The Tale of Two Cultures: Differences in Technology Acceptance in Twitter Usage

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Abstract

Despite its huge uptake all over the world, Twitter is still in its early stages of being used as an educational tool. Here, we present an experiment that was conducted across two undergraduate groups from different universities, an Australian and another American university. In this experiment we looked at Twitter usage in class and compared the results with a particular focus on analysing technology acceptance differences between the two groups. Both groups used Twitter as part of their tutorial work and participated in a survey at the end of the semester. Empirical investigation was done using Davis' technology acceptance model (TAM). The study findings reveal highly significant differences in the technology acceptance behaviours of the two groups, thus highlight cultural differences in the acceptance of technology, in this case Twitter.

Keywords

Technology acceptance model (TAM), Twitter, Cultural differences, Higher education.

INTRODUCTION

The growing usage of micro-blogging in many facets of academia is undeniable. The key features of micro-blogging seem to suit academia, filling the void created by traditional class discussions and existing learning management systems which lack social presence as mentioned in Dunlap and Lowenthal (2009b). Notably, ease of posting, brevity (up to 140 characters in the case of Twitter), the ability to include abbreviated hypertext links, and mobility with which such posts can be made. Twitter (a popular micro-blogging service), for instance, allows posting via Short Messaging Service (SMS); mobile computing devices such as mobile phones and tablets; instant messaging (IM) services, email among others. These are all in addition to a conventional web-based interface and custom application software.

Accordingly, there has been a steady increase in studies linking Twitter usage in universities (Dunlap and Lowenthal 2009a; Dunlap and Lowenthal 2009b; Junco et al. 2011). However, the usage of Twitter for academic purposes is rather new and is challenging due to various reasons normally associated with the usage of social media in universities. Grosseck and Holotescu (2008) pointed out that these reasons are mainly caused by the limited number of characters, access to free-flowing topics and range of topics generated by a large number of users which could prove as major distraction to students. Further, the release of Twitter Application Programming Interface (API) has generated a plethora of platforms available for students to engage in Twitter conversations, which add to the complexity in monitoring and adopting just one tool for academic purposes. Apart from these varying levels of student and educator IT literacy, social media exposure and culture differences, there are apparent contributing factors in deciding Twitter adoption for academic purposes. Twitter, though a popular communication medium across many parts of the world isn't available everywhere. Countries like China, Iran and a few more have restricted Twitter or have almost made it non-existent for political reasons.

The increased acceptance of social media usage at universities in Australia has bridged some of these restrictions alongside the usage in smart phones and tablet computing. Steady flow of international students from these Twitter-restricted countries and poorer nations has exposed many students to a new approach towards learning by using Twitter. However, cultural differences can lead to different adoption and learning outcomes as shown in numerous different IS-related studies. As educators it is important to understand these differences prior to adopting a technology for academic purposes, especially if it is going to be assessed. Social media forums could sometimes pose a threat to the intended objective by derailing the discussions or unknowingly inviting outsiders. Therefore it is important that cultural differences are examined. Hence, in this paper we investigate the technology acceptance between two groups of students, one studying at Swinburne University of Technology in Australia and the other at Georgia State University in the USA. To achieve this, the paper has been organised into sections. The background section will discuss Twitter as the popular micro-blogging platform and review the literature on technology acceptance. We then discuss the methodology and results, including an analysis of construct validity, reliability, hypotheses and model testing. This is followed by a discussion of the results and finally we present the conclusions.

BACKGROUND

Here we introduce the micro-blogging phenomenon with a particular focus on Twitter and provide some examples of academic uses of Twitter. We also discuss the theory of technology acceptance with key emphasis on technology acceptance model (TAM) and the rationale behind using TAM in this study.

