# A META ANALYSIS OF FACTORS AFFECTING PERCEIVED USEFULNESS AND PERCEIVED EASE OF USE IN THE ADOPTION OF E-LEARNING SYSTEMS

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## ABSTRACT

**The full potential of e-learning, a trend that is of growing importance lately, will not be reaped unless the users fully utilize the system, triggering extensive research to be conducted in order to provide valuable insight on a myriad of variables influencing user acceptance in e-learning systems. The main purpose of the study is to determine the factors that affect the intention of users to use e-learning and to get results which can guide system developers and researchers. In accordance with this purpose, 203 studies investigating the e-learning acceptance of the users through the Technology Acceptance Model (TAM) were found in the literature. In those studies, variables which are suggested to determine Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) and results of related hypotheses are analyzed. Finally, a model is proposed. In this model, the most widely accepted hypotheses, affecting PU and PEOU according to the literature are included in the original TAM. As a result; it determines Self Efficacy-PEOU, Subjective Norm-PU, Self Efficacy-PU, Interaction-PU, Enjoyment-PEOU, Anxiety-PEOU, Enjoyment-PU, Compatibility-PU, Subjective Norm-PEOU and Interaction-PEOU as variables that have statistical significance in users' PU and PEOU, respectively. Moreover, the study examines the relationship between the User Satisfaction and original TAM variables, and proposes the Acceptance and Satisfaction Model for E-Learning (ASME) as a model to best explain the dependent variables described above.**

**Keywords:** **E-learning, Technology Acceptance Model, perceived ease of use, perceived usefulness, user satisfaction.**

## INTRODUCTION

**Recent and exponential developments in information and communication technologies have caused significant shifts in both corporates' and users' working practices, resulting in individuals being introduced to new paradigms such as e-government, e-commerce, online banking and e-learning, the last being the most wide-spread and substantial advancement in the education sector.**

**E-learning can be described as the utilization of telecommunications technologies to transfer information in education and training activities (Sun, Tsai & Finger, 2008). E-learning connects all education activities conducted by individuals and groups, both online and offline, through networked or standalone devices, allowing users to access a learning platform without the restriction of time and space (Naidu, 2006). The system's competitive advantage stems through its ability to allow users to direct and customize content via eliminating a one-size-fits-all approach to education and training (Pantazis, 2002), facilitating a learning platform that transcends time and space (Trentin, 1997).**

**Despite having notable advantages, under-utilized systems can pose a problem for organizations (Venkatesh & Davis, 2000), because information systems are known to improve organizational performance only when they are used in their full capacity (Mathieson, 1991). For one to be able to better forecast, assess and enhance user acceptance, the need to better understand why information systems are accepted or rejected is vital (Davis, Bagozzi & Warshaw, 1989). As a consequence, researchers have benefitted from various theories to identify the factors that explain users' intention to use e-learning, the most widespread being TAM (Sumak, Hericko & Pusnik, 2011). TAM is a robust forecast model that is extensively used to assess users' perceptions of technology acceptance (Hussein & Saad, 2016).**

**The model, developed to estimate the adoption and utilization of information technologies, puts forward that the individuals' intention to use information technologies has its foundation in two basic (PU and PEOU) beliefs (Venkatesh & Bala, 2008). In the model, external variables allow one to understand the factors that most significantly influence PU and PEOU, while offering guidance in developing action plans that will increase usage (Legris, Ingham & Collerette, 2003). TAM's main objective is to lay upon a basis to monitor the effect of external variables in beliefs, attitudes and actions (Davis, Bagozzi & Warshaw, 1989), leading to many researchers testing and developing the model with different external variables. A systematic evaluation of all these studies that predicate upon TAM to assess users' e-learning acceptance, as well as an analysis of the relationship of PU and PEOU with all the external variables investigated in the literature will provide valuable insight to researchers and system developers.**

**This work examines 203 different studies that explore users' e-learning acceptance and identifies 129 external variables to explain PU/PEOU, leading to the testing of 220 different hypothesis for 714 times. It is being aimed that an extention to TAM is proposed after a careful examination of external variables with beliefs.**

## TECHNOLOGY ACCEPTANCE MODEL

**TAM is a theoretically validated, robust model that aims to explain computer acceptance determinants (Davis, Bagozzi & Warshaw, 1989) and comprises of five basic components; Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude Towards Using (A), Behavioral Intention to Use (I) and Actual Use (A). Being an adaptation of Theory of Reasoned Action (TRA), TAM identifies two main belief structures, PU and PEOU as attitude determinants of both the use of intention and actual use of information technologies (Taylor and Todd, 1995). The model proposes external variables to explain PU and PEOU, while the latter determines PU and A, the former establishes A and I. Additionally, A affects I, and I influences U (As shown in Figure 1).**

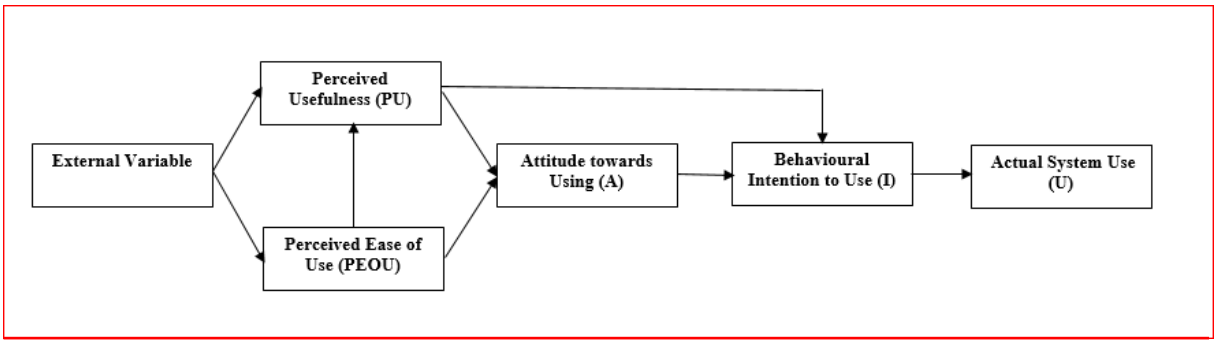


**Figure 1. Technology Acceptance Model (Davis, Bagozzi & Warshaw, 1989)**

**TAM proposes that individuals' intention to use information technologies are determined by two belief structures: PU, the belief that one's utilization of information technologies will enhance her work performance and PEOU, the belief that no significant effort will be spared to use information technologies (Vankatesh & Bala, 2008). PU and PEOU are two theoretical structures that are the basic determinants of systems usage (Davis, 1989).**

**In most of the empirical work conducted, it has been shown that PU is a robust determinant of adoption intention, while PEOU has a relatively less consistent effect (Venkatesh & Davis, 2000). The 'attitude' variable is expected to partially mediate the effect of these beliefs on intention to use. Nonetheless, research show that attitude is not a significant facilitator in explaining the causal relationship between belief structures and intention to use. (Davis, Bargozzi & Warshaw, 1989).**

**According to TAM; PU and PEOU mediates between the effects of various external variables on the intention to use (Vankatesh & Davis, 2000). Even though TAM and other user acceptance models have been validated empirically, researchers still add new external variables to improve the limited specificity and explanatory utility of these models (Tarhini, Hone & Liu, 2013.b). To improve the explanatory power of the model, incorporating additional variables or integrating it with other information technologies models is crucial (Hu, Chau & Sheng, 1999).**

**Researchers are expected to extend and assess theoretical acceptance models with various external variables, especially in the field of e-learning. Correlation with TAM is often supported in e-learning acceptance studies, since the model proves effective in the investigation of e-learning acceptance technologies (Sumak, Hericko & Pusnik, 2011). This study evaluates previous research that utilized TAM to assess e-learning acceptance; and examines the relationship between additional external variables analyzed in these research with belief structures.**

## RESEARCH METHOD

**A quantitative meta-analysis is conducted to identify the users' perception of usefulness and ease of use in e-learning systems. Previous work that benefitted from TAM to examine the acceptance or usage of e-learning technologies or systems have been carefully evaluated, resulting in the selection of 203 valid studies to be analyzed. These work comprise of 177 published journal papers, 22 conference papers and 4 PhD thesis. Studies are obtained through applying key words as Technology Acceptance Model, TAM 2, TAM 3, Perceived Usefulness, Perceived Ease of Use, Behavioural Intention to Use for TAM; and E-Learning, Learning Management System, Web-Based Learning, Online Learning, Distant Education, Moodle, Second Life for e-learning systems.**

**Following the selection of studies to be analyzed; publications are grouped by their respective countries, participants, TAM components utilized and variables tested against PU and PEOU (As shown in Appendix 1). Studies in the scope of this work are conducted in 41 different countries, respectively in, Taiwan (44), Malaysia (16), Spain (15), China (14), United States of America**

**(12), Hong Kong (10), South Korea (8), Iran (8), Turkey (8) and United Kingdom (7). Seven of these publications are conducted in multiple countries (Abbas (2016), Arenas-Gaitan, Ramírez-Correa & Rondan-Cataluña (2011), Capece & Campisi (2011), Ramírez-Correa Arenas-Gaitan & Rondan-Cataluña (2015), Tajudeen, Basha, Michael & Mukthar (2012), Zhao & Tan (2010).**

**In addition, Armenteros, Liaw, Fernandez, Díaz & Sanchez (2013) carried out their research with instructors from various countries. When these work are grouped by seven main geographical regions (As shown in Table 1), it has been seen that the majority of research conducted are clustered in East Asia and Pacific (104), Europe and Central Asia (41) and Middle East and North Africa (32), as the distribution of research is remarkably skewed towards East Asian countries like Taiwan, Malaysia, China, Hong Kong and South Korea.**

**The work spanned in this study is also classified based on the e-learning user types that the models developed are tested for. 152 of these research examines the e-learning acceptance behaviors of students in primary, secondary and tertiary stages. Employees from different professions (construction professionals, managers, nurses, blue-collar workers, etc.) are studied in 28 publications and 16 papers span the behaviors of education professionals (academics, faculty members, instructors, lecturers and teachers). In addition, 5 of these papers extend their scope to a wider range of citizens. A model developed in one of these studies is tested both on educators and students while another paper fails to give sufficient information regarding the user base studied.**

**Table 1. Distribution of Research by Region (For Studies Conducted in Multiple Countries, All Countries in Question Are Taken into Consideration)**

| Region | Number of Studies |
|---|---|
| East Asia & Pacific | 104 |
| Europe & Central Asia | 41 |
| Middle East & North Africa | 32 |
| North America | 16 |
| Latin America & the Caribbean | 7 |
| Sub-Saharan Africa | 6 |
| South Asia | 3 |
| International | 1 |
| Total | 210 |

**Majority of the information technologies acceptance research that takes the model as a reference does not include all of TAM's five main components due to various reasons. For instance, it is still being debated whether A acts as a robust mediator of the effect of the belief variables on I, as TRA and TRM proposes (Davis, Bagozzi & Warshaw, 1989). PU, PEOU and I ensue as the most extensively used variables in the research spanned (As shown in Table 2).**

**Table 2. TAM Variable Combinations Used in Literature Reviewed**

| TAM Variable Combinations Used | Number of Studies |
|---|---|
| PU-PEOU-I | 77 |
| PU-PEOU-A-I | 51 |
| PU-PEOU-I-U | 31 |
| PU-PEOU-A-I-U | 12 |
| PU-PEOU-A | 7 |
| PU-PEOU-U | 7 |
| Others | 18 |
| Total | 203 |

**129 different external variables to be tested as determinants of PU and PEOU are incorporated into the models studied in all these aforementioned research. Since this study's main objective is to identify the factors that affect user beliefs in e-learning systems, relationships that locate these external variables as the antecedents of A,I, U or the interdependences between dependent variables are not within the scope of this work. The effects of 129 different external variables on PU and PEOU are tested in 220 different hypotheses in 203 publications studied (As shown in Appendix 2). In some of the cases, researchers have chosen to examine the impact of these independent variables in only one of the belief structures, where 220 different hypotheses are tested 714 times.**

**As a result, the hypotheses examined most frequently are ordered as follows: Self Efficacy-PEOU (71), Self Efficacy-PU (50), Subjective Norm-PU (33), Anxiety-PEOU (19), Interaction-PU (18), Experience-PEOU (18), Enjoyment-PEOU (16), Experience-PU (14), Interaction-PEOU (12), Enjoyment-PU (12) and Subjective Norm-PEOU (12). Moreover, it has been observed that some external variables are tested relatively more frequently against the belief structures than their counterparts. For instance, Subjective Norm's influence on PU and Anxiety's predictive value on PEOU are examined more frequently than the variable's effect on PEOU and PU, respectively.**

**Among the research studied, the relationship between Self Efficacy and PEOU ranks as the most validated and acccepted with 58 instances, followed by Subjective Norm-PU (27), Self Efficacy-PU (24), Interaction-PU (15), Enjoyment-PEOU (13), Anxiety-PEOU (12), Enjoyment-PU (12), Compatibility-PU (10), Subjective Norm-PEOU (9) and Interaction-PEOU(8). The most frequently accepted relationships in these research are incorporated into the ASME proposed in this study.**

**Factoring in the relatively sporadically validated hypotheses into the model can pose a threat to its credibility. For example, three of the publications examined find out Information Quality to significantly influence users' PU with a positive coefficient. Nevertheless, these tests do not provide a solid foundation on the validity of this relationship and the scarcity makes it difficult to find consistent questionnaire items on the variable studied.**

**This study reviews and analyses the literature based on the hypotheses between independent variables and belief structures, rather taking into account the former in an absolute basis, proposing an extended model as a result. The reason why the study's approach is predicated on the most validated hypotheses rather than the external variables themselves stems from the fact that, if the most frequently used regressors were taken into account, the Experience variable would have to be incorporated into the model. Nevertheless, in the literature review conducted, of the 18 publications that examine the relationship between Experience and PEOU only 8 of them explain a significant pattern. The statistic is a mere 14 to 5 for the relationship between Experience and PU. Therefore, independent variables that have no significant effect on belief structures, despite having been frequently examined, are eliminated from this study.**

