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September 27, 2018

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Abstract. In this paper we present a study that aims exploring two components of the Technology Acceptance Model. As evaluation environment, we used Tesys e-Learning platform, for data processing R programming language and for data collection Google Forms. The study indented to explore if there are significant differences between genders regarding the perceived usefulness and attitude towards evaluation using online educational environments. The questionnaire that explored the above-mentioned components was administrated to a group of students enrolled in full time education which never used e-Learning platforms. The results showed that the questionnaire was reliable and there is no cross-gender difference regarding students perceived usefulness of e-Learning platforms and their attitude towards using them. The overall feedback gathered from each of the explored items is positive with an above fourth grade on a one to five Likert scale.

Keywords: Interface evaluation · e-Learning · HCI.

1 INTRODUCTION

One of the main activities in which a student is envolved is evaluation for a specific discipline. Depending on the educational context, there can be several types of evaluations and some of them can be modeled using online educational environments. The most flexible type of evaluation is multiple choice quizzes with one or more valid answers as this type can be easily implemented in the e-Learning platforms and it will offer almost the same experience as the full-time education systems.

There are several advantages taking test using online educational environments, but also some drawbacks. The most important advantage is represented by elimination of the human error because once the system is set up and there the there cannot be errors during the correction and grading of the papers. Taking tests using online educational environments don't require the students to be in the classroom to take the test and there is no specific time to start the test as

the system can have an implemented countdown timer that may start once it is triggered by the student. Another advantage is also the time lost with redoing the testing setup that needs to be done every year or semester because once the system is set up with a consistent pool of questions it can be used over the years. The randomization used in most of the programming languages ensures a very objective questions selection and during the tests, depending on the number of questions, there is a low chance that two students can have the same question at the same time. Drawbacks are mostly technical, because an unreliable internet connection or low power delivery can interrupt the tests. Another drawback is that it is the availability of devices on which the test is held because in case of considerable number of students that hold the tests at the same time there is a significant number of devices which needs to be available for them.

The problem referred in this paper is to explore if there are significant indicators that can make the difference between groups of students and also how they perceive Tesys [1] e-Learning environment. Regarding the group separation, considering the context of the study, only a cross gender analysis could be performed because they had the same age and they were from the same faculty, specialization and year of study.

Taking into consideration all the benefits and drawbacks related to testing using e-Learning platform one problem is to understand how students perceive this action because their perception [2] can directly influence their motivation to learn. In this paper we aim to explore the Perceived Usefulness (PU) and Attitude Towards (AT) using Tesys e-Learning platform. PU and AT are two parts of Technology Acceptance Model (TAM) [3] which is a great theoretical tool that helps us to understand the students acceptance of e-Learning system.

Regarding TAM, there are seven components that should be explored every time we need to evaluate an e-Learning system and see how well it is accepted: perceived ease of use, perceived usefulness, attitude, behavioral intention, e-Learning self-efficacy, subjective norm, and system accessibility. In our case, we choose PU and AT because of the users experience with the e-Learning platform; in order to evaluate the whole model, the students should have had a full experience and they should have used all the platforms capabilities. Another reason regarding the exploration of only these two components is that the study subjects were students from full-time education and not distance learning programs. It is a difference between students engaged in distance learning programs and full-time education because these students are not supposed to use an e-Learning platform and they had the first contact during a test at one of the disciplines learned during the semester, so they had no previous experience. In the case of students from distance learning programs take time to learn the platform, they spend weekly several hours on it and somehow get more familiar with the e-Learning platform, so the results may vary from this approach.

For our experiment we used Tesys e-Learning platform, an e-Learning platform designed and developed at the University of Craiova. It was especially designed to fulfill the needs of the faculties from our University that have distance learning programs and it is continuously developed. We also pay efforts to

make it more user friendly and to be easier to be used by students and professors from any faculty with or without technical profile or background.

In this paper we aim to analyze if there are any differences between male and female [4] students and also how do they perceive the action of doing tests using e-Learning platforms and their attitude regarding this situation. In order to make this study, we used Wilcoxon [5] statistic for group separation and then we tested the reliability of the questionnaire using Cronbachs alpha [6]. After a short-related work, the method and the environment are described. The results obtained along with an analysis are described before the conclusions.

