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Abstract: This work has investigated the relationship between SM use and its four antecedents, i.e., perceived interactivity, perceived usefulness, perceived ease of use and perceived enjoyment. Moreover, it has also examined the association of SM use with its outcome variables, i.e., active learning, creativity and collaborative learning, leading to learning performance. This work has been conducted on university learners with a sample size of 511. A causal research design was applied in this work as it allowed the testing of relationships amongst various variables. Structural equation modelling (SEM) analysis revealed interesting results as SM use positively correlates with its four antecedents. Perceived enjoyment has the most substantial influence on SM use. Moreover, the results show that SM use enhances active learning, creativity and collaborative learning amongst learners, improving their academic performance. SM use has the most influence on active learning, and active learning has the most substantial impact on learning performance.

Keywords: online learning; social media; social media usage; social media learning; learning performance; virtual learning; antecedents of social media usage; education; structural equation modelling; SEM.

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1 Introduction

The technological and internet-based innovations in the preceding two decades have led to the radical rise of social media (SM) networks that have wholly transformed communications worldwide (Beig and Khan, 2018). SM has been defined as the internet-based platform that allows its users to interact and present themselves, instantaneously or non-simultaneously, with a diverse range of viewers who gain value from people-created content and communicate with other users (Carr and Hayes, 2015).

In contemporary times, SM platforms also assist learners in developing social relationships with other learners, thus promoting interactivity, idea-dissemination and feedback to create knowledge (Al-Rahmi and Zeki, 2017; Redondo Duarte et al., 2017; Greenhow, 2011; Li, 2017). SM applications offer immense potential for enhancing student learning in the higher education setup (Al-Rahmi et al., 2018; McLoughlin and Lee, 2008). Some college establishments have also employed SM to foster social connectivity and collaborative education amongst the students (Al-Rahmi and Zeki, 2017) and enhance their ingenuity and interaction skills (Kabilan et al., 2010). Thus, SM has been transformed into an online learning platform that enables information-sharing and involvement through collaborative education (Rau et al., 2008; Sarwar et al., 2019). However, learning can be either formal or informal (Anderson, 2008). 'Formal learning' is backed by an educational establishment, and the programme is structured and often under the control of an instructor, resulting in an accreditation/certificate (Alexander et al., 2009; Livingstone, 2001). 'Informal learning' has been described as learning that is not attributed to an instructive or institution. It is mainly under the control of a learner without any predefined programme of study or credentials (Livingstone, 2001). Learners have used SM for formal and informal learning (Al-Rahmi et al., 2020; Al-Sabaawi and Dahlan, 2018). SM as an interactive platform has allowed learners' to learn informally from other users and also through virtual communities (Prestridge, 2019; Zhang and Liu, 2019). Moreover, informal education via SM entices learners' to gain knowledge that is helpful in their everyday life (Mao, 2014). Sharing information and discussions on SM transcends the rigid hierarchy in formal education (Whitty and Anane, 2014) that has transformed it into a flexible, informal learning platform (Al-Sabaawi and Dahlan, 2018). SM has also been used to support and enhance formal education (Al-Rahmi et al., 2020; Dabbagh and Kitsantas, 2012) as it adds value to learning (Greenhow and Lewin, 2016). Researchers have also postulated that SM as a participatory platform has the power to coalesce both formal and informal styles of learning (Greenhow and Lewin, 2016). This makes it imperative to study SM as an online learning platform and investigate its antecedents and outcomes.

Moreover, research into collaborative education also supports the formation of online communities that encourage collaborative knowledge (Lewis et al., 2010), which will benefit both organisational and individual learners by improving their learning performance (Barron, 2003; Sarwar et al., 2019). Collaborative learning through SM platforms has also proved immensely beneficial for learners, especially in higher education institutions (Ansari and Khan, 2020). However, SM research on its learning implications through a collaborative culture that can augment the learning competence in higher education is relatively scarce (Al-Rahmi et al., 2018). Another contemporary aspect concerning SM learning is whether it can foster creativity amongst learners or not (Acar et al., 2021). In higher education, SM use amongst students may help them develop critical thinking and ingenuity, but the results have proven inconclusive so far (Allen et al., 2012). Thus, this narrative needs further exploration and testing for this association's generalisability (Allen et al., 2012). Many scholars and practitioners also advocate using SM for active learning rather than just focussing on traditional methodologies, which need to be augmented by contemporary technological innovations (Dahdal, 2020; George et al., 2013). This is because active learning is an essential domain in higher education due to its potential benefits for the learners (Prince, 2004; Carr et al., 2015). Nevertheless, the relationship between SM use and active learning has

not been explored and is limited to some SM platforms (Dahdal, 2020). This study attempts to fulfil this critical gap by examining the association between SM use and active learning in addition to the creativity and collaborative learning opportunities.