**Another issue that one has to put forward is that, while an external variable is shown to have a significant effect on one belief structure, a similar relationship may not be pertinent for the one with the other belief variable. For example, the hypothesis that Anxiety being a significant determinant of PEOU has been accepted in 12 of the 19 studies conducted. On the other hand, Anxiety's influence on PU bears significance in only 3 among 8 models. This urges the study's research method to only take into account external variables shown to have significant effect on PU and PEOU, rather than the frequency in which they are incorporated in the models spanned.**

**In conclusion, this study embeds into ASME the external variables that are shown to have significant effects on e-learning users' perception of Usefulness and Ease of Use in the literature review conducted, helping increase the model's explanatory power.**

## ACCEPTENCE AND SATISFACTION MODEL FOR E-LEARNING (ASME)

**Following the literature review, hypotheses that are most frequently accepted in tests where external variables are examined against belief structures are incorporated in the model. These can be listed as follows: Self Efficacy-PEOU, Subjective Norm-PU, Self Efficacy-PU, Interaction-PU, Enjoyment-PEOU, Anxiety-PEOU, Enjoyment-PU, Compatibility-PU, Subjective Norm-PEOU and Interaction-PEOU. Apart from 6 regressors and 10 hypotheses, the model also includes PU, PEOU and I, variables embodied in original TAM. Satisfaction, a factor that was not included in the original TAM has also been added to the model.**

### Research Hypotheses Based on External Variables

#### Self Efficacy

**Self Efficacy is an individuals' own perception of her talent of accomplishing a duty (Bandura, 1982). From an e-learning point of view, this description can be paraphrased as an individual's self perception of her talent in receiving education via utilizing the e-learning system. In this meta-analysis, it has been assessed that Self Efficacy is the most widely used and accepted determinant of users' Ease of Use perceptions. Moreover, the hypothesis that Self Efficacy has a significant effect on PU is the second most examined and the third most accepted in the researched reviewed within the scope of this study. Self-Efficacy Theory predicts that individuals perform better when they believe they possess the necessary talents (Barling & Beattie, 1983). Hence, it is expected that users with a higher degree of Self-Efficacy have stronger intentions to adopt e-learning systems (Hsia, Chang & Tseng, 2014).**

**Research show that Self Efficacy directly influences the e-learning users' perception of Ease of Use. In the literature review conducted, 58 of the 71 publications that examine Self-Efficacy's level of influence on PEOU for e-learning systems confirm the presence of a significant and positive relationship. This can be explained by the relatively higher level of perseverance among users with higher levels of Self-Efficacy upon facing problems.**
**24 of these work accept the hypothesis that there is positive correlation between Self-Effiacy and PU. It is expected that e-learning systems' users with high levels of Self-Efficacy will believe in benefitting from the system without facing a major difficulty. Therefore, following hypotheses can be put forward:**

- **Hypothesis 1: Self-Efficacy has a positive and significant effect on PU for e-learning systems.**
- **Hypothesis 2: Self-Efficacy has a positive and significant effect on PEOU for e-learning systems.**

#### Subjective Norm

**Subjective Norm is defined as an individual's perception of whether the majority of people important to the individual think she should perform the activity in question (Venkatesh & Davis, 2000). It can also be referred to as the social pressure perceived on whether to perform the behaviour or not (Ajzen, 1991). From an e-learning based perspective, one can also characterize the paradigm as the social pressure one perceives on using e-learning systems (Agudo-Peregrina, Hernandez-García & Pascual-Miguel, 2014). Even though TRA theorizes Subjective Norm as a direct determinant of intention, TAM hypothesizes otherwise (Davis, Bagozzi & Warshaw, 1989). Subjective Norm and social impact are used interchangeably in various theories (Venkatesh, Morris, Davis & Davis, 2003), this study follows the same path.**

**Subjective Norm's effect on e-learning systems' users PU has been examined and accepted in an extensive array of research. In the literature reviewed within the scope of this work, 27 of the 33 publications testing Subjective Norm's influence on users' PU accept the hypothesis of a positive and significant relationship, which is the second most frequently accepted one among the 220 hypotheses covered. The social pressure on an e-learning**

**systems' user from her esteemed peers, instructors or family to use the aforementioned system may trigger the user's perception of the system's practicality.**

**The relationship between Subjective Norm and PEOU, despite having been tested less frequently, implies a positive and significant relationship as well. In 8 of the 12 publications studied, it has been accepted that Subjective Norm directly influences PEOU. E-learning systems' users thought that her esteemed peers should also benefit from the system may result in the perception of the convenience of the system. In light of all these views, one can propose the following hypotheses:**

- **Hypothesis 3: Subjective Norm has a positive and significant effect on PU for e-learning systems.**
- **Hypothesis 4: Subjective Norm has a positive and significant effect on PEOU for e-learning systems.**

### Interaction

**The key aspects of learning processes can be listed as the interactions between students, between students and teaching staff as well as the collaboration in learning from these interactions (Abbad, Morris & Nahlik, 2009). Literature review suggests that increasing interaction results in higher motivation, boosts the level of satisfaction received from learning, causes a more optimistic view on learning, triggers effective learning and success (Donnelly, 2010). Interaction, is as critical as in e-learning as it is in conventional learning processes. Interaction between students and teaching staff as well as among students is facilitated via the extensive utilization of e-mails, chat rooms, bulletin boards in e-learning systems (Pituch & Lee, 2006). Development of e-learning systems is mainly triggered by technological improvements that facilitate interactions among students (Abbad, Morris & Nahlik, 2009).**

**The hypothesis that interaction influences the e-learning systems' users' PU has been examined and accepted in 18 and 15 studies, respectively, the hypothesis ranking fourth among in the most frequently accepted hypotheses of the literature reviewed. Moreover, the relationship between Interaction and PEOU has been confirmed to have significance in 8 of the 12 publications spanned. It can be inferred that the advanced interaction level users build among themselves and with their instructors can have a direct and positive effect on their PU and PEOU, leading one to propose the following hypotheses:**

- **Hypothesis 5: Interaction has a positive and significant effect on PU for e-learning systems.**
- **Hypothesis 6: Interaction has a positive and significant effect on PEOU for e-learning systems.**

### Enjoyment

**Enjoyment is the level an individual perceives her usage of technology as enjoyable without taking into account the expected performance results (Lubbe & Low, 1999). In e-learning systems, Enjoyment is closely related to whether the individual deems her usage as exciting, satisfactory and pleasant (Armenteros, 2013). Enjoyment is an example of internal motivation and a significant determinant of user acceptance (Shyu & Huang, 2011). In TAM 3, Enjoyment is proposed as an antecedent of PEOU (Venkatesh & Bala, 2008).**

**Various research have examined whether the enjoyment of an e-learning system's user significantly and positively influences her PU. In the 16 publications reviewed within the scope of this study, 13 accepts this hypothesis. Many software developers include enjoyable design features in systems, not only aiming to increase the level of Enjoyment but also bearing the intention to boost the system's perceived user-friendliness (Venkatesh, 2000). The lack of enjoyment may cause the user to feel that she has to spare more effort to use the system. Likewise, in all the 12 research reviewed, Enjoyment is found**

**out to significantly and positively affect PEOU. Therefore, the below hypotheses can be suggested:**

- **Hypothesis 7: Enjoyment has a positive and significant effect on PU for e-learning systems.**
- **Hypothesis 8: Enjoyment has a positive and significant effect on PEOU for e-learning systems.**

### Anxiety

**From a computer-science perspective, anxiety is simply the fear and concern upon facing the probability of using a computer (Venkatesh, 2000), while another definition describes Computer Anxiety as an individual's inclination to feel concern about using a computer (Howard and Smith, 1986). Interaction with a computer can revive strong and negative feelings in users (Saade and Kira, 2006). Hence, users with a relatively lower level of anxiety have a higher possibility of interaction with systems (Karaali, Gumussoy & Calisir, 2011).**

**Research reviewed within the scope of this study found out that the relationship between Computer Anxiety and PEOU have been tested and accepted more frequently than the one between Computer Anxiety and PU. (12 of the 19 studies examined found out that Computer Anxiety is a significant determinant of PEOU whereas only 3 of the 8 publications do so for the external variable's relationship with PU). If an individual gets anxious upon her usage of information technologies, she might perceive the system as complicated and difficult (Raaij & Schepers, 2008). This lemma can also be replicated for e-learning systems. Therefore, the following hypothesis can be put forward:**

- **Hypothesis 9: Anxiety has a negative and significant effect on PEOU for e-learning systems.**

### Compatibility

**Compatibility is the level in which users perceive an innovation to be compatible with their current values, needs and past experiences (Moore & Benbasat, 1991). A higher level of Compatibility generally results in a higher level of system acceptance (Tung & Chang, 2008.a), whereas the Diffusion of Innovation Theory classifies innovations' characteristics based on their Relative Advantage, Compatibility, Complexity, Trialability and Observability (Rogers, 1983).**

**The Relative Advantage and Complexity paradigms in DIT can be used interchangeably with PU and PEOU in TAM, respectively (Chang & Tung, 2008). Therefore, it has been assessed that many of the studies examined developed a hybrid model via synthesizing DIT and TAM, and theorized Compatibility as a pre-determinant of TAM's belief structures.**

**Research reviewed within the scope of this study found out that the relationship between Compatibility and PU have been tested and accepted more frequently than the one between Compatibility and PU. (10 of the 11 studies examined found out that Compatibility is a significant determinant of PU whereas only 3 of the 6 publications do so for the external variable's relationship with PEOU). A user's thought that e-learning is harmonious with her own beliefs, needs and experiences can trigger a positive perception of the system's value added. Hence, the following hypothesis can be tested:**

- **Hypothesis 10: Compatibility has a positive and significant effect on PU for e-learning systems.**

## The TAM Variables

**Original TAM comprises of PU, PEOU, A, I and U (As shown in Figure 1), where the first two variables represent the belief structures in TRA. Among the many determinants of system usage, PU and PEOU are the most important (Davis, 1989). TAM proposes that PU and PEOU (Venkatesh & Davis, 2000) mediate the impact of many external variables on the intention to use. External variables help understand the impact scale and scope of PU and PEOU and provide guidance in designing action plans to facilitate usage (Legris, Ingham & Collerette, 2003).**

**It is expected from the variable A to mediate the effect of belief variables on I. Nevertheless, current research show that Attitude does not sufficiently explain the causal relationship between belief and intention (Davis, Bagozzi & Warshaw, 1989), leading to the opinion that the connection between A and I is spurious (Venkatesh, Morris, Davis & Davis, 2003). Eliminating A, therefore, could prove valuable in examining PU and PEOU's influence on I (Venkatesh, 2000). In line with this view, it has been observed that many studies frequently use PU, PEOU and I of the TAM components and rule out A (As shown in Table 2). Moreover, TAM proposes that PEOU is a direct determinant of PU, influencing I directly and through its effect on PU (As shown in Figure 1). In e-learning systems, user's opinion on the difficulty of the system can affect her perception on the system's usefulness. Therefore, the following hypotheses can be tested:**

- **Hypothesis 11: PEOU has a positive and significant effect on PU for e-learning systems.**
- **Hypothesis 12: PU has a positive and significant effect on I for e-learning systems.**
- **Hypothesis 13: PEOU has a positive and significant effect on I for e-learning systems.**

## Satisfaction

**The main objective of a company is to cater for the needs that increase customer satisfaction, rather than just rendering goods and services. Therefore; customer satisfaction is a key factor in gaining competitive advantage (Dominici & Palumbo, 2013). One of the results of customer satisfaction is the re-purchasing of the good and service rendered. Similarities can be found between this activity of re-purchasing and the continuous usage of information technologies (Lee, 2010). User satisfaction is one of the important criteria that measures the success of information systems, where the variable is proposed to be one of the six main dimensions of information systems success in the IS Success Model (DeLone & McLean, 1992).**

**A considerable amount of research investigating users' acceptance of e-learning systems incorporated user satisfaction into TAM and tested its inter-relationships with other TAM components, even though original TAM does not take into consideration the effect of user satisfaction on information systems' acceptance. In all of the 14 publications spanned, PU has been accepted as a significant determinant of Satisfaction, whereas in 7 of the 10 research examined find out a significant connection between PEOU and Satisfaction. Relationship between Satisfaction and I and Satisfaction and U was deemed to be significant in 10 and 2 of the studies investigated, respectively (As shown in Table 3).**

**Table 3. Relationship Between Satisfaction Variable & TAM Components in Research Analyzed**

| Independent variable | Dependent variable | Number of studies investigated | Number of studies that accept a significant relationship | Referances |
|---|---|---|---|---|
| PU | Satisfaction | 14 | 14 | Al-Azawei & Lundqvist (2015), Al-Azawei, Parslow & Lundqvist (2017), Al-Hawari & Mouakket (2010), Capece & Campisi, (2011), Italy & Portugal, Capace & Campisi (2013), Basic & Optional, Lee (2010), Lee & Lehto (2013), Ma, Chao & Cheng (2013), Park, Son & Kim (2012), Perreira, Ramos & Chagas (2015), Roca, Chiu & Martinez (2006), Shih, Chen, Shih & Su (2012) |
| PEOU | Satisfaction | 10 | 7 | Al-Azawei & Lundqvist (2015), Al-Azawei, Parslow & Lundqvist (2017), Al-Hawari & Mouakket (2010), Capece & Campisi, (2011), Italy & Portugal, Capace & Campisi (2013), Basic & Optional, Lee (2010), Park, Son & Kim (2012), Perreira, Ramos & Chagas (2015), Roca, Chiu & Martinez (2006) |
| Satisfaction | I | 10 | 10 | Cho, Cheng & Lai (2009), Cho, Cheng & Hung (2009), Lee (2010), Lee & Lehto (2013), Ma, Chao & Cheng (2013), Mohammadi (2015.a), Mohammadi (2015.b), Ramayah & Lee (2012), Roca, Chiu & Martinez (2006), Shih, Chen, Shih & Su (2012) |
| Satisfaction | U | 2 | 2 | Mohammadi (2015.a), Mohammadi (2015.b) |

**Users' belief that e-learning systems may influence performance and apprehension of the system as relatively easy can trigger a positive perception of satisfaction. In addition, user satisfaction may appear as a vital determinant of the intention to use e-learning systems. Therefore, the below hypotheses can be suggested:**

