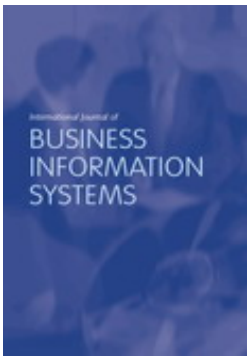

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Factors influencing adoption of cloud computing services in HEIs: a UTAUT approach based on students' perception

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Factors influencing adoption of cloud computing services in HEIs: a UTAUT approach based on students' perception

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Abstract: The use of cloud computing services in higher education institutions (HEIs) is gaining momentum. From a stakeholder analysis perspective, this study aims to advance the understanding of students' intentions to adopt cloud technologies. By extending the unified theory of acceptance and use of technology (UTAUT) framework, we have tried to investigate the interplay and influence of students' cognitive factors in explaining their perception towards cloud adoption. The data sample consisted of 190 undergraduate students from Indian educational institutes. The findings revealed that social influence, performance expectancy and facilitating conditions are positively related to the attitude towards cloud adoption. Moreover, the positive effect of facilitating conditions on students' attitude is mediated by perceived trust. It was also found that performance expectancy of cloud-enabled learning mediates the effects of social influence on students' attitude towards the latest technology. The present study has profound implications on HEI's change management plans and can design ways for the seamless integration of learning functions using cloud technologies.

Keywords: cloud computing; higher education; technology; UTAUT; empirical research.

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1 Introduction

Technology has significantly changed the lives of people in the way they interact, communicate, learn and work (Qadri and Quadri, 2018). Technology-driven changes can be observed in the areas of communication, ticketing, online shopping and election campaigning (Salehan et al., 2018). Similarly, technology has brought significant changes in the education system (Alamri and Qureshi, 2015; Au-Yong-Oliveira et al., 2018; Martins et al., 2019). These include the way information is acquired and disseminated as well as how knowledge is generated and shared among students and faculties (Qadri and Quadri, 2018). The stakeholders of the education sector have reported positive benefits of technology in the case of student learning (Nayar and Kumar, 2018). Young learners have started using their smart devices to communicate, access and disseminate information (Thakre and Thakre, 2015). In the digital era, students are prone to use SMAC (social, mobility, analytics and cloud) technologies for accessing, storing and distributing informal information. However, there is a debate on how university students can use social media as a tool for formal learning (Junco, 2012). The time spent on the internet can be a positive or a negative predictor of commitment towards students' learning.

Higher educational institutes (HEIs) contribute significantly to economic development and play a important role in the sustainable development of a country (Ramísio et al., 2019; Shawe et al., 2019). Top educational institutes over the globe are investing efforts to attract learners from around the globe (Jose and Chacko, 2017). In particular, the Indian higher education sector (HES) has experienced exponential growth in the last two decades (Parvez and Agrawal, 2019). Furthermore, the HES in India is likely to increase to a value of US$35.03 billion by 2025 (IBEF, 2018–2019). In India, the prevalence of face to face education has been widely recognised. However recently, HEIs face acute challenges such as upsurge in operational costs, shortage of competent faculties (Sharma and Sharma, 2015; Sheikh, 2017), inadequate infrastructure (Sharma and Sharma, 2015; Sheikh, 2017), gaps in the supply and demand (Nagrale, 2015; Sharma and Sharma, 2015; Sheikh, 2017) and threats from the private players (Nagrale, 2015). However, the development of online education, especially massive open online courses (MOOCs), has been considered as a promising way to solve these problems. India has the second-highest number of users of MOOCs (Brindaalakshmi, 2016; Chakravarty and Kaur, 2016; Chauhan, 2017). These open online courses can be accessed by students to upgrade skills and knowledge in various academic and non-academic fields.

The Indian Ministry of Human Resource Development (MHRD) has also launched several platforms, such as NPTEL and SWAYAM, to facilitate e-learning (Chauhan, 2017). However, many of the educational stakeholders feel that MOOC courses have failed to create the peer-to-peer learning experience due to its one-way mode of communication. Up to 90% drop out is witnessed across MOOC courses due to reasons such as low incentive for completion and lack of instant support (Hew and Cheung, 2014). Low course completion rates and high dropout rates from MOOC courses within the first few weeks of enrolment may provide evidence of student's apathy towards technological interventions in education (Perna et al., 2013).

