The moderator role of Gender in the Unified Theory of Acceptance and Use of Technology (UTAUT): A study on users of Electronic Document Management Systems

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ABSTRACT

Venkatesh et al. [1] tried to integrate predictability capabilities from the different existing models of technology acceptance. This produced the Unified Theory of Acceptance and Use of Technology (UTAUT). This comprehensive model resulted in the identification of common aspects. It proposed several constructs with a greater explanatory power and analyzed moderating drivers, such as age, Gender, experience and voluntariness of use. By doing so, UTAUT identifies three major drivers of behavioral intention: performance expectancy, effort expectancy and social influence. On the other hand, facilitating conditions and behavioral intention were identified as determinant factors of actual use [1].

In addition to previous considerations about UTAUT, empirical research has scarcely analyzed the moderating role of Gender [2]. This is why this paper particularly aims to fill this gap. Hofstede [3] describes strength, competitiveness and guidance for material success as social roles linked to male values, whilst modesty, tenderness, sensitivity and concern for the quality of life are values associated with women. With respect to UTAUT, existing studies have shown that performance expectancy positively influences behavioral intention more strongly for men (cf. [4], [5], [6] and [7]). Moreover, it has been observed that effort expectancy positively influences behavioral intention more strongly for women (cf. [4], [5] and [6]), while social influence positively affects behavioral intention more strongly for women (cf. [5], [7] and [8]).

In our research, with the aim of testing the moderating effects of Gender, a sample of 2,175 users of Electronic Document Management Systems (EDMS) in Portuguese municipalities was used. Taking into account that Gender is a categorical variable, we have adopted a multi-group or multi-sample analysis [9] -dividing the sample into two groups (male = 748; female = 1,427) and estimating each group of observations separately. Before comparing the groups, an analysis of the measurement invariance was carried out to make sure that the construct measures were invariant between both groups [10]. Once the metric invariance had been assessed, we carried out a set of multi-group analyses –interpreting statistically-significant differences in path coefficients as moderating effects. On the one hand, the parametric approach considering both equal variances and different variances has been used [11, 12]. On the other hand, we have applied non-parametric approaches exemplified by the permutation test [13], and Henseler's PLS multi-group analysis [10, 12, 14]. This study notes slight differences in the results of the aforementioned methods. As a result, the moderating effect of Gender on the relation between performance expectancy and behavioral intention showed that this relationship is stronger among men than women. Finally, a discussion on the implications of Gender as a moderator for the UTAUT model is included.

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INTRODUCTION

The Technology Acceptance Model (TAM) has provided a theoretical basis to consider the reasons underlying the intention to use Information Systems and Technology (IST). Growing empirical findings have proved it to be a valid model for predicting IST acceptance and use. The TAM model's contextualization in different technologies involved additional constructs to the core model. Thus, this stream of research evolved supported on extensions of the TAM model. As a result of this, Venkatesh et al. [1] developed the UTAUT model to prevent the use of constructs from various models and provide a unified perspective of the acceptance of technologies. This model identifies three major constructs with great explanatory power. These major drivers of behavioral intention are performance expectancy, effort expectancy and social influence. The constructs facilitating conditions and behavioral intention were identified as determinant factors of actual use [1]. The role of moderating effects in the explanatory power of the UTAUT model is well-known [2]. In order to enhance the model's predictive power, Venkatesh et al. [1] included a group of moderating variables, such as age, Gender, experience and voluntariness of use. The introduction of these moderators allow the heterogeneity noticed in the observations to be tackled.

The role of Gender in human interactions with information systems and technology has been the subject of few studies (cf. [15], [16] and [17]). Nor are there many studies with the UTAUT model that considered the moderating effect of Gender (cf. [4], [5], [6], [7] and [8]).

During the 90s, with the emergence of the Electronic Document Management System (EDMS), Sprague [18] defined EDMS as the use of information systems and technology to manage and make digital documents available for organizational needs. Despite these features, the implementation of EDMS projects has a low rate of success, which depends on the use and acceptance of a large number of active employees [19].

With the aim of testing the moderating effects of Gender on the UTAUT model in a study on users of EDMS in Portuguese municipalities, this paper is structured as follows. The research hypotheses are proposed in the second section. The method is presented in the third section. Section four shows the data analysis and results. The final sections have the discussion with the identification of the implications for academics and professionals. We also refer to limitations and future research.