Micro-blogging (Twitter)

Micro-blogging in general has been around for a number of years now and has been a key feature in the suite of Web 2.0 technologies. Originating from blog, micro-blogging is just smaller in size and normally posted by one person in reverse chronological order. Since the inception of Twitter in 2006, micro-blogging has become very popular. Comparative to all micro-blogging platforms, Twitter is the fastest growing Web 2.0 technology (CrunchBase 2011). Micro-blogging quickly became popular due to its communication features that allowed the exchange of information in 140 characters or less with the ability to include hypertext links. These links could lead users to images, text or other sites. The portability of micro-blogs and their ability to be accessed and written by any Web interface or mobile phone via SMS and IM services led to an explosion of micro-blogging. Despite this, there have been few reported examples of micro-blogging usage within the higher education scene. Comparatively, though there has been an increase in the usage of Twitter in higher education worldwide, a report from Faculty Focus in 2010 noted that Twitter's potential has yet to be harnessed (Faculty-Focus 2010). Most higher education institutions are currently using Twitter for sharing information among peers and as a real time news source. There have been few or limited examples of pedagogical use. The authors' previous work has highlighted the acceptance of Twitter by a group of Australian students in a tertiary education institution with key focus on behavioural and social influence constructs (Saeed and Sinnappan 2011). This paper reports the results of a similar study conducted at a US tertiary education institution at the same time but more importantly focuses on comparing the technology acceptance differences between the two groups.

Technology Acceptance

Technology acceptance or user acceptance is defined as *the demonstrable willingness within a user group to employ IT for the tasks it is designed to support* (Dillon and Morris 1996). It is considered as an outcome variable in a psychological process while making decisions about a technology. It has been viewed as pivotal in determining the success (or failure) of any IS project (Venkatesh et al. 2003) and holds special importance for the practitioners and researchers of IS disciplines. Researchers have studied a range of issues related to the concept of acceptance and developed several technology acceptance models to explain or predict individuals' decision to accept a new technology (Chakraborty et al. 2008). Most prominent of these are: Theory of Reasoned Action (TRA) (Ajzen and Fishbein 1980), Theory of Planned Behaviour (TPB) (Ajzen 1991), Technology Acceptance Model (TAM) (Davis 1986), and Unified Theory of Acceptance and Use of Technology (UTAT) (Venkatesh et al. 2003).

TRA posits that attitudes and subjective norms jointly influence the behavioural intention which in turn drives individual behaviour. *TPB* introduced another construct (perceived behavioural control) into TRA which jointly influenced behavioural intention along with attitudes and subjective norms. *TAM* was devised in order to explain or predict individuals' acceptance of computer based systems in various scenarios and organisational contexts. TAM posits that user perceptions of usefulness and ease-of-use determine attitudes towards using a system or technology while attitude is hypothesised to influence behavioural intention to use a technology, which in turn leads to actual use. Perceived usefulness is also influenced by perceived ease-of-use because the easier the system (technology) is, the more useful it can be. In the follow-up model, *TAM2* (Venkatesh and Davis 2000),

the attitude component was dropped and perceived technology characteristics directly influenced the individual's intention to use technology. Finally, *UTAT* posits that performance expectancy, effort expectancy, social influence and facilitating conditions influence behavioural intention which in turn drives individual behaviour. All TAM constructs are also integrated into UTAT model.

Of all the models mentioned above, TAM is the most-used and cited model in IS research. It has been considered as being both robust and parsimonious for predicting user acceptance of a variety of new technology (Raaij and Schepers 2008) and is well suited for modelling IT acceptance (Davis et al. 1989). Both TAM and TAM2 have been validated for a variety of technologies including word processors, email, spreadsheets, Web-based learning systems, multimedia learning systems, etc (Halawi and McCarthy 2007; Lederer et al. 2000; Saade et al. 2007).