2   Related Works

The work described in this paper is the next step of analysis after three previous papers. First paper [7] aimed to evaluate the Tesys e-Learning platform interface but from a high-level view. The group size was small, and the questions were mostly about specific functionalities. The study revealed some small problems and helped us understand better how easy is to use the platform for both students and professors. These papers gave us the starting point for the next two papers extended the number of responders and also addressed more standardized problems. The next paper [8] explored one of the TAM components, perceived ease of use, and we had a slightly larger number of responders for it. The students that attended the study were engaged in a distance learning program and they were very familiar with the platform. There were several limitations revealed by the study and we considered that the professors interface needs to be evaluated as well. The last paper [9] explored the perceived ease of use but for the professors interface and the responders of the study were professors that were teaching on Tesys for two distance learning programs. There were four group separation questions at the beginning of the questionnaire but only two of them separated the professors into comparable groups and we could not find factors that influence directly how professors perceive the e-Learning platform. The evaluation of the professors interface gave us good feedback but no improvement directions and one of the factors that may influence this situation is that both students and professors that attended the previous studies were already familiar with the e-Learning platform, so they were able to find easily functionalities and controls.

Recent research published by Pribeanu et. al. [10] present a similar approach applied on Facebook users and on a larger group of responders. The study explored only PU component and the responders group had two separation factors: gender and country. The authors used eight items for PU exploration divided in three categories: social usefulness, information usefulness, and collaboration usefulness and the answers were evaluated on a seven items Likert scale. The findings presented in the paper show that in both countries, students perceive Facebook as being more useful for collaboration, Romanian students find Facebook more useful than the Lithuanian students and the female students have a higher perception of Facebook usefulness. There are also other papers that

explore Facebook and the motives of using it [11] using other methods but choosing TAM or TAM components provides a standardized approach and comparable results.

Gender difference exploration in online systems is a much older problem which was referred in many papers like Gender differences in Facebook addiction [12]. The authors performed the study at Technical University of Civil engineering from Bucharest and the aim of the paper was to analyze the relationship between the Facebook dependence and the negative consequences on the students' university work but also to analyze the measurement invariance across gender. Their results showed that females spend more of their time on Facebook which may allow the inference that woman tend to score higher at behavioral addiction involving social interaction [13].

Regarding TAM [14], there are many papers that present its usefulness on different domains like mobile commerce [15], online banking [16], online shopping [17] or even more general approach [18]. The authors of [14] state that over the time, TAM has evolved and became a key model in understanding predictors of human behavior toward potential acceptance or rejection of technology; this assumption is based on 85 scientific publication which have been selected and classified according to their aim and content.

Newer paper [19] explores the influence of gender and age on e-Learning platforms and enforce the idea that the success of e-Learning depends to a considerable extent on student acceptance and use of the technology. They also state that it has become imperative for practitioners and policy makers to understand the factors affecting the user acceptance of e-Learning environments in order to provide a better user learning experience. The authors found that age influences the effect of perceived ease of use, perceived usefulness, self-efficacy and behavioral intention and the gender influences the perceived ease of use, social norm and behavioral intention to use e-Learning systems. For our approach, we couldn't explore age as an influencing factor because all the students were enrolled on the same year of study and the age difference between them was small.

3   Method

3.1   Context of the study

For this study we used students from the third year of studies from the Faculty of Automation, Computers and Electronics so we can say that they had a technical background, but they had no previous contact with e-Learning platforms. The students had to take a test which consists of 10 questions regarding software engineering discipline and after that a questionnaire that is presented here was administrated. It is important to take into consideration some details of the test as it represents the experience they had with the e-Learning platform and it may influence the results from the questionnaire. There were 50 questions assigned to the testing unit and each student got 10 questions randomly assigned by

the system. The type of the questions was multiple choice questions and there were two minutes assigned for each question. The students had access also to a practice test with blank questions because this gave them the possibility to see how the test work and to be more accurate then they take the real one. Once the test was over, they had enough time to complete the questionnaire. The questionnaire consisted of 6 questions adapted to our context from the TAM model defined by S. Y. Park [3], one group separation question and one free completion form designed to receive feedback were added in order to improve the feedback and to extend the analysis capabilities.

