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Unveiling the Usage of Technology in Higher Education Institutions (HEIs) in Pakistan: A Study Employing Multi-Group Analysis (MGA)

Muhammad Asif Munir Mr.
University of Central Punjab, Lahore, masifmunir@gmail.com

Ghulam Shabir Dr.
University of Central Punjab, Lahore

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Abstract

Technology has brought changes in the behavioral intentions of students in higher education institutions (HEIs). It also helps them to be creative and innovative during their studies at universities. Literature review reveals that technology acceptance model (TAM) has been widely studied but unfortunately the usage of technology at academia has never been comparatively measured between private and public higher education institutions. This study measures effects of TAM-core variables on academic performance of graduate students of public and private HEIs, additionally, the moderating role of academic self-efficacy between actual usage of social media and academic performance was tested. By using a quantitative method followed by a convenient sampling approach, this study tested multi-group analysis (MGA) by using Smart PLS 3.3.3. The designed survey questionnaire was administered among the students of public and private HEIs. The findings showed that all FOUR dimensions of TAM had a significant impact on academic performance in both public and private HEIs. The moderating role of academic self-efficacy on academic performance was significant in private HEIs but not in public. The results suggest that private sector educational institutions provide better technological facilities to their students than public sector educational institutions. Based on MGA, the impact of perceived ease of use and perceived usefulness on intention to use social media had a significant difference between public and private HEIs. The study also provides the research contribution, limitations, and future directions.

Keywords: TAM-core variables, actual use of social media, academic self-efficacy, academic performance, Multi-group Analysis (MGA), Graduate Students of HEIs

Introduction

Today, technological advancements in social media have brought a wonderful world. The applications related to social media have brought changes and innovations in the learning behaviors of the students. It is the fundamental theme, this study encompasses the learning behaviors of the graduate students of the public and private Higher Educational Institutions (HEIs).

The usage of social media platforms like YouTube, LinkedIn, and Twitter are quite productive given for purely academic purposes and enhancing coordination between teachers-to-teachers and students-to-teachers or teachers-to-students in Ghana (Afful & Akrong, 2019) however, there was a need of the hour to integrate modern technologies into learning processes i.e. library books sharing and other digital resources sharing from the platform of the library. So, as long as, social media are now used for purely academic purposes, its usage is quite productive.

The researcher revealed in the Saudi Arabian context that the students are inclined to use social media for enhancing their social interactions among peer groups, academic as well as social discussion and social media platform including YouTube, LinkedIn, and Twitter which are considered the most usable social media applications divided the entire world into two spectrums of life; online and offline (Talaue et al., 2018). Undoubtedly, social media has improved the communication and coordination between academician students and their faculty-based teachers on social platforms. Where they are acting as the bridge between teachers and students for sharing valuable information including notes, academic events, conferences, etc. The influence of using social media on students' academic performance and was found quite astonishing in Malaysian Tertiary Institution (Mensah & Nizam, 2016), and the effect of this type was negative on students' academic performance but social media may have more positive effects on student' academic performance (Helou & Rahim, 2014). Therefore, this study scrutinizes to test the impact of social media usage on academic performance.

Based on social media, Davis (1989) proposed TAM (Technology acceptance model) that is the bridge of positive psychology towards motivation and self-determination. Besides, the proposed TAM was composed of FIVE core variables such as perceived ease of use (PEU), perceived usefulness (PU), intention to use (ITU), and actual use (AU) although, PU and PEU are the most influential factors for directly and indirectly enhancing academic performance (AP) (Marangunić & Granić, 2015). Additionally, motivational and academic factors like academic self-efficacy (ASE) enlightens the notion of strengthening PEU and PU are found in the study of Abdullah & Ward, (2016) and Schepers & Wetzels (2007). As well, both the core variables of the TAM model that facilitate the users to adopt and implement the usage of social media technologies in academic institutions (Edmunds, Thorpe and Conole, 2012). Based on the above empiricism, this study sees the effect of TAM-core variables in higher educational institutions.