Moreover, this study has also explored the relationship of SM use with its four antecedents. The previous studies have examined the relationship between SM use and its three antecedents, i.e., perceived usefulness (PU), perceived ease of use (PEU) and perceived enjoyment (Al-Rahmi and Zeki, 2017; Al-Rahmi et al., 2018; Sarwar et al., 2019) based on technology acceptance model (TAM). TAM has been considered an important framework in adopting SM for learning (Al-Rahmi et al., 2018; Sarwar et al., 2019). This study has added an essential antecedent of SM use, i.e., perceived interactivity, in the research framework, which is an addition to TAM within the context of online learning. The relevance of perceived interactivity concerning consumer attitudes and behaviour on social networks and online platforms is well documented in the literature (Alalwan, 2018; Xu and Sundar, 2016), making it imperative to include it in this work. Furthermore, earlier research has been primarily conducted in developed nations (Al-Rahmi et al., 2018), making it essential to study SM educational use and enhanced learning performance in developing countries. This research focuses on university students in India. Students are considered avid and frequent users of social networks for learning and entertainment (Dahdal, 2020). This work fulfils a critical research gap in the literature by investigating the influence of SM usage on collaborative learning, active learning, and learners' creativity, leading to their learning performance. Earlier attempts have overlooked SM users' effect on creativity and active learning in a learning framework. Thus, this work makes an essential contribution by adding the two factors to the education research framework.

This work is an important attempt to test the theoretical research framework proposed using regression analysis through structural equation modelling (SEM). Regression analysis would allow studying the influence of PU, PEU, perceived enjoyment and perceived interactivity on SM use. The analysis would also study the impact of SM use on collaborative learning, active learning, and learners' creativity. Finally, the study would also study the influence of collaborative learning, active learning and learners' creativity on learning performance. The following section is the literature review that discusses the theoretical framework and briefly discusses the role of social networks in education. It also includes the study variables (PU, PEU, perceived enjoyment, perceived interactivity, SM use, active learning, creativity, collaborative learning and learning performance) and the relationship between them. This section also includes the conceptual framework. The literature section is followed by research methods, including the methodology section and study measures. The methodology is followed by data analysis which includes participant profiles and results from SEM. Finally, the discussions, conclusion and future work directions are discussed.

2 Literature review

2.1 Social media

SM has been at the centre of attention in commercial and non-commercial entities as it is unimaginable to picture a world without SM (Shaw, 2018). It has emerged as the primary mass communication system on digital platforms over the past ten years (Ranginwala and

Towdin, 2018). SM has been defined as the set of online tools and web networks that have transformed communication into an interesting and interactive discourse (Selwyn, 2012).

2.2 SM in education

SM in the context of education has been defined as the technological innovation that induces a novel learning style related to shared exploration and interactivity (Ansari and Khan, 2020). Facebook has been considered one of the important and innovative tools by learners in the higher education domain (Roblyer et al., 2010; Wang et al., 2012). Other platforms such as YouTube, Google Docs, WebQuest, Twitter, LinkedIn, WhatsApp, Instagram, etc. have also been considered for academic learning purposes such as information sharing, collaboration, and interaction amongst learners and their mentors (Eid and Al-Jabri, 2016; Uskov et al., 2015; Zainuddin and Halili, 2016). In one study, Twitter has been found to be an effective SM platform for e-learning in the USA (Barnes and Lescault, 2011). But, not all SM platforms provide similar advantages; some platforms are more effective than others in achieving the learners' educational objectives (Ansari and Khan, 2020). Moreover, SM platforms can also be disadvantageous for the learners as learners often use them for non-educational uses (Khan and Khan, 2012; Kuppuswamy and Narayan, 2010). But, overall SM's use in the educational environment needs unique consideration as such platforms can assist and facilitate student learning (Stathopoulou et al., 2019). Students' proficiency in information technologies, mainly Web 2.0, has led to the extensive use of virtual platforms by educators, facilitators, and faculty members across institutions (Zdravkova, 2016). Some studies suggest that SM use in education can also emerge as a cause of distraction, becoming a hindrance to learning (Ali et al., 2017; Smith, 2016). On the other hand, there is significant empirical evidence suggesting extensive use of SM by professionals for teaching on virtual platforms (Cabrera et al., 2020; Nickerson, 2019; Todaro et al., 2018; Ranginwala and Towbin, 2018; Colbert et al., 2018; Shah and Kotsenas, 2017; Duke et al., 2017). Previous research also suggests that students understand the importance of SM integration in online teaching and evaluation (Manca, 2020; Stathopoulou et al., 2019; Sobaih et al., 2016). SM platforms also assist in education and appraisal in higher learning institutes (Stathopoulou et al., 2019). Students actively exchange knowledge and interact in virtual communities on SM; thus, education has been enhanced with a new element (Zdravkova, 2016). SM is used by students to better retain the content delivered in the lectures (Stathopoulou et al., 2019), which is in consonance with the findings regarding benefits derived for practical learners in the context of technology use (Kurilovas et al., 2014). Literature also finds some mention about the growing utilisation of SM by both faculty and students, about networks like Facebook (Sharma et al., 2016) and YouTube (Al-Bahrani et al., 2017). The emergence of Web 3.0 and SM and the dynamic nature of contemporary technologies have transformed the interaction amongst the people and how they gather and share knowledge (Kezar, 2014). SM present students with an interactive, vibrant and recognisable platform that enables them to learn effectively (Stathopoulou et al., 2019). Studies continue to reveal pedagogical benefits from such platforms (Greenhow and Robelia, 2009; Voorn and Kommers, 2013). Students can also co-create knowledge and provide support to each other on SM networks (Kearney and Bailey, 2016). The role of SM in knowledge sharing for academicians is also evident in many