Despite its huge popularity and application in measuring acceptance of a variety of technologies, very few studies are available that compare TAM across various cultures or countries, comparison of Web 2.0 technologies (such as Twitter) among various cultures is even scarcer. Some noted examples of comparative technology acceptance research include a study by Srite (2006) in which he used core TAM constructs along with subjective norms to compare the technology acceptance differences between US and Chinese students. The study revealed significant differences among the two groups. Similarly, Straub et al. (1997) performed a comparison study among three countries (US, Switzerland and Japan) using basic TAM constructs and reported that TAM holds true for US and Switzerland but not for Japan. In another comparative study, Rose and Straub (1998) reported that TAM held true when tested among five different Arab countries (Saudi Arabia, Jordan, Lebanon, Egypt and Sudan). In this paper, we adopt a similar approach to compare technology acceptance differences between Australian and US students in Twitter usage. It is important to mention here that almost all of the students from the Australian group were international students from China. So this study is essentially a comparison of Twitter acceptance between the US and expatriate Chinese cultures. Based on the previous research in the areas of technology acceptance/diffusion and cultural differences, we use basic TAM constructs and subjective norms as the predictors of students' intentions to use Twitter and propose the following hypotheses:

H1. Perceived usefulness (PU) will have a positive influence on behavioural intention (BI) to use Twitter.
H2. Perceived ease-of-use (PEU) will have a positive influence on behavioural intention (BI) to use Twitter.
H3. Perceived ease-of-use (PEU) will have a positive influence on perceived usefulness (PU) of Twitter.
H4. Subjective norms (SN) will have a positive influence on behavioural intention (BI) to use Twitter.

Based on these hypotheses, the following research model is presented:
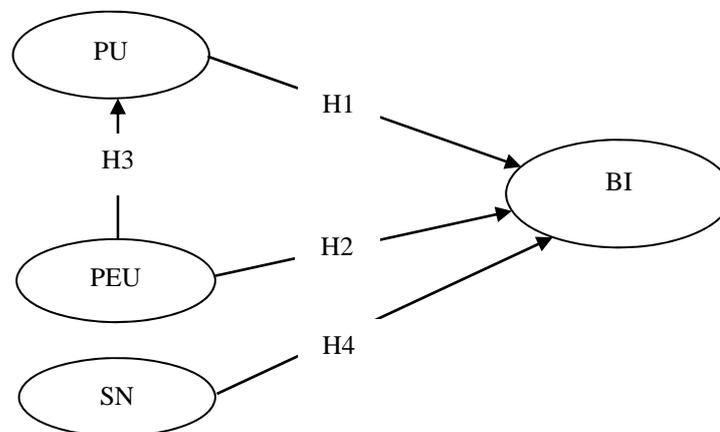

Figure 1: Research model

METHOD

Participants

As mentioned earlier, the study was conducted simultaneously at Swinburne University of Technology in Australia and Georgia State University in the USA. The Australian participants were second year undergraduate students studying "e-Commerce" subject. On the other hand, the US participants were undergraduate Computer Science students undertaking "Professional Practices and Ethics" subject. For the sake of simplicity we call them AU and US groups in this paper. Both groups were exposed to micro-blogging and were encouraged to use Twitter as part of their weekly tutorials. The usage of Twitter was not assessed as part of the unit but was monitored by the lecturers constantly. Both groups took part in a survey that was conducted at the end of the semester. For the AU group, 27 out of 45 students took part in the survey while 29 out of 35 responded from the US group.

Measures

Perceived usefulness, perceived ease-of-use and behavioural intention are the major constructs of TAM that are investigated in this study. Subjective norms construct was also included because it's an integral part of TAM2 and has been examined in a number of technology acceptance studies (Karahanna and Straub 1999; Taylor and Todd 1995; Venkatesh and Davis 2000; Venkatesh et al. 2003). Moreover, the inclusion of subjective norms will better allow the capturing of cultural effects on Twitter adoption. The scales for perceived ease-of-use (PEU), perceived usefulness (PU) and subjective norms (SN) were adopted from Davis et al (1989) and the scales for behavioural intention (BI) were adopted from Venkatesh et al (2003). A complete list of survey items used in the study is presented in Appendix A.