Besides, self-efficacy means the phases of irrevocability society has the highest capacity to target and achieve the goals e.g. academic performance (Bandura, 1997). It was suggested that ASE impacts behavioral intentions that keep taking initiatives to obtain a specific goal, how much struggle be obliged to accomplish the task, and the degree of determination to pact with difficulties and hurdles to achieve the special findings (Bandura, 1982) and findings of the study showed that ASE may influence the students' AP (Hu, Clark & Ma, 2003). Besides, Bandura (1997) proved that the AP and ASE of the students are the anticipated outcomes of TAM-core variables in innovating the behavioral intentions. It scrutinizes academic performance and academic self-efficacy. Furthermore, ASE is the predicted component of in-depth coverage of the students' competencies such as academic performance (Pajares, 1996; Pajares & Miller, 1995). Based on empirical pieces of evidence, this study intends to sightseeing the effect of TAM-core variables on students in higher educational institutions. This was the unique study that employs the Multi-group analysis (MGA) to measure the significant difference of students' self-efficacy and academic performance by social media usage (TAM-core variables) between the Public and Private higher educational institutions (HEIs) because, this study scrutinizes the future directions of Asif, Bashir and Shahbaz (2021) who further suggest to comparing students' self-efficacy and academic performance between Public and Private HEIs. Therefore, the present study considers the influence of TAM-core variables on AP interestingly, the study explores the moderating role of ASE over AU of social media and AP of the graduate students in Punjab, Pakistan.

Literature Review and Hypotheses Development

Linkages among TAM-Core Variables

The technology acceptance model (TAM) was projected on the Reasoned Action theory of Martin Fishbein in 1967 (Fishbein, 2008) that linages TAM-core variables including Perceived ease of use (PEU), Perceived usefulness (PU), intention to use (ITU), and actual use (AU) of social media (Davis, 1989). Besides, Mathieson, (1991) compared the technology acceptance model (TAM) regarding the theory of planned behavior (TPB) to check the intents of users of social media in using information systems. The study found that both theories had the good predictive power to foretell an individual's intention to practice an evidence system by PEU and PU of social media. It was further found that the technology acceptance model was easier to apply to predict peoples' intentions to use technology as compare to theory of planned behavior. It was also noted that specific information was provided by TPB whereas the information general was general. This

study highlights that TAM is easy to apply for understanding the individuals' intention to use media technology. Likewise, the previous study scrutinized that PEU and PU had a positive linkage that auxiliary impact intention to use of information technology system (Davis, 1993).

TAM is generic in gauging users' behavior of technology acceptance and there are substantial empirical pieces of evidence about the usability of TAM to investigate users' technology acceptance behavior thus it has made it a popular theory (Hu, Clark & Ma, 2003) that extends the link between ITU and AU of technology (Edmunds, Thorpe and Conole, 2012). These findings were more consistent with the study of Al-Adwan and Smedley (2013) to explore TAM-core links among students of Jordanian Universities. Meanwhile, examining the students' intentions and acceptance to utilize learning management systems in universities, Eraslan Yalcin and Kutlu (2019) established that TAM has been widely used to explore the intentions to accept and adopt several technologies including information systems, online applications, and software in the last few years. It is further observed that there are considerable empirical pieces of evidence about the effectiveness of TAM in understanding the actual usage of technology by the postgraduate students of Pakistan (Asif, Bashir and Shahbaz, 2021). This theory has strong linkage with this study, as social media is comparatively a new phenomenon based on emerging trends and the theory discusses the adoption and acceptance of new technologies are based upon people's perception about the usefulness of the technology and ease of use of the technology. The study in hand also intends to explore the adaptive behavior of the students regarding social media for improving students' AP of the graduate students of both Public and Private HEIs. Based on the above discussion and literature pieces of evidence, the present study develops the research hypotheses.

H1a: b. Perceived ease of use (PEU) of social media affects perceived usefulness (PU)

H2a: b. Perceived usefulness (PU) of social media affects intention to use (ITU) of social media

H3a: b. Perceived ease of use (PEU) of social media affects intention to use (ITU) of social media

H4a: b. Intention to use (ITU) of social media affects actual use (AU) of social media

Actual Usage of Social Media and Academic Performance

Widely, actual usage is a behavioral intention to use technology in actual time and real place. The actual use of technology devotes behavioral psychology to do indeed. Like, Wood and Locke, (1987) conducted studies in four tenures and found that AU of social media is the key to boost the

AP of the students (Mathieson, 1991). Additional, the previous study showed in Pakistan higher educational institutions that the significant effect of AU of social media on AP of postgraduate students of HEIs was proved (Asif, Bashir and Shahbaz, 2021) however, the researchers suggested seeing the comparative effect of AU of social media on AP of the graduate students in Public and Private HEIs. Based on empirical shreds of evidence, this study sightsees the significant difference of AU of social media on AP between the Public and Private HEIs, Pakistan.