Contemporary research has reported the dominance of technology in student academic life in developed countries (Roberts and Pirog, 2013; Gilbert et al., 2007). Following this trend, the traditional ways of learning in developing countries need a radical change. However, the volume of studies on the student's readiness for e-learning is scarce as compared to developed countries where such studies are common (Paturusi et al., 2015). It is evident that incorporation of new technologies in education without assessing informational readiness for innovation acceptance can lead to high resistance against the change (Zolait and Sulaiman, 2008). As students' readiness towards adopting new technology is one of the critical factors for implementing e-learning or a sophisticated version of it – *cloud-based learning* (Paturusi et al., 2015), it is worthy to examine psychological and contextual parameters to understand their motivation towards learning.

The critical factors and the benefits of cloud computing services (CCS) adoption has been extensively researched under the commercial lens which includes SMEs (Priyadarshinee et al., 2017; Alshamaila et al., 2013), implementation of e-government systems (Mohammed et al., 2018), supply chains (Cegielski et al., 2012), information systems (Chauhan and Jaiswal, 2015) and HR operations (Ghosh and Tripathi, 2018). However, the adoption of CCS in the educational sector requires further investigation from a stakeholder's perspective. Drawing on this argument, students' perceptions of the cloud's importance and value addition in the field of learning is an interesting area of investigation (Ashtari and Eydgahi, 2017).

The unified theory of acceptance and use of technology (UTAUT) model proposed by Venkatesh et al. (2003) explains 70% variance in intention to use technology and, therefore has been suggested as a benchmark model for the technology acceptance literature. As this model was adopted by several studies and in different cultural settings (e.g., Slade et al., 2013), we have adopted the model to examine the factors that determine cloud adoption in Indian HEIs. Research in this area may help educational leaders in aligning institutional strategy to the learning processes; this would make students more aware of institutional development (Ali et al., 2014). Thus, this study is an attempt to contribute in the literature by formulating the following research objectives:

- to investigate the psychological and contextual factors that affect students' cloud adoption in Indian HEIs
- application of the UTAUT model in the context of cloud computing services adoption in HEIs.

The remaining paper is organised as follows. Section 2 discusses the conceptual model and hypotheses developed in the context of HEIs in India. Section 3 discusses the research design. Section 4 presents the survey results. Section 5 details the research findings followed by the research implications.

2 Conceptual model and hypotheses development

2.1 Cloud computing benefits and challenges in higher educational institutes

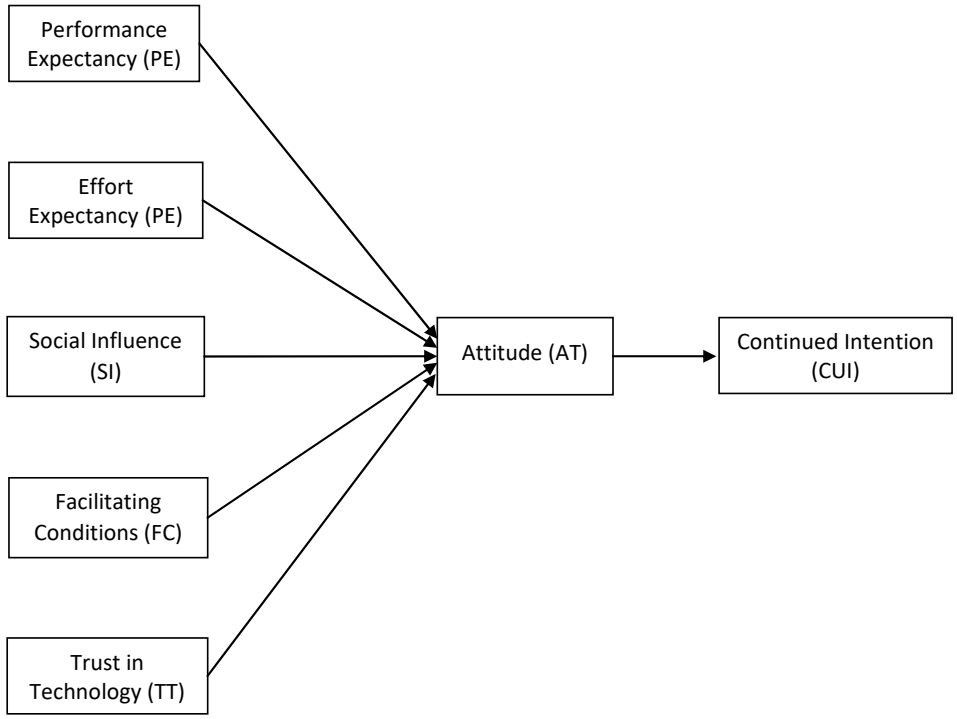
Cloud services enable big organisations to use high voluminous and variety of resources optimally, thus ensuring enterprise sustainability (Babu et al., 2014). Cloud computing is defined as " a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Mell, 2009). Relying on the success stories of cloud implementation in profit-centric organisations, non-profit sectors have been trying to adopt the technology (Senyo et al., 2016; Yeboah-Boateng and Essandoh, 2014). However, small firms prefer a critical analysis of cloud benefits over the hype as they lack the know-how and limitations of this new technology (Vidhyalakshmi and Kumar, 2016). This conservative approach can also be seen in educational institutions of developing nations.

