Perceived usefulness of Facebook for university students: A gender analysis across two countries

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ABSTRACT

The usefulness of Facebook for the university students has been widely researched in the last decade. Existing studies reveal a diversity of potential educational benefits, such as better student engagement, better student integration in the community, and valuable support for social learning. Few studies exist that analyze the gender differences and cultural differences in using Facebook. This paper aims at analyzing the gender differences as regards the Facebook usefulness perceived by university students. The perceived usefulness has been conceptualized as a global factor with three dimensions: social, information, and collaboration usefulness. An invariance analysis has been carried on to assess the invariance of the measurement model across gender using samples from two countries: Romania and Lithuania. In both countries, students perceived Facebook as more useful for collaboration. The results show that in Romania female students have a higher perception of Facebook usefulness. A third finding is that Facebook has been perceived as being more useful by the Romanian students than by the Lithuanian students.

Key words

Facebook, social networking websites, gender differences, cultural differences.

INTRODUCTION

The popularity of Facebook among university students stimulated the research on the educational potential of social networking websites. Several studies have been published in the last decade that highlight the potential educational benefits, such as better student engagement [13, 14], better student integration in the community [21], useful information sources [15, 16], and valuable support for social learning [5].

Few studies exist that analyze the gender differences and even fewer (if any) that analyze the cultural differences as regards Facebook use by university students.

A shortcoming of many studies that are reporting gender differences by applying traditional statistical significance tests is the assumption that respondents are interpreting the variables in the same way. This approach may work with independent variables but may lead to ambiguous results if the variables under consideration are measures of an underlying model. In this case, an invariance analysis is needed [6, 24, 27].

The purpose of this paper is to analyze the gender and cultural differences as regards the usefulness of Facebook. The study is focusing on the usefulness for educational purposes. In this respect, it does not include the usefulness for socialization or entertainment. The perceived usefulness has been conceptualized as a global factor with three dimensions: social, information, and collaboration usefulness. In order to test the model on samples from different countries, an evaluation instrument has been developed in the context of a cooperation between researchers from ICI Bucharest (Romania) and Siauliai University (Lithuania).

The paper has two main objectives. The first is to analyze the gender differences in each country. The second objective is to analyze if there are cultural (cross-national) differences for each gender. Two data samples have been collected: one from Romania (N=758) and the second from Lithuania (N=297). Then, an invariance analysis across gender has been carried on for each sample.

The rest of this paper is organized as follows. The following section presents related work with a focus on gender differences and Facebook usefulness. In the next two sections, the method and results are presented. The paper ends with a conclusion and future work.

RELATED WORK

Social media technologies are reshaping the way students are learning and interacting with each other. Facebook is the most popular social networking website among university students and is a challenge for educators to find the most suitable ways to exploit the educational potential.

The paradigm shift towards social learning requires considering a diversity of activities, such as meeting, active participation, critical thinking, information and content sharing [5]. As shown by Kumar [14], undergraduate students value the use of new technologies in e-learning and perceive Web 2.0 as a useful support for online discussions and engagement with their teachers and colleagues. Also, Arteaga-Sanchez et al. [3] suggest that Facebook should support collaborative and cooperative learning and may enrich the learning experience.

There are few studies that report gender differences in using Facebook in university contexts. This issue is a concern from both the computer-supported learning and e-learning aids in universities, such as the social media technologies.

Recent work in this are suggest that women are disadvantaged as regards the computer-supported learning and e-learning aids because of the inferior levels of access, technology literacy, and the dominant male behavior [11]. However, the assumption that difference implies disadvantage is challenged by the evidence that various factors, such as professed confidence and apparently dominant interaction styles, do not necessarily lead to better educational opportunity and performance. Furthermore, women often have better results than men despite the observable differences in the interaction style [11].

Evidence demonstrates that theoretical conceptions of computer-supported learning environments as offering equal opportunities are flawed because social and educational interaction that takes place through electronic channels loses none of the socio-cultural complexity or gender imbalance that exists in more traditional learning environments [28]. Such imbalances can be determined by cultural differences [10]. The impact of culture on conceptions of gender and behavior is identified as a strong determining factor of both the existence and the nature of differences [25]. So unequivocal generalization about gender differences in the usage of e-learning aids and computer-supported learning is impossible.

According to Gunn [11], the assumption that gender-based inequity as regards the access and computer literacy is a disappearing problem. This is based on the findings of his study and other various sources across the western world. The discussion turns to the differences that persist in this "more equitable" environment and possible interpretations of their impact. Losh [18] found that gender parity does exist in computer and Internet usage in the United States.