- **Hypothesis 14: PEOU has a positive and significant effect on Satisfaction for e-learning systems.**
- **Hypothesis 15: PU has a positive and significant effect on Satisfaction for e-learning systems.**
- **Hypothesis 16: Satisfaction has a positive and significant effect on I for e-learning systems.**

**As a result of the meta-analysis conducted, Acceptance and Satisfaction Model for E-Learning (ASME) has been proposed (As shown in Figure 2).**

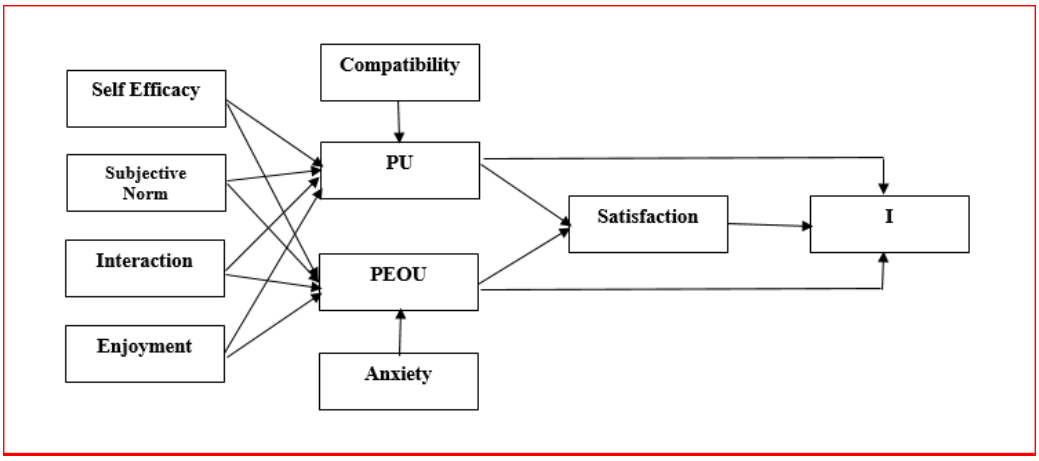


**Figure 2. Acceptance and Satisfaction Model for E-learning (ASME)**

## CONCLUSION

**The main objective of this study is to identify the factors that influence users' acceptance of e-learning systems and hence, guide researchers and systems developers in designing the necessary corrective measures. In line with this target, research that investigate user acceptance in e-learning systems via utilising TAM was specified and assessed. Relationships between TAM's belief structures, PU and PEOU with the external variables proposed in these research were analyzed. Hypotheses that were frequently accepted in the literature were identified and incorporated into the model proposed.**

**In the meta-analysis conducted, 177 journal papers, 22 conference papers and 4 PhD thesis that examine user acceptance in e-learning systems via TAM are analyzed where 129 different external variables are proposed as antecedents of belief structures. 220 hypotheses that question the relationship of these external variables with PU and PEOU are tested 714 times. As a result of this literature review, the most frequently accepted relationships are ranked as follows: Self Efficacy-PEOU (58), Subjective Norm-PU (27), Self Efficacy-PU (24), Interaction-PU (15), Enjoyment-POEU (13), Anxiety-PEOU (12), Enjoyment-PU (12), Compatibility-PU (10), Subjective Norm-PEOU (9) and Interaction-PEOU (8).**

**Variables and hypotheses proposed in the model are identified through a three-phased approach. First, relationships between variables recurrently accepted in the literature reviewed and PU/PEOU are analyzed and the most frequently accepted hypotheses are incorporated into the model. In the second step, a thorough assessment is conducted on the utilization of TAM's components and inferences made regarding these variables. In line with these takeaways, the variables A and U, which make up two of the five components of the original TAM are excluded from the model proposed. Last, the relationship between TAM variables and User Satisfaction, a variable not included in the original TAM is examined. Conforming to the findings of these studies, the position of User Satisfaction in the model proposed is identified. As a result of this three-phased approach Acceptance and Satisfaction Model for E-Learning (ASME) is proposed.**

**In the literature reviewed, only one publication that conducted a meta-analysis of the studies utilizing TAM within the perspective of users' e-learning acceptance is attained. Abdullah and Ward (2016) investigated 107 studies and identified the five most recurrently used external variables. This study increases the span of the literature review to 203 and takes into account the most frequently accepted hypotheses, rather than the external variables. Therefore, the model proposed does not include hypotheses that are not accepted, despite having been frequently tested or external variables that are found out to have a significant relationship with only one of the belief structures.**

**Literature reviewed are also classified based on their respective geographical region and countries, allowing the researchers to investigate the differences of users in different regions. Most of the literature reviewed was conducted in East Asia and Pacific, while relatively less publications within the scope of the study originated from Latin America and the Caribbean, Sub-Saharan Africa and South Asia. It is also observed that the effect of System Functionality (91.7%), Playfulness (81.8%) and Self-Efficacy (85%) on PU and PEOU were the most recurrently accepted hypotheses in East Asia and Pacific, Europe and Central Asia and Middle East and North Africa, respectively. Moreover, Subjective Norm is expected to have a higher acceptance rate in Eastern cultures where users' social attributes are regarded with increased value. The higher acceptance rates of Subjective Norm in Middle East and North Africa (87,5%) and East Asia and Pacific (85%) compared to Europe and Central Asia (76,9%) validates this view. It should also be emphasized that Self Efficacy has a high acceptance rate in Middle East and North Africa (85%) compared to East Asia and Pacific (67.6%), Europe and Central Asia (52.2%).**

**Further research should focus upon empirically testing the model on different e-learning systems, allowing researchers to modify the model based on the structure of the e-learning system as well as the region the study is conducted.**

## LIMITATIONS OF STUDY

**The study has some limitations that can be addressed in future studies. Firstly, the model proposed as a result of the literature review, has not been empirically tested. In future works, the proposed model should be empirically tested and results should be discussed. Moreover, in the model proposed in this study, according to the literature the most accepted hypotheses affecting PU and PEOU, proposed by TAM as two main determinants of intention to use, are suggested. However, some hypotheses that have never been tested or rarely tested in the literature may also give effective results. In future studies, researchers should test possible extrinsic variables that they consider possibly effective on e-learning acceptance, by adding those variables to the suggested model in this study. Despite the existing limitations, this study may contribute to the e-learning system developers and researchers working on this field.**

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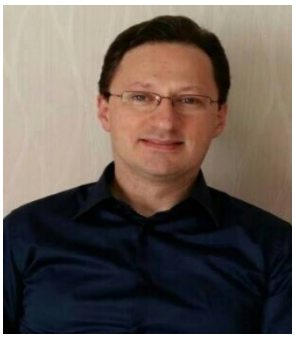

