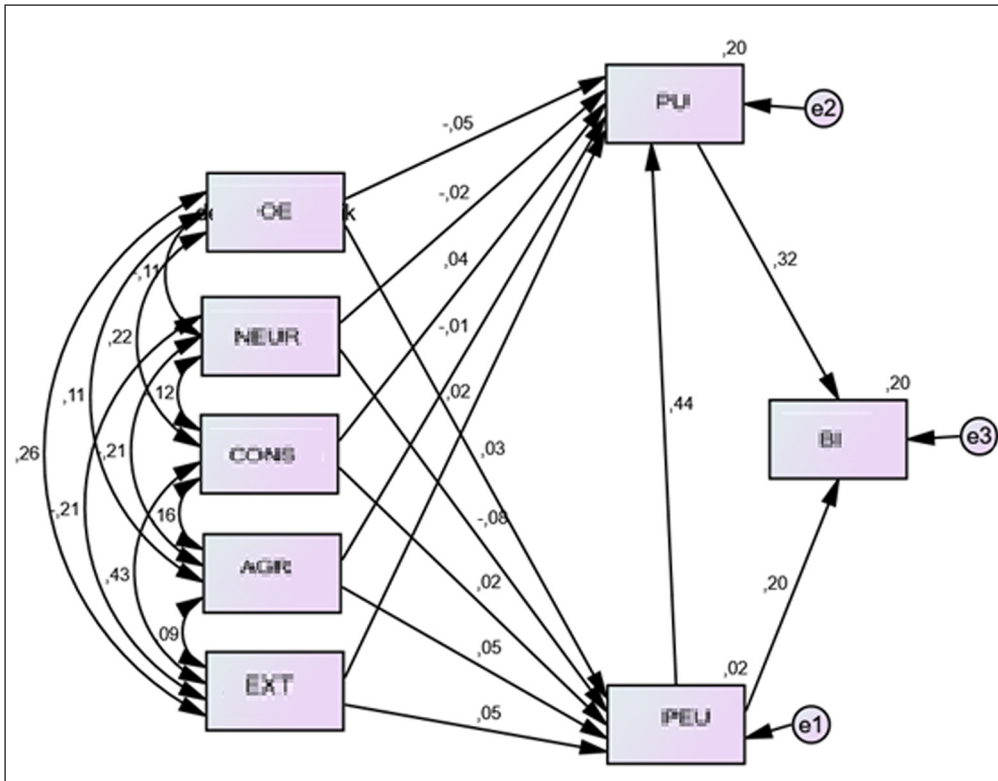
FIT CRITERIA	PERFECT FIT VALUES	ACCEPTABLE FIT VALUES	ACHIEVED FIT VALUES
( $\chi^2/df$ )	≤3	≤4–5	0.33
AGFI	≥0.90	≥0.85	0.99
GFI	≥0.90	≥0.85	0.99
CFI	≥0.97	≥0.90	1
RMSEA	≤0.05	0.06–0.08	0.000
SRMR	≤0.05	0.06–0.08	0.006

**Table 2** Perfect and Acceptable Fit Values regarding the Path Analysis.

Table 1 shows descriptive statistics of the variables such as sample size, mean, standard deviation, and minimum-maximum, and skewness-kurtosis values.

According to the fit values in Table 2, the model has acceptable and perfect fit values ( $\chi^2/sd = 0.33$ ; RMSEA = 0.000; SRMR = 0.006; CFI = 1; GFI = 0.99; AGFI = 0.99) (Baumgartner & Homburg, 1996; Bentler & Bonett, 1980; Bollen, 1990; Browne & Cudeck, 1993; Byrne, 2001; Hu & Bentler, 1999; Joreskog & Sorbom, 1993; Kline, 2011; Marsh et al., 2006; Steiger, 2007; Schermelleh-Engel & Moosbrugger, 2003; Tanaka & Huba, 1985). The developed and test path analysis is shown in Figure 2. The information on direct and indirect effects on the variable tested in the model is provided in Table 3.

It is seen in the model that while NEUR has a direct and negative effect on the “PEU” ( $\beta = -0.08$ ,  $p < 0.05$ ), and has not a significant predictors of “PU” ( $\beta = -0.02$ ,  $p > 0.05$ ). On the other hand, EXT, AGR, CONS, and OE are not significant predictors of “PEU” ( $\beta = 0.05$ ,  $p > 0.05$ ), ( $\beta = 0.05$ ,  $p > 0.05$ ), ( $\beta = 0.02$ ,  $p > 0.05$ ), ( $\beta = 0.05$ ,  $p > 0.05$ ), and “PU” ( $\beta = 0.02$ ,  $p > 0.05$ ), ( $\beta = -0.01$ ,  $p > 0.05$ ), ( $\beta = 0.04$ ,  $p > 0.05$ ), ( $\beta = -0.02$ ,  $p > 0.05$ ), ( $\beta = -0.05$ ,  $p > 0.05$ ), respectively. Moreover, “PEU” has a direct and positive effect on the “PU” ( $\beta = 0.44$ ,  $p < 0.001$ ), and “BI” is significantly predicted by both “PEU” and “PU”, respectively ( $\beta = 0.20$ ,  $p < 0.001$ ), ( $\beta = 0.32$ ,  $p < 0.001$ ). The dependent variable of PEU was explained by the independent variables of NEUR 2% ( $R^2 = 0.02$ ). In addition, the independent variable of PEU alone explained PU at 20% ( $R^2 = 0.20$ ), and the independent variables of PEU and PU explained BI at 20% ( $R^2 = 0.20$ ). Accordingly, it can be argued that NEUR had a small effect size even though it was a significant variable explaining PEU. On the other hand, PEU and PU had a moderate effect on BI, and similarly, PEU had a moderate effect on PU.