The advent of new technologies brings a paradigm shift into teaching and learning methods (Aristovnik et al., 2017). Zhang and Nunamaker (2003) argue that, "the concept of traditional education does not fit well with the new world of lifelong learning in which the roles of the instructor, students and curriculum are changing". The rise in the use of cloud technology in HEIs is designed to attract learners and meet their ever-changing requirements (Clark and Mayer, 2011). Cloud computing services facilitate collaborative learning activities (Grabinger and Dunlap, 1995) through cloud-enabled channels (e.g., hardware, software, dedicated learning management tools, social media platforms) which can help to initiate, implement and sustain growth in HEIs (Agashe, 2004). Similarly, Alghabban et al. (2016) proposed cloud-based m-learning tool for promoting dyslexia.

According to the available literature in developing countries, the main challenges regarding implementation of cloud-based learning systems in universities can be categorised under two heads – technical and socio-cultural. The top management of educational institutes are concerned about the reliability of CCS providers and lack of available resources in cloud computing to addresses their problems (Njenga et al., 2019). Regulatory and privacy concerns of cloud (Akin et al., 2014) and lack of investigation on socio-cultural values and beliefs on the usefulness of this new technology within various social groups in universities (Sabi et al., 2018) pose a significant challenge towards its adoption.

Out of several factors that impact the effectiveness of technology adoption in educational institutions, it is noted that some of these are psychological (Ashtari and Eydgahi, 2017). As the current education system is largely socio-technical (Upadhyaya and Mallik, 2013), it is imperative to assess the perception of students towards technology adoption, such as their intent to use CCS.

Figure 1 Conceptual model



2.2 Examining the factors of UTAUT in the context of cloud adoption

Contemporary studies suggest several theoretical models from social psychology to understand consumer adoption of new technology. Traditional 'theory of reasoned action' (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980) posit that attitude and subjective social norms form human intentions that inadvertently drive an individual's behaviour. Later, Ajzen (1991) proposed the 'theory of planned behaviour' where he included

'perceived behavioural control' as a factor which influences one's intention and actual behaviour (Ajzen, 1991). At the same time the 'technology acceptance model' (Davis, 1989; Davis and Bagozzi, 1989) evolved, developing the exploration of the user's adoption factors for new technologies. Further, the UTAUT model was developed to examine the factors influencing the adoption of new technology (Venkatesh et al., 2003). In the current study, the authors have adapted the model to measure the students' perceptions of cloud adoption in HEIs. Moreover, in line with other studies especially by Kabra et al., (2017) on supply chain management, a factor viz., *trust* has been added to our model (see Figure 1).

2.2.1 Facilitating conditions, effort expectancy, trust and attitude

The present paper defines 'facilitating conditions' (FC) as "the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system" [Venkatesh et al., (2003), p.453]. Theoretically, the importance of 'facilitating conditions' (FC) in adoption has been supported by current literature (e.g., Duyck et al., 2010; Foon and Yin-Fah, 2011; Yeow and Loo, 2009). Few studies have explored its relevance in the area of mobile banking (Islam et al., 2019), e-learning in schools (Kumi et al., 2012) and e-governance (Smitha et al., 2012). FC is found to affect student's anxiety, self-efficacy, attitude and perceived ease-of-use towards adoption of a specific new technology (Kumi et al., 2012).