RESULTS

Constructs Validity and Reliability

Tables 1a and 1b present a summary of construct reliability measures including mean, factor loadings (FL), t-values, composite reliabilities (CR), and Average Variance Extracted (AVE) for the two groups. The factor loadings provide evidence for convergent validity as all our constructs (except SN3 and SN4 in Table 1b) loaded greater than the threshold of 0.60 as suggested by Chin (1998a). The t-values derived from our analysis also provide evidence for convergent validity since all values (except SN4 in Table 1b) exceeded the threshold of 1.96 as suggested by Gefen and Straub (2005). Internal consistency appears significant for all of our constructs since the composite reliability values exceeded the minimum of 0.70 as suggested by Nunnally and Bernstein (1994).

Table 1a: Construct reliability measures (AU group)

Constructs	Mean	FL	t-values	CR	AVE
				0.93	0.67
PU1	3.56	0.88	22.68		
PU2	3.26	0.93	36.50		
PU3	3.30	0.78	9.69		
PU4	3.07	0.76	5.97		
PU5	3.78	0.83	7.53		
PU6	3.30	0.86	6.19		
				0.82	0.54
PEU1	3.89	0.83	7.57		
PEU2	3.63	0.60	2.39		
PEU3	3.44	0.82	7.77		
PEU4	3.73	0.67	3.94		
				0.86	0.62
SN1	3.19	0.90	32.38		
SN2	3.19	0.81	11.40		
SN3	2.85	0.61	1.96		
SN4	2.89	0.88	6.69		
				0.84	0.64
BI1	3.04	0.93	45.76		
BI2	3.15	0.81	8.17		
BI3	3.04	0.65	3.90		

Table 1b: Construct reliability measures (US group)

Constructs	Mean	FL	t-values	CR	AVE
				0.95	0.77
PU1	2.10	0.87	16.81		
PU2	1.90	0.92	18.62		
PU3	1.79	0.87	12.28		
PU4	2.10	0.92	31.97		
PU5	2.55	0.81	10.79		
PU6	2.20	0.86	12.62		
				0.81	0.52
PEU1	4.14	0.60	2.73		
PEU2	3.07	0.77	3.61		
PEU3	2.90	0.75	5.87		
PEU4	3.45	0.78	3.53		
				0.70	0.41
SN1	1.76	0.89	3.52		
SN2	1.62	0.71	3.19		
SN3	1.83	0.48	2.01		
SN4	1.55	0.28	1.17		
				0.98	0.97
BI1	1.75	0.96	20.95		
BI2	1.72	0.99	103.5		
BI3	1.79	0.97	32.51		

Table 2a: Discriminant validity of constructs (AU group)

	PU	PEU	SN	BI
PU	**0.820**			
PEU	0.698	**0.734**		
SN	0.762	0.639	**0.787**	
BI	0.764	0.719	0.769	**0.800**

Table 2b: Discriminant validity of constructs (US group)

	PU	PEU	SN	BI
PU	**0.877**			
PEU	0.549	**0.730**		
SN	-0.10	0.248	**0.640**	
BI	0.097	0.376	0.185	**0.974**

Discriminant validity was met using the Fornell and Larcker test (Fornell and Larcker 1981). The procedure involves computing the square root of the AVE of each construct, which should exceed the correlation shared

between the construct and other constructs in the model. Tables 2a and 2b show that square roots (in bold) of all AVEs (on the diagonal) are greater than the cross-correlations of all other constructs. Thus, all our constructs demonstrated a good degree of validity and reliability.

Hypotheses and Model Testing

The research model was tested using the PLS (partial least squares) approach. PLS is considered a powerful tool in analysing structural models involving multiple constructs and multiple indicators. Previous research shows that PLS is more suitable for prediction as compared to other structural equation modelling (SEM) approaches like LISREL or EQs (Chin 1998b), and is considered effective even with smaller sample sizes (Cavusgil et al. 2009).

Figures 2a and 2b summarise the hypotheses testing of the proposed model. The strength and significance of each relationship is represented by the path co-efficient values, with t-values in parentheses. The solid lines represent significant relationships while dotted lines represent insignificant relationships. R^2 is indicated next to each dependant variable (PU and BI).