Link and Marz [17] identified gender differences in many computer-related aspects. They found that the men are using the computers more frequently, and have access to a better computer infrastructure, including the Internet connection.

Enoch and Soker [9] point to the presence of a digital divide among male-female university students in Israel, whereby males who form the dominant group are able to benefit more than the female subordinate group as the differences persist over time.

With regard to gender differences, Selwyn [23] data found female students to be significantly more likely to make use of the Internet for academic information seeking than their male counterparts. This finding runs counter to much of the research literature during the 1980s and 1990s which highlighted men's dominance in the area of education technology (for example, Sutton, [26]).

In terms of how academic information searching was patterned, female students were significantly more likely than male students to report looking for information about university studies/assignments [23]. The finding is also consistent with more general studies on Facebook usage showing that females and young people spend more time on Facebook and have more Facebook friends [20].

Donlan [8] has explored students' views on the use of Facebook in an academic context, finding, as with several previous studies, that the picture is far from clear and there is still a considerable amount of diversity among students in terms of existing adoption and willingness to use Facebook for teaching and learning purposes. Survey findings indicated an interest among students in using Facebook for a range of teaching and learning purposes, including accessing and posting links, discussing work with others and tutorials with lecturers. There was no significant difference between male and female students in their likelihood of using social networking sites.

While exploring the use of social networking tools, Rodriguez-Hoyos et al. [22] discussed the need to widen the research by including include other dimensions such as geographical and gender differences that could affect attitudes, resistance and actual uses of these sites.

Mazman & Usluel [19] carried out a study in Turkey (N=870) and found that females are using Facebook for maintaining existing relationship, academic usage, and the following agenda more than males do.

METHOD

Variables and data samples

In this study, a multidimensional model of the Facebook usefulness has been used that has three dimensions: social usefulness (US), information usefulness (UI), and collaboration usefulness (UC). The conceptual model has been developed and validated in a previous work [4] on a sample collected from a Romanian university. The constructs and items are presented in Table 1.

Table 1. Facebook usefulness for university students

Item	Statement
US1	Using Facebook improves participation in collective activities
US2	Using Facebook I can better present my university work to other people
UI1	Using Facebook I am better informed about events of interest in my university
UI2	Using Facebook I get useful information from university people
UI3	On Facebook, I can find useful resources for my university work
UC1	Using Facebook improves communication between colleagues
UC2	Using Facebook encourages the creation of academic groups based on similar interests and needs
UC3	Using Facebook improves student group work

The questionnaire has been administrated to university students from Romania and Lithuania. Students were invited to answer general questions (university, faculty, program of study, year of study, and demographics), questions regarding the Facebook use (network size, frequency, and duration of use), and then to evaluate the items on 7-points Likert scale.

The initial samples included 796 students from Romania and 303 students from Lithuania. After checking the completeness of the answers and the normality of the data, including univariate and multivariate outliers, several observations were eliminated so the working sample has 758 observations from Romania and 297 from Lithuania.

The demographics, the mean number of Facebook friends, and mean time spent daily are given in Table 2.

Table 2. Data samples

Variable	Romania (N=758)	Lithuania (N=297)
Gender M/F	418 / 340	118 / 179
Mean age	21.6 (SD=2.8)	22.3 (SD=5.3)
FB friends	756.0 (SD=816.2)	267.9 (222.2)
Min/Day	78.3 (SD=74.9)	94.3 (SD=103.8)

As shown in Table 3, in both countries female students have larger Facebook networks and spend more time daily on Facebook.

Table 3. Gender differences in usage

Variable	Romania	Lithuania
FB friends - M	684.2 (SD=737.5)	223.4 (227.2)
FB friends - F	844.3 (SD=896.9)	297.4 (227.4)
Min/Day - M	72.6 (SD=68.8)	89.7 (SD=76.3)
Min/Day - F	85.9 (SD=81.3)	97.3 (SD=118.6)

A one-way ANOVA showed that the gender differences are statistically significant in both countries as regards the number of Facebook friends and only in Romania as regards the time spent daily.

Methodological approach

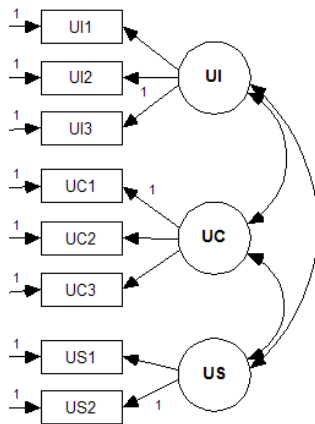The measurement model specification is presented in Figure 1.