The impact of 'trust' on new technology adoption intention has been widely acknowledged in relevant literature in areas such as humanitarian supply chains (Kabra et al., 2017), e-commerce (Wei et al., 2009; Yoon, 2009), mobile services (Malaquias and Hwang, 2016) m-learning (Hamidi and Chavoshi, 2018), and other persuasive technologies (Ahmad et al., 2018). In a different sphere, Lichtenstein and Williamson (2006) and Ongori (2009) reported 'lack of trust' as the key factor impeding the internet banking services adoption. Moreover, Baptista and Oliveira (2015) and Alqatan et al. (2012) further recommended the inclusion of trust in the UTAUT model. In a similar vein, we argue that many students may be reluctant to adopt CCS in HEIs due to a typical characteristic of any IT application – *abstractness*. Users cannot see the background processes of any software application and thus, their trust in that application is limited. Therefore, it is worthy to examine trust in technology as a factor, which encourages students to adopt that particular technology. However, 'effort expectancy' (EE), i.e., 'the degree of ease associated with IT usage' can play a pivotal role in technology adoption (Venkatesh et al., 2003).

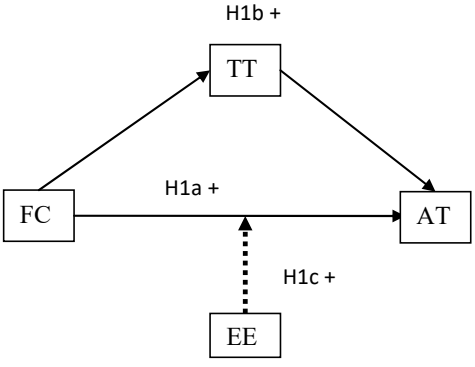
In the present context, EE signifies the students' efforts required to adopt cloud computing services. Drawing from work motivational theories, it is assumed that people expect high informational processing efforts lead to a greater judgmental confidence (Bohner et al., 1998). Therefore, for a student, the degree of perceived effort requires to handle cloud-based services may strengthen or weaken the relationship between FC and attitude towards its adoption. Moreover, in terms of a new technology adoption, student's perceived ability to use that technology weighs more than the benefits they may gain from its use (Ashtari and Eydgahi, 2017). Thus, we posit the following hypotheses (see Figure 2 for the conceptual framework):

H1a Facilitating conditions (FC) for cloud adoption in education is positively related to the attitude of students towards the adoption.

H1b The positive effect of the FC on student attitude is mediated by perceived trust towards cloud adoption.

H1c Effort expectancy of students moderates the positive relationship between FC and attitude (AT) in such a way that when effort expectancy is higher, the strength of the relationship between FC and AT is higher than when expectancy is lower.

Figure 2 The relationship between facilitating conditions (FC), attitude (AT), effort expectancy (EE) and trust in technology (TT)



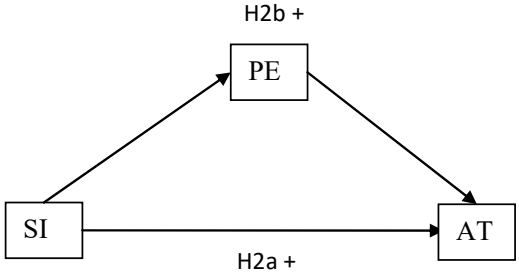
2.2.2 Social influence, performance expectancy and attitude

'Social influence' (SI) is an individual's perception of being influenced by others to adopt new systems (Venkatesh et al., 2003). Technology users tend to comply with the opinions of colleagues, peers, family members, supervisors and others who are important to them (Bagozzi and Lee, 2002). As the students of this generation are no exception to this, the SI factor is pivotal for technological success (Martins et al., 2014) in educational setups. Generally, students are highly influenced by their peer groups. It is likely that a student starts using cloud-based services when his or her group members are using it. Moreover, the impact of CCS on an individual's work performance may significantly influence the individual's attitude towards its adoption. Thus, 'performance expectancy' (PE), i.e., "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" [Venkatesh et al., (2003), p.447] becomes important. PE can have a significant impact on student's attitude towards adopting new technologies in learning. Thus, we posit the following hypotheses (see Figure 3):

H2a Social influence positively affects the attitude of students towards cloud adoption.