studies (Forte et al., 2012; Macià and García, 2016; Ranieri et al., 2012). SM benefits students by providing them with learning opportunities through knowledge sharing (Twinning et al., 2013). Research illustrates the development of online knowledge communities (Lewis et al., 2010), where individual social interactions lead to knowledge creation as propounded by the social learning premise (Henning et al., 2004). SM's growing influence has induced professionals, including teachers, to explore opportunities to connect with their audience on virtual platforms like Facebook, Instagram, YouTube, and others (Popoiu et al., 2012; Ranginwala and Towbin, 2018; Weaver et al., 2018). Faculties are embracing SM technologies as students exhibit disinterest in conventional virtual educational environments (Kearney and Bailey, 2016) despite the risks and anxiety associated with SM (Bennett, 2017). A survey conducted in the USA showed that two-thirds of the faculties examined had employed SM during classroom teaching, and 30% of them have posted online content for their students (Moran et al., 2011). Freely available online resources have helped teachers to utilise the virtual platforms for education by providing them opportunities to share their ideas fearlessly (Prestridge, 2019). On virtual networks, faculty efforts are recorded, empowering students to engage in educational activities at their convenience (Bal and Bicen, 2017; Leak et al., 2014). Higher learning establishments are not only using SM to attract more prospects to their institutes (Constantinides and Zinck Stagno, 2011) but are integrating it as an essential component of their teaching course (Stathopoulou et al., 2019). Some of the reputed institutes that have integrated SM support in their academic courses include London Business School, Harvard Business School and Columbia Business School (Saadi, 2011). This shows the growing popularity of such networks in the education environment (Stathopoulou et al., 2019).

2.3 Perceived interactivity

Literature shows two concepts of interactivity, i.e., technical/objective interactivity and perceived interactivity. The former kind is considered the structural capacity in an online environment that reflects its functional attributes and design (Rodrıguez-Ardura and Meseguer-Artola, 2016). In the current study, perceived interactivity has been adopted. This is because the objective/actual interactivity in a virtual setting does not always correspond with the user's assessment of both business web platforms (Song and Zinkhan, 2008) and online learning platforms (Sun and Hsu, 2012). Perceived interactivity has been defined as a mutual communication concerning an entity/establishment that is characterised by perceived receptiveness/swiftness of the system response (Rodrıguez-Ardura and Meseguer-Artola, 2016). Scholars concur that perceived interactivity may be deemed as users' awareness of the SM setting (Zhang et al., 2014). In this work, perceived interactivity is assumed as how the learners perceive their interaction with the SM platforms as bi-directional and receptive to their actions.

2.4 PEU and PU

Both PEU and PU have been considered vital constructs in the TAM framework proposed by Davis (1989). PEU can be best described as the person's belief about a system that would be effortless in use (Davis, 1989). It characterises the beneficial outcomes derived from the elements of the technology used (Rauniar et al., 2014). PU can be illustrated as a person's conviction that using a specific system will augment its

performance (Davis, 1989). It is found to have a stronger influence on people's intentions to use a system (Osubor and Chiemeke, 2015). In the current context, it could be described as the level of SM users' belief that these platforms/networks would assist them in realising their objectives (Kusyanti et al., 2018), such as learning.

2.5 Perceived enjoyment

With the technological evolution, an additional construct was introduced in the TAM Framework that helps predict consumers' intent to use, i.e., perceived enjoyment (Lambey et al., 2016). When users start to enjoy any particular activity via new technological adoption, it can affect their intention to use such a technology (Cheema et al., 2013). Davis et al. (1989) describe perceived enjoyment as the extent of pleasure derived from technological use, which is distinct concerning its performance. It is intricately linked with hedonic attributes and can be described as a consumer delight in a place where their desired need is essential (Salehi et al., 2013). The user's perception of hedonism on SM has also been implied in some studies (Voorveld et al., 2018). Sarwar et al. (2019) also found that perceived enjoyment is one of the inherent functions of SM that induce users to use such networks.

2.6 Active learning

According to Lachman (1997), "learning is the process by which a relatively stable modification in stimulus-response relations is developed as a consequence of functional environmental interaction via the senses". Active learning can be illustrated as engaging learners during their learning activities (Bonwell and Eison, 1991; Dahdal, 2020). This learning type allows learners to get involved and passionately construct their own knowledge structure (Carr et al., 2015). Active learning is in contrast to the traditional form of learning that is considered passive and dependent on the teachers for disseminating information (Dahdal, 2020). Students in active learning are more occupied and engage in discussions which help them learn better (Dahdal, 2020). Braxton et al. (2000) found that learners consider active learning a constructive form of educational pedagogy.

2.7 Collaborative learning

Collaborative learning can be illustrated as a practice in which learners solve various problem-solving assignments in an interactive setting through mutual teamwork (Alavi et al., 1995). This learning paradigm assumes that the information is created when members of a population segment work together amongst themselves through a shared experience mechanism. This knowledge development course entails involvement with the people and other entities in a societal framework (Sarwar et al., 2019). From this perspective, SM is being considered a useful medium of collaborative learning by providing educational assistance and material to the students (Schrader, 2015).

2.8 Creativity

Creativity is conceptualised as the development of the perception concerning one's predicaments, deficiencies, knowledge inadequacies, missing aspects and dissonance, and also recognising, probing for explanations, making presumptions or hypotheses formulation, and probably altering and paraphrasing them, and carrying out experimentations to discover the results and then interpreting the findings (Penick, 1992). In the field of education, creative learning can foster the development of new abilities, proficiency, outlook, enthusiasm, knowledge, and many other characteristics (Starko, 2010; Sternberg, 2003). This has led to the introduction of new and innovative learning methods (Pishghadam, 2011) like SM.