Figure 1. The measurement model

The unidimensionality has been assessed by examining the loadings (λ) and t-values. The scale reliability has been assessed with the Cronbach's alpha. The convergent validity has been analyzed by examining the composite reliability (CR) and average variance extracted (AVE), following the recommendations in [1, 12].

In order to analyze the gender differences across the two countries, a methodological approach is required that is based on invariance analysis. The invariance analysis checks if the constructs are equivalent across groups [6, 27]. Lack of invariance across groups makes not possible to assess if the differences are due to different perceptions or to different interpretations of the evaluation instrument. In other words, the conclusions based on the measurement scale are ambiguous if not erroneous [27].

A multi-group CFA (MGCFA) using AMOS for Windows [2] has been conducted to check if the scale is invariant across gender. MGCFA is based on testing a hierarchical series of nested models, starting with a baseline model that fits all the samples together. The parameters are freely estimated and a baseline chi-square value is derived.

The nested models are obtained by adding constraints for invariance [6, 27]. Two tests have been used: $\Delta\chi^2$ (invariance if nonsignificant) and ΔCFI (invariance if the depreciation is less than 0.01) [7].

Metric invariance tests if the factor loadings are equivalent across groups (equality of scaling units). Metric invariance enables the comparison of the observed scores.

The scalar invariance tests the equality of the intercepts (origin of the scale) across groups. Scalar invariance enables the comparison of latent mean scores. The next test adds constraints for the equivalence of the structural covariance of factors (dimensions) and, if successful, enable the comparison of the inter-factor correlations.

Prior to carrying on the multi-group CFA, the model has been tested and validated on each group, in order to check the configural invariance. Configural invariance means that in each group the dimensions are perceived in a similar way (same pattern of free and fixed factor loadings on the items) [24, 27]).

RESULTS

Romanian sample

The first step is to test the model for each gender group. The descriptive statistics for the sample and each gender is presented in Table 4.

Table 4. Descriptive statistics (N=758)

Item	Male (418)		Female (340)		Total	
	M	SD	M	SD	M	SD
US1	4.47	1.57	4.68	1.50	4.56	1.54
US2	3.93	1.59	3.97	1.59	3.95	1.59
UI1	4.68	1.54	4.96	1.52	4.81	1.54
UI2	4.78	1.44	4.79	1.51	4.79	1.47
UI3	4.43	1.68	4.63	1.60	4.52	1.65
UC1	4.99	1.65	5.07	1.64	5.02	1.65
UC2	4.92	1.59	5.19	1.50	5.04	1.55
UC3	4.83	1.59	5.08	1.48	4.94	1.55

In all cases, the loadings were over 0.6, ranging from 0.68 to 0.83, providing evidence for unidimensionality. The scale reliability (Cronbach's alpha) was over 0.7 for all dimensions. The composite reliability (CR) was above the threshold of 0.7 and the average variance extracted (AVE) was above the threshold of 0.5, thus giving support for the convergent validity of each dimension.

The correlation between the three dimensions is statistically significant ($p<0.001$), the correlation coefficient ranging from 0.68 to 0.73.

Table 5. GOF indices

	N	χ^2	DF	χ^2/DF	TLI	CFI	RMSEA
Ro	758	120.54	34	3.55	0.95	0.97	0.058
Ro-M	418	68.43	17	4.025	0.94	0.97	0.085
Ro-F	340	52.11	17	3.065	0.95	0.97	0.078

The model fit with the data is very good. Although the chi-square is significant, the goodness-of-fit (GOF) indices are within the limits recommended by Hair et al. [12].The testing results are summarized in Table 5

The model testing results on each group provide evidence for the configural invariance of the Romanian sample across gender.

Next step is to test the metric invariance by constraining the loadings to be equivalent. The model comparison shows a nonsignificant chi-square difference ($\Delta\chi^2$ = 2.30, ΔDF = 5, p = .806), therefore the model exhibits metric invariance. This means that the model has been perceived in the same way in each group.

Testing the scalar invariance is done by constraining the intercepts to be equivalent. Although the model comparison shows a significant chi-square difference ($\Delta\chi^2$ = 17.55, ΔDF = 8, p = 0.004), the depreciation of CFI is less than 0.01 so the model has scalar invariance, according to this criterion [7].