H5a: b. Actual use (AU) of social media influences academic performance (AP)

Moderation of Academic Self-efficacy over Actual Usage of Social Media and Academic Performance

Self-efficacy is painstaking as the elevations of inevitability folks have in their capability to achieve or accomplish certain tasks (Bandura, 1997). It is observed that personal efficacy affects the behavior that becomes a reason to take initiatives to start a specific task, how much effort will be put to achieve the objective, and the degree of perseverance to deal with challenges and difficulties to achieve the result (Bandura, 1982). Findings of several pieces of research are evident that self-efficacy resulted in higher academic performances (Asif, Bashir and Shahbaz, 2021) even though the intensity of the relationship differs among the studies. Bandura (1997) contended that for ASE to anticipate the outcome of performance, ASE estimations ought to be made toward components vital to the achievement of the individual behavior and his/her interest.

Self-efficacy measures and performance must be lying within the same behavioral sphere. The parameters that the researcher chose as the foundation for self-efficacy rankings must be the parameters required in executing consequent performance (Lachman & Leff, 1989; Pajares, 1996; Pajares & Miller, 1995). Hence, self-efficacy research must engage an exhaustive analysis of the competencies that support performance. The study conducted in Pakistan HEIs revealed that ASE was moderated the effect over AU of social media and academic performance of the postgraduate students in HEIs (Asif, Bashir, and Shahbaz, 2021). Although the influential differences of AU of social media and AP of graduate students were not explored, therefore, this should be done in the future (Asif, Bashir and Shahbaz, 2021). Based on the above discussion, this study proposes the research hypothesis:

H6a: b: Academic self-efficacy (ASE) moderates the influence of actual usage (AU) of social media on academic performance (AP)
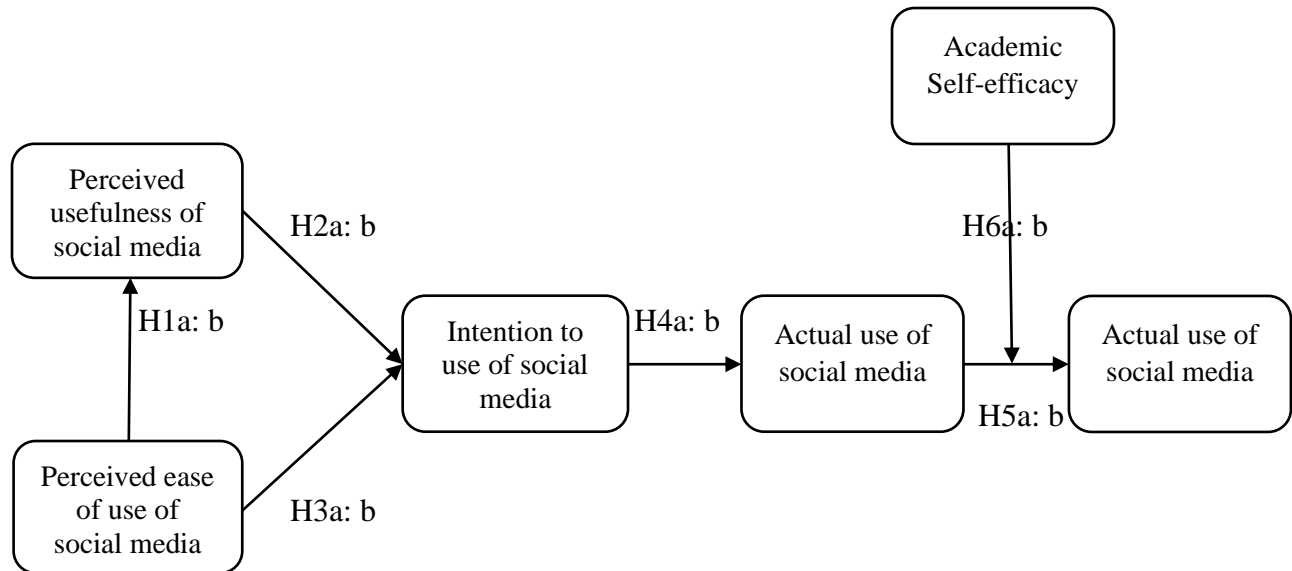
Note: 'a' represents Public HEI's and 'b' represents Private HEI's

Figure 1. TAM-core variables Model 1

Research Methodology

Population and sample size

The quantitative research method was investigated by using the convenient sampling technique. The study administered the designed survey questionnaire among the public and private Higher Educational Institutions (HEIs). The researcher personally and face to face administered 605 survey questionnaires among the students of public and private Higher Educational Institutions (HEIs). Out of 605, 391 survey questionnaires were correctly answered and validly responded. Therefore, the response rate was almost 64.63%. 203 students have participated from the public HEIs and 188 students have participated from the private HEIs. Almost 51.9% of students were from private HEIs and 48.1% of students were from public HEIs.