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## APPENDICES

## Appendix 1. 203 Publications Aiming to Explain User Acceptance in E-Learning Systems

| Study | Territory | Participant Information | TAM Compenents | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | PU | P EOU | A | I | U | External Factors |
| Abbad, Morris & Nahlik (2009) | Jordan | 486 Students | + | + | - | + | - | Subjective Norms (-,x), Internet Experience (-,+), System Interactivity (-,-), Self Efficacy (-,+), Technical Support (+,-) |
| Abbas (2016) | Egypt<br>UK | 468 Students | + | + | - | + | - | Egypt: Interpersonel Influence (+,x), External Influence (+,x), Instructor Influence (+,+)<br>UK: Interpersonel Influence (-,x), External Influence (-,x), Instructor Influence (+,+) |
| Abdel-Wahab (2008) | Egypt | 258 Students | + | + | + | + | - | - |
| Abdullah, Ward & Ahmed (2016) | UK | 242 Students | + | + | - | + | - | Experience(-,+), Subjective Norm (-,+), Enjoyment (+,+), Computer Anxiety (x,-), Self Efficacy (-,+) |
| Abramson, Dawson & Stevens (2015) | U.S.A | - | + | + | + | + | - | Prior Use of E-learning(-,+), Self Efficacy(-,+), Subjective Norms(-,+) |
| Adetiimirin (2015) | Nigeria | 121 Students | - | - | - | - | + | - |
| Agudo-Peregrina, Hernandez-García, & Pascual-Miguel (2014) | Spain | 147 Students | + | + | - | + | + | Higher Education: Relevance for Learning (+,x) Perceived Interaction (+,x), Subjective Norm (-,x), Self Efficacy(x,-), Computer Anxiety (x,-), Personel Innovativeness (x,+), Perceived Playfulness (x,-), Facilitating Conditions (x,+)<br>Lifelong Learning: Relevance for Learning (+,x) Perceived Interaction (+,x), Subjective Norm (+,x), Self Efficacy (x,-), Computer Anxiety (x,+), Personel Innovativeness (x,-), Perceived Playfulness (x,+), Facilitating Conditions (x,+) |
| Al-Adwan, Al-Adwan & Smedley (2013) | Jordan | 107 Students | + | + | + | + | - | - |
| Al-Alak & Alnawas (2011) | Jordan | 799 Lecturers | + | + | - | + | - | - |
| Al-Ammary, Al-Sherooqi, & Al-Sherooqi (2014) | Bahrain | 109 Students | + | + | - | + | - | Computer Self Efficacy (+,+), System Design & Features(+,x), Perceived Enjoyment (x,+), Perceived Mobility Value (+,x), Perceived Interectivity (-,-) |
| Al-Ammari & Hamad (2008) | Bahrain | 155 Students | + | + | - | + | - | Content Quality (+,+), Computer Self Efficacy (+,+) |
| Al-Aulamie, Mansour, Daly & Adjei (2012) | UK | 51 Students | + | + | - | + | - | Enjoyment (+,+), Computer Playfulness (+,-) |
| Al-Azawei & Lundqvist (2015) | Iraq | 70 Students | + | + | - | - | - | Learning Styles (-,x), Gender Diversity (-,-), Online Self Efficacy (+,+) |
| Al-Azawei, Parslow & Lundqvist (2017) | Iraq | 210 Students | + | + | - | + | - | Blended E-learning System Self Efficacy (+,+), Learning Styles (-,x) |
| Alenezi (2012) | Saudi Arabia | 408 Students | + | + | + | + | + | - |
| Alenezi, Karim & Veloo (2010) | Saudi Arabia | 408 Students | + | + | + | + | - | - |
| Alenezi, Karim & Veloo (2011) | Saudi Arabia | 408 Students | + | + | - | + | + | - |
| Al-Gahtani (2016) | Saudi Arabia | 286 Students | + | + | - | + | + | Subjective Norm (+,x), Image (+,x), Job Relevance (+,x), Result Demonstrability (-,x), Computer Self Efficacy (x,+), Perceptions of External Control (x,+), Computer Anxiety (x,+), Computer Playfulness (x,-), Perceived Enjoyment (x,+) |
| Al-Hawari & Mouakket (2010) | U.A.E | 340 Students | + | + | - | + | - | - |
| Ali, Ahmed, Tariq & Safdar (2013) | Bahrain | 425 Students | + | + | - | + | - | Computer Playfulness (x,+), Computer Self Efficacy (x,+), Computer Anxiety (x,+) |
| Al-Mushasha (2013) | Saudi Arabia | 224 Students | + | + | + | + | - | University Support (+,+), Computer Self Efficacy (+,+) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Althunibat (2015) | Jordan | 239 Students | + | + | - | + | - | Facilitating Conditions (+,+), Perceived Self Efficacy (+,+) |
| Arenas-Gaitan, Rondan-Cataluña & Ramirez-Correa (2010) | Spain | 189 Students | + | + | - | + | + | Result Demonstrability (+,x), Perception of External Control (x,+), Perceived Enjoyment (x,+) |
| Arenas-Gaitan, Ramírez-Correa & Rondan-Cataluña (2011) | Spain Chile | 352 Students | + | + | + | - | + | Spain: Job Relevance(+,x), Result Demonstrability(+,x), Perception of External Control(x,+) Chile: Job Relevance(+,x), Result Demonstrability(+,x), Perception of External Control(x,+) |
| Armenteros, Liaw, Fernandez, Díaz & Sanchez (2013) | International | 88 Instructors | + | + | - | + | - | Previous Experience with Technology (-,-), Perception Enjoyment (+,+) |
| Attis (2014) | U.S.A | 112 Instructors | + | + | + | + | - | - |
| Aypay, Celik, Aypay & Sever (2012) | Turkey | 754 Students | + | + | + | + | - | Facilitating Conditions (+,+), Technological Complexity (-,+), Computer Self Efficacy (+,-) |
| Baharin, Lateh, Nathan & Nawawia (2015) | Malaysia | 223 Students | + | + | - | + | + | Interactivity (+,+) |
| Bao, Xiong, Hu & Kibelloh (2013) | China | 137 Students | + | + | - | + | - | General Computer Self Efficacy (+,+), Specific Computer Self Efficacy (+,+) |
| Basoglu & Ozdogan (2011) | Turkey | 81 Students | + | + | + | - | - | Mobility (-,x), Peer Influence (-,x), Computer Self Efficacy (x,+), Personal Innovativeness (x,-), User Interface (x,-) |
| Bhatiasevi (2011) | Thail& | 207 Students | + | + | - | + | - | Computer Self Efficacy (-,+), System Functionality (-,+), Teaching Materials (+,+) |
| Brown, Ingram & Thorp (2006) | South Africa | 171 Students | + | + | - | + | + | Compatibility (+,-), Perceived Enjoyment (x,-), Self Efficacy (x,+) |
| Calisir, Gumussoy, Bayraktaroglu & Karaali (2014) | Turkey | 546 Workers | + | + | + | + | - | Image(-,x), Perceived Content Quality(+,x), Perceived System Quality(x,+), Anxiety (x,+) |
| Cabada, Estrada, Hernandez, Bustillos & Reyes-García (2017) | Mexico | 43 Students | + | + | + | + | - | - |
| Capece & Campisi (2011) | Italy Portugal | 253 Students | + | + | + | + | - | - |
| Capace & Campisi (2013) | Italian | 5083 Employees | + | + | - | - | - | - |
| Chang, Yan & Tseng (2012) | Taiwan | 158 Students | + | + | + | + | - | Perceived Convenience (x,+) |
| Chang, Tseng, Liang & Yan (2013) | Taiwan | 125 Students | + | + | - | + | - | Perceived Convenience (+,+) |
| Chang, Chao & Cheng (2015) | Taiwan | 682 Nurses | + | + | + | + | - | Perceived Risk (+,-) |
| Chang, Hajiyev & Su (2017) | Azerbaijan | 714 Students | + | + | - | + | - | Subjective Norm (+,-), Experience (+,+), Enjoyment (+,+), Computer Anxiety (+,+), Self Efficacy (-,+) |
| Chang & Liu (2013) | Taiwan | 60 Students | + | + | - | + | - | Augmented Reality (+,+), Content Quality (+,+), Environment Interaction (+,+) |
| Chang & Tung (2008) | Taiwan | 212 Students | + | + | - | + | - | Compatibility (+,x) |
| Chen, Lin, Yeh & Lou (2013) | Taiwan | 218 Students | + | + | - | + | - | Perceived Enjoyment (+,+), System Characteristics (+,+) |
| Chen & Tseng (2012) | Taiwan | 402 Teachers | + | + | - | + | - | Motivation to Use (+,+), Computer Anxiety (-,+), Internet Self Efficacy (+,+) |
| Cheng (2011) | Taiwan | 328 Employees | + | + | + | + | + | Network Externality (-,+), Interpersonal Influence (+,x), External Influence (+,x), Content Quality (+,x), System Response, System Interactivity (+,+), System Functionality (+,+), Computer Self Efficacy (-,+), Internet Self Efficacy (-,+), Cognitive Absorption (+,+) |
| Cheng (2012) | Taiwan | 483 Employees | + | + | - | + | - | Course Content Quality (+,+), Course Design Quality (-,+), Support Service Quality (+,+), System Functionality (+,+), System Interactivity (+,+), System Response (+,-), User Interface Design (+,+),Instructor Attitude Towards E-learners (+,x) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cheng (2013) | Taiwan | 218 Nurses | + | + | - | + | - | Learner-System Interaction (+,+), Instructor-Learner Interaction (+,+), Learner-Learner Interaction (+,+) |
| Cheng (2014) | Taiwan | 225 Students | + | + | - | + | - | Controllability (+,+), Responsiveness (+,+), Two Way Communication (+,+), Personalization (+,+) |
| Cheng (2015) | Taiwan | 486 Users | + | + | - | + | - | Navigation (+,+), Convenience (+,+), Compatibility (+,+) |
| Cheung & Vogel (2013) | Hong Kong | 136 Students | + | + | + | + | + | Perceived Resource (x,+), Compatibility (x,+), Sharing (+,x) |
| Cho, Cheng & Lai (2009) | Hong Kong | 445 Students | + | + | - | + | - | Perceived Functionality (+,x), Perceived User-Interface Design (-,+), Perceived System Support (x,+) |
| Cho, Cheng & Hung (2009) | Hong Kong | 445 Students | + | - | - | - | + | - |
| Chow, Herold, Choo & Chan (2012) | Hong Kong | 206 Students | + | + | - | + | - | Computer Self Efficacy (+,+) |
| Chow, Chan, Lo, Chu, Chan & Lai (2013) | Hong Kong | 128 Students | + | + | + | + | - | Computer Self Efficacy (-,+) |
| Cigdem & Topcu (2015) | Turkey | 115 Instructors | + | + | - | + | - | Subjective Norm (+,+), Technological Complexity (x,+), Application Self Efficacy (-,+) |
| Coskuncay & Ozkan (2013) | Turkey | 224 Academicians | + | + | - | + | - | Application Self Efficacy (+,+), Subjective Norm (+,+), Technological Complexity (x,+) |
| Davis & Wong (2007) | New Zeal& | 964 Students | + | + | - | + | + | Subjective Norm (+,x), Output Quality (+,x), Flow/Playfullness (x,+) |
| De Smet, Bourgonjon, Wever, Schellens & Valcke (2012) | Belgium | 505 Teachers | + | + | - | - | + | Personal Innovativeness toward IT (+,+), Experience (x,+), Subjective Norm (+,x) |
| Deshp&e, Bhattacharya & Yammiyavar (2012) | India | 40 Students | + | + | + | + | + | Computer Friendliness Experience+Knowledge (x,-) |
| Escobar-Rodriguez & Monge-Lozano (2012) | Spain | 162 Students | + | + | - | + | - | Perceived Usefulness for Professors (+,x), Perceived Compatibility with Student Tasks (-,+), Training (+,-) |
| Fadare, Babatunde, Akomolafe & Lawal (2011) | Nigeria | 458 Students | + | + | + | + | - | - |
| Fagan, Kilmon annd P&ey (2012) | U.S.A | 158 Students | + | + | - | + | - | Personal Innovativeness in the Domain of IT (+,+) |
| Farahat (2012) | Egypt | 153 Students | + | + | + | + | - | Social Inflence (+,+) |
| Floental (2016) | U.S.A | 156 Students | - | + | + | - | - | - |
| Freitas, Ferreira, Garcia & Kurtz (2017) | Brazil | 260 Students | + | + | + | + | - | Interactivity (+,x), Technical Support Availability (x,+) |
| Harmon (2015) | U.S.A | 195 Students | + | + | - | + | - | Personal Innovativeness (+,-) |
| Hashim (2008) | Maleysia | 261 Employees | + | + | + | - | - | - |
| Hei & Hu (2011) | China | 253 Students | + | + | + | + | - | Social Inflences (-,x) |
| Hidayanto, Febriawan, Sucahyo & Purw&ari (2014) | Indonesia | 74 Students | + | + | + | + | + | Task Technology Fit (-,+) |
| Ho, Ke, Liu (2015) | Hong Kong | 131 Students | + | + | + | + | - | - |
| Hsia, Chang & Tseng (2014) | China | 223 Employees | + | + | - | + | - | Locus of Control (+,+), Computer Self Efficacy (x,+) |
| Hsia & Tseng (2008) | Taiwan | 233 Employees | + | + | - | + | - | Computer Self Efficacy (+,+), Perceived Flexibility (+,x) |
| Hsiao & Chen (2015) | Taiwan | 60 Students | + | + | - | + | - | Mobile Learning Self Efficacy (+,+), Task Technology Fit (+,+) |
| Hsu & Chang (2013) | Taiwan | 82 Students | + | + | + | + | - | Perceived Convenience (+,x) |
| Huang, Lin & Chuang (2007) | Taiwan | 313 Students | + | + | + | + | - | Perceived Mobility Value (+,x), Peceived Enjoyment (x,+) |
| Hussein, Aditiawarman & Mohamed (2007) | Indonesia | 147 ogrenci | + | + | - | + | - | Computer Self Efficacy (+,-), Convenience (x,-), Instructional Design (+,+), Technological Factor (-,+), Instructor's Characteristic (x,-) |
| Hussein (2017) | Malaysia | 151 Students | + | + | + | + | - | - |
| Ibrahim, Leng, Yusoff, Samy, | Malaysia | 95 Students | + | + | - | + | - | Instructor Characteristics (-,x), Computer Self Efficacy (-,+) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Masrom & Rizman (2017) | | | | | | | | |
| Ifinedo (2006) | Estonia | 72 Students | + | + | - | + | + | Technology Characteristics (+,+), User Characteristics (+;+) |
| Indahyanti & Sukarjadi (2014) | Indonesia | 60 Students | + | + | + | + | + | - |
| Islam (2013) | Finl& | 249 Students | + | + | - | - | + | - |
| Ismail, Razak, Zakariah, Alias & Aziz. (2012) | Malaysia | 215 Students | + | + | - | + | - | - |
| Jan & Contreras (2011) | Peru | 89 ogrenci | + | + | + | + | + | - |
| Jung (2015) | South Korea | 189 Students | + | + | - | + | + | Instant Connectivity (+,x), Compatibility (+,x), Interaction (+,x), Content Enrichness (+,x), Computer Self Efficacy (+,x) |
| Kang & Shin (2015) | Guney Kore | 251 Students | + | + | - | + | - | Self Efficacy (+,-), Systematic Lecture Content (-,-), Subjective Norm (+,+), System Accessibility (-,+) |
| Karaali, Gumussoy & Calisir (2011) | Turkey | 546 Workers | + | + | + | + | - | Social Influence (+,x), Facilitating Conditions (x,+), Anxiety (x,+) |
| Khor (2014) | Malaysia | 125 Students | + | + | + | + | - | - |
| Kilic, Guler & Celik (2015) | Turkey | 416 Students | + | + | + | - | - | Interactive Whiteboard Self Efficacy (+,+), Perceived Learning (+,+) |
| Kim, Kim & Han (2013) | South Korea | 60 Teachers | + | + | + | + | - | - |
| Lai & Ulhas (2012) | Taiwan | 96 Students | + | - | - | + | - | Compatibility (+,x), Convenience (+,x), Perceived Enjoyment (+,x) |
| Lau & Woods (2008) | Malaysia | 342 Students | + | + | - | + | + | Technical Quality (-,+), Content Quality (-,+), Pedagogical Quality (+,+), Self-Efficacy (-,-), Internet Experience (-,-) |
| Lau & Woods (2009) | Malaysia | 312 Students | + | + | - | + | + | Technical Quality (-,+), Content Quality (-,+), Pedagogical Quality (+,+), Self-Efficacy (-,-), Internet Experience (-,-) |
| Lee, Cheung & Chen (2005) | Hong Kong | 544 Students | + | + | + | + | - | - |
| Lee (2006) | Taiwan | 1085 Students | + | + | - | + | + | Content Quality (+,x), Perceived Network Externality (+,+), Computer Self Efficacy (+,+), Course Attributes (-,-), Subjective Norms (+,x) |
| Lee (2008) | Taiwan | 1107 ogrenci | + | + | - | + | - | Internal Computing Support (+,+), Internal Computing Training (+,+), Internal Equipment Accessability (-,-), External Computing Support (+,+), External Computing Training (-,+), External Equipment Accessability (-,+) |
| Lee, Yoon & Lee (2009) | South Korea | 214 Students | + | + | - | + | - | Instructor Characteristics (+,x), Teaching Materials (+,x), Design of Learning Contents (x,+) |
| Lee (2010) | Taiwan | 363 Students | + | + | + | + | - | Confirmation (+,x) |
| Lee, Hsieh & Ma (2011) | Taiwan | 357 Employees | + | + | - | + | - | Organizational Support (+,-), Management Support (-,+), Computer Self Efficacy (-,+), Individuals' Experience with Computers (-,+), Task Equivocality (-,-), Task Interdependence (-,+), Subjective Norm (+,+) |
| Lee, Hsieh & Hsu (2011) | Taiwan | 552 Employees | + | + | - | + | - | Compatibility (+,-), Complexity (+,+), Relative Advantages (+,+), Observability (-,-), Trialability (+,+) |
| Lee, Hsieh & Chen (2013) | Taiwan | 332 Employees | + | + | + | + | - | Organisational Support (+,+), Computer Self Efficacy (-,+), Prior Experiences (+,+), Task Equivocality (+,-) |
| Lee, Hsiao, Purnomo (2014) | Indonesia | 326 Students | + | + | - | + | - | Computer Self Efficacy (-,+), Internet Self Efficacy (+,+), Instructor Attitude Toward Students (-,x), Learning Content (+,+), Technology Accessibility (x,+) |
| Lee & Lehto (2013) | Guney Kore | 432 Respondents | + | + | - | + | - | Task Technology Fit (+,x), Content Richness (+,x), Vividness (+,x), YouTube Self Efficacy (+,x) |
| Lefievre (2012) | France | 404 Students | + | + | - | + | + | Computer Playfulness (x,+), Perceived Enjoyment (x,-), Computer Anxiety (x,+), Result Demonstrability (+,x), Relevance (+,x) |
| Letchumanan & Tarmizi (2011) | Malaysia | 169 Students | + | + | + | + | + | Gender (-,-) |
| Li, Duan & Alfrod (2012) | China | 280 Students | + | + | - | + | - | System Funcationality (+,+), System Response (+,+), System Interactivity (-,+), Self Efficacy (x,+) |
| Lin, Chen & Yeh (2010) | Taiwan | 214 Students | + | + | - | + | - | Perceived Enjoyment (+,x), System Characteristics (+,x), Course Features (x,+), Self Efficacy (x,+) |
| Lin (2013) | Taiwan | 212 Students | + | + | - | + | - | Underst&ing U-learning (+,+), Assimilating U-learning (+,+), Applying U-learning (+,+) |
| Lin, Persada & Nadlifatin (2014) | Taiwan | 302 Students | + | + | + | + | - | Perceived Interactivity (+,+) |
| Little (2016) | U.S.A | 318 Nurses | - | - | + | + | - | - |
| Liu, Liao & Peng (2005) | Taiwan | 88 Students | + | + | + | + | - | E-learning Materials Presentation Types (+,x) |