2.9 Learning performance

The learning performance has been explained as a concept in behaviourism that focuses on the difference between the learner's behaviour and the tangibility of the behavioural exhibition. It is quite subjective and, in this research, is conceptualised as how SM user feels that he/she has gained competence in their skills in order to perform their academic tasks (Ainin et al., 2015). Many academicians have stressed this outcome variable, especially within online learning (Al-Rahmi and Zeki, 2017; Sarwar et al., 2019; Zhan et al., 2011).

2.10 Hypotheses development

2.10.1 Theoretical perspective

The socio-cultural narrative emphasises that learning for a person occurs in a communal and cultural setting (McLean et al., 2017). Alternatively, the socio-cultural narrative proposed by Vygotsky (1978) suggests that learning occurs through social contacts, sharing of experiences and societal ideas. Vygotsky (1978) demonstrated that a person's learning transpires on a common platform first and then on an individual platform. For instance, individual learning takes place through interactions and contacts with the social members (family, peers, others) and is then internalised personally. SM allows individual users to interact with other users conveniently to access information which is then assimilated into one's cognitive framework. SM disseminates information from different sources, including professionals and experts, which is available to everyone on the network. The use of SM is an accepted social norm in modern culture (Boulianne, 2015), and its omnipresence allows individuals to create and sustain social relationships and share knowledge with other users (Ellison et al., 2011; Whiting and Williams, 2013). Further, Vygotsky (1978) postulated that community development stimulates cognitive transformation in his study of the learning process via shared structure (cited in Bivens, 1990). This study also focuses on the socio-cultural aspect of learning (Repkin, 2003). The development of learning activity theory has led to online education's conceptualisation in higher learning establishments (Edwards, 2012). Learning actions are among the five phases or levels of psychological development that an individual needs to achieve complete mental development (Vygotsky, 1978). The individual's learning acts are always located in the shared conditions of development, identified as 'collective theorising', which includes collective thinking, conversations, sharing and

enactments (McLean et al., 2017). The collective theorising drives the psychological task of attention. This function (attention) is essential as community members are attentive to a collective learning activity during the societal development state of collective theorising (McLean et al., 2017). 'Development', as propounded by Vygotsky (1978), can be conceptualised as the transformation of collectively shared actions into internal processes (John-Steiner and Mahn, 1996). In this study, SM creates a collective development situation for the users to jointly conceive about learning activities. Moreover, the systems approach framework postulated by Csikszentmihalyi (1996) can provide some insights into the association between SM use and creativity. Csikszentmihalyi's (1996) model includes three elements, i.e., an individual, a field, and a domain.

When a person is involved in a creative action through using a particular culture and expressions in a certain field, a new idea can be integrated into the domain. The SM environment also allows an individual exposure to different ideas and thoughts that can get integrated into his/her domain and spawn creativity. The 'use and gratification theory' propounded by Whiting and Williams (2013) also suggests that when individuals are attracted to SM platforms, they feel contented with fulfilling their needs. The interactive SM setting allows individuals to express their opinions and share their ideas, and some of these activities (ideas, interactions, information, etc.) can lead to the creation of novel ideas (Acar et al., 2021). And, due to people's dependency on SM, they may feel less inclined to search for satisfaction through ingenious activities beyond these networks (Van den Eijnden et al., 2016). Thus, SM platforms provide an online shared space for the learners to collaborate with other learners or experts and actively learn about their area of interest. They also get creative ideas which may get assimilated into their thought processes. All such activities and interactions on SM networks can then lead to improved learners' performance.

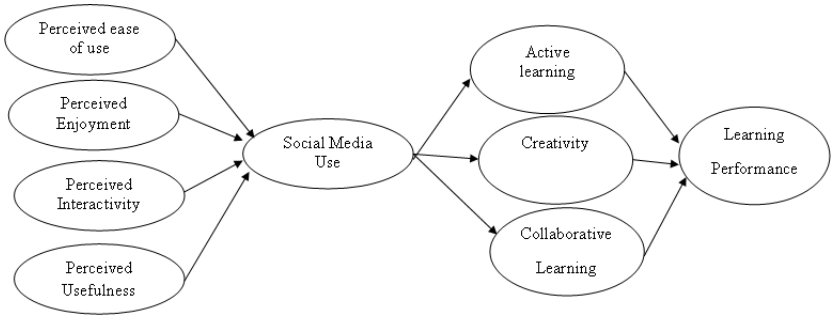
3 Conceptual framework

The TAM framework (Bagozzi et al., 1992) has been applied in many studies concerning factors influencing an individual's new technological use (Venkatesh and Davis, 2000). TAM has also been widely used by researchers concerning the factors that influence online learning, including using SM for academic purposes (Ali et al., 2017; Al-Rahmi et al., 2018; Sarwar et al., 2019). PEU and PU have been considered essential factors are influencing users' technological adoption, including SM use (Venkatesh and Davis, 2000). Some scholars have also argued that perceived enjoyment is essential in adopting self-service technology such as SM (Curran and Meuter, 2007; Curran and Lennon, 2011). However, perceived interactivity has been missing from such research frameworks, although some evidence suggests that users' SM behaviour may be influenced by it (Xu and Sundar, 2016). Thus, the current work would improve upon the TAM model concerning SM usage by including perceived interactivity in the research framework. This is because earlier studies concerning TAM and online learning have focussed on factors like PU, PEU and perceived enjoyment (Al-Rahmi and Zeki, 2017; Al-Rahmi et al., 2018; Sarwar et al., 2019).