In the case of the AU group, the core TAM constructs (perceived usefulness (PU) and perceived ease-of-use (PEU)) failed to influence behavioural intention (BI). However, perceived ease-of-use influenced BI via perceived usefulness through the process of internalisation, with coefficient value of 0.698. Subjective norms (SN) also had a significant effect on BI with co-efficient value of 0.372. Hence, only hypotheses H3 and H4 are supported by the data. Overall, the proposed structural model explained 70.3% of students' intentions to use Twitter, which is a highly significant finding when compared to similar studies of technology acceptance such as Raaij and Schepers (2008); Shin and Kim (2008); and, Agrifoglio, Black et al. (2010).

In the case of the US group, PEU directly influenced BI and also via PU (with coefficient values of 0.433 and 0.549 respectively). However, PU and SN failed to influence BI. Hence, only hypotheses H2 and H3 are supported by the data. Overall, the model in Fig 2b explained only 16.2% of the variance, which is relatively low. However, this does not really mean that the overall model is not good for prediction as R^2 only tells about the "goodness of fit" or how well the regression went. Finally, the subjective norms (SN) variable was the main predictor of Twitter adoption for the AU group while perceived ease-of-use was the main driver of Twitter adoption for the US group.
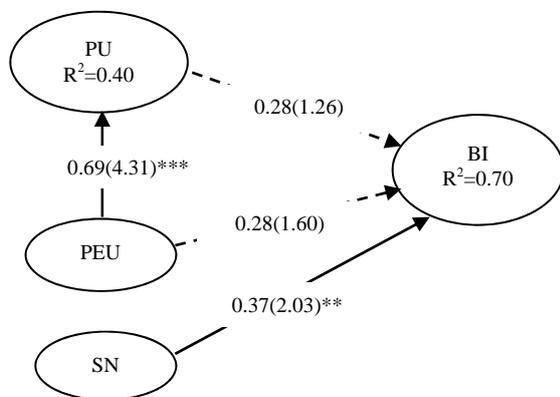

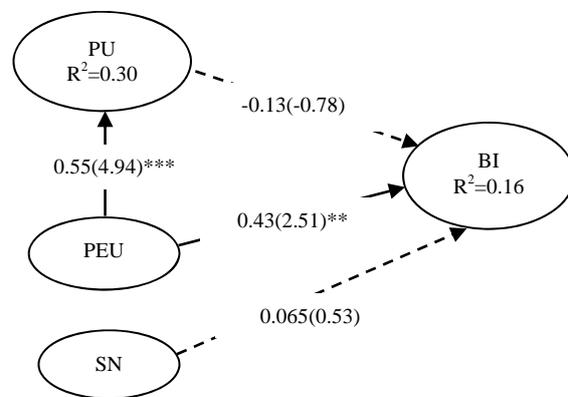Figure 2a: PLS results (AU group); **= significant at the 0.01 level; ***= at the 0.001 level.

Figure 2b: PLS results (US group); **= significant at the 0.01 level; *** at the 0.001 level.

DISCUSSION

The aim of this study was to compare the technology acceptance of a popular micro-blogging tool (Twitter) across two different groups of students geographically distant from each other. The first group was studying undergraduate Information Systems course at Swinburne University of Technology in Australia while the other group was studying undergraduate Computer Science course at Georgia State University in US. Both groups used Twitter as part of their tutorial work and took part in a survey about their Twitter usage at the end of the semester. Almost all students from the Australian group were international students from China so this study was essentially a comparison between US and expatriate Chinese students. To analyse the adoption of Twitter between the two groups, Davis' technology acceptance model (TAM) was used as a theoretical baseline. TAM's core constructs of perceived usefulness and perceived ease-of-use were used to capture technology adoption of

Twitter. Subjective norms construct was also included in the model to better capture the cultural effects of Twitter usage. PLS was used to test the theoretical model which revealed several insightful results presented below:

Although TAM's core constructs failed to influence behavioural intention to use Twitter in the case of the AU (Chinese) group, the model as a whole held true. Subjective norms emerged as the strongest predictor of Twitter adoption, demonstrating the huge impact of social influence in Chinese culture. Similarly, the proposed TAM also held true for the US student but with much less significance than the AU group as the model explained only 16% of user acceptance towards Twitter. Perceived ease-of-use emerged as the strongest predictor hinting at an individualistic approach of the US culture. These results are consistent with the findings of Srite (2006) where he tested a similar model to compare technology acceptance of US and Chinese participants. In that study, the overall variance explained by the Chinese group was higher than the US group as in our case.