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|---|---|---|---|---|---|---|---|---|
| Liu, Liao & Pratt (2009) | Taiwan | 88 Students | + | + | + | + | - | E-learning Materials Presentation Types (+,x) |
| Liu (2010) | U.S.A | 126 Students | + | + | - | + | + | Wiki Self Efficacy (-,+), Online Posting Anxiety (-,-) |
| Liu, Li & Carlsson (2010) | China | 209 ogrenci | + | + | - | + | - | Personal Innovativeness (+,+) |
| Lo, Hong, Lin & Hsu (2012) | China | 45 Students | + | + | + | - | - | - |
| Lo, Liu & Wang (2014) | Taiwan | 35 Students | + | - | + | + | - | - |
| Loukis, Pazalos & Salagara (2012) | Greece | 98 Professionals | + | + | - | - | + | - |
| Lowe, D'aless&ro, Winzar, Laffey & Collier (2013) | UK | 144 Students | + | + | + | + | - | Affinity (+,+), Risk Tolerance (x,+) |
| Ma, Chao & Cheng (2013) | Taiwan | 650 Nurses | + | + | - | + | + | Task Technology Fit (+,x), Computer Sef Efficacy (-,x) |
| Mafunda, Swart & Bere (2016) | South Africa | 49 Students | + | + | + | - | + | - |
| Macharia & Nyakwende (2009) | Kenya | 200 Students | + | + | - | + | + | Competition Pressure (+,-), Government Support (+,+), ICT Vendors Support (+,-), Perceived Socio Economic (+,+) |
| Martin (2012) | Oman | 210 Students & Educators | + | + | - | + | + | Subjective Norm (+,x), Extrinsic Motivation (-,x), Intrinsic Motivation (x,+), Technology Experience (+,-), System Interactivity (+,-), Information Privacy (x,-) |
| Martinez-Torres, Marin, Garcia, Vazquez, Oliva & Torres (2008) | Spain | 220 Students | + | + | - | + | + | Methodology, Accessibility (x,+), Reliability (x,+), Enjoyment (x,+), Interactivity & Control (+,x) |
| Moghadam & Bairamzadeh (2009) | Iran | 155 Students | + | + | - | + | - | Subjective Norm (+,x), Personal Innovativeness in Domain of Information Technology (-,+), Computer Self Efficacy (x,+) |
| Mohammed & Karim (2012) | Malaysia | 160 Students | + | + | - | + | - | Computer Application Anxiety (-,-), Self Efficacy (-,-) |
| Mohammadi (2015.a) | Iran | 390 Students | + | + | - | + | + | - |
| Mohammadi (2015.b) | Iran | 390 Students | + | + | - | + | + | - |
| Moreno, Cavazotte & Alves (2016) | Brazil | 251 Students | + | + | + | + | - | System Interactivity (+,x), Social Influence (-,x), Output Quality (-,x), Cognitive Absorbtion (+,+), Self Efficacy (x,+), Facilitating Conditions (x,+), Prior Experience (x,-) |
| Motaghian, Hassanzadeh & Moghadam (2013) | Iran | 115 Instructors | + | + | - | + | + | Information Quality (+,+), System Quality (-,-), Service Quality (-,+), Subjective Norm (+,+), Self Efficacy (-,+) |
| Nan, Xun-hua & Guo-qing (2007) | China | 121 Students | + | + | + | + | - | Training Impression (x,+), Technology Facilitating Condition (x,-), Perceived Enjoyment (+,x), Personal Innovativeness of IT (-,x), Job Relevance (+,x), Substitutability (-,x) |
| Ngai, Poon & Chan (2007) | Hong Kong | 836 Students | + | + | + | - | + | Technical Support (+,+) |
| Okazaki & Santos (2012) | Brazil | 446 Faculty Members | + | + | + | + | + | - |
| Ong, Lai & Wang (2004) | Taiwan | 140 Engineers | + | + | - | + | - | Computer Self-Efficacy (+,+) |
| Ong & Lai (2006) | Taiwan | 156 Employees | + | + | - | + | - | Computer Self-Efficacy (+,+) |
| Ouyang, Tang, Rong, Zhang, Yin & Xiong (2017) | China | 234 Students | + | - | - | + | - | Confirmation (+,x) |
| Padilla-Melendez, Garrido-Moreno & Aguila-Obra (2008) | Spain | 225 Students | + | + | + | + | - | Computer Self Efficacy (x,+) |
| Padilla-Melendez, Aguila-Obra & Garrido-Moreno (2013) | Spain | 484 Students | + | + | + | + | - | Males: Perceived Playfulness (+,+)<br>Females: Perceived Playfulness (+,+) |
| Park (2009) | South Korea | 628 Students | + | + | + | + | - | E-learning Self Efficacy (+,+), Subjective Norm (+,-), System Accessibility (-,+) |
| Park, Lee & Cheong (2008) | U.S.A | 191 Instructors | + | + | - | + | + | Motivation (+,+), Instructional Technology Cluster (-,-) |

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|---|---|---|---|---|---|---|---|---|
| Park, Nam & Cha (2012) | South Korea | 288 Students | + | + | + | + | - | Mobil Learning Self Efficacy (-,+), Major Relevance (+,-), System Accessibility (-,+), Subjective Norm (+,-) |
| Park, Son & Kim (2012) | South Korea | 408 Professionals | + | + | - | - | - | Enjoyment (+,-), Computer Anxiety (+,+), Social Influence (+,x), Organizational Support (-,+), Information Quality (+,x), System Quality (-,+) |
| Perreira, Ramos & Chagas (2015) | Brazil | 192 Students | + | + | - | - | + | - |
| Pituch & Lee (2006) | Taiwan | 259 Students | + | + | - | - | + | System Functionality (+,+), System Interactivity (+,-), System Response (+,+), Self-Efficacy (-,+), Internet Experience (-,-) |
| Poelmans, Wessa, Milis, Bloemen & Doom (2008) | Belgium | 200 Students | + | + | - | + | - | Information Quality (+,x), System Quality (x,+) |
| Post (2010) | U.S.A | 134 Students | + | + | + | + | - | Subjective Social Norm (+,x), Perceived Compatbility (+,x) |
| Premchaiswadi, Porouhan & Premchaiswadi (2012) | Thail& | 86 Students | + | + | - | + | - | - |
| Punnose (2012) | Thail& | 249 Students | + | + | - | + | - | Computer Self-Efficacy (x,+), Conscientiousness (+,x), Subjective Norms (+,x) |
| Purnomo & Lee (2012) | Indonesia | 306 Employees | + | + | - | + | - | Management Support (+,+), Computer Self Efficacy (-,-), Prior Experience (+,+), Computer Anxiety (+,-), Compatibility (+,+) |
| Raaij & Schepers (2008) | China | 40 Managers | + | + | - | - | + | Personal Innovativeness in the Domain of Information Technology (-,+), Computer Anxiety (x,+), Social Norms (+,x) |
| Ramayah & Lee (2012) | Malaysia | 250 Students | - | - | - | + | - | - |
| Ramírez-Correa Arenas-Gaitan & Rondan-Cataluña (2015) | Chile Spain | 389 Students | + | + | - | + | + | Result Demonstrability (+,x), Perceived Enjoyment (x,+), Perception of External Control (x,+) |
| Rejón-Guardia, Sanchez-Fernandez & Muñoz-Leiva (2013) | Spain | 135 Students | + | + | - | + | - | Subjective Norms (+,x), Image (+,x) |
| Rezaei, Mohammadi, Asadi & Kalantary (2008) | Iran | 120 Students | + | + | - | + | - | Internet Experience (+,-), Computer Anxiety (x,-), Age (-,x), Computer Self Efficacy (x,-), Affect (x,-) |
| Roca, Chiu & Martinez (2006) | Spain | 172 Workers | + | + | - | + | - | Confirmation (+,+), Computer Self Efficacy (x,+), Internet Self Efficacy (x,+) |
| Roca & Gagne (2008) | Spain | 166 Workers | + | + | - | + | - | Perceived Autonomy Support (+,x), Perceived Competence (+,+), Perceived Relatedness (-,x), Perceived Playfulness (+,+) |
| Ros, Hernandez, Caminero, Robles, Barbero, Macia & Holgado (2014) | Spain | 80 Students | + | + | - | + | - | Gadget Design (+,-), Container Design (x,+), Previous Experience (-,-) |
| Saade, Nebebe & Tan (2007) | Canada | 362 Students | + | + | + | + | - | - |
| Saade & Kira (2006) | Canada | 114 Students | + | + | + | - | - | Affect (-,+), Anxiety (-,+) |
| Sadeghi, Saribagloo, Aghdam & Mahmoudi (2014) | Iran | 275 Teachers | + | + | + | + | - | Masculinity (+,+), Uncertainty Avoidance (+,+), Individualism (+,-), Power Distance (+,+) |
| Sanchez-Franco (2010) | Spain | 431 Students | + | + | - | + | - | Flow (+,+) |
| Sanchez & Hueros (2010) | Spain | 226 Students | + | + | + | - | + | Technical support (+,+), Computer self-efficacy (-,-) |
| Seet & Goh (2012) | New Zelal& | 54 Students | - | - | - | + | - | - |
| Seif, Rastegar, Ardakani & Saeedikiya (2013) | Iran | 120 Students | + | + | - | + | - | Pleasure seeking (+,+), Applicability (+,+) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Shah, Bhatti, Iftikhar, Qureshi & Zaman (2013) | Pakistan | 400 Students | + | + | - | + | - | Information Quality (+,x), Service Quality (+,+), System Quality (x,+) |
| Shah, Iqbal, Janjua & Amjad (2013) | Pakistan | 172 Employees | + | + | - | + | - | Learning Objectives (+,+), Demographic Factors (-,-) |
| Shen & Chuang (2010) | Taiwan | 350 Students | + | + | + | + | - | Interactivity (+,+) |
| Shen & Eder (2009) | U.S.A | 77 Students | + | + | - | + | - | Computer Playfulness (x,+), Computer Self Efficacy (x,+), Computer Anxiety (x,-) |
| Shih, Chen, Shih & Su (2012) | China | 304 Students | + | + | + | + | - | - |
| Shroff, Deneen & Ng (2011) | Hong Kong | 72 Students | + | + | + | + | - | - |
| Shyu & Huang (2011) | Taiwan | 307 Students | + | + | + | + | + | Perceived E-government Learning Value (+,x), Perceived Enjoyment (x,+) |
| Smith & Sivo (2012) | U.S.A | 517 Teacher | + | + | - | + | - | Social Presence (+,+) |
| Sanchez, Hueros & Ordaz (2013) | Spain | 226 Students | + | + | + | - | + | Technical Support (+,+), Computer Self Efficacy (-,-) |
| Song & Kong (2017) | Hong Kong | 102 Students | + | + | + | + | - | Subjective Norm (+,x), Facilitating Conditions (-,+), Self Efficacy (+,+), Anxiety (-,+) |
| Suki & Suki (2012) | Malaysia | 100 Students | + | + | + | + | - | - |
| Tajudeen, Basha, Michael & Mukthar (2012) | Malaysia & Nigeria | 247 Students | + | + | + | + | + | - |
| Tan (2015) | Taiwan | 370 Citizens | + | + | + | + | + | - |
| Tarhini, Hone & Liu (2013.a) | UK | 604 Students | + | + | - | + | + | - |
| Tarhini, Hone & Liu (2013.b) | Lebanon | 569 Students | + | + | - | + | + | - |
| Tarhini, Hone & Liu (2014) | Lebanon | 569 Students | + | + | - | + | + | - |
| Tarhini, Hone & Liu (2015) | Lebanon UK | 1173 Students | + | + | - | + | + | - |
| Tarhini, Hassouna, Abbasi & Orozco (2015) | Lebanon | 235 Students | + | + | + | + | - | - |
| Tarhini, Hone, Liu & Tarhini (2017) | Lebanon | 569 Students | + | + | - | + | + | - |
| Teo (2011) | Singapore | 189 Students | + | - | - | - | - | Learning Environment (-,x), Course Delivery (+,x), Tutor Attribute (+,x), Facilitating Conditions (+,x) |
| Tobing, Hamzah, Sura & Amin (2008) | Malaysia | 314 Students | + | + | - | + | - | System Adaptability (+,+) |
| Tran (2016) | Vietnam | 396 Students | + | + | + | - | - | System Functionality (x,+), Language Capability (x,+), Computer Self Efficacy (x,+), Extraversion (x,+), Openness (x,-) |
| Trayek & Hassan (2013) | Malaysia | 120 Students | + | + | + | - | - | - |
| Tselios, Daskalakis & Papadopoulou (2011) | Greece | 102 Students | + | + | + | + | - | - |
| Tseng & Hsia (2008) | Taiwan | 204 Employees | + | + | - | + | - | Internal Locus of Control (+,+), Computer Self Efficacy (x,+) |
| Tung & Chang (2008.a) | Taiwan | 228 Students | + | + | - | + | - | Compatibility (+,x) |
| Tung & Chang (2008.b) | Taiwan | 267 Students | + | + | - | + | - | Compatibility (+,x) |
| Ursavas (2015) | Turkey | 311 Teachers | + | + | - | + | - | - |
| Veloo & Masood (2014) | Malaysia | 100 Employees | + | + | - | + | - | Relative Advantage (+,+), Compatibility (-,-), Complexity (-,+), Trialability (-,-), Observability (+,-) |
| Wang & Wang (2009) | Taiwan | 268 Instructors | + | + | - | + | + | Information Quality (+,x), System Quality (-,+), Service Quality (x,+), Subjective Norm (+,x), Self Efficacy (x,+) |
| Williams & Williams (2009) | UK | 237 Students | + | + | + | + | - | Incentive to Use (+,x), Faculty Encouragement (-,x), Peer Encouragement (+,x), Awareness of System Capabilities (-,x), Access to System (-,x), Technical Support (+,x), Prior Experience (-,x), Self Efficacy (-,x) |
| Wu & Chen (2017) | China | 252 Respondents | + | + | + | + | - | Individual Technology Fit (-,+), Task Technical Fit (+,+), Openness (-,+), Reputation (+,x), Social Recognition (+,x), Social Influence (+,x) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Wu & Gao (2011) | U.S.A | 101 Students | + | + | + | + | - | Perceived Enjoyment (+,x) |
| Wu & Zhang (2014) | China | 214 Employees | + | + | + | + | - | Reliability (+,+), Accessibility (-,+), Accuracy (+,x), Completeness (+,x), Sociality (+,x) |
| Wu, Kuo & Wu (2013) | Taiwan | 392 Students | + | + | - | + | - | Ipad Self Efficacy (x,+) |
| Yang & Lin (2011) | Taiwan | 377 Employees | + | + | - | - | + | Social Influence (+,x), Computer Self Efficacy (x,+) |
| Yi-Cheng, Chun-Yu, Yi-Chen & Ron-Chen (2007) | Taiwan | 214 Students | + | + | - | + | + | Perceived Enjoyment (+,x), System Features (+,x), Characteristics of Teaching Materials (x,+), Self Efficacy (x,+) |
| Yuen & Ma (2008) | Taiwan | 152 Teachers | + | + | - | + | - | Subjective Norm (+,+), Efficacy (-,+) |
| Zare & Yazdanparast (2013) | Iran | 379 Students | + | + | - | + | - | Computer Playfulness (x,+), Perceived Enjoyment (+,+), Facilitative Condition (+,+), Cognitive Absorption (+,+) |
| Zhang, Zhao & Tan (2008) | China | 121 Students | + | + | - | + | + | - |
| Zhao & Tan (2010) | Canada China | 282 Students | + | + | - | + | - | - |