Hence, based on the literature review and the earlier arguments, the authors propose the following conceptual framework for the study. Figure 1 shows the relationship

between PU, PEU, perceived enjoyment, perceived interactivity, SM use, active learning, creativity, collaborative learning and learning performance.

Figure 1 Conceptual framework



4 Research methodology

The design adopted for this research work was a causal type, as it tested the cause and effect relationship between the concerned variable in the study. Two expert researchers in the online learning domain assessed the instrument in this work that established the scale's content validity. However, the instrument was first subjected to exploratory factor analysis (EFA) as the questionnaire was adapted from various sources to confirm that every item loaded on their respective factors (Hair et al., 2006). This was followed by confirmatory factor analysis (CFA), which confirmed the data structure that was obtained from EFA. Both reliability and validity of the instrument were assessed during conducting EFA and CFA. The results of EFA and CFA are discussed in subsequent sections. The study participants were students from the five universities in the Northern region of India. The data was collected from the students using an online quantitative questionnaire. Only those students were instructed to complete the questionnaire that used SM for online learning. The questionnaire asked the respondents about the type of SM (Facebook, YouTube, Twitter, Slideshare, LinkedIn, ResearchGate) they use for online learning. The respondents had the option of selecting the SM platform they used most for their learning. Many researchers have described these SM websites as the most popular online learning platforms as they are excellent tools for interaction, collaboration and virtual learning (Ansari and Khan, 2020; Uskov et al., 2015; Zainuddin and Halili, 2016). The items of both exogenous and endogenous constructs in the instrument were assessed on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The responses for demographic items were obtained on a nominal scale. The data obtained was assessed using the SEM technique in IBM's SPSS and AMOS software package.

4.1 Measurement

Established scales (with good reliability and validity) concerning online learning or SM learning have been adopted for this study. The scales adopted have well-established reliability, as seen in different studies conducted over time. The scale items chosen in this

work were selected from reputed studies concerning SM learning. The instrument's content validity was assessed by two experts in the field of online learning before finalising the instrument (Hawkins and Tull, 1994; De Vellis et al., 1991). Convergent and discriminant validity of the instrument was also confirmed, as can be seen in the data analysis section. Perceived interactivity was measured with three items that were adopted from the studies of Liu (2003) and McMillan and Hwang's (2002) work. PU was measured by four items adapted from the study of Sánchez et al. (2014) and Davis et al. (1989). PEU was measured by three items adapted from the study of Davis et al. (1989). Collaborative learning was measured by four items which were adopted from the study of McMillan and Hwang (2002) and Al-Rahmi and Othman (2013). Perceived enjoyment was measured by four items adapted from the study of Sarwar et al. (2019). Creativity was measured with three items that were adopted from the work of Zhou and George (2003). Active learning was measured by four items that were adopted from the study of Molinillo et al. (2017). SM use and learner performance were measured by three items each that were adopted from the study of Sarwar et al. (2019). These responses were measured on a five-point Likert scale (1 = 'strong disagree', 2 = 'disagree', 3 = 'neutral', 4 = 'agree' and 5 =' strongly agree').

5 Data analysis

The data analysis in this work started with descriptive statistics concerning the participants' demographic profile, which is discussed in the next section.

5.1 Factor analysis

It was followed by EFA (in SPSS), which revealed that there were no cross-loadings in the factor matrix and all the construct loadings were above the minimum threshold of 0.50 (Hair et al., 2006). Moreover, the measures of sampling adequacy were also beyond the acceptable values. The value of KMO (Kaiser-Meyer-Olkin = 0.874) was 0.874, which is greater than the minimum value of 0.5 (Kaiser, 1974). Bartlett's test of sphericity value is 15136.109 (P = 0.000 and degree of freedom are 561), which is also acceptable (Pett et al., 2003). Moreover, the reliability of the instrument was confirmed as the value of Cronbach's alpha was 0.873, above 0.60 (Cronbach, 1951).

5.2 Participants

The total number of responses received was 579, of which only 511 were functional. Sixty-eight questionnaires were not included in the data analysis as they consisted of an outlier, missing and unengaged responses. Table 1 shows the participants' profiles.

5.3 Measurement model testing

CFA was performed in AMOS to confirm covariance-based SEM's measurement model. CFA also helps in confirming the validity and reliability of the study's instrument. The measurement model (Figure 2) shows the covariance structure obtained after performing CFA on the dataset obtained from EFA. The results of the CFA specify a good data fit in

this study (CMIN/DF = 2.8, CFI = 0.951, TLI = 0.941, GFI = 0.907, RMSEA = 0.06, NFI = 0.927).

Table 1 Participants profile

Gender	*Frequency*	*Percentage*
Female	217	42.45%
Male	294	57.5%
Education	*Frequency*	*Percentage*
Pursuing graduation	92	18%
Pursuing post-graduation	289	56.5%
PhD	87	17.01%
Vocational courses	43	8.4%
Age	*Frequency*	*Percentage*
21–24 years	81	15.8%
25–30 years	237	46.3%
30–35 years	108	21.1%
More than 35 years	85	16.6%
Internet usage	*Frequency*	*Percentage*
1–5 hours per week	255	49.9%
5–10 hours per week	142	27.7%
10–15 hours per week	73	14.2%
More than 15 hours per week	41	8%
Social media website	*Frequency*	*Percentage*
YouTube	201	39.3%
ResearchGate	115	22.5%
Slideshare	113	22.1%
LinkedIn	41	8.02%
Facebook	29	5.6%
Twitter	11	2.1%

5.4 Reliability and validity

The reliability of the instrument was measured with values of composite reliability (CR) which was above the recommended value of 0.6 (Fornell and Larcker, 1981). The standard loadings for all the items of the constructs were above 0.5, and AVE scores were above 0.50, which implies convergent validity in the study (Fornell and Larcker, 1981). From Table 2, it can be observed that the diagonal value (square root of AVE) is more than the off-diagonal value (correlation coefficient between constructs) which implies that discriminant validity exists in the study (Fornell and Larcker, 1981).