Demographic information

The study provides the demographic information of the students who participated in the research. At the overall sampling stage, almost 199 (50.9%) of students were under the age of 25 years and 192 (49.1%) students were above the age of 25 years. 215 (54.9%) students were male students and 176 (45.1%) of students were female students. 178 (45.5%) of students were from the rural areas of Punjab and 213 (55.5%) of students were from the urban areas of the province Punjab.

Survey Instrument

This study employs the TAM-core Model in Public and Private Higher Educational Institutions (HEI's) to explore the impact of TAM-core variables on academic performance and through the moderation of academic self-efficacy. TAM is comprised of FIVE dimensions including perceived usefulness (PU), perceived ease of use (PEU), intention to use (ITU), and actual usage (AU). This model was adapted from the developed scale of Davis et al. (1992). TAM-core Model was proved to be valid and reliable in the previous empirical studies (Aboelmaged, 2010; Pikkarainen et al., 2004) and Eraslan Yalcin & Kutlu, (2019). Six items of PEU of social media have been adapted from (Eraslan Yalcin & Kutlu, 2019; McKenzie et al., 2006). ITU of social media comprised of six items has been adapted from Ronnie H. Shroff, (2011). AU of social media, comprised of three items has been adapted from (Eraslan Yalcin & Kutlu, 2019). The academic performance consists of five items from Peter Osharive (2015), Questionnaire (SMAAPOS) and eight items of academic self-efficacy from Morgan and Jink Self Efficacy Scale (MJSES) (1999). All measurement scale items were measured using a 5-point Likert scale ranging from 1=not et al to 5=frequently.

Results of the study

Assessment of Measurement Model

Assessment of measurement model includes the construct validity and reliability (Hair et al. 2017; 2019). For assessing construct validity and reliability, this study runs the algorithm technique by using Partial Least Square Structural Equation Modeling (PLS-SEM). Foremost, in this study trial, the construct validity includes both convergent validity and discriminant validity. Additionally, convergent validity includes two parameters of assessing factor/outer loadings of construct' items which value should be higher than 0.7 as well as the average variance extracted (AVE) which value should be higher than 0.5. Meanwhile, discriminant validity includes cross-loadings which loadings should be higher than the loadings of another construct, and heterotrait-monotrait (HTMT) ratio which value should be lesser than 0.9 (Hair et al. 2013; Hair et al. 2019 and Sarstedt et al. 2020). This study runs an algorithm and finds that 1 item of perceived ease of use of social media (*PEU6=0.590*) and 2 items of academic self-efficacy (*ASE4=68, and ASE8=626*) was deleted from the model due to low factor loadings. Then, this study runs the algorithm again. *Table .1* presents that the outer loadings of all six constructs' items were greater than 0.7 and the average variance extracted explained above the 50% variance in latent variables. Therefore, there was good convergent validity of the six constructs. In the meantime, cross-loadings of each construct' items were higher than the loadings of another construct in the model and heterotrait-monotrait ratios of

all six constructs were lesser than 0.9 (*Table .2*). So, there was also good discriminant validity in the model. Finally, this study concluded that the constructs in the model had good validity. On the other hand, the reliability value of the construct should be higher than 0.7 (Hair et al. 2020; Wong, 2013) therefore, *Table .1* shows that the reliability value of each variable/construct in the present model was higher than 0.7. Resultantly, the constructs had good validity and reliability.

Table 1. Validity and reliability of the constructs

Scales	Standardized loadings	Composite reliability	AVE
TAM-core Dimensions			
Perceived Usefulness of social media		0.910	0.628
PU1	0.727		
PU2	0.844		
PU3	0.791		
PU4	0.819		
PU5	0.797		
PU6	0.771		
Actual Usage of social media		0.840	0.637
AU1	0.784		
AU2	0.809		
AU3	0.800		
Perceived ease of use of social media		0.925	0.713
PEU1	0.752		
PEU2	0.883		
PEU3	0.868		
PEU4	0.871		
PEU5	0.842		
Intention to use of social media		0.892	0.580
ITU1	0.732		
ITU2	0.736		
ITU3	0.775		
ITU4	0.799		
ITU5	0.763		
ITU6	0.764		
Academic Performance		0.913	
AP1	0.818		
AP2	0.802		
AP3	0.888		
AP4	0.854		
AP5	0.751		
Academic self-efficacy		0.907	0.620
ASE1	0.752		
ASE2	0.736		
ASE3	0.786		