2 LITERATURE REVIEW AND RESEARCH HYPOTHESES

Based on Venkatesh et al. [1], Performance Expectancy refers to the extent to which employees believe that EDMS use improves productivity, speeds up work, is useful in performing their tasks and enhances their decision capacity. In research with the UTAUT model this construct presents a stronger influence on the Intention of Use than the other UTAUT constructs [2]. These studies have also shown that this positive effect of Performance Expectancy on Intention of Use is stronger for men (cf. [4], [5], [6] and [7]). The perception of success at work referred to by Performance Expectancy is related to the Hofstede [3] male values of strength, competitiveness and guidance for material success. In the same sense, Venkatesh and Morris [16] suggest that the work role is more important for men than the family role. Therefore, we hypothesize:

H1 (+): Performance Expectancy has a positive effect on Intention of Use.

H2 (M>W): Performance Expectancy has a stronger positive effect on Intention of Use for Men than for Women.

According to Venkatesh et al. [1], Effort Expectancy is related to the extent to which employees believe that EDMS use is easy and effortless. The positive effect of this construct on Intention of Use is verified in a significant body of UTAUT research [2]. Prior UTAUT studies' results presented this effect as being stronger for women (cf. [1], [4], [5] and [6]). Also, research prior to UTAUT suggests that an effort-oriented construct such as Effort Expectancy will have a greater effect on individual intentions for women (cf. [1], [16], [17] and [20]). Thus we hypothesize:

H3 (+): Effort Expectancy has a positive effect on Intention of Use.

H4 (W>M): Effort Expectancy has a stronger positive effect on Intention of Use for Women than for Men.

Social Influence can be considered, as defined by Venkatesh et al. [1], as the extent to which employees give importance to the opinion of others about their EDMS use. This effect of socially-influential factors is recognized in many UTAUT works [2]. In these cases the role of the Social Influence in the formation of the intention to use new technologies is observed (cf. [5], [7] and [8]). Also, some of these studies showed that women tend to be more permeable to the opinions of others [2]. This tendency of women makes Social Influence more significant at the

moment of forming an intention of EDMS use. Similarly, Venkatesh and Morris [16] suggest that women are more directed toward collective goals than men. We therefore present the following hypotheses:
H5 (+): Social Influence has a positive effect on Intention of Use.
H6 (W>M): Social Influence has a stronger positive effect on Intention of Use for Women than for Men.
In harmony with the UTAUT model [1] definition, Facilitating Conditions are the extent to which employees believe that there is technical and organizational support for EDMS use. Some studies have analyzed this variable and found its effect on Intention of Use to be significant [2].
Thus, we hypothesize:
H7 (+): Facilitating Conditions have a positive effect on Intention of Use.
The reflection of the effects of user knowledge and skills, access to resources and existing support on the Use of a technology and information system is consistent with the works of Ajzen [21], Thompson et al. [22] and Venkatesh et al. [1].Also, a large number of studies have verified the UTAUT's significant effect of Facilitating Conditions on Use [2]. Prior research on Gender differences indicates that women rate the importance of a support service and technical conditions in an organization more highly than men [3, 5]. We therefore present the following hypotheses:
H9 (+): Facilitating Conditions have a positive effect on Use Behavior.
H8 (W>M): Facilitating Conditions have a more positive effect on Intention of Use for Women than for Men.
H10 (W>M): Facilitating Conditions have a more positive effect on Use Behavior for Women than for Men.
Originating from the Theory of Reasoned Action of Fishbein and Ajzen [23], the Intention of Use construct measures the user's motivation to adopt a behavior. In this way, we suggest that employees' EDMS use is determined by their intention to carry out that EDMS use [1]. In a similar way to the UTAUT model [1], in this model the Intention of Use is influenced by Performance Expectancy, Effort Expectancy and Social Influence. In addition, Intention of Use is, along with the Facilitating Conditions, decisive in Use Behavior. After the work of Venkatesh et al. [1], various UTAUT research presented the positive effect of Intention of Use on Use behavior [2]. The above discussion allows us to formulate the following hypotheses:
H11 (+): Intention of Use has a positive effect on Use Behavior.

3 METHOD

3.1 Participants

The necessary data to carry out this empirical research were obtained from 2,715 valid responses to an on-line survey by EDMS users of Portuguese municipalities. They were invited to take part by e-mail with a link to the on-line survey. Considering Gender as a categorical variable, we have split the sample into two groups (men = 748; women = 1,427). The power analysis approach was used for the analysis of the necessary number of responses. The necessary 599 [24] responses for an alpha value of 0.05, a high power of 0.80, a small effect size and four predictors were largely surpassed.