A careful examination of the results explained in Figures 2a and 2b reveal significant differences in the scores of each relationship. Although this study did not directly measure cultural associations, we believe that these differences can be explained through the concept of cultural dimensions. Hofstede (2001) has proposed a widely cited set of cultural dimensions: Power Distance (PD), Individualism/Collectivism (I/C), Masculinity/Femininity (M/F), Uncertainty Avoidance (UA) and Long Term Orientation (LTO). Definition of each of these cultural dimensions is presented in Appendix B. Hofstede has collected a huge database of cultural dimension scores across for nearly 76 countries over a period of 45 years and has developed instruments to compare scores of various cultures or countries on his website (http://geert-hofstede.com/index.php). A graph showing a comparison of the US and Chinese cultural dimensions has been adopted from that website and is presented in Figure 3.
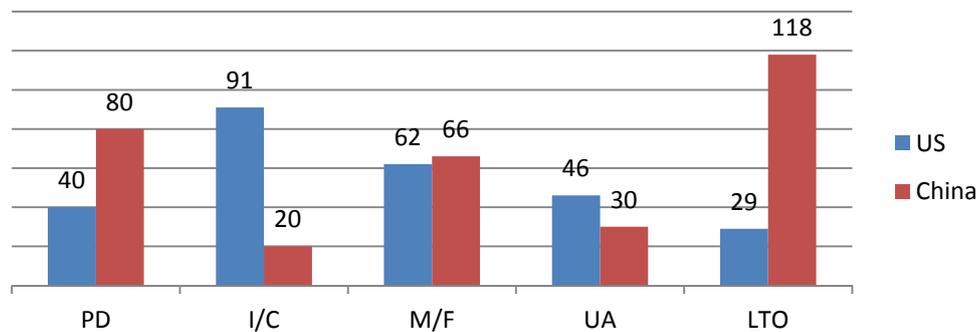

Figure 3: Comparison of cultural dimensions for US and Chinese cultures, adopted from http://geert-hofstede.com/china.html

When comparing Figures 2a and 2b the relationships between perceived usefulness (PU) and behavioural intention (BI) were not significant for both groups. However the scores for AU group were stronger than the US group showing that Chinese students conceived Twitter as being more useful for their academic purposes as compared to their US counterparts. This could be partially attributed to the reason that American students were more familiar with Twitter and formed a perception that Twitter is nothing more than a social tool. On the other hand, Chinese students have never used Twitter and were more enthusiastic to explore and use for academic purposes. The differences in the scores of perceived usefulness (PU) might be explained through the Masculinity/Femininity (M/F) dimension scores in Figure 3. At 66 China is a masculine society and Chinese people are success oriented and driven by competition, achievement and success, hence perceived the usefulness of adopting Twitter more than the US students. On the other hand, feminine society is one where quality of life is the sign of success and caring for others is the dominant value. The same trend is reflected in our study where US students perceived ease-of-using (PEU) Twitter more than their Chinese counterparts.

The relationship between subjective norms (SN) and behavioural intention (BI) was significant in the case of Chinese student but insignificant for the other group. This can be easily explained through individualism/collectivism dimension scores in Figure 3, which confirms that Chinese culture (91) is highly collectivist than US culture (20) meaning that people act in the interest of the group and not necessarily of themselves. This was evident in the experiment where Chinese students, in general, were seen to be keener and participatory compared to the American students. Chinese students were seen to involve on average more American students in their tweets by using the @mention tag. In contrast, American students preferred to keep the discussions among themselves. This is despite partial anonymity as students were free to choose any name for their Twitter account. However due to platform familiarity and exposure we found American students to be at