5.5 Structural model

Using AMOS, the second step in SEM was run in order to examine the association between the variables proposed in the research framework. The results of the structural model indicate a good data fit (CMIN/DF = 2.95, CFI = 0.907, TLI = 0.908, GFI = 0.903, RMSEA = 0.062, NFI = 0.921). Finally, the path analysis helps examine the association between the study variables (Table 3 in Appendix).

Figure 2 Measurement model (see online version for colours)

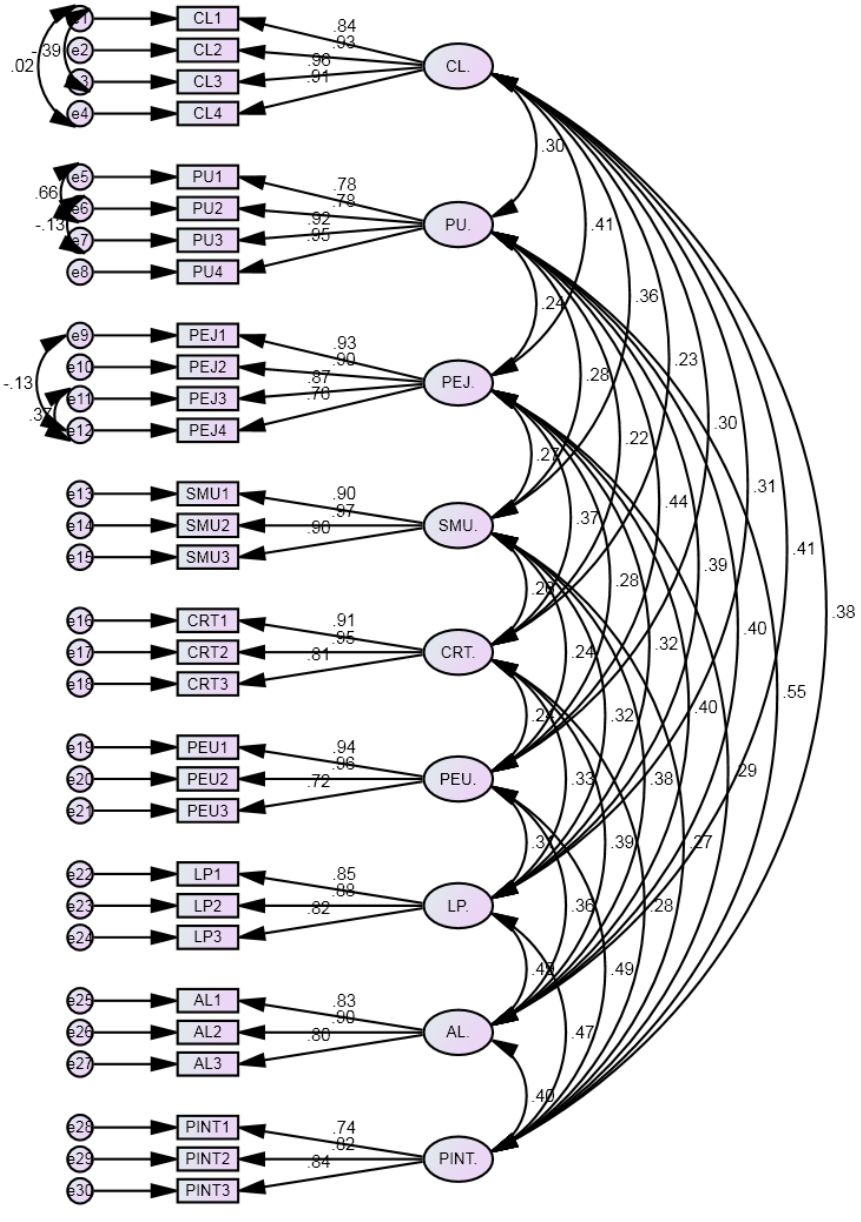


Table 2 Convergent and discriminant validity

	CR	*AVE*	*AL*	*CL*	*PU*	*PEJ.*	*SMU*	*CRT*	*PEU*	*LP*	*PINT*
AL	0.883	0.717	0.846								
CL	0.952	0.833	0.307	0.913							
PU	0.920	0.744	0.396	0.296	0.863						
PEJ.	0.923	0.752	0.403	0.407	0.240	0.867					
SMU	0.947	0.856	0.381	0.357	0.279	0.268	0.925				
CRT	0.918	0.789	0.389	0.227	0.224	0.366	0.259	0.888			
PEU	0.910	0.775	0.363	0.301	0.442	0.280	0.236	0.236	0.880		
LP	0.889	0.727	0.488	0.311	0.387	0.316	0.322	0.334	0.309	0.853	
PINT	0.842	0.641	0.396	0.377	0.547	0.288	0.267	0.277	0.487	0.275	0.801

Notes: The values in the above matrix's diagonal are the AVE's square root.
CRT – creativity, SMU – social media use, PU – perceived usefulness, PEU – perceived ease of use, PEJ – perceived enjoyment, PINT – perceived interactivity, LP – learning performance, CRT – creativity, AL – active learning and CL – collaborative learning.
AVE = average variance extracted and CR = composite reliability.