The test for the structural covariance invariance resulted in a non-significant chi-square difference ($\Delta\chi^2$ = 8.94, ΔDF = 6, p = 0.685). The results of the invariance analysis are presented in Table 6.

Table 6. Model comparison for the Romanian sample (N=758)

Model	$\Delta\chi^2$	ΔDF	p	CFI	ΔCFI
unconstraint				0.969	
measurement weights	2.30	5	0.806	0.970	0.001
measurement intercepts	17.55	8	0.004	0.964	-0.006
structural covariances	8.94	6	0.685	0.965	0.001

Overall, the invariance analysis results enable an analysis of gender differences for the Romanian sample.

Lithuanian sample

The descriptive statistics for the sample and each gender is presented in Table 7.

Table 7. Descriptive statistics (N=297)

Item	Male (118)		Female (179)		Total	
	M	SD	M	SD	M	SD
US1	4.30	1.63	4.37	1.66	4.34	1.64
US2	3.78	1.84	3.68	1.92	3.72	1.88
UI1	4.58	1.83	4.49	1.94	4.53	1.89
UI2	4.99	1.60	4.60	1.86	4.75	1.77
UI3	4.25	1.76	3.81	1.87	3.98	1.84
UC1	4.60	1.73	4.66	1.83	4.64	1.78
UC2	4.70	1.62	4.99	1.70	4.88	1.67
UC3	4.79	1.61	4.74	1.67	4.76	1.64

The loadings were over 0.6, with one exception, ranging from 0.56 to 0.90. The correlation between the three dimensions is ranging from 0.68 to 0.90. The scale reliability (Cronbach's alpha) was over 0.7 for all dimensions.

The composite reliability and the average variance extracted were above the threshold of 0.7, respectively 0.5 (except for one dimension), thus providing evidence for the convergent validity of each dimension.

The model fit with the Lithuanian data is acceptable. Although the chi-square is significant, the goodness-of-fit (GOF) indices are within the limits recommended by Hair et al. [12]. The testing results are summarized in Table 8.

The model testing results provide evidence for the configural invariance of the Lithuanian sample across gender.

Table 8. GOF indices

	N	χ^2	DF	χ^2/DF	TLI	CFI	RMSEA
Lt	297	100.30	34	2.950	0.90	0.94	0.081
Lt-M	118	68.42	17	4.025	0.94	0.97	0.085
Lt-F	179	52.11	17	3.065	0.95	0.97	0.078

The test for metric invariance shows a nonsignificant chi-square difference ($\Delta\chi^2$ = 2.30, ΔDF = 5, p = .361), therefore the model exhibits metric invariance. Testing the scalar invariance also shows a nonsignificant chi-square difference ($\Delta\chi^2$ = 14.82, ΔDF = 8, p = 0.063), so the model has scalar invariance.

The test for the structural covariance invariance resulted in a non-significant chi-square difference ($\Delta\chi^2$ = 3.63, ΔDF = 6, p = 0.726). The results of the invariance analysis are presented in Table 9.

Table 9. Model comparison for the Lithuanian sample (N=297)

Model	$\Delta\chi^2$	ΔDF	p	CFI	ΔCFI
unconstraint				0.939	
measurement weights	5.47	5	0.361	0.938	-0.001
measurement intercepts	14.82	8	0.063	0.932	-0.006
structural covariances	3.63	6	0.726	0.924	-0.008

Overall, the invariance analysis results enable an analysis of gender differences for the Lithuanian sample.

Gender analysis

The gender differences are firstly analyzed at dimension level. The descriptive statistics (mean value and standard deviation) for each group are presented in Table 11.

Table 11. Gender differences in the usefulness dimensions

Gender		Romania			Lithuania		
		US	UI	UC	US	UI	UC
Male	M	4.20	4.63	4.91	4.04	4.61	4.70
	SD	1.40	1.32	1.40	1.56	1.50	1.32
Female	M	4.32	4.80	5.11	4.03	4.30	4.80
	SD	1.36	1.36	1.32	1.59	1.60	1.45

In the Romanian sample, female students have a higher perception of each Facebook usefulness dimension. A one-way ANOVA (1, 756. 757) showed that the gender differences are marginally significant for the information usefulness (F=2.895, p=.089), and significant for the collaboration usefulness (F=3.990, p<0.046).

In the Lithuanian sample, male students have a higher perception of the social and information usefulness while female students valued higher the collaboration usefulness. The one-way ANOVA test (1, 295,296) showed that the differences are marginally significant for the information usefulness (F=2.750, p<0.098).