3.2 Measures

The variables used in this research model were adapted from the UTAUT model [1]. Thus, the items from Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions and Intention of Use were properly adapted to the context of EDMS use. Moreover, the self-reported behavioral construct Use was measured by the items: number of hours by week [25], degree of frequency of use [26] and number of uses per week [25]. A pretest of the on-line survey was carried out with the participation of EDMS users, EDMS experts, academics and information system managers. The survey was applied after all the necessary adjustments had been made.

3.3 Data Analysis

For the analyzing of the measurement model and hypothesis testing we used Partial Least Squares (PLS). This technique is indicated for prediction and complex models [27], such as the model of this research. In addition, given that our study presents an incremental character, that is, it is based on the UTAUT model but with new structural paths introduced into it, PLS is very suitable. To carry out the data analysis we used the XLSTAT-PLSPM [28] and the SmartPLS software [29].
The moderating effects of Gender were analyzed through a multigroup comparison approach. This is due to the Gender type of variable being categorical [9]. For this purpose, responses were divided into two groups, depending on Gender. Then, with the use of PLS we estimated the path coefficients for each subsample [10]. Finally, we

analyzed the differences between the coefficients' paths. If they are significant, they can be interpreted as having moderating effects. To determine the significance of differences between the estimated parameters for each of the groups we have followed two approaches. On the one hand, the parametric approach considering both equal variances and different variances [11, 12]. On the other hand, we have applied non-parametric approaches exemplified by the permutation based procedure [13], and the Henseler's PLS multi-group analysis [10, 12, 14].

4 RESULTS

4.1 Measurement Model and Structural Model

The outer model is assessed in terms of validity and reliability. According to the PLS analyses, the measurement model is completely satisfactory for our model both with the total sample and with each subsample. Thus, our model meets the commonly-accepted guidelines [27] for item and construct reliability, and for convergent and divergent validity. Table 1 shows the results of the structural model assessment. Consistent with Chin [30], bootstrapping (500 resamples) was used to generate standard errors and t-statistics. All direct relationships are statistically significant in the entire sample. This result is also verifiable observing the percentile bootstrap 95% confidence interval of each path proposed[2]. R^2 values surpass the minimum level of .10 [31] and cross-validated redundancy measures show that the theoretical / structural model has a predictive relevance ($Q^2 > 0$).

Table 1. Structural model results.

	Total sample		Men		Women	
Effects on IU	$R^2 = 0.329$	$Q^2 = 0.152$	$R^2 = 0.382$	$Q^2 = 0.181$	$R^2 = 0.294$	$Q^2 = 0.136$
	Path	t-value	Path	t-value	Path	t-value
H1(+): PE -> IU	0.297***	12.399	0.372***	9.179	0.254***	8.559
H3(+): EE -> IU	0.057*	2.255	0.010ns	0.239	0.077**	2.425
H5(+): SI -> IU	0.104***	4.743	0.075*	1.967	0.118***	4.371
H7(+): FC -> IU	0.229***	8.995	0.254***	5.983	0.216***	6.771
Effects on U	$R^2 = 0.220$	$Q^2 = 0.051$	$R^2 = 0.201$	$Q^2 = 0.042$	$R^2 = 0.229$	$Q^2 = 0.054$
	Path	t-value	Path	t-value	Path	t-value
H9(+): FC -> U	0.150***	6.920	0.127***	3.321	0.160***	6.118
H11(+): IU -> U	0.378***	17.489	0.369***	9.647	0.384***	14.691

*p < 0.05; **p < 0.01; ***p < 0.001; ^{ns}: not significant (based on t(499), one-tailed test)
t(0.05; 499) = 1.64791345; t(0.01; 499) = 2.333843952; t(0.001; 499) = 3.106644601

4.2 Multi-group analyses

Once we have tested the structural model, we carry out the multi-group analyses. However, before comparing path estimates across groups it is necessary to ensure the metric invariance of the construct measures. That is, factor loadings for the same indicators should be invariant between groups. This means that the effect of Gender, as a moderating variable, is restricted to the path coefficients of the structural model and not on the item loadings of the outer model. For this purpose, we used the permutation-based procedure for multi-group analysis [13] applied to the standardized loadings. As a result, this test showed that only 2 of the 22 items (9.09%) present significant differences between groups. Therefore, practically, there is metric invariance, which is usually regarded as sufficient for the assessment of group effects [32].

Table 2. Metric invariance assessment. Permutation-based procedure for multi-group analysis. Analysis of significant differences in loadings between groups.