ASE5	0.777	
ASE6	0.834	
ASE7	0.835	

Notes: AVE = Average variance extracted

Table 2. Heterotrait-Monotrait Ratio (HTMT)

	Academic Performance	Academic self-efficacy	Actual Usage of Social Media	Intention to use of social media	Perceived ease of use of social media
Academic self-efficacy	0.654				
Actual Usage of Social Media	0.724	0.776			
Intention to use of social media	0.731	0.646	0.695		
Perceived ease of use of social media	0.698	0.658	0.671	0.633	
Perceived usefulness	0.843	0.677	0.703	0.746	0.669

Assessment of Path Model

This study runs bootstrapping technique to assess the path coefficient (Hair et al. 2020; 2019). This bootstrapping was run by applying 1000 subsamples. This technique is used to test the path coefficient (regression effect) between independent and dependent construct. By assessing the path coefficient, there would be analyzed three important parameters including path coefficient value, t-value which should be equal to or higher than +1.96 in case of 5% significance level and 95% confidence interval, and p-value which should be lower than 0.05 (p<5%) (Hair et al. 2020; Sarstedt et al. 2020). To test the path coefficient of TAM-core dimensions on academic performance in Public and Private HEIs, this study used Multi-group analysis (Hair et al. 2020; 2017; 2013). *Table .3* and *Figure .2, .3* present the picture of MGA by applying bootstrapping techniques (Sarstedt et al. 2020). The study revealed that the impact of PEU of social media on PU of social media was positive and significant in both Public (β=0.651***, t-value=15.23, p<0.01) and Private (β=0.520***, t-value=6.837, p<0.01) higher educational institutions. The hypothesis *H1a: b* was supported and accepted but PEU of social media highly influenced PU in Public HEIs than Private. PU of social media impact on ITU of social media (ITU) was significant in both Public (β=0.585***, t-value=10.52, p<0.01) and Private (β=0.394***, t-value=5.099, p<0.01) HEI's but it was quite higher in Public HEIs than Private. However, hypothesis H2a: b was supported and accepted.

PEU of social media (PEU) had a significant impact on ITU of social media in both Public (β=0.148**, t-value=2.171, p<0.05) and Private (β=0.421***, t-value=6.156, p<0.01) HEIs but the effect was higher in Private HEIs than Public. The hypothesis H3a: b was accepted and supported. ITU of social media impact on AU of social media was significant and positive in both Public (β=0.510***, t-value=9.169, p<0.01) and Private (β=0.633***, t-value=11.24, p<0.01) HEIs. The impact of ITU of social media on AU of social media was higher in Private HEI's than Public HEIs so, the hypothesis H4a: b was supported and accepted. Actual usage (AU) of social media had a significant impact on AP in both Public (β=0.431***, t-value=6.960, p<0.01) and Private (β=0.268***, t-value=2.954, p<0.01) HEIs however, the impact was significantly higher in Public HEIs than private. Therefore, hypothesis H5a: b was supported and accepted. The direct impact of ASE on AP was significant in both Public and Private higher educational institutions but it was quite higher in Private HEIs than Public. By assessing the moderating role of ASE over AU of social media and AP, this study found that the moderation of ASE on AP was significant in Private HEIs (β=0.093***, t-value=1.976, p<0.05) but not significant in Public HEIs (β=0.056, t-value=1.923, p>0.05) due to difference in path coefficient value. Therefore, H6a: b was partially supported and accepted in Private HEIs and partially rejected in the case of Public HEIs.
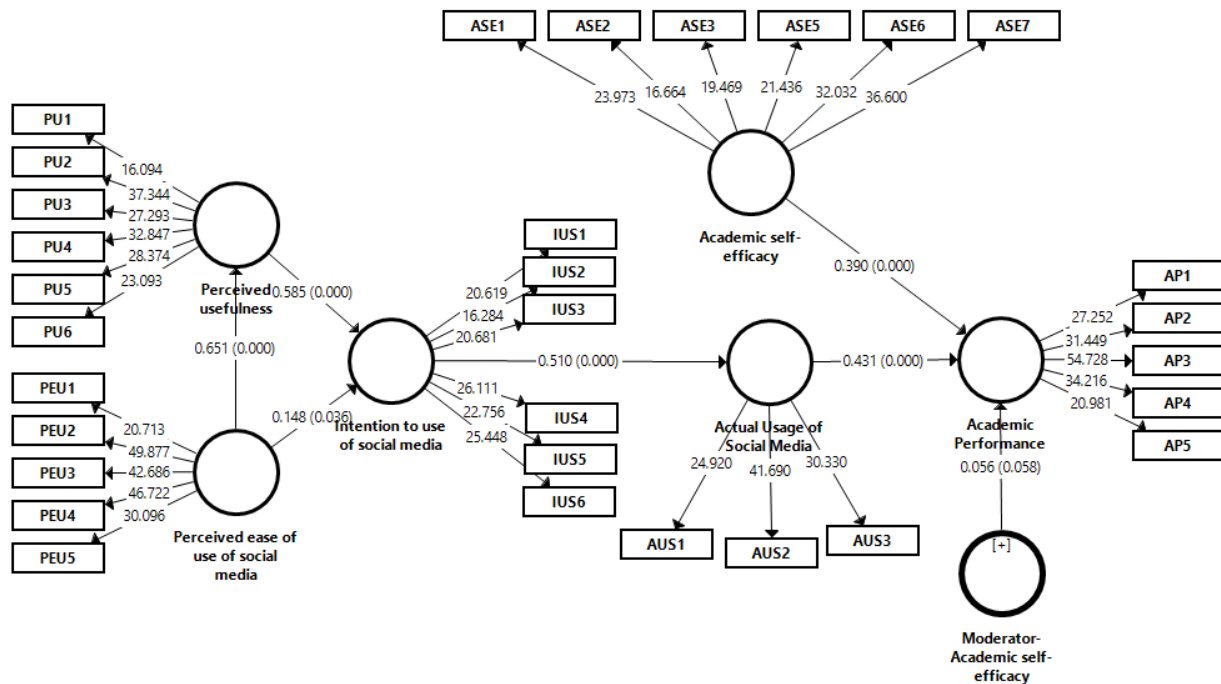