H2b Performance expectancy of students mediates the positive effects of social influence on the attitude of students towards cloud adoption.

Figure 3 The relationship between social influence (SI), performance expectancy (PE) and attitude (AT)

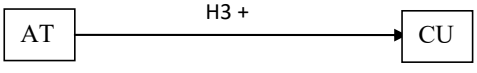


2.2.3 Attitude and continued intentions to use technology

The authors have examined 'attitude' as an antecedent to students' 'continued intention to use technology'. However, some of the models inspired by TAM and TAM2 consider attitude as an inherent part of an individual's belief. As cited by Scherer et al. (2019), *attitude towards technology* (AT) refers to "a person's evaluation of technology or specific behaviour associated with the use of technology" (Zhang et al., 2008). Gilbert (2015) has reported the positive impact of student's attitude on technology use. In a similar vein, few studies (Lin, 2011; Naaz, 2012) have reported a positive relationship between teachers' attitude and technology. However, few studies have also reported mixed results (e.g., Ifenthaler and Schweinbenz, 2013). Despite these different views, "empirical research has shown that specific behaviours can be predicted quite well from compatible measures of attitude toward the behaviours in question" (Ajzen and Fishbein, 2005). In this study, AT has been included in the UTAUT model to explain the *continuing usage intention* (CUI) of cloud computing services. Thus, we posit the following hypothesis (see Figure 4):

H3 Attitude towards cloud adoption in education is positively related to the continued use intentions of students towards cloud adoption.

Figure 4 The relationship between attitude (AT) and continuation intention to use (CUI)



3 Research design

The present study has applied the UTAUT model to examine factors that determines student intention to adopt cloud storage services in Indian HEIs. A structured questionnaire utilising 'seven-point Likert scale', from '1 = strongly disagree' to '7 = strongly agree', was used to record the response of the students. 190 undergraduate students across India participated in the study with a self-administrated paper-and-pencil

survey. The scales used to operationalise the constructs PE, EE, SI, FC and CUI were adapted from the original UTAUT (Venkatesh et al., 2003). The construct *trust in technology* was adapted from Gao and Bai (2014) and Gao et al. (2011). Similarly, *attitude toward technology* was adapted from Thomas et al. (2013). Items used in the questionnaire (see Appendix) were adapted to match the current focus of the study, i.e., Indian HEIs.

The sample comprised of young educated students, as prior studies have suggested that young students are important stakeholders and a crucial group of technology consumers as they are more open to new ideas and are generally supportive of sustainable development measures (Lee, 2014; Ottman et al., 2006). Experts reviewed the questionnaire to ensure the content validity of the scale.

4 Results

Table 1 shows the descriptive statistics of all the variables considered in this study. All study variables demonstrated high-reliability coefficients.

Table 1 Means, standard deviations and inter-correlations among variables

Dimensions	*1*	*2*	*3*	*4*	*5*	*6*	*7*
1 Performance expectancy (PE)	(.85)						
2 Effort expectancy (EE)	.86**	(.77)					
3 Social influence (SI)	.75**	.71**	(.80)				
4 Facilitating conditions (FC)	.67**	.74**	.64**	(.76)			
5 Continued use intentions (IU)	82**	.84**	.72**	.84**	(.84)		
6 Attitude (AT)	.68**	.75**	.61**	.70**	.74**	(.80)	
7 Trust (TT)	.76**	.76**	.82**	.80**	.86**	.67**	(.88)
Mean	3.41	3.42	3.40	3.47	3.42	3.38	3.47
SD	.71	.63	.70	.71	.73	.68	.68

Notes: $N = 190$. **$p < .01$; *$p < .05$. Cronbach's alphas are reported in brackets.

4.1 Hypotheses testing

To test Hypotheses 1a, 1b and 1c, hierarchical regression was applied. Step 1b (refer to Table 2) indicates the positive effect of FC on AT ($\beta = .70$, $p < .001$). Thus, Hypothesis 1a was supported.

FC was positively related to trust (TT) ($\beta = .80$, $p < .001$). From step2b, TT was found to be positively related to AT ($\beta = .67$, $p < .001$). After controlling FC, in step 3b, TT was found to be positively related to AT ($\beta = .31$, $p < .001$). Moreover, by executing PROCESS macro V. 3.12 (Hayes, 2013), the bootstrap confidence interval validated the significance of the indirect effect (Preacher and Hayes, 2004). PROCESS macro (model 4) indicated a strong indirect effect through TT ($\beta = .24$, 95% BCa CI [.07, .41]). Therefore, Hypothesis 1b was supported.