Table 1. Explored items.

Item	Question
PU1	Doing tests through online educational environments would improve my learning performance?
PU2	Doing tests through online educational environments would increase my academic productivity?
PU3	Doing tests through an online educational environment would be easier than classical tests?
AT1	Doing tests through e-Learning platforms is a good idea?
AT2	Doing tests through e-Learning platforms is a wise idea?
At3	I feel positive about doing tests using e-Learning platforms?

Table 1 presents the indicators used to explore PU and AT regarding Tesys e-learning platform; we used three questions for each TAM explored component (PU and AT). The items were specifically designed and modified to capture the contrast between doing regular tests for full time education programs and test through e-Learning platforms. We used a one to five Likert scale for each question; for each answer one was assigned as the worth answer or a strong disagree and five to a positive answer or a strong agree with the statement

The pipeline of this study is presented in Figure. 1. We started with a test held on Tesys e-Learning platform that was designed to evaluate the students knowledge level. Then, the students were asked to complete a questionnaire which set up on Google forms. Once the study ended the data was preprocessed to a more familiar format and then we used R programming language to apply Cronbachs alpha and Wilcoxon statistic on this data in order to obtain the results presented in this paper.

Figure 2. presents the study design; on the left side we have the explored items and how they compose the explored components (PU and AT) of the TAM. Both components are explored using a questionnaire administrated to the students. On the gathered data we apply two statistical methods: Cronbachs alpha and Wilcoxon statistic which are used for group exploration and items reliability.

Figure 3. presents the ratio between of male and female that answered the questionnaire. The number of male students (37), which represents 63.8% of the
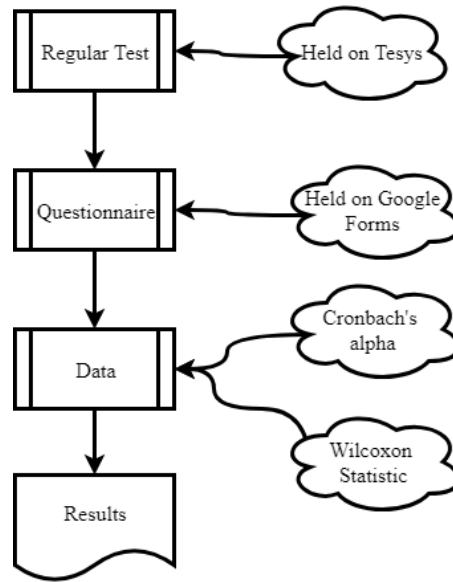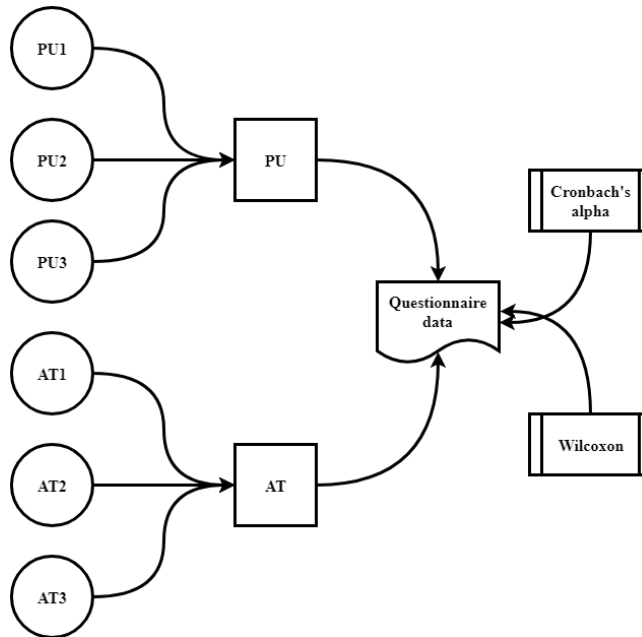
Fig. 1. Study pipeline.
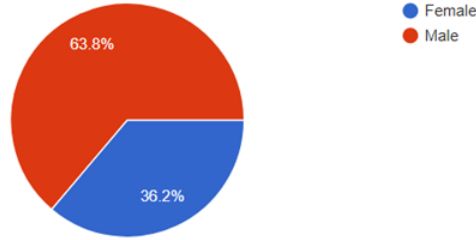

Fig. 2. Study design.