**Note: Expressions in parentheses indicate the tested relationship between the external variable & the belief variable. Value (+) in parantheses indicates that the relationship is found to be significant, value (-) in parantheses indicates that the relationship is found to be insignificant, value (x) in parantheses indicates that the relation is not tested.**

## Appendix 2. 129 Variables Proposed as Determinants of PU & PEOU in E-Learning Systems & 220 Hypotheses Tested in the Literature Reviewed

| No. | Independent Varible | Dependent Variable | Inv. | Acc. | References |
|---|---|---|---|---|---|
| 1 | Accessibility | PU | 4 | 4 | Kang & Shin (2015), Park (2009), Park, Nam & Cha (2012), , Wu & Zhang (2014) |
| 2 | Accessibility | PEOU | 7 | 6 | Kang & Shin (2015), Lee, Hsiao, Purnomo (2014), Martinez-Torres, Marin, Garcia, Vazquez, Oliva & Torres (2008), Park (2009), Park, Nam & Cha (2012), Williams & Williams (2009), Wu & Zhang (2014) |
| 3 | Accuracy | PU | 1 | 1 | Wu & Zhang (2014) |
| 4 | Affect | PU | 1 | 0 | Saade & Kira (2006) |
| 5 | Affect | PEOU | 2 | 1 | Rezaei, Mohammadi, Asadi & Kalantary (2008), Saade & Kira (2006) |
| 6 | Affinity | PU | 1 | 1 | Lowe, D'aless&ro, Winzar, Laffey & Collier (2013) |
| 7 | Affinity | PEOU | 1 | 1 | Lowe, D'aless&ro, Winzar, Laffey & Collier (2013) |
| 8 | Age | PU | 1 | 0 | Rezaei, Mohammadi, Asadi & Kalantary (2008) |
| 9 | Anxiety | PU | 8 | 3 | Chang, Hajiyev & Su (2017), Chen & Tseng (2012), Liu (2010), Mohammed & Karim (2012), Park, Son & Kim (2012), Purnomo & Lee (2012), Saade & Kira (2006), Song & Kong (2017) |
| 10 | Anxiety | PEOU | 19 | 12 | Abdullah, Ward & Ahmed(2016), Agudo-Peregrina, Hernandez-García, & Pascual-Miguel, Higher Education & Lifelong Learning (2014), Al-Gahtani (2016), Ali, Ahmed, Tariq & Safdar (2013), Calisir, Gumussoy, Bayraktaroglu & Karaali (2014), Chang, Hajiyev & Su (2017), Chen & Tseng (2012), Karaali, Gumussoy & Calisir (2011), Lefievre (2012), Liu (2010), Mohammed & Karim (2012), Park, Son & Kim (2012), Purnomo & Lee (2012), Raaij & Schepers (2008), Rezaei, Mohammadi, Asadi & Kalantary (2008), Saade & Kira (2006), Shen & Eder (2009), Song & Kong (2017) |
| 11 | Applicability | PU | 1 | 1 | Seif, Rastegar, Ardakani & Saeedikiya (2013) |
| 12 | Applicability | PEOU | 1 | 1 | Seif, Rastegar, Ardakani & Saeedikiya (2013) |
| 13 | Applying | PU | 1 | 1 | Lin (2013) |
| 14 | Applying | PEOU | 1 | 1 | Lin (2013) |
| 15 | Assimilating | PU | 1 | 1 | Lin (2013) |

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| 16 | Assimilating | PEOU | 1 | 1 | Lin (2013) |
| 17 | Augmented Reality | PU | 1 | 1 | Chang & Liu (2013) |
| 18 | Augmented Reality | PEOU | 1 | 1 | Chang & Liu (2013) |
| 19 | Autonomy Support | PU | 1 | 1 | Roca & Gagne (2008) |
| 20 | Awareness of System Capabilities | PU | 1 | 0 | Williams & Williams (2009) |
| 21 | Cognitive Absorption | PU | 3 | 3 | Cheng (2011), Moreno, Cavazotte & Alves (2017), Zare & Yazdanparast (2013) |
| 22 | Cognitive Absorption | PEOU | 3 | 3 | Cheng (2011), Moreno, Cavazotte & Alves (2017), Zare & Yazdanparast (2013) |
| 23 | Compatibility | PU | 11 | 10 | Brown, Ingram & Thorp (2006), Chang & Tung (2008), Cheng (2015), Jung (2015), Lai & Ulhas (2012), Lee, Hsieh & Hsu (2011), Post (2010), Purnomo & Lee (2012), Tung & Chang (2008.a), Tung & Chang (2008.b), Veloo & Masood (2014) |
| 24 | Compatibility | PEOU | 6 | 3 | Brown, Ingram & Thorp (2006), Cheng (2015), Cheung & Vogel (2013), Lee, Hsieh & Hsu (2011), Purnomo & Lee (2012), Veloo & Masood (2014) |
| 25 | Compatibility with Student Tasks | PU | 1 | 0 | Escobar-Rodriguez & Monge-Lozano (2012) |
| 26 | Compatibility with Student Tasks | PEOU | 1 | 1 | Escobar-Rodriguez & Monge-Lozano (2012) |
| 27 | Competence | PU | 1 | 1 | Roca & Gagne (2008) |
| 28 | Competence | PEOU | 1 | 1 | Roca & Gagne (2008) |
| 29 | Competition Pressure | PU | 1 | 1 | Macharia & Nyakwende (2009) |
| 30 | Competition Pressure | PEOU | 1 | 0 | Macharia & Nyakwende (2009) |
| 31 | Completeness | PU | 1 | 1 | Wu & Zhang (2014) |
| 32 | Complexity | PU | 3 | 1 | Aypay, Celik, Aypay & Sever (2012), Lee, Hsieh & Hsu (2011), Veloo & Masood (2014) |
| 33 | Complexity | PEOU | 5 | 5 | Aypay, Celik, Aypay & Sever (2012), Cigdem & Topcu (2015), Coskuncay & Ozkan (2013), Lee, Hsieh & Hsu (2011), Veloo & Masood (2014) |
| 34 | Confirmation | PU | 3 | 3 | Lee (2010), Roca, Chiu & Martinez (2006), Ouyang, Tang, Rong, Zhang, Yin & Xiong (2017) |
| 35 | Confirmation | PEOU | 1 | 1 | Roca, Chiu & Martinez (2006) |
| 36 | Conscientiousness | PU | 1 | 1 | Punnose (2012) |
| 37 | Container Design | PEOU | 1 | 1 | Ros, Hernandez, Caminero, Robles, Barbero, Macia & Holgado (2014) |
| 38 | Content Quality | PEOU | 6 | 5 | Al-Ammari & Hamad (2008), Chang & Liu (2013), Cheng (2012), Kang & Shin (2015), Lau & Woods (2008), Lau & Woods (2009) |
| 39 | Content Quality, Content Richness | PU | 11 | 8 | Al-Ammari & Hamad (2008), Calisir, Gumussoy, Bayraktaroglu & Karaali (2014), Chang & Liu (2013), Cheng (2011), Cheng (2012), Jung (2015), Kang & Shin (2015), Lau & Woods (2008), Lau & Woods (2009), Lee (2006), Lee & Lehto (2013) |
| 40 | Controllability | PU | 1 | 1 | Cheng (2014) |
| 41 | Controllability | PEOU | 1 | 1 | Cheng (2014) |
| 42 | Convenience | PU | 5 | 5 | Chang, Yan & Tseng (2012), Chang, Tseng, Liang & Yan (2013), Cheng (2015), Hsu & Chang (2013), Lai & Ulhas (2012) |
| 43 | Convenience | PEOU | 3 | 2 | Chang, Tseng, Liang & Yan (2013), Cheng (2015), Hussein, Aditiawarman & Mohamed (2007) |
| 44 | Course Attributes | PEOU | 2 | 1 | Lee (2006), Lin, Chen & Yeh (2010) |
| 45 | Course Attributes | PU | 1 | 0 | Lee (2006) |
| 46 | Course Delivery | PU | 1 | 1 | Teo (2011) |
| 47 | Demographic Factors | PU | 1 | 0 | Shah, Iqbal, Janjua & Amjad (2013) |
| 48 | Demographic Factors | PEOU | 1 | 0 | Shah, Iqbal, Janjua & Amjad (2013) |
| 49 | Design | PU | 3 | 2 | Al-Ammary, Al-Sherooqi, & Al-Sherooqi (2014), Cheng (2012), Hussein, Aditiawarman & Mohamed (2007) |
| 50 | Design | PEOU | 3 | 3 | Cheng (2012), Hussein, Aditiawarman & Mohamed (2007), Lee, Yoon & Lee (2009) |
| 51 | Enjoyment | PU | 12 | 12 | Abdullah, Ward & Ahmed (2016), Al-Aulamie, Mansour, Daly & Adjei (2012), Armenteros, Liaw, Fernandez, Díaz & Sanchez (2013), Brown, Ingram & Thorp (2006), Chang, Hajiyev & Su (2017), Chen, Lin, Yeh & Lou (2013), Lai & Ulhas (2012), Lin, Chen & Yeh (2010), Nan, Xun-hua & Guo- |

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| | | | | | qing (2007), Park, Son & Kim (2012), Wu & Gao (2011), Yi-Cheng, Chun-Yu, Yi-Chen & Ron-Chen (2007), Zare & Yazdanparast (2013) |
| 52 | Enjoyment | PEOU | 16 | 13 | Abdullah, Ward & Ahmed (2016), Al-Ammary, Al-Sherooqi, & Al-Sherooqi (2014), Al-Aulamie, Mansour, Daly & Adjei (2012), Al-Gahtani (2016), Arenas-Gaitan, Rondan-Cataluña & Ramirez-Correa (2010), Armenteros, Liaw, Fernandez, Díaz & Sanchez (2013), Brown, Ingram & Thorp (2006), Chang, Hajiyev & Su (2017), Chen, Lin, Yeh & Lou (2013), Huang, Lin & Chuang (2007), Lefievre (2012), Martinez-Torres, Marin, Garcia, Vazquez, Oliva & Torres (2008), Park, Son & Kim (2012), Ramírez-Correa Arenas-Gaitan & Rondan-Cataluña (2015), Shyu & Huang (2011), Zare & Yazdanparast (2013) |
| 53 | Experience | PU | 14 | 5 | Abbad, Morris & Nahlik (2009), Abdullah, Ward & Ahmed(2016), Abramson, Dawson & Stevens (2015), Armenteros, Liaw, Fernandez, Díaz & Sanchez (2013), Chang, Hajiyev & Su (2017), Lau & Woods (2008), Lau & Woods (2009), Lee, Hsieh & Ma (2011), Lee, Hsieh & Chen (2013), Martin (2012), Pituch & Lee (2006), Purnomo & Lee (2012), Rezaei, Mohammadi, Asadi & Kalantary (2008), Ros, Hernandez, Caminero, Robles, Barbero, Macia & Holgado (2014) |
| 54 | Experience | PEOU | 18 | 8 | Abbad, Morris & Nahlik (2009), Abdullah, Ward & Ahmed(2016), Abramson, Dawson & Stevens (2015), Armenteros, Liaw, Fernandez, Díaz & Sanchez (2013), Chang, Hajiyev & Su (2017), De Smet, Bourgonjon, Wever, Schellens & Valcke (2012), Deshp&e, Bhattacharya & Yammiyavar (2012), Lau & Woods (2008), Lau & Woods (2009), Lee, Hsieh & Ma (2011), Lee, Hsieh & Chen (2013), Martin (2012), Moreno, Cavazotte & Alves (2017), Pituch & Lee (2006), Purnomo & Lee (2012), Rezaei, Mohammadi, Asadi & Kalantary (2008), Ros, Hernandez, Caminero, Robles, Barbero, Macia & Holgado (2014), Williams & Williams (2009) |
| 55 | External Computing Support | PU | 1 | 1 | Lee (2008) |
| 56 | External Computing Support | PEOU | 1 | 1 | Lee (2008) |
| 57 | External Control | PEOU | 5 | 5 | Al-Gahtani (2016), Arenas-Gaitan, Rondan-Cataluña & Ramirez-Correa (2010), Arenas-Gaitan, Ramírez-Correa & Rondan-Cataluña, Chile & Spain(2011), Ramírez-Correa Arenas-Gaitan & Rondan-Cataluña (2015) |
| 58 | External Equipment Accessability | PU | 1 | 0 | Lee (2008) |
| 59 | External Equipment Accessability | PEOU | 1 | 1 | Lee (2008) |
| 60 | External Influence | PU | 3 | 2 | Abbas, Egypt & UK (2016), Cheng (2011) |
| 61 | Extraversion | PEOU | 1 | 1 | Tran (2016) |
| 62 | Facilitating Conditions | PU | 5 | 4 | Althunibat (2015), Aypay, Celik, Aypay & Sever (2012), Song & Kong (2017), Teo (2011), Zare & Yazdanparast (2013) |
| 63 | Facilitating Conditions | PEOU | 9 | 8 | Agudo-Peregrina, Hernandez-García, & Pascual-Miguel, Higer Education & Lifelong Learning (2014), Althunibat (2015), Aypay, Celik, Aypay & Sever (2012), Karaali, Gumussoy & Calisir (2011), Moreno, Cavazotte & Alves (2017), Nan, Xun-hua & Guo-qing (2007), Song & Kong (2017), Zare & Yazdanparast (2013) |
| 64 | Flexibility | PU | 1 | 1 | Hsia & Tseng (2008) |
| 65 | Flow | PU | 1 | 1 | Sanchez-Franco (2010) |
| 66 | Flow | PEOU | 2 | 2 | Davis & Wong (2007), Sanchez-Franco (2010) |
| 67 | Gadget Design | PU | 1 | 1 | Ros, Hernandez, Caminero, Robles, Barbero, Macia & Holgado (2014) |
| 68 | Gadget Design | PEOU | 1 | 0 | Ros, Hernandez, Caminero, Robles, Barbero, Macia & Holgado (2014) |
| 69 | Gender | PU | 1 | 0 | Letchumanan & Tarmizi (2011) |
| 70 | Gender | PEOU | 1 | 0 | Letchumanan & Tarmizi (2011) |
| 71 | Gender Diversity | PU | 1 | 0 | Al-Azawei & Lundqvist (2015) |
| 72 | Gender Diversity | PEOU | 1 | 0 | Al-Azawei & Lundqvist (2015) |
| 73 | Government Support | PU | 1 | 1 | Macharia & Nyakwende (2009) |
| 74 | Government Support | PEOU | 1 | 1 | Macharia & Nyakwende (2009) |
| 75 | Image | PU | 3 | 2 | Al-Gahtani (2016), Calisir, Gumussoy, Bayraktaroglu & Karaali (2014), Rejón-Guardia, Sanchez-Fernandez & Muñoz-Leiva (2013) |