5.6 Hypothesis testing

The findings support all the ten hypotheses proposed initially in the study concerning the nine constructs. The strongest direct influence on SM use is from the perceived enjoyment ($\beta = 0.28$; $R^2 = 0.33$), followed by PU ($\beta = 0.26$; $R^2 = 0.33$), PEU ($\beta = 0.24$; $R^2 = 0.33$) and perceived interactivity ($\beta = 0.21$; $R^2 = 0.33$). Similarly, the strongest direct influence of SM use is on active learning ($\beta = 0.39$; $R^2 = 0.27$), followed by collaborative learning ($\beta = 0.37$; $R^2 = 0.24$) and creativity ($\beta = 0.21$; $R^2 = 0.20$). Lastly, the greatest direct influence on learning performance is from active learning ($\beta = 0.38$; $R^2 = 0.23$), followed by creativity ($\beta = 0.27$; $R^2 = 0.23$) and collaborative learning ($\beta = 0.19$; $R^2 = 0.23$).

6 Discussion

This work's finding offers a practical insight concerning the learning performance of university learners and examines various antecedents and consequences of SM use for learning. This work also augments the existing academic literature through the integration of the TAM model along with socio-cultural theory to improve the comprehension of SM use as regards online learning amongst the learners. SM networks have, in essence, transformed the means of communication, interactions, socialisation, and collaboration amongst learners (Sarwar et al., 2019). Effortless collaborations that are possible through SM have allowed learners and educators to come together for mutually beneficial learning (Stevens, 2009). It has been found that students are more enthused to learn, leading to more creative achievements via such emerging technological platforms (Gregory et al., 2014, Sarwar et al., 2019). These networks allow learners' to distribute and exchange valuable information amongst them. Furthermore, the constructive usage of

SM leads to collaborative learning, interactive learning and enhanced creativity, ultimately leading to augmented learning performance amongst the participants.

The conceptual framework used in this work is an extension of 'TAM' by including 'perceived interactivity' as an essential antecedent to SM use for learning, which is in addition to the PEU, perceived enjoyment, and PU that have been studied in prior studies. In addition, essential linkages were also explored between social use and its outcomes, i.e., active learning, creativity, and collaborative learning, which finally led to the learning performance amongst the participants. This research work signifies the importance of interactivity amongst participants and between the online system and participants as an essential precursor for SM use. The importance of perceived functionalities, hedonic attributes, and effortless systems concerning SM platforms is also highlighted by this work about the learners' objectives. The current model also emphasises the importance of SM learning in virtual communities for learners that enhance their creativity and ability to learn actively and through collaboration with other learners on SM platforms. The results obtained using SEM analysis validates the proposed research model with strong values for standard estimates and variance discussed in the previous section. SM use was strongly influenced by perceived enjoyment followed by PU, PEU and perceived interactivity. This means hedonic attributes on SM platforms are the strongest influencers for online learners that induce them to use them for their learning objectives. Whereas perceived interactivity has the lowest influence and thus, SM platforms must incorporate more interactive features (chat features, customisations, etc.) on their websites to increase participation for learners. Learners should also use SM platforms with more interactive features to enhance their learning. Both PEU and PU have proven to be strong predictors of SM usage in this work, as is the case in previous works on SM for learning (Al-Rahmi and Zeki, 2017; Al-Rahmi et al., 2020).

The most substantial outcomes of SM users are active learning, followed by collaborative learning and creativity. Thus, based on the current findings, SM learning enables learners to enhance their learning capacities. However, the influence on creativity is relatively low compared to other outcomes, as this may be due to the distractions on such platforms. Lastly, the results show that learning performance is strongly influenced by active learning followed by creativity and collaborative learning. Hence, this work provides vital evidence on the role of SM learning for enhanced learner performance.

Therefore, the current framework provides an essential basis for enhanced participation in virtual communities for knowledge sharing (Redondo Duarte et al., 2017), ultimately leading to improved learning. This work has proved that knowledge sharing amongst participants on online platforms leads to learners' more engaged education and cooperation. Hence, this work has made an essential contribution to the literature on SM learning. The following section describes how each of the variables in the research framework is related to the others.

The current findings suggest an affirmative association between SM use and its antecedent variables, i.e., PEU and PU which corroborates with some of the previous works (Al-Rahmi and Zeki, 2017; Al-Rahmi et al., 2020). Similarly, the current work results are in congruence with the earlier studies concerning the association between SM use and perceived enjoyment (Al-Rahmi and Zeki, 2017, Sarwar et al., 2019). These findings imply that the usefulness and ease of use of SM networks are vital factors influencing students' use of such platforms. These results also suggest that social

networks have become popular amongst learners due to their expediency and universal usage. Learners also enjoy such platforms for their features and resource sharing, and mutual work. This study has thus, advanced the research on SM use for learning and its antecedents in a different geographical setting. Moreover, this work has also explored a unique association between perceived interactivity and SM use for learning. Since this study, perceived interactivity has been studied as an experiential entity that includes both person-to-person interaction and person-to-content interaction within the SM environment (Wie et al., 2015). Thus, users who are inclined to use SM for learning consider such platforms an excellent means to communicate instantaneously with their peers and educationists. Moreover, such users also believe that SM is an excellent tool for gaining and sharing informative content concerning their learning. Thus, stakeholders must focus on such interactive features on the social networks to promote effective learning for the learners.