LV	PE				EE				SI				FC				IU			U		
MV	pe1	pe2	pe3	pe4	ee1	ee2	ee3	ee4	si1	si2	si3	si4	fc1	fc2	fc3	fc4	iu1	iu2	iu3	u1	u2	u3
Diff	.039	.001	.005	.010	.002	.016	.003	.012	.003	.022	.078	.065	.006	.017	.001	.064	.016	.017	.001	.004	.024	.013
P	.060	.892	.519	.731	.900	.115	.743	.253	.888	.337	.005	.079	.821	.562	.971	.084	.310	.358	.878	.001	.538	.592

[2] Because of paper length limits, we have not included these data.

Sign	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	Yes	No	No

Once the metric invariance has been evaluated, we proceed with the multi-group analysis. We start with the application of the parametric approach. This method was initially proposed by Chin [11]. The moderating effect is examined using a t-test with pooled standard errors. This approach requires the data to be distributed normally and/or the variances of the two samples are not too different from one another. In the case of our assuming different variances for the two samples, a Welch-Satterthwait test can be applied [10]. We have applied both tests in our comparison obtaining similar results (Table 3, see $t_{\text{Param(EV)}}$ and $t_{\text{param(NEV)}}$ respectively). This is due to the presence of large samples and almost equivalent variances (there are almost no significant differences in loadings between the groups) [11]. As we can observe, we only find statistically support for H2. The same result is derived from the application of the non-parametric approaches. These methods have the advantage that does not rely on distributional assumptions. First, the permutation-based procedure [13] is applied (Table 3, see $P_{\text{Permutation}}$). This technique is based on an approximate randomization test where a subset of all possible data permutations between groups is made. We have developed this analysis with XLSTAT-PLSPM [28]. In addition, we present the output from Henseler's PLS multi-group analysis [12] (Table 3, P_{Henseler}). "Initially, the subsamples are exposed to separate bootstrap analyses, and the bootstrap outcomes serve as a basis for testing the potential group differences" [10] (p. 202). We can observe differences in the results between both tests. This is because Henseler's approach is based on testing one-sided hypotheses, while the probability offered by the permutation test is built on a two-sided test.

Table 3. Multi-group analysis. Test Results.

	Path_{Men}	$\text{Path}_{\text{Women}}$	diff. (M-W)	$t_{\text{Param(EV)}}$	$t_{\text{param(NEV)}}$	$P_{\text{Permutation}}$	P_{Henseler}
H2 (M>W) PE -> IU	0.372	0.254	0.118	2.360[a]	2.347[a]	0.093[b]	0.035[c]
H3 (M<W) EE -> IU	0.010	0.077	-0.067	-1.356	-1.256	0.261	0.093
H6 (M<W) SI -> IU	0.075	0.118	-0.043	-1.074	-0.921	0.409	0.196
H8 (M<W) FC -> IU	0.254	0.216	0.038	0.664	0.715	0.579	0.698
H9 (M<W) FC -> U	0.127	0.160	-0.033	-0.906	-0.712	0.561	0.280

Notes: [a] Significant (one-tail t distribution, one-sided test); [b] Significant at 0.10; [c] Significant (one-sided test).

5 DISCUSSION

5.1 Theoretical Implications

With respect to the implications of this study for academics, it replicates an extension of the UTAUT [1] model. Therefore, it contributes to increasing the generalization of the UTAUT model. In addition, it develops the understanding of the role of Gender in the use of information systems by employees. Also, it increases the accumulated knowledge in this area of research and in the field of Information Systems.

The results from the direct model showed that the Intention to Use the EDMS is at first the result of the perception of its usefulness (Performance Expectancy), this being the most important determinant of Intention to Use [2]. Secondly, the perception that the organizational and technical support for the use exists is, along with the knowledge and skill as an EDMS user (Facilitating Conditions), the second strongest determinant of Intention to Use [2]. This relationship was not part of the UTAUT model [1], based on the argument that this effect was not significant in the presence of the relationship between Effort Expectancy and Intention to Use. Thirdly, what others think about their use of EDMS (Social Influence) is important for employees. This role in organizational contexts is suggested by Davis [25] and can be explained by EDMS supporting organizational processes that influence the need of employees to work with others. On the other hand, the Portuguese cultural dimension of power distance [3], which verifies an index value of 63, suggests that employees tend to exhibit a strong effect from Social Influence on Intention to Use. In addition, the low level (27) of Portuguese individualism [3], suggests a high respect for groups and that the collective opinion of others can have an impact on individual Intention to Use the EDMS. In addition, this system is used easily and effortlessly (Effort Expectancy) (cf. [1], [4], [5] and [6]).