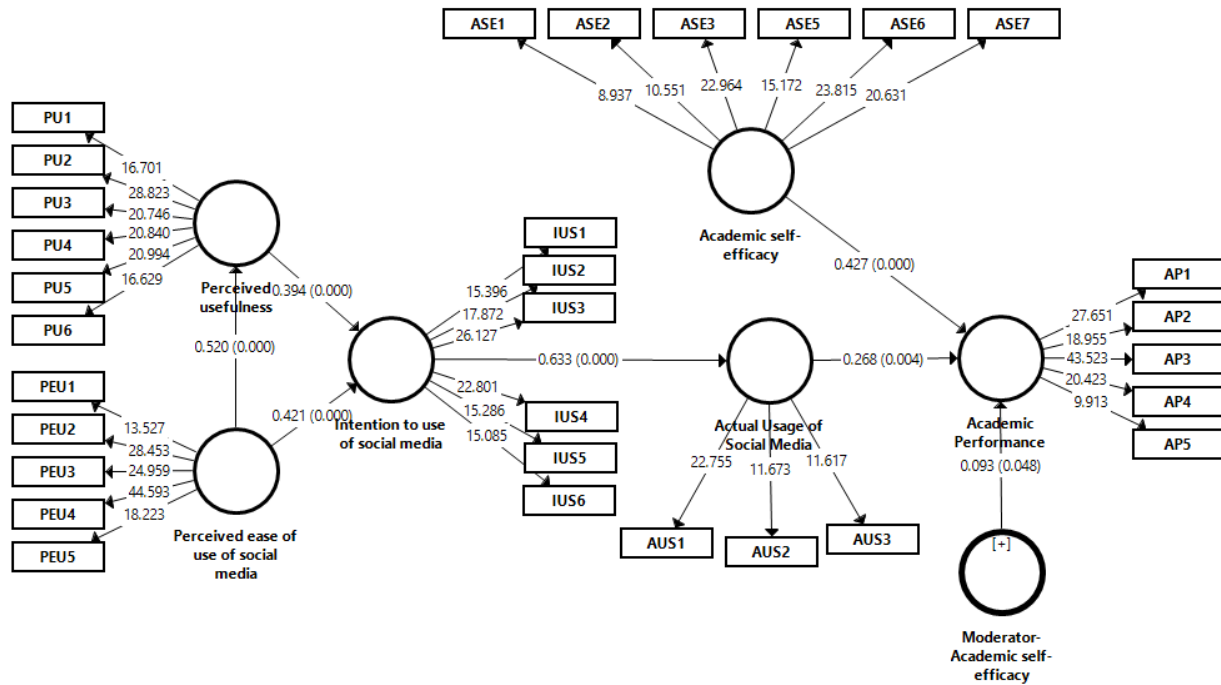**Figure 2**. TAM-core linkages in Public HEI's