Table 2 Summary of hierarchical regression and bootstrapping analysis: trust (TT) as a mediator

	TT	*AT*		
	Step 1a	*Step1b*	*Step2b*	*Step3b*
FC	.80 **	.70**		.45**
TT			.67**	.31**
R^2	.65	.48	.46	.52**
ΔR^2				
F	352.38**	186.49**	160.06**	106.15**
Process macro V3.2 result				
Indirect effect	.24			
95% BCI	[.07, .41]			
SE	.08			

Notes: $N = 190$; bootstrap sample = 5,000; TT – trust; FC – facilitating conditions; AT – Attitude. *$p < 0.05$; **$p < 0.01$.

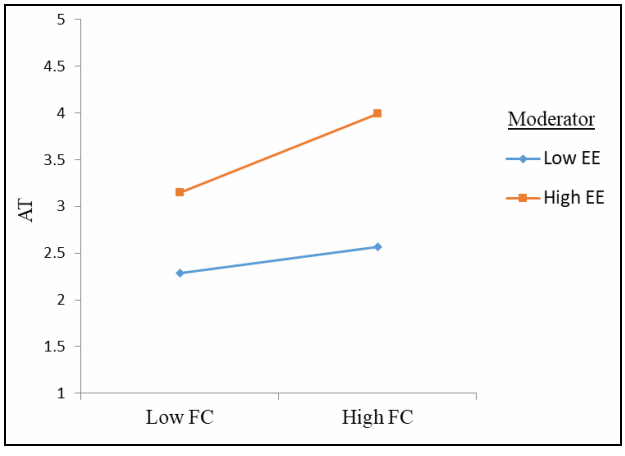
Table 3 Summary of hierarchical regression analysis: EE as a moderator

AT (Attitude)			
	Step 1	*Step 2*	*Step 3*
FC	.70**	.32**	.30**
EE		.51**	.52**
FC × EE			.10*
*R*2	.49	.61	.63
$\Delta R2$		.12	.01
F	186.49**	151.88**	105.56**

Notes: $N = 190$, bootstrap sample = 5,000; AT – attitude; FC – facilitating conditions; EE – effort expectancy. *$p < 0.05$; **$p < 0.01$; unstandardised coefficients are reported.

Hypothesis 1c examined the moderating role of effort expectancy (EE) in the relationship between FC and AT. Variables Trust and Facilitating Conditions were mean-centred to avoid a multi-collinearity effect (Aiken et al., 1991). Step 3 (refer to Table 3), clearly indicates that 'facilitating conditions × effort expectancy' is positively related to attitude ($\beta = .10$, $p < .05$). Similar results were encountered when we run PROCESS macro (model 1) for testing the moderating effect of EE. Figure 5 illustrates the moderating effect of effort expectancy. The slope analysis of the interaction revealed that the positive effect of FC on AT was greater for students whose EE was high. Therefore, Hypothesis 1c was supported.

Figure 5 Moderating effect of effort expectancy (see online version for colours)



To test Hypothesis 2a and Hypothesis 2c, hierarchical regression was applied. From step 1a (refer to Table 4) it is evident that there is a positive relationship between SI and PE ($\beta = .75$, $p < .001$). Therefore, Hypothesis 2a was supported. From step2b (Refer to Table 4), it was evident that PE positively influenced AT ($\beta = .61$, $p < .001$). After controlling SI, in step 3b, PE was again found to be positively related to AT ($\beta = .51$, $p < .001$ A strong indirect effect of SI on AT through PE ($\beta = .24$, 95% BCa CI [.07, .41]) was observed. Therefore, Hypothesis 2b was supported.

Table 4 Summary of hierarchical regression and bootstrapping analysis: performance expectancy (PE) as a mediator

	PE (performance expectancy)	*AT (Attitude)*		
	Step 1a	*Step1b*	*Step2b*	*Step3b*
SI	.75**	.61**		.23**
PE			.61**	.51**
R^2	.56	.38	.47	.50
ΔR^2			.09	.03
F	264.22**	115.47**	167.39**	91.33**
Process macro V3.2 result				
Indirect effect	.37			
95% BCI	[.22, .49]			
SE	.06			

Notes: $N = 190$; bootstrap sample = 5,000; AT – Attitude; PE – performance expectancy; AT – attitude; SI – social influence. *$p < 0.05$; **$p < 0.01$; unstandardised coefficients are reported.