**Figure 2** Findings Achieved in the Path Analysis.

INDEPENDENT VARIABLE	DEPENDENT VARIABLE	TOTAL EFFECT	DIRECT EFFECT	INDIRECT EFFECT	STANDARD ERROR	CRITICAL RATIO (T)
EXT	PEU	0.046	0.046	-	0.124	1.094
AGR	PEU	0.046	0.046	-	0.138	1.207
CONS	PEU	0.018	0.018	-	0.135	0.434
NEUR	PEU	-0.076	-0.076	-	0.114	-1.965*
OE	PEU	0.29	0.29	-	0.117	0.758
PEU	BI	0.344	0.203	0.141	0.029	5.473***
PU	BI	0.319	0.319	-	0.026	8.592***
PEU	PU	0.442	0.442	-	0.036	13.156***
EXT	PU	0.043	0.023	0.020	0.121	0.595
AGR	PU	0.006	-0.015	0.020	0.135	-0.429
CONS	PU	0.050	0.042	0.008	0.132	1.121
NEUR	PU	-0.054	-0.020	-0.033	0.111	-0.583
OE	PU	-0.37	-0.050	0.013	0.114	-1.432
EXT	BI	0.023	-	0.023	-	-
AGR	BI	0.011	-	0.011	-	-
CONS	BI	0.020	-	0.020	-	-
NEUR	BI	-0.033	-	-0.033	-	-
OE	BI	-0.006	-	-0.006	-	-

**Table 3** Direct and Indirect Effects on the PU, PEU, and BI Variables.

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ;  
 \*\*\*  $p < 0.001$ .

## DISCUSSION AND CONCLUSION

This study aimed to investigate individuals' (N = 722) acceptance and individual usage of cloud computing systems (CCSs) in education through their personality traits. The participants were enrolled in the pedagogical certificate program of Sakarya University. As expected, the results indicate the link between the acceptance and individual usage of the cloud computing systems and individual differences. To determine this relationship, PU and PEU –components



of TAM 3), and BIG 5 were used. It is also emphasized and suggested in recent studies that the acceptance of educational technologies in general require the consideration of individual differences (Kamyab & Delafrooz, 2016; Nistor et al., 2013). Our findings confirm this in case of the use of cloud computing in education specifically.

The findings of this study contribute to the field of educational computer systems as follows:

1. As a result of this study, it has been seen that personality traits affect the acceptance of technology, but this effect is very little (%2). For this reason, it is recommended that personality traits should be taken into consideration in designing the education systems and other variables that affect the acceptance and individual usage of the systems should be investigated. Although there is less impact of 2%, it can be said that each difference is important in terms of considering the effect of the system on designing the systems. The founded low impact could be explained with other variables. In the study of Siddiquei and Khalid (2018) it is reported that there is a relation between personality traits, learning styles and academic performance of e-learners. This finding is important to look for another variable in future studies to discuss and compare the obtained impact. 2. Considering in the context of the recent studies it is possible to claim that the added value of the present research for readers is a pedagogical point of view because of working within the framework of TAM and working in a non-profit organization (i.g university) through cloud computing systems applications in the developing and changing world. The results discussed below considering the literature.