A more detailed comparison could be done at observed score level. The mean values are presented in Table 13.

In the Romanian sample, female students scored higher all items. The differences are statistically significant for three items (UI1, UC2, UC3) and marginally significant for two (US1, UI3). In the Lithuanian sample, male students scored higher five items (US2, UC3, and all information usefulness items). However, only one difference was significant (UI3) and another marginally significant (UI2).

Table 12. Means of the observed scores

	US1	US2	UI1	UI2	UI3	UC1	UC2	UC3
Ro-M	4.47	3.93	4.68	4.78	4.43	4.99	4.92	4.83
Ro-F	4.68	3.97	4.96	4.79	4.63	5.07	5.19	5.08
Lt-M	4.30	3.78	4.58	4.99	4.25	4.60	4.70	4.79
Lt-F	4.37	3.68	4.49	4.60	3.81	4.66	4.99	4.74

As regards the structural covariance, the gender differences are small, except for the correlation between the information and collaboration dimensions, which is stronger for the female students in the Lithuanian sample.

Cross-country analysis

Given the gender differences in each country, a cross-country comparison makes sense for each gender. In order to do this, MGCFA and an invariance analysis have been carried on for each gender.

The model comparison results for the male sample (N=536) shows metric, scalar, and covariance invariance (see Table 13).

Table 13. Model comparison for the male sample (N=536)

Model	$\Delta\chi^2$	ΔDF	p	CFI	ΔCFI
unconstraint				0.962	
measurement weights	14.78	5	0.011	0.956	-0.006
measurement intercepts	15.07	8	0.058	0.953	-0.003
structural covariances	16.94	6	0.009	0.947	-0.006

Romanian male students scored higher on each dimension. The ANOVA test showed that the differences are not statistically significant. At observed score level, Romanian male students scored higher, except for the item UI2 (getting useful information from university people). The ANOVA test showed that the difference is only statistically significant only for the item UC1.

The model comparison results for the female sample (N=519) shows only a metric invariance. The results are presented in Table 14.

Table 14. Model comparison for the female sample (N=519)

Model	$\Delta\chi^2$	ΔDF	p	CFI	ΔCFI
unconstraint				0.959	
measurement weights	9.47	5	0.092	0.957	-0.002
measurement intercepts	30.88	8	0.000	0.945	-0.012
structural covariances	20.91	6	0.002	0.937	-0.008

The cross-country comparison shows that the Romanian female students have a higher perception as regards all items of the Facebook usefulness. The ANOVA test showed that the differences are statistically significant, except for the items US2 and UC2.

DISCUSSION

The analysis of invariance across gender in two countries provides evidence for the configural, metric, and scalar invariance. This finding has two implications: it brings further evidence for the reliability of the measurement scale and enables gender and cultural analyses.

The main contribution of this study is the analysis of gender differences as regards the Facebook usefulness as perceived by university students from Lithuania and Romania. This analysis has been performed both at country level and across the two countries.

In both countries, both genders perceived Facebook as being more useful for collaboration, then for information.

In Romania, female students have a higher perception of the Facebook usefulness. The gender differences are higher and statistically significant for most of the Facebook usefulness measures. The results are consistent with previous findings showing that females are more interested in the academic use of Facebook [19, 23].

In Lithuania, the results show that male students have a higher perception of information support while female students scored higher than their male colleagues on the collaboration support.

A third finding is that for the female students, Facebook has been perceived as being more useful by Romanians than by Lithuanians. A possible explanation is a difference as regards the size of the Facebook network which is much larger in the Romanian sample. Having more Facebook friends is increasing the information source and provides more opportunities for collaboration. In the case of male students, the cross-country comparison shows a higher perception of the Romanians.

There are several limitations that should be considered for future research. First, there are typical limitations because of the cross-sectional nature of the study. Second, the study is limited by the overall objective of identifying the potential educational outcomes of Facebook. As such, it does not consider the usefulness for socialization and entertainment. Third, the data have been collected from only two countries.

CONCLUSION AND FUTURE WORK

This study contributes to a better understanding of the perceived usefulness of Facebook for university students. The results provide evidence for the reliability and validity of the scale that exhibits metric and scalar invariance across gender in each country.

There are several research directions to advance the study of gender and cultural differences as regards the Facebook use in universities. Future research needs to validate the model on other samples and check the invariance on samples from other countries. Also, a qualitative study may shed light on each dimension of the Facebook usefulness and explain more specific gender differences. A research question to be answered is if there are gender or cultural differences as regards the information and collaboration usefulness.

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