Figure 3. TAM-core linkages in Private HEI's

Table 3. Path Coefficients of Public and Private

	Path Coefficients Original (Private)	Path Coefficients Original (Public)	STDEV (Private)	STDEV (Public)	t-Value (Private)	t-Value (Public)	p-Value (Private)	p-Value (Public)
Academic self-efficacy -> Academic Performance	0.427	0.390	0.077	0.062	5.582	6.286	0.000	0.000
Actual Use -> Academic Performance	0.268	0.431	0.091	0.062	2.954	6.960	0.003	0.000
Intention to use -> Actual Use	0.633	0.510	0.056	0.056	11.24	9.169	0.000	0.000
Moderator-Academic self-efficacy -> Academic Performance	0.093	0.056	0.047	0.029	1.976	1.923	0.048	0.055
Perceived ease of use -> Intention to use	0.421	0.148	0.068	0.068	6.156	2.171	0.000	0.030
Perceived ease of use -> Perceived usefulness	0.520	0.651	0.076	0.043	6.837	15.23	0.000	0.000
Perceived usefulness -> Intention to use	0.394	0.585	0.077	0.056	5.099	10.52	0.000	0.000

Note: p<0.05

This study applied Multi-group analysis to assess the difference of graduate students using social media between Public and Private higher educational institutions (HEIs) (*Table .4*). By analyzing the significant difference in MGA, the parametric test should be drawn and calculated (Hair et al. 2019; Sarstedt et al. 2020; Wong, 2013). Therefore, the parametric tests showed that there was no significant difference in using social media between Perceived ease of use of social media ->

Perceived usefulness (β difference=-0.038, p>0.05), Intention to use of social media -> Actual Usage of Social Media (β difference=-0.124, p>0.05), Actual Usage of Social Media -> Academic Performance (β difference=0.162, p>0.05) and between Academic self-efficacy -> Academic Performance (β difference=-0.038, p>0.05) in Public and Private HEIs. Consequently, the moderating effect of academic self-efficacy on academic performance of the graduate students was not significantly different (β difference=-0.037, p>0.05) between Public and Private HEI's. However, the impact of perceived ease of use of social media (β difference=-0.273, p<0.05) and perceived usefulness of social media (β difference=0.191, p>0.05) an intention to use social media had the significant difference of using social media in both Public and Private Higher educational institutions (HEIs).

Table 4. Parametric test (MGA)

	Path Coefficients-diff (Public - Private)	t-Value(|Public vs Private|)	p-Value (Public vs Private)
Academic self-efficacy -> Academic Performance	-0.038	0.380	0.704
Actual Use -> Academic Performance	0.162	1.528	0.127
Intention to use -> Actual Use	-0.124	1.469	0.143
Moderator-Academic self-efficacy -> Academic Performance	-0.037	0.710	0.478
Perceived ease of use -> Intention to use	-0.273	2.657	0.008[***]
Perceived ease of use -> Perceived usefulness	0.132	1.639	0.102
Perceived usefulness -> Intention to use	0.191	2.046	0.041[**]

Note: p<0.05, MGA=Multi-group analysis

Assessment of Model Fitness

By assessing the model fitness, this study runs the blindfolding technique in PLS-SEM ((Hair et al. 2019; Sarstedt et al. 2020). The model fitness includes the R square and Q square in the model. The R square value should be within range ≥0.25, ≥0.50, and ≥0.75 which signify the weak, moderate, and strong impact of an exogenous variable into endogenous respectively. Meanwhile, the Q square value should be higher than zero (0) that signifies the model adequacy (Wong, 2013; Hair et al. 2020). Table 5. This shows that R square and Q square values of all TAM-core variables' impacts were within the threshold values (Hair et al. 2019; Sarstedt et al. 2020). Therefore, it was proved that there was good models' fitness in both Public and Private higher educational institutions (HEIs).