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| 76 | Incentive to Use | PU | 1 | 1 | Williams & Williams (2009) |
| 77 | Individual Technology Fit | PU | 1 | 0 | Wu & Chen (2017) |
| 78 | Individual Technology Fit | PEOU | 1 | 1 | Wu & Chen (2017) |
| 79 | Individualism | PU | 1 | 1 | Sadeghi, Saribagloo, Aghdam & Mahmoudi (2014) |
| 80 | Individualism | PEOU | 1 | 0 | Sadeghi, Saribagloo, Aghdam & Mahmoudi (2014) |
| 81 | Information Privacy | PEOU | 1 | 0 | Martin (2012) |
| 82 | Information Quality | PU | 5 | 5 | Motaghian, Hassanzadeh & Moghadam (2013), Park, Son & Kim (2012),Poelmans, Wessa, Milis, Bloemen & Doom (2008), Shah, Bhatti, Iftikhar, Qureshi & Zaman (2013), Wang & Wang (2009) |
| 83 | Information Quality | PEOU | 1 | 1 | Motaghian, Hassanzadeh & Moghadam (2013) |
| 84 | Innovativeness | PU | 7 | 4 | De Smet, Bourgonjon, Wever, Schellens & Valcke (2012), Fagan, Kilmon annd P&ey (2012), Harmon (2015), Liu, Li & Carlsson (2010), Moghadam & Bairamzadeh (2009), Nan, Xun-hua & Guo-qing (2007), Raaij & Schepers (2008) |
| 85 | Innovativeness | PEOU | 9 | 6 | Agudo-Peregrina, Hernandez-García, & Pascual-Miguel, Higher Education & Lifelong Learning (2014), Basoglu & Ozdogan (2011), De Smet, Bourgonjon, Wever, Schellens & Valcke (2012), Fagan, Kilmon annd P&ey (2012), Harmon (2015), Liu, Li & Carlsson (2010), Moghadam & Bairamzadeh (2009), Raaij & Schepers (2008) |
| 86 | Instant Connectivity | PU | 1 | 1 | Jung (2015) |
| 87 | Instructional Technology Cluster | PU | 1 | 0 | Park, Lee & Cheong (2008) |
| 88 | Instructional Technology Cluster | PEOU | 1 | 0 | Park, Lee & Cheong (2008) |
| 89 | Instructor Influence / Charecteristic | PU | 8 | 6 | Abbas, Egypt & UK (2016), Cheng (2012), Cheng (2013), Lee, Yoon & Lee (2009), Lee, Hsiao, Purnomo (2014), Teo (2011), Ibrahim, Leng, Yusoff, Samy, Masrom & Rizman (2017) |
| 90 | Instructor Influence / Charecteristic | PEOU | 4 | 3 | Abbas, Egypt & UK (2016), Cheng (2013), Hussein, Aditiawarman & Mohamed (2007) |
| 91 | Interface | PU | 2 | 1 | Cheng (2012), Cho, Cheng & Lai (2009) |
| 92 | Interface | PEOU | 3 | 2 | Basoglu & Ozdogan (2011), Cheng (2012), Cho, Cheng & Lai (2009) |
| 93 | Internal Computing Support | PU | 1 | 1 | Lee (2008) |
| 94 | Internal Computing Support | PEOU | 1 | 1 | Lee (2008) |
| 95 | Internal Equipment Accessability | PU | 1 | 0 | Lee (2008) |
| 96 | Internal Equipment Accessability | PEOU | 1 | 0 | Lee (2008) |
| 97 | Interpersonal Influence | PU | 3 | 2 | Abbas, Egypy & UK (2016), Cheng (2011) |
| 98 | Job Relevance | PU | 6 | 6 | Al-Gahtani (2016), Arenas-Gaitan, Ramírez-Correa & Rondan-Cataluña, Chile & Spain (2011), Lefievre (2012), Nan, Xun-hua & Guo-qing (2007), Park, Nam & Cha (2012) |
| 99 | Job Relevance | PEOU | 1 | 0 | Park, Nam & Cha (2012) |
| 100 | Language Capability | PEOU | 1 | 1 | Tran (2016) |
| 101 | Learning | PU | 1 | 1 | Kilic, Guler & Celik (2015) |
| 102 | Learning | PEOU | 1 | 1 | Kilic, Guler & Celik (2015) |
| 103 | Learning Content | PU | 1 | 1 | Lee, Hsiao, Purnomo (2014) |
| 104 | Learning Content | PEOU | 1 | 1 | Lee, Hsiao, Purnomo (2014) |
| 105 | Learning Environment | PU | 1 | 0 | Teo (2011) |
| 106 | Learning Objectives | PU | 1 | 1 | Shah, Iqbal, Janjua & Amjad (2013) |
| 107 | Learning Objectives | PEOU | 1 | 1 | Shah, Iqbal, Janjua & Amjad (2013) |
| 108 | Learning Styles | PU | 2 | 0 | Al-Azawei & Lundqvist (2015), Al-Azawei, Parslow & Lundqvist (2017) |
| 109 | Learning Value | PU | 1 | 1 | Shyu & Huang (2011) |
| 110 | Locus of Control | PU | 2 | 2 | Hsia, Chang & Tseng (2014), Tseng & Hsia (2008) |
| 111 | Locus of Control | PEOU | 2 | 2 | Hsia, Chang & Tseng (2014), Tseng & Hsia (2008) |
| 112 | Management Support | PU | 2 | 1 | Lee, Hsieh & Ma (2011), Purnomo & Lee (2012) |

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| 113 | Management Support | PEOU | 2 | 2 | Lee, Hsieh & Ma (2011), Purnomo & Lee (2012) |
| 114 | Masculinity | PU | 1 | 1 | Sadeghi, Saribagloo, Aghdam & Mahmoudi (2014) |
| 115 | Masculinity | PEOU | 1 | 1 | Sadeghi, Saribagloo, Aghdam & Mahmoudi (2014) |
| 116 | Materials Presentation Types | PU | 2 | 2 | Liu, Liao & Peng (2005), Liu, Liao & Pratt (2009) |
| 117 | Mobility | PU | 3 | 2 | Al-Ammary, Al-Sherooqi, & Al-Sherooqi (2014), Basoglu & Ozdogan (2011), Huang, Lin & Chuang (2007) |
| 118 | Motivation | PU | 3 | 2 | Chen & Tseng (2012), Martin (2012),Park, Lee & Cheong (2008) |
| 119 | Motivation | PEOU | 3 | 3 | Chen & Tseng (2012), Martin (2012),Park, Lee & Cheong (2008) |
| 120 | Navigation | PU | 1 | 1 | Cheng (2015) |
| 121 | Navigation | PEOU | 1 | 1 | Cheng (2015) |
| 122 | Network Externality | PU | 2 | 1 | Cheng (2011), Lee (2006) |
| 123 | Network Externality | PEOU | 2 | 2 | Cheng (2011), Lee (2006) |
| 124 | Observability | PU | 2 | 1 | Lee, Hsieh & Hsu (2011), Veloo & Masood (2014) |
| 125 | Observability | PEOU | 2 | 0 | Lee, Hsieh & Hsu (2011), Veloo & Masood (2014) |
| 126 | Openness | PU | 1 | 0 | Wu & Chen (2017) |
| 127 | Openness | PEOU | 2 | 1 | Tran (2016), Wu & Chen (2017) |
| 128 | Organizational Support | PU | 3 | 2 | Lee, Hsieh & Ma (2011), Lee, Hsieh & Chen (2013), Park, Son & Kim (2012) |
| 129 | Organizational Support | PEOU | 3 | 2 | Lee, Hsieh & Ma (2011), Lee, Hsieh & Chen (2013), Park, Son & Kim (2012) |
| 130 | Output Quality | PU | 2 | 1 | Davis & Wong (2007), Moreno, Cavazotte & Alves (2017) |
| 131 | Pedagogical Quality | PU | 2 | 2 | Lau & Woods (2008), Lau & Woods (2009) |
| 132 | Pedagogical Quality | PEOU | 2 | 2 | Lau & Woods (2008), Lau & Woods (2009) |
| 133 | Peer Influence | PU | 3 | 2 | Basoglu & Ozdogan (2011), Cheng (2013), Williams & Williams (2009) |
| 134 | Peer Influence | PEOU | 1 | 1 | Cheng (2013) |
| 135 | Personalization | PU | 1 | 1 | Cheng (2014) |
| 136 | Personalization | PEOU | 1 | 1 | Cheng (2014) |
| 137 | Playfulness | PU | 4 | 4 | Al-Aulamie, Mansour, Daly & Adjei (2012), Padilla-Melendez, Aguila-Obra & Garrido-Moreno, Male & Female (2013), Roca & Gagne (2008) |
| 138 | Playfulness | PEOU | 11 | 8 | Agudo-Peregrina, Hernandez-García, & Pascual-Miguel, Higher Education & Lifelong Learning (2014), Al-Aulamie, Mansour, Daly & Adjei (2012), Al-Gahtani (2016), Ali, Ahmed, Tariq & Safdar (2013), Lefievre (2012), Padilla-Melendez, Aguila-Obra & Garrido-Moreno, Males & Females (2013), Roca & Gagne (2008), Shen & Eder (2009), Zare & Yazdanparast (2013) |
| 139 | Pleasure seeking | PU | 1 | 1 | Seif, Rastegar, Ardakani & Saeedikiya (2013) |
| 140 | Pleasure seeking | PEOU | 1 | 1 | Seif, Rastegar, Ardakani & Saeedikiya (2013) |
| 141 | Power Distance | PU | 1 | 1 | Sadeghi, Saribagloo, Aghdam & Mahmoudi (2014) |
| 142 | Power Distance | PEOU | 1 | 1 | Sadeghi, Saribagloo, Aghdam & Mahmoudi (2014) |
| 143 | Relatedness | PU | 1 | 0 | Roca & Gagne (2008) |
| 144 | Relative Advantage | PU | 2 | 2 | Lee, Hsieh & Hsu (2011), Veloo & Masood (2014) |
| 145 | Relative Advantage | PEOU | 2 | 2 | Lee, Hsieh & Hsu (2011), Veloo & Masood (2014) |
| 146 | Relevance for Learning | PU | 2 | 2 | Agudo-Peregrina, Hernandez-García, & Pascual-Miguel, Higher Education & Lifelong Learning (2014) |
| 147 | Reliability | PU | 1 | 1 | Wu & Zhang (2014) |
| 148 | Reliability | PEOU | 2 | 2 | Martinez-Torres, Marin, Garcia, Vazquez, Oliva & Torres (2008), Wu & Zhang (2014) |
| 149 | Reputation | PU | 1 | 1 | Wu & Chen (2017) |
| 150 | Resource | PEOU | 1 | 1 | Cheung & Vogel (2013) |
| 151 | Responsiveness | PU | 1 | 1 | Cheng (2014) |
| 152 | Responsiveness | PEOU | 1 | 1 | Cheng (2014) |
| 153 | Result Demonstrability | PU | 6 | 5 | Al-Gahtani (2016), Arenas-Gaitan, Ramírez-Correa & Rondan-Cataluña, Spain & Chile (2011), Arenas-Gaitan, Rondan-Cataluña & Ramirez-Correa (2010), Lefievre |