### **THE DIRECT AND INDIRECT EFFECTS OF BIG 5 ON PEU, PU, AND BI IN ASSESSING THE USE OF CCSS IN EDUCATION**

In this study, the components Extroversion, Conscientiousness, Agreeableness, Nervousness, and Openness to Experiences account as given in BIG 5 were used. According to the results, among the individual differences only NEUR is the significant predictor of PEU variable. In the study of Saadé and Kira (2007) anxiety was shown to present some moderating influence on perceived ease of use (PEU), and they state trait anxiety is defined as a general pervasive anxiety that is experienced by a person over the entire range of life experience. Reed et al. (1996) states previous experience on computers is posited as a factor influencing the computer anxiety. Based on the studies it is possible to say nervousness person could have an anxiety while using computer technologies, and this could be a negative effect on perceived ease of use. Considering the sample characteristics, they might not have an experience on CCSS previously. Although this issue is the limitation of present study, it is important to note that having a previous experience on computers might play an important role on perceived ease of use. Venkatesh and Davis (2000) and Venkatesh and Bala (2008) emphasis the moderator role of experience on the acceptance and usage of a technology in the model of TAM 2 and TAM 3, respectively. The results are parallel with the literature considering the indirect effect of NEUR on BI (Punnoose, 2012). Additionally, it is also claimed that nervousness personality type could have possible additional effects on PEU (Punnoose, 2012). Contrary to the literature PU is directly and positively predicted by NEUR (Komarraju & Karau, 2005; Teh et al., 2011), and extroversion could have possible additional effects on PU, PEU and BI (Punnoose, 2012; Svendsen et al., 2009). Another results for conscientiousness were shown some differences compared to literature. While it has a positive direct effect on PU (Devaraj et al., 2008; Komarraju & Karau, 2005; Punnoose, 2012), this trait could have a possible additional effect on BI and has no relation with PEU (Punnoose, 2012). In addition to the contradictory, agreeableness has a significant positive direct effect on PU (Devaraj et al., 2008) and it is also suggested that agreeableness could have a possible additional effect BI (Punnoose, 2012). Finally, openness to experience has a significant positive direct effect on PU, (Komarraju & Karau, 2005), and on BI (Devaraj et al., 2008; Jacques et al., 2009). It is also stated that openness to experience is significantly and positively related to perceived ease of use (Svendsen et al., 2013) which is contradictory to the present studies result.

### **THE DIRECT AND INDIRECT EFFECTS OF PEU ON PU AND BI, AND PU ON BI ASSESSING THE USE OF CCSS IN EDUCATION**

The findings also show that BI is significantly predicted by PU and PEU variables. This finding can be supported with the studies in the literature (Padilla-Meléndez et al., 2013; Terzis & Economides, 2011). In the study, personality variable do not meaningfully predict PU and BI,

and it is considered that this finding is related with the characteristics of the sample from which the data were collected. Considering the fact that the participants do not have a job and the fact that they are enrolled in this program to find a job in the Ministry of Education. Considering the program structure within the context of education pedagogy, they all expect to be a teacher after completing this program. Moreover, this finding might be explained by the following reasons: The participants are not experienced in cloud technologies, they do not use them that much in their lives, and they are not closely acquainted with such systems. Besides believing in the necessity of using technology in accordance with the others' expectations is not related with personality traits. Moreover, the findings of the study demonstrate that there is not a significant relationship between these predicted independent and dependent variables. In contrast to the findings of Jackson et al. (2013) personal innovativeness (individual user characteristics, (Zmud & Apple, 1992) on Internet technologies had significant direct effect on BI. However, in this study the results of PU and personality trait contradicts the findings of Uffen et al. (2013) in which it is claimed that neuroticism is negatively correlated with the perceived usefulness and behavioural control. This may be due to the cultural differences of the subjects groups in the use of technologies. Furthermore, the unfamiliarity of the subjects to the use of cloud computing technologies may have given rise to our findings. On the other hand, although PU and personality traits are important factors on the university students' information systems acceptance behaviour (Li, 2016), the findings in this study is contradictory to that. This may have been affected by the attendance patterns of the students concerned (i.e. weekend attendance only). This diminishes their chances of observing the use of such technologies by others which impacts the students' perception of usefulness. It is also possible to draw similar conclusions for other dependent parameter PEU and BI with the exception of NEUR independent variable.

The results show that openness to experience and extroversion were not significantly correlated with any components. However, only nervousness has a significant effect of PEU. Neurotics have trouble in performing a work since they have negative feelings. Therefore, the participants having high score in those traits are more likely to be affected by PEU in the use of CCSs. Xua et al. (2016) noted that less extrovert persons are more likely to adopt mobile gaming apps. Furthermore, nervousness is negatively correlated with PEU. PEU and the above-mentioned individual differences are highlighted and consistent in Rosen and Kluemper's study (2008), where the impact of personality types on the acceptance of social networking is presented.

Finally, this study suggests that considering individual differences while adapting a new technology into the classroom might affect the efficient and sufficient usage of technologies and outlines future research opportunities. Thus, it seems vital for researchers in the future to consider the individual and also cultural differences on the acceptance and individual usage. These results can be used to improve the technology acceptance models in integrating new technologies into the future classrooms. Furthermore, it is suggested that it is important to see the direct and indirect effects of different personality traits -not only the main components of behavioural intention- on the whole components of TAM3. Also, focusing on the academic performance of teachers according to their personality by using TAM3 can be useful to shed a light on future studies.

## LIMITATIONS OF THE STUDY AND SUGGESTIONS FOR FURTHER STUDIES

The findings might stem from the characteristics of the sample- attending a certificate program which could be taken in account of a life-long program. CCSs could be more useful for the participants that have been already working in a job, and this is the limitation of the study by not having any data whether they have an occupation or not. Future studies could investigate the participants if they are working. Furthermore, the lack of awareness and experience of the participants on CCSs could be another reason on results. The fact that it predicts at a very low level is thought to be related with this. Besides, it can be seen that the characteristic of the sample in this study is efficient in TAM acceptance. When the fact that the sample should have similar characteristics is considered in the future studies, creating experience and making them believe that it is related to the job are thought to have an effect on acceptancy, and they can increase this. Further studies can also be conducted with individuals who have advanced command of technology, and it might yield different results.





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