ease and ahead with the experiment though none of them had used Twitter before for academic purposes. Their tweets were more appropriate and had more response in contrast to Chinese students. Chinese tweets were more academic and lacked conversational attributes and were deemed to be not effective for academic discussion (self-cited reference). Further, to facilitate discussions American students created Twitter group list to capture all discussions made by both cohorts without being prompted by either of the instructors. The lack of innovation among the Chinese students could be linked to the Chinese culture and eastern ideology where students are prohibited to question the educator or act against conformity. The authors feel that these cultural differences are readily seen in class situations and have been widely reported in Chinese learner related literature.

Like any other user study this study has some limitations too. First, although the findings of our study demonstrate that some of the differences in the acceptance of Twitter can be attributed to the differences in masculine/feminine and individualistic/collectivist dimensions, the study does not directly measure influence of cultural dimension on TAM constructs. We aim to integrate this phenomenon in our future studies. Second, the non-compulsory use of Twitter in our study might have biased students' opinion about perceived usefulness and perceived ease-of-use of Twitter. We aim to address this issue in our future offerings by adjusting our pedagogy. Finally, the self-reported data might have caused common method bias (CMB) in the study. However, Harman's single factor test did not confirm the presence of CMB in our data.

CONCLUSION

This experiment supports and extends research involving the usage of Twitter in universities. The study highlighted clear differences in Twitter adoption linked to student cultural associations. Though TAM constructs failed to influence behavioural intention of the Australian group, perceived ease-of-use and subjective norms influenced their behavioural intention. This model accounted for 70.3% of the Australian students' intention to use Twitter which is significant to comparable studies. On the other hand, the US group showed that their intentions to use Twitter was directly influenced by perceived ease-of-use and not perceived usefulness or social norms. The findings provide some insight on how American and Chinese students approached and used Twitter defined by their individualism/collectivism dimension. This suggests that educators need to be aware and accommodate student cultural differences with regards to technology adoption in class. As such, more research should be carried out with regards to technology adoption and usages in universities which may host a variety of cultural associations. In future, authors aim to extend this research to a variety of universities around the world to gauge Twitter acceptance according to cultural associations.

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APPENDIX A: LIST OF CONSTRUCTS USED IN THE STUDY

PU1: Using Twitter enables me to accomplish my tasks more quickly.
PU2: Using Twitter improves my class/study performance.
PU3: Using Twitter increases my productivity.
PU4: Using Twitter makes it easier for me to understand my studies.
PU5: Using Twitter makes it easier for me to communicate with lecturer/friends.
PU6: Overall, I find Twitter useful in my class/study.
PEU1: Learning to use Twitter is easy for me.
PEU2: I find it not difficult to get Twitter to do what I want it to do.
PEU3: I find Twitter to be flexible to interact with.
PEU4: It is easy for me to become skilful at using Twitter.
SN1: People who influence my behaviour think that I should use Twitter.
SN2: People who are important to me would think that I should use Twitter.
SN3: People whose opinion I value would prefer me to use Twitter rather than other micro-blogging tools.
SN4: I think that those people who are important to me would want me to use Twitter rather than other micro-blogging tools.
BI1: Assuming I had access to Twitter, I intend to use it.
BI2: Given that I had access to Twitter, I predict that I would use it.
BI3: I will use Twitter frequently in the future.

APPENDIX B: HOFSTEDE'S CULTURAL DIMENSIONS

Dimension	Definition
Power distance	the extent to which the less powerful members of institutions and organisations within a country expect and accept that power is distributed unequally.
Individualism/Collectivism	the degree of interdependence a society maintains among its members.
Masculinity/Femininity	what motivates people, wanting to be the best (masculine) or liking what you do (feminine)
Uncertainty Avoidance	The extent to which the members of a culture feel threatened by ambiguous or unknown situations and have created beliefs and institutions that try to avoid these
Long Term Orientation	the extent to which a society shows a pragmatic future-oriented perspective rather than a conventional historical short-term point of view.

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