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| | | | | | (2012), Ramírez-Correa Arenas-Gaitan & Rondan-Cataluña (2015) |
| 154 | Risk | PU | 1 | 1 | Chang, Chao & Cheng (2015) |
| 155 | Risk | PEOU | 2 | 1 | Chang, Chao & Cheng (2015), Lowe, D'aless&ro, Winzar, Laffey & Collier (2013) |
| 156 | Self Efficacy | PU | 50 | 24 | Abbad, Morris & Nahlik (2009), Abdullah, Ward & Ahmed (2016), Abramson, Dawson & Stevens (2015), Al-Ammary, Al-Sherooqi, & Al-Sherooqi. (2014), Al-Ammari & Hamad (2008), Al-Azawei & Lundqvist (2015), Al-Azawei, Parslow & Lundqvist (2017), Al-Mushasha (2013), Althunibat (2015), Aypay, Celik, Aypay & Sever (2012), Bao, Xiong, Hu & Kibelloh, General & Spesific (2013), Bhatiasevi (2011), Chang, Hajiyev & Su (2017), Chen & Tseng (2012), Cheng, Computer & Internet (2011), Chow, Herold, Choo & Chan (2012), Chow, Chan, Lo, Chu, Chan & Lai (2013), Cigdem & Topcu (2015), Coskuncay & Ozkan (2013), Hsia & Tseng (2008), Hsiao & Chen (2015), Hussein, Aditiawarman & Mohamed (2007), Ibrahim, Leng, Yusoff, Samy, Masrom & Rizman (2017), Jung (2015), Kang & Shin (2015), Kilic, Guler & Celik (2015), Lau & Woods (2008), Lau & Woods (2009), Lee (2006), Lee, Hsieh & Ma (2011), Lee, Hsieh & Chen (2013), Lee, Hsiao, Purnomo, Computer & Internet (2014), Lee & Lehto (2013), Liu (2010), Ma, Chao & Cheng (2013), Mohammed & Karim (2012), Motaghian, Hassanzadeh & Moghadam (2013), Ong, Lai & Wang (2004), Ong & Lai (2006), Park (2009), Park, Nam & Cha (2012), Pituch & Lee (2006), Purnomo & Lee (2012), Sanchez & Hueros (2010), Sanchez, Hueros & Ordaz (2013), Song & Kong (2017), Yuen & Ma (2008) |
| 157 | Self Efficacy | PEOU | 71 | 58 | Abbad, Morris & Nahlik (2009), Abdullah, Ward & Ahmed (2016), Abramson, Dawson & Stevens (2015), Agudo-Peregrina, Hernandez-García, & Pascual-Miguel, Higher Education & Lifelong Learning (2014), Al-Ammary, Al-Sherooqi, & Al-Sherooqi. (2014), Al-Ammari & Hamad (2008), Al-Azawei & Lundqvist (2015), Al-Azawei, Parslow & Lundqvist (2017), Al-Gahtani (2016), Ali, Ahmed, Tariq & Safdar (2013), Al-Mushasha (2013), Althunibat (2015), Aypay, Celik, Aypay & Sever (2012), Bao, Xiong, Hu & Kibelloh, General & Spesific (2013), Basoglu & Ozdogan (2011), Bhatiasevi (2011), Brown, Ingram & Thorp (2006), Chang, Hajiyev & Su (2017), Chen & Tseng (2012), Cheng, Computer & Internet (2011), Chow, Herold, Choo & Chan (2012), Chow, Chan, Lo, Chu, Chan & Lai (2013), Cigdem & Topcu (2015), Coskuncay & Ozkan (2013), Hsia, Chang & Tseng (2014), Hsia & Tseng (2008), Hsiao & Chen (2015), Hussein, Aditiawarman & Mohamed (2007), Ibrahim, Leng, Yusoff, Samy, Masrom & Rizman (2017), Kang & Shin (2015), Kilic, Guler & Celik (2015), Lau & Woods (2008), Lau & Woods (2009), Lee (2006), Lee, Hsieh & Ma (2011), Lee, Hsieh & Chen (2013), Lee, Hsiao, Purnomo, Computer & Internet (2014), Li, Duan & Alfrod (2012), Lin, Chen & Yeh (2010), Liu (2010), Moghadam & Bairamzadeh (2009), Mohammed & Karim (2012), Moreno, Cavazotte & Alves (2017), Motaghian, Hassanzadeh & Moghadam (2013),, Ong, Lai & Wang (2004), Ong & Lai (2006), Padilla-Melendez, Garrido-Moreno & Aguila-Obra (2008), Park (2009), Park, Nam & Cha (2012), Pituch & Lee (2006), Punnose (2012), Purnomo & Lee (2012), Rezaei, Mohammadi, Asadi & Kalantary (2008), Roca, Chiu & Martinez, Computer & Internet (2006), Sanchez & Hueros (2010), Sanchez, Hueros & Ordaz (2013), Shen & Eder (2009), Song & Kong (2017), Tran (2016), Tseng & Hsia (2008), Wang & Wang (2009), Williams & Williams (2009), Wu, Kuo & Wu (2013), Yang & Lin (2011), Yi-Cheng, Chun-Yu, Yi-Chen & Ron-Chen (2007), Yuen & Ma (2008) |
| 158 | Service Quality | PU | 2 | 1 | Motaghian, Hassanzadeh & Moghadam (2013), Shah, Bhatti, Iftikhar, Qureshi & Zaman (2013) |
| 159 | Service Quality | PEOU | 3 | 3 | Motaghian, Hassanzadeh & Moghadam (2013), Shah, Bhatti, Iftikhar, Qureshi & Zaman (2013), Wang & Wang (2009) |
| 160 | Sharing | PU | 1 | 1 | Cheung & Vogel (2013) |
| 161 | Social Presence | PU | 1 | 1 | Smith & Sivo (2012) |
| 162 | Social Presence | PEOU | 1 | 1 | Smith & Sivo (2012) |
| 163 | Social Recognition | PU | 1 | 1 | Wu & Chen (2017) |
| 164 | Sociality | PU | 1 | 1 | Wu & Zhang (2014) |
| 165 | Socio Economic Factors | PU | 1 | 1 | Macharia & Nyakwende (2009) |

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| 166 | Socio Economic Factors | PEOU | 1 | 1 | Macharia & Nyakwende (2009) |
| 167 | Subjective Norm | PU | 33 | 27 | Abbad, Morris & Nahlik (2009), Abdullah, Ward & Ahmed(2016), Abramson, Dawson & Stevens (2015), Agudo-Peregrina, Hernandez-García, & Pascual-Miguel, Higher Education & Lifelong Learning (2014), Al-Gahtani (2016), Chang, Hajiyev & Su (2017), Cigdem & Topcu (2015), Coskuncay & Ozkan (2013), Davis & Wong (2007), De Smet, Bourgonjon, Wever, Schellens & Valcke (2012), Farahat (2012), Hei & Hu (2011), Kang & Shin (2015), Karaali, Gumussoy & Calisir (2011), Lee (2006), Lee, Hsieh & Ma (2011), Martin (2012), Moghadam & Bairamzadeh (2009), Moreno, Cavazotte & Alves (2017), Motaghian, Hassanzadeh & Moghadam (2013), Park (2009), Park, Nam & Cha (2012), Park, Son & Kim (2012), Post (2010), Punnose (2012), Raaij & Schepers (2008), Rejón-Guardia, Sanchez-Fernandez & Muñoz-Leiva (2013), Song & Kong (2017), Wang & Wang (2009), Wu & Chen (2017), Yang & Lin (2011), Yuen & Ma (2008) |
| 168 | Subjective Norm | PEOU | 12 | 9 | Abdullah, Ward & Ahmed(2016), Abramson, Dawson & Stevens (2015), Chang, Hajiyev & Su (2017), Cigdem & Topcu (2015), Coskuncay & Ozkan (2013), Farahat (2012), Kang & Shin (2015), Lee, Hsieh & Ma (2011), Motaghian, Hassanzadeh & Moghadam (2013), Park (2009), Park, Nam & Cha (2012), Yuen & Ma (2008) |
| 169 | Substitutability | PU | 1 | 0 | Nan, Xun-hua & Guo-qing (2007) |
| 170 | Support Service Quality | PU | 1 | 1 | Cheng (2012) |
| 171 | Support Service Quality | PEOU | 1 | 1 | Cheng (2012) |
| 172 | System Adaptability | PU | 1 | 1 | Tobing, Hamzah, Sura & Amin (2008) |
| 173 | System Adaptability | PEOU | 1 | 1 | Tobing, Hamzah, Sura & Amin (2008) |
| 174 | System Characteristics | PU | 2 | 2 | Chen, Lin, Yeh & Lou (2013), Lin, Chen & Yeh (2010) |
| 175 | System Characteristics | PEOU | 1 | 1 | Chen, Lin, Yeh & Lou (2013) |
| 176 | System Features | PU | 1 | 1 | Yi-Cheng, Chun-Yu, Yi-Chen & Ron-Chen (2007) |
| 177 | System Functionality | PU | 6 | 5 | Bhatiasevi (2011), Cheng (2011), Cheng (2012), Cho, Cheng & Lai (2009), Li, Duan & Alfrod (2012), Pituch & Lee (2006) |
| 178 | System Functionality | PEOU | 6 | 6 | Bhatiasevi (2011), Cheng (2011), Cheng (2012), Li, Duan & Alfrod (2012), Pituch & Lee (2006), Tran (2016) |
| 179 | System Interactivity / Interaction | PU | 18 | 15 | Abbad, Morris & Nahlik (2009), Agudo-Peregrina, Hernandez-García, & Pascual-Miguel, Higher Education & Lifelong Learning(2014), Al-Ammary, Al-Sherooqi, & Al-Sherooqi (2014), Baharin, Lateh, Nathan & Nawawia (2015), Chang & Liu (2013), Freitas, Ferreira, Garcia & Kurtz (2017), Cheng (2011), Cheng (2012), Cheng (2013), Jung (2015), Li, Duan & Alfrod (2012), Lin, Persada & Nadlifatin (2014), Martin (2012), Martinez-Torres, Marin, Garcia, Vazquez, Oliva & Torres (2008), Moreno, Cavazotte & Alves (2017), Pituch & Lee (2006), Shen & Chuang (2010) |
| 180 | System Interactivity / Interaction | PEOU | 12 | 8 | Abbad, Morris & Nahlik (2009), Al-Ammary, Al-Sherooqi, & Al-Sherooqi (2014), Baharin, Lateh, Nathan & Nawawia (2015), Chang & Liu (2013), Cheng (2011), Cheng (2012), Cheng (2013), Li, Duan & Alfrod (2012), Lin, Persada & Nadlifatin (2014), Martin (2012), Pituch & Lee (2006), Shen & Chuang (2010) |
| 181 | System Quality | PU | 3 | 0 | Motaghian, Hassanzadeh & Moghadam (2013), Park, Son & Kim (2012), Wang & Wang (2009) |
| 182 | System Quality | PEOU | 6 | 5 | Calisir, Gumussoy, Bayraktaroglu & Karaali (2014), Motaghian, Hassanzadeh & Moghadam (2013), Park, Son & Kim (2012), Poelmans, Wessa, Milis, Bloemen ve Doom (2008), Shah, Bhatti, Iftikhar, Qureshi & Zaman (2013), Wang & Wang (2009) |
| 183 | System Response | PU | 3 | 3 | Cheng (2012), Li, Duan & Alfrod (2012), Pituch & Lee (2006) |
| 184 | System Response | PEOU | 3 | 2 | Cheng (2012), Li, Duan & Alfrod (2012), Pituch & Lee (2006) |
| 185 | System Support | PEOU | 1 | 1 | Cho, Cheng & Lai (2009) |
| 186 | Task Equivocality | PU | 2 | 1 | Lee, Hsieh & Ma (2011), Lee, Hsieh & Chen (2013) |
| 187 | Task Equivocality | PEOU | 2 | 0 | Lee, Hsieh & Ma (2011), Lee, Hsieh & Chen (2013) |
| 188 | Task Interdependence | PU | 1 | 0 | Lee, Hsieh & Ma (2011) |
| 189 | Task Interdependence | PEOU | 1 | 1 | Lee, Hsieh & Ma (2011) |

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| 190 | Task Technology Fit | PU | 5 | 4 | Hidayanto, Febriawan, Sucahyo & Purw&ari (2014), Hsiao & Chen (2015), Lee & Lehto (2013), Ma, Chao & Cheng (2013), Wu & Chen (2017) |
| 191 | Task Technology Fit | PEOU | 3 | 3 | Hidayanto, Febriawan, Sucahyo & Purw&ari (2014), Hsiao & Chen (2015), Wu & Chen (2017) |
| 192 | Teaching Materials | PU | 2 | 2 | Bhatiasevi (2011), Lee, Yoon & Lee (2009) |
| 193 | Teaching Materials | PEOU | 2 | 2 | Bhatiasevi (2011), Yi-Cheng, Chun-Yu, Yi-Chen & Ron-Chen (2007) |
| 194 | Technical Quality | PU | 2 | 0 | Lau & Woods (2008), Lau & Woods (2009) |
| 195 | Technical Quality | PEOU | 2 | 2 | Lau & Woods (2008), Lau & Woods (2009) |
| 196 | Technical Support | PU | 4 | 4 | Abbad, Morris & Nahlik (2009), Ngai, Poon & Chan. (2007), Sanchez & Hueros (2010), Sanchez, Hueros & Ordaz (2013) |
| 197 | Technical Support | PEOU | 6 | 5 | Abbad, Morris & Nahlik (2009), Freitas, Ferreira, Garcia & Kurtz (2017), Ngai, Poon & Chan. (2007), Sanchez & Hueros (2010), Sanchez, Hueros & Ordaz (2013), Williams & Williams (2009) |
| 198 | Technological Factor | PU | 1 | 0 | Hussein, Aditiawarman & Mohamed (2007) |
| 199 | Technological Factor | PEOU | 1 | 1 | Hussein, Aditiawarman & Mohamed (2007) |
| 200 | Technology Characteristics | PU | 1 | 1 | Ifinedo (2006) |
| 201 | Technology Characteristics | PEOU | 1 | 1 | Ifinedo (2006) |
| 202 | Training | PU | 3 | 2 | Escobar-Rodriguez & Monge-Lozano (2012), Lee, Internal & External (2008) |
| 203 | Training | PEOU | 3 | 2 | Escobar-Rodriguez & Monge-Lozano (2012), Lee, Internal & External (2008) |
| 204 | Training Impression | PEOU | 1 | 1 | Nan, Xun-hua & Guo-qing (2007) |
| 205 | Trialability | PU | 2 | 1 | Lee, Hsieh & Hsu (2011), Veloo & Masood (2014) |
| 206 | Trialability | PEOU | 2 | 1 | Lee, Hsieh & Hsu (2011), Veloo & Masood (2014) |
| 207 | Two Way Communication | PU | 1 | 1 | Cheng (2014) |
| 208 | Two Way Communication | PEOU | 1 | 1 | Cheng (2014) |
| 209 | Uncertainty Avoidance | PU | 1 | 1 | Sadeghi, Saribagloo, Aghdam & Mahmoudi (2014) |
| 210 | Uncertainty Avoidance | PEOU | 1 | 1 | Sadeghi, Saribagloo, Aghdam & Mahmoudi (2014) |
| 211 | Underst&ing | PEOU | 1 | 1 | Lin (2013) |
| 212 | Underst&ing | PU | 1 | 1 | Lin (2013) |
| 213 | University Support | PU | 2 | 1 | Al-Mushasha (2013), Williams & Williams (2009) |
| 214 | University Support | PEOU | 1 | 1 | Al-Mushasha (2013) |
| 215 | Usefulness for Professors | PU | 1 | 1 | Escobar-Rodriguez & Monge-Lozano (2012) |
| 216 | User Characteristic | PU | 1 | 1 | Ifinedo (2006) |
| 217 | User Characteristic | PEOU | 1 | 1 | Ifinedo (2006) |
| 218 | Vendors Support | PU | 1 | 1 | Macharia & Nyakwende (2009) |
| 219 | Vendors Support | PEOU | 1 | 0 | Macharia & Nyakwende (2009) |
| 220 | Vividness | PU | 1 | 1 | Lee & Lehto (2013) |