Table 5. R square and Q square

Constructs	R Square Public HEI's	R Square Private HEI's	Q Square Public HEI's	Q Square Private HEI's
Academic Performance	0.422	0.324	0.313	0.212
Actual Usage of Social Media	0.302	0.432	0.164	0.211
Intention to use of social media	0.469	0.462	0.263	0.297
Perceived usefulness	0.359	0.301	0.252	0.159

Note: HEI's=Higher Educational Institutions

Discussion and conclusion

The present study uses TAM-core variables to test the academic performance of graduate students of Public and Private HEIs. Particularly, this study introduces the moderating role of ASE over AU of social media and AP in graduate students of Public and Private higher educational institutions. The study revealed that PU of social media and PEU had a significant effect on ITU of social media in both public and private HEIs. The findings show that ITU of social media was highly influenced by PU of social media in public HEIs rather than in private HEIs that means. The graduate students of public HEIs were using more social media because they knew the social media would enhance their capabilities and skills so, they were ready to accept it. On the other hand, PEU of social media highly influenced ITU of social media in private HEIs rather than a public that means the graduates' students of private HEIs were provided more technological facilities, equipment, as well as a complete technology environment and they were ready to use them in an effective way to perform better (Davis et al. 1992). Additionally, the PEU of social media on PU was slight high in public HEIs than private that meant, the students of public HEIs were more convenient of using social media facilities provided by public Universities so, they were trying to manipulate their efforts of using social media into their academic performance. As well, educational institutions should always establish and accept new technologies so that the students will use them with great effort (Romeo, Lloyd & Downes, 2013).

Accordingly, ITU of social had a slightly higher impact on AC of social media in private HEIs that means, the students were more intentionally involved in using social media therefore, their actual performance was identified the higher usage of technology in their academic career in private HEIs. Moreover, the impact of actual usage of social media had a slightly higher impact on academic performance in public HEIs which means the students of public Universities were presenting more good academic performance through actual usage of social media by showing

grades, percentages, GPA, and CGPA rather than private HEIs. This was the fundamental needs of the higher educational institutions (Fraillon et al., 2014) but there is still a need for preventive measures to remove challenges in higher educational institutions (Straub, 2009). Interestingly, the technology acceptance model is the best method to determine the higher learning outcomes of using social media (technology acceptance) (Fraillon et al., 2014).

Besides, the moderating role of ASE on AP was slightly higher in private HEIs and significant but not significant in public HEIs. The findings present that the graduate students of private HEIs had selected the subjects and course outlines according to their needs and specialties so that they could achieve good academic performance by using social media. The students of private HEIs had successfully defended their learning, tasks, and academic activities in achieving good AP rather than public HEIs. The findings were well-established and generated according to psychology theories of Planned Behavior (Ajzen, 1991) and Reasoned Action (Fishbein, 1979) because behavioral intention to use social media and technology depends on academic learning efforts (Venkatesh and Morris, 2003). The results were quite consistent with the findings of Asif, Bashir, and Shahbaz (2021) and slightly associated with (Williams, Rana & Dwivedi, 2015).

Finally, this study concludes that all the variables of the TAM-core model were significantly predicting the outcomes (ASE) however, using multi-group analysis (MGA), this study identified the two big gaps in public and private HEIs. Using MGA, there was a significant difference of PEU and ITU of social media (B=-0.273, p=0.008<0.05) between public and private HEIs. It means the graduate students of private HEI's were more convenient in using technology and social media as compared to public HEIs. Additionally, there was a significant difference in PU of social media and ITU of social media (B=0.191, p=0.041<0.05) between public and private HEIs. It means the students of public HEIs were more involved in enhancing their learning capabilities, skills, and performance as compare to private HEIs.

Theoretical contribution

This study used TAM-core variables to test explore the usage of social media and academic performance of the graduate students. This study was previously done by Asif, Bashir and Shahbaz (2021) that revealed the impact of TAM-core variables on academic performance and the moderating role of self-efficacy over actual usage of social media and academic performance of postgraduate students. However, this study followed the future directions and limitations of the

study of Asif, Bashir and Shahbaz (2021) that suggested exploring the impact of TAM-core variables on the academic performance of the graduate students of the higher educational institutions (HEIs) separately. Moreover, the previous study suggested testing the moderating role of academic self-efficacy on academic performance and create a significant difference between the students of using social media and technologies in public and private HEIs.

Limitations and Future directions

Every research has limitations and future directions. This study has also some limitations and future directions in the context of social media and technology acceptance. This study administered only graduate students of the higher educational institutions (HEIs) however, there is a need to touch the intermediate, graduate, and postgraduate students in the same set of study. This study applied a convenient sampling approach to collect and interpret the data therefore, there will be longitudinal or case studies to test the behavioral intention to use social media and technology acceptance criteria. This study used multi-group analysis (MGA) to find the difference of using social media between public and private HEIs in Pakistan however, the difference of using social media should be tested public and private HEIs of other developing countries. The future study may use organizational culture to moderate the link between the actual usage of social media and the academic performance of the students.

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