The attitude of students towards adopting cloud technologies was found to be positively related with continued use intentions of cloud ($\beta = .74$, $p < .001$). Thus, Hypothesis 3 was supported.

5 Discussion

The importance of technology in learning has been widely acknowledged in literature (Au-Yong-Oliveira et al., 2018; Martins et al., 2019; Wong et al., 2012). By applying machine learning algorithms, a recent research has demonstrated that student's information management capabilities can predict their behavioural intentions to use mobile cloud computing services with an accuracy of 72% (Arpaci, 2019). This study is an attempt to further extend the UTAUT model in HEI context by integrating *trust* and *attitude* dimensions. The findings reveal that Indian students readily accept cloud computing as a technology enabler in learning. Our results indicate that students' intention to use cloud computing services was significantly affected by PE, EE, trust, attitude, FC and SI.

Regarding PE, our finding supported its positive influence on the *attitude* towards cloud computing services. These results are in line with earlier studies (Ezzi, 2014; Venkatesh et al., 2012; Venkatesh and Zhang, 2010). Hence, when students find the adoption of CCS to be useful in learning and acquiring new knowledge, they are more likely to adopt it. Therefore, educational institutes need to improve the quality of their cloud computing services based on students' suggestions to meet their changing needs and expectations. The strong effect of PE on the intention to use cloud services confirms that features and benefits of cloud services motivate students to adopt them. This study suggests that education leaders need to demonstrate, as well as communicate, the benefits of using cloud services.

In line with other studies (e.g., Foon and Yin-Fah, 2011), our results indicate the significant impact of SI on attitude. The theory of consumer socialisation affirms that consumption behaviour of young people gets affected by social gatherings (John, 1999). Further, adoption of technology is associated with social values. The effect of social influence represents a 'group effect' on students' use of cloud computing services (Dotson and Hyatt, 2000). Most people have an association with some social gathering. Some of these gatherings may have 'set-up behavioural standards', which may include the use of cloud-based services (Joshi and Rahman, 2016).

The students may feel obliged to pursue the standards set by the institute's policies, their peers and teachers to gain social endorsement and acknowledgement within a gathering. In this context, educational institutes should encourage students, who are after all the early adopters of technology, to be the evangelists of cloud-based services. Moreover, research indicates a positive relationship between educational sustainability and servant leadership (Dalati, 2016). Therefore, managers of Indian educational institutes should try to demonstrate this leadership quality which emphasises building trust between all stakeholders by selflessly serving them. One of the key roles in this transformation is creation of an 'IT leader' (Harrow and Oblinger, 2015). The university leaders can play the role of an IT strategist or a 'navigator' where they focus on achieving strategic and operational benefits through appropriate technology selection and adoption. The faculties and staff can play the role of an 'executioner' where their responsibilities may facilitate guidance, encouragement and support to colleagues and students for the adoption of new technology. Numerous studies have reported the positive impact of FC on the actual usage behaviour of technology (e.g., McKeown and Anderson, 2016). The present study confirms this finding in the context of CCS in Indian HEIs. The finding can be explained in terms of Yang and Forney's (2013) work who suggested that better facilitating conditions overcome students' anxiety about adopting new technology.

Similarly, facilitating conditions may help consumers to overcome adoption anxiety and can guide them in its application. Therefore, educational institutes should invest more in technology infrastructure and provide enhanced facilities such as training programmes to increase the students' skills in using such applications. Moreover, trust has been found to have a favorable association with student intention to use cloud-based services; this is in accordance with previous studies (Osterwalder, 2001). Therefore, cloud computing vendors need to protect individual information; this will develop trust, without which, individuals and institutions would be hesitant to utilise cloud-based storage services.

5.1 Implications

The present study is the first of its kind in the Indian context which attempts to fill the current gap in existing literature on the evolving field of CCS in the higher educational sector. To the best of the authors' knowledge, there is hardly any research which focuses on Indian students' intentions to adopt CCS. The addition of *attitude* as a factor in the model receives support from the findings of Dwivedi et al. (2017), where this factor played an important role in explaining the behavioural intentions and usage behaviours.