The model analysis also showed that the EDMS use is determined by the Intention to Use it and also by the perception that there being hardware and software resources, knowledge and technical support allows users to overcome the barriers to EDMS use and facilitate it (Facilitating Conditions) [1].
In short, the research has empirically demonstrated the direct effects of the main constructs of the UTAUT model (Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions) on behavioral intention to use EDMS. However, results not observed in the UTAUT model were obtained. First, there is the significant relationship between Facilitating Conditions and Intention of Use. Second, the UTAUT model [1] demonstrated the effect of these constructs only with the moderation of Experience, Gender, Age and Voluntariness.
On the other hand, the moderating effect of Gender in the various relations in our model was studied. The results showed a particular sustenance for the suggestion that perceived features of EDMS can diverge between Genders. As expected, the results verified that Performance Expectancy had a stronger positive effect on Intention of Use for Men than for Women. The findings suggest that males are more driven by instrumental factors, more competitive, assertive, have a higher achievement motivation and perceive the EDMS as being more useful [1, 17]. However, from all of the moderation hypotheses, this was the only one to be verified. With respect to the relationship of Effort Expectancy, results suggest that women have an experience of EDMS use sufficient to mitigate some difficulty of use and complexity [1, 17]. Third, Social Influence moderation by Gender also reveals no Gender differences. These results suggest that women have a level of experience with EDMS use that is sufficient to be less influenced by processes of conformity. There are substituted by internalization. Also, with the experience of EDMS use women tend to be more confident about their judgments [1, 16].

5.2 Practical Implications

From the perspective of information systems and management professionals, the findings of this research also provide important implications. In this sense the research proposes a model to be used by managers in order to have an understanding about the role of Gender in EDMS adoption and use. The use of this model can take place at a single point of time, but to understand the evolutionary adoption of EDMS better, the model should be used periodically.
The study results indicate that the Gender role moderates the most significant relationship in the model: the effect of performance expectancy on behavioral intention of use. Given the findings, this effect is stronger for males than for females. Due to this, ways of increasing the performance expectancy of the EDMS should be contemplated. Thus, we propose the following measures: make mainly male users aware of the impacts of the EDMS on work performance; develop a variety of functions with a value that can help to meet the potential needs of the most demanding users, especially males; train with the aim of strengthening the expected consequences of EDMS, mainly for men; create structured training programs taking into account the different needs of each group and for each Gender; create organizational goals - group or individual- and time-related handling of documents; monitor pending cases of the employees, and of the working group for the process, thus making this process visible.
With respect to the effect of effort expectancy on the intended EDMS use, it is proposed that managers identify users, males or females, with little or no experience using the EDMS and create a clear interface for them that is easy to use and involves little effort. Managers should incentivize users to gain initial experience with the EDMS. When the effect of effort expectancy on the intended EDMS use is no longer significant, more advanced options and more complex interfaces with a focus on instrumentality should be offered, especially for males.
Also, the increase of the effect of Social Influence on EDMS adoption is not influenced by Gender. In this sense, the following measures are recommended: to publicize the success of early adopters; to cultivate a positive reaction to the EDMS by the organization's opinion leaders; to identify individuals with greater social capital during the pre-implementation of the EDMS and to create a Community of Practice.
For Facilitating Conditions we propose: emphasizing the successes and progress in order to increase self-confidence; informing that support is being offered to ensure that users have the necessary support and confidence to use the EDMS; ensuring technical improvements based on the necessities of the different users or group of users; inquiring with users' for suggestions in order to improve the information systems and working conditions; increasing EDMS acceptance by emphasizing in training that it is easy to use EDMS.

5.3 Limitations and future research

This research presents several limitations. Firstly, this study's model does not include all UTAUT [1] variables that moderate the effects of independent variables on those that are dependent. We propose future research of this

study's model with the moderating variables of organizational units, various EDMS software solutions, a hierarchical level of respondents, different sizes of organizations and with different levels of Hofstede's [3] cultural dimensions to those of Portugal. Secondly, the present study is limited to a single point in time. A longitudinal study could give us a view of the changes in users´ perceptions and intentions. Thirdly, with this study we cannot generalize the results to non-governmental organizations. Fourthly, frequency of use is measured in a self-reported way. Finally, the Gender was measured with a biological concept of Gender. Further research should use an index of masculinity to measure the Gender.

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