Fig. 3. Proportion between male and female

study audience, that answered is significantly bigger than the number of females (36.2%). We analyzed the proportions and also the number of responders before proceeding further and we concluded that the number of female responders (21 from the total of 58) is big enough to compute statistical differences between groups. All the collected data can be checked at https://goo.gl/ZVTwh4.

4   Study Results

The study presented in this paper analyses the differences between genders regarding the PU and AT using Wilcoxon statistic and how reliable are the answers gathered from the questionnaire using Cronbach alpha. First, we used Wilcoxon statistics on the data gathered from questionnaires after we split it based on the gender of the responder. After computing the p-value given by Wilcoxon we also computed the mean grade given by male and female responders for each question.

Table 2. Results based on Wilcoxon statistic.

Item	P-value	Mean for male	Mean for female
PU1	0.55	4.13	4.28
PU2	0.59	4	4.19
PU3	0.69	4.59	4.47
AT1	0.93	4.56	4.61
AT2	0.30	4.18	4.47
At3	0.27	4.40	4.66

Table 2. presents p-value and the mean value of the answers for male and female responders. The p-value must be less than 0.05 in order to conclude a strong statistical difference between genders and its range of values is from zero to one where one means a clear no statistical difference. In our case, p-value, indicate that user's gender does not reveal a statistical difference in terms of

analyzing perceived usefulness and attitude towards using an e-Learning platform for testing purposes. It is necessary to mention that in our case a strong impact may be represented by the context of the study as these students are very familiar with information technology. They are not familiar with e-Learning systems and they didnt had tests using e-Learning systems but depending on their knowledge they may tend to perceive the technology friendlier than others.

Exploring the grade gathered for each analyzed item we can see that there is a small overall difference between male and female subjects as females gave a slightly bigger grades at each question. From this analysis, even if every question got a grade bigger than four, female responders tend to perceive better the testing through e-Learning platforms and also their attitude towards using them is better. Overall, a grade bigger than four on a scale from one to five give us a good feedback regarding the explored items.

Table 3. Results based on Cronbach's alpha

Item	Raw alpha	Std. alpha	Mean value
PU1	0.75	0.76	4.2
PU2	0.74	0.76	4.1
PU3	0.82	0.82	4.6
AT1	0.75	0.75	4.6
AT2	0.73	0.74	4.3
At3	0.75	0.74	4.5

After applying Cronbach's alpha on the six explored items we gathered the values presented in Table 3. On the first column we have the identifier for a specific item and on the next ones the results regarding them. The second row presents the raw alphas value, which have values between 0 and 1. A value of 0.7 or higher for alpha represents a reliable questionnaire and the lowest acceptable value is 0.6. In our case, raw alpha is between 0.74 and 0.83 which ensures us the reliability for each question. The third column represents the standardized alpha based upon the correlations despite the second column which was alpha based upon the covariances [20]. In both of the cases the values are above the reliability limit and we can conclude that the results gathered from the questionnaire is reliable enough.

The mean value represents the average for each question and give us an intuition regarding the explored items. Our explored indicators regarding PU and AT got average values between 4.1 and 4.6. Regarding the question that got a mean of 4.1, it was exploring if students perceive the usage of e-Learning would improve the academic productivity. The mean is determined by thirteen students who graded less than four. The question that got the biggest mean value was referring the difference between doing classical tests and e-Learning tests; only six students graded less than four.

5   Conclusion and Future Work

This paper presents a study conducted on two components of TAM model which was applied on Tesys e-Learning platform. The results revealed that there is no statistical difference between male and female in terms of how they perceive the usefulness of using e-Learning platforms or their attitude towards using e-Learning platforms. Based on the explored items we could conclude that they perceive useful and have a good attitude regarding using the e-Learning platforms. We also performed reliability tests on the explored items in order to get an intuition regarding the values obtained for each of the explored items and the confidence factor scored high enough for each of them.

The study needs to be further extended in two main directions: one is to explore other TAM components or even to explore the whole model and the other one is to perform this study on a different group of students enrolled at other faculties. Enforcing the study with groups of students enrolled at other faculties can give us an intuition regarding the bias that may be given by their context.

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