These findings have a unique appeal to the governing bodies of HEIs and administration in general. The present study identifies the key factors influencing student adoption of cloud-based services, thus helping to promote such behaviour. The high impact of performance expectancy implies that favourable attitude and intention towards cloud-based services can be developed by providing and communicating distinct features and benefits of cloud-based services. Teachers can encourage such normative behaviours through motivating students to discuss the benefits of using cloud-based services in their social circles.

6 Conclusions

The present study has investigated the key determinants of student adoption of cloud-based services. Identification of various factors affecting the adoption of cloud computing services in HEIs would maximise the benefits of investment in IT infrastructure and provide better information sharing and knowledge transfer among students. Results obtained using path analysis indicated that *social influence* shared the highest predictive power regarding adoption of cloud-based services. *Social influence* was followed by *performance expectancy*, *effort expectancy*, *facilitating conditions* and *trust*. These findings may prove useful in better understanding the various motives behind student adoption of cloud services, thereby enabling managers and policymakers to design campaigns, provide activities and develop suitable interventions to promote the use of cloud.

The results of the present study may guide the educational policymakers to design and develop strategies to encourage student adoption of newer technologies. Our study provides a basic framework for analysing the adoption potential of cloud-based technologies. Educational researchers who are keen on examining the ideas of cloud computing adoption in relation to HEI administration, can extend this framework if deemed fit to their cultural setting.

Though cloud computing services have a significant impact on the bottom-line of any business, its application and benefits in HEIs may not be realised quickly. The perceived

usefulness of new technology adoption in HEIs varies across its different stakeholders such as management, staffs, faculties and students. The present study has only examined the factors determining the adoption of cloud computing services from the student perspective, whereas the other stakeholders' perspectives were not considered. Thus, future research may fill the gap with due consideration of all the stakeholder's viewpoints. Examining the moderating influences of leadership and organisation culture on any new technology adoption can be another dimension of future research.

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Appendix

Questionnaire

Performance expectancy (PE) adapted from Lallmahomed et al. (2017) and Venkatesh et al. (2003):

PE1 Using cloud computing services would improve my academic performance.

PE2 Using cloud computing services would increase the efficiency of my studies and work.

PE3 Using cloud computing services would enable me to accomplish tasks more quickly

PE4 Using cloud computing services would increase my productivity.

Effort expectancy (EE) adapted from Armida (2008) and Venkatesh et al. (2003):

EE1 My interaction with the cloud computing services would be clear and understandable.

EE2 It would be easy for me to become skilful using cloud computing services.

EE3 I would find cloud computing services easy to use.

EE4 Learning to use cloud computing services is easy for me.

Social influence (SI) adapted from Gao and Bai (2014) and Venkatesh et al. (2003):

SI1 People whose opinions I value would prefer me to use cloud computing services.

SI2 People who are important to me think that I should use cloud computing services.

SI3 People who influence my behaviour think that I should use cloud computing services.

Facilitating conditions (FC) adapted from Gao and Bai (2014) and Venkatesh et al. (2003):

FC1 I have the necessary resources to use cloud computing services.

FC2 I have the necessary knowledge to use cloud computing services.

FC3 I can get help from others when I have difficulties using cloud computing services.

Attitude toward technology (AT) adapted from Thomas et al. (2013):

AT1 Using cloud computing services for educational purposes is a good idea.

AT2 Using cloud computing services for educational purposes is fun.

AT3 Using cloud computing services to manage knowledge is pleasant.

Trust in technology (TT) adapted from Armida (2008), Gao and Bai (2014) and Gao et al. (2011):

TT1 I believe it is safe to use cloud computing services.

TT2 I think cloud computing services will provide reliable information.

TT3 I believe it is risk free to use cloud computing services.

TT4 I believe that the utilization of cloud computing services will meet my expectations.

TT5 I believe that cloud computing services will keep my best interests in mind.

Continued use intentions (CUI) adapted from Gao and Bai (2014), Venkatesh et al. (2003):

IU1 I intend to use cloud computing services for educational purposes in the future.

IU2 I predict that I would continue to use cloud computing services for educational purposes.

IU3 I plan to use cloud computing services to manage knowledge in the future.

IU4 I will recommend others to use cloud computing services.