Moreover, this work has also studied two more consequences of SM use (i.e., creativity and active learning) in addition to the collaborative learning as examined in the earlier studies. The positive association found between collaborative learning and SM use in this work is in congruence with some of the earlier studies (Al-Rahmi and Zeki, 2017; Al-Rahmi et al., 2020). SM network usage creates a setting that allows for collaborative learning to help learners improve their learning (Al-Rahmi et al., 2018).

These findings suggest that SM can serve as an active tool to assist the growth of the education environment through collaboration and expression amongst the learners. SM enables the learners to engage in vigorous discussions and person-person integration. The relationship between SM use and creativity is an interesting finding. Caldwell et al. (2020) also suggest that SM networks can lead to creative thinking amongst learners. SM allows the dissemination of innovative ideas and allows learners to engage in productive discussions with their peers and mentors that may lead to critical thinking amongst the learners (Acar et al., 2021). However, more research needs to be performed to generalise this assumption.

Lastly, the influence of creativity, active learning and collaborative learning on learning performance is also positively significant. The influence of collaborative learning on its outcome variable, i.e., learning performance, has been proved in earlier studies (Al-Rahmi and Zeki, 2016; Li et al., 2012; Sarwar et al., 2019). This is because SM allows the learners to cooperate with other learners or their supervisors, improving their learning ability. SM allows the exchange of knowledge between learners that can enhance their learning effectiveness. SM also fosters creativity in online learners and actively engages them in their educational endeavours, thereby increasing their learning performance. Research has indicated that creativity is positively associated with learners' educational performance (Akpur, 2020). Active learning, in contrast to conventional learning, allows learners to express more and engage more vigorously with their education, leading to better learning ability (Dahdal, 2020). SM provides an excellent interactive platform for active learning, leading to better performance (Cummings et al., 2017). Thus, this research augments the existing literature concerning online learning by integrating four important antecedents of SM use for education. Moreover, it also explores the important association between SM use and three outcome variables that ultimately improve learners' performance on SM platforms.

7 Conclusions

The present work is an important work in an evolving domain concerning the use of SM technologies for learning amongst learners. The current work supports SM's valuable applications for enhancing learners' performance by influencing learners' creativity, supporting collaborative education, and facilitating the learners' active learning process. This work also demonstrated that PEU, perceived interactivity, PU, and perceived enjoyment of SM influence SM usage for education. Current work findings authenticated the use of socio-cultural narrative in investigating active learning, collaborative learning and creativity through the use of SM use. Overall, creativity, active learning and collaborative learning through social networks deepen the learning of students and finally improve their performance.

8 Future work

This article only serves as a coarse guide for considering the factors that influence SM use for learning and its outcomes. Future scholars can also use this framework to incorporate more factors into the current framework. Perceived benefits have been described as an important factor that may influence SM use for learning (Chen and Bryer, 2012) which was left out in this work's conceptual model. Future scholars can also investigate the relationship between SM use for learning and perceived benefits and thus, improve upon this model. Future works also need to integrate other factors influencing SM interactivity, for instance, internet bandwidth, to assess their influence on learners' learning performance. Moreover, the findings showed that interactivity in the current model had the least influence on SM use for learning, and thus, future studies may explore the underlying reason for the same. Similarly, the influence of SM use on creativity was also the least compared to other outcomes. The underlying reason for this can also be investigated by other scholars. Future scholars can also use the current model to explore the possibilities for educators and trainers that might want to incorporate SM learning for enhanced learning for their students/learners.

Moreover, this work has employed only questionnaires and does not use the data triangulation technique for collecting responses from the subjects, which can produce some bias in the research (Fielding and Fielding, 1986). Moreover, data collection using a survey employed in this work can produce prejudice concerning the data (Fernández-Pérez et al., 2014). Future scholars can explore the possibilities of data triangulation in their data collection and can overcome such shortcomings through the application of qualitative techniques to supplement the quantitative methods (Fernández-Pérez et al., 2014; Fielding and Fielding, 1986). This study was only limited to public universities; therefore, the current findings may not reveal the behaviour of private universities or other vocational institutes. Future academicians may include other institutes to improve the generalisability of the findings. Future works can also include a larger sample and a large geographical area. Future researchers are also suggested to replicate this study in different countries with diverse cultures. This work has used cross-sectional investigation approaches that can constrain the study as a person's behaviour may alter over time (Bowen and Wiersema, 1995). Future endeavours could use a longitudinal approach (Carlone et al., 2014), a mixed-method approach

(Rittichainuwat and Rattanaphinanchai, 2015) or even a cross-case technique (Bower et al., 2015). Cyberbullying has been considered one of the factors on SM platforms that may hinder one's learning process (Sarwar et al., 2019). Future scholars can thus, investigate the interruptions concerning SM learning in the form of cyberbullying.

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Appendix

Table 3 Structural model estimates

Dependent variable	*Direction*	*Independent variable*	*Standard estimate*
SMU	←	PU	0.26
SMU	←	PEJ	0.28
SMU	←	PEU	0.24
SMU	←	PINT	0.21
CRT	←	SMU	0.25
AL	←	SMU	0.39
CL	←	SMU	0.37
LP	←	CRT	0.27
LP	←	AL	0.38
LP	←	CL	0.19