ATTITUDE'S MEDIATING EFFECT ON INTENTION TO USE SAAS CLOUD COMPUTING SERVICES AS A MEANS OF GREEN IT: MALAYSIAN UNIVERSITY SETTING

Ghilan Al-Madhagy Taufiq-Hail[1]
Huda Ibrahim[2]
Shafiz Affendi Mohd Yusof[3]

[1]PhD. Candidate and IT consultant, School of Computing (SOC), UUM College of Arts and Sciences (CAS), Universiti Utara Malaysia (UUM), Sintok, 06010 Jitra, Kedah, Malaysia.
Tel.: +60124712405, E-mail: towfeeq2k5@yahoo.com or taufiq.ghilan@gmail.com (G. A. Taufiq Hail)
[2]Associate Professor Dr., Assistant Vice Chancellor/Dean,School of Computing (SOC), UUM College of Arts and Sciences (CAS), Universiti Utara Malaysia (UUM), Sintok, 06010 Jitra, Kedah, Malaysia.
E-mail: huda753@uum.edu.my
[3]Associated Professor Dr, Faculty of Engineering and Information Sciences, University of Wollongong, Dubai;
E-mail: ShafizMohdYusof@uowdubai.ac.ae

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Abstract: Since the beginning of the 21st century, technology development increased rapidly and the need for more powerful hardware is becoming a must. Nonetheless, many side effects emerged that affected human's life and environment. Therefore, Cloud Computing with its service model Software as a Service (SaaS) surfaced to cope with the fast growing demand for high processing with minimum loss of time, money, and manpower. This concept aligns with the Green IT concept in meeting the demand and safeguard the environment. These two concepts, however, got less scholarly attention and empirical investigation at developing countries, Higher education sector, besides the attitude's mediating effect towards intention to use innovative technology of SaaS services. Hence, the objective is to fill this gap empirically and focus on the attitude's mediating effect to use SaaS CC services from the individuals' perception. Results revealed the strongest attitude's effect towards intention, followed by Perceived Behaviour Control, while Subjective Norms show no significance. However, subjective norm exerts significant role with attitude. Besides, attitude revealed to be a full mediator towards intention. Besides, intention revealed to a strong driver on Accepting and Using SaaS Cloud Computing as a means of Green IT. Limitation found in conducting cross-sectional survey, and employing students and lecturers as respondents. Future studies are invited to extend the suggested framework and test the mediating role of attitude in different contexts. Findings give more insights of attitude's mediating role and the significant effect of subjective norms on attitude to adopt or use SaaS Cloud Computing services.

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Introduction

Since the beginning of the 21st century, technology development increased rapidly and the need for more powerful hardware is becoming a must. Nonetheless, many side effects emerged that affected human's life and environment. Therefore, Cloud Computing with its service model Software as a Service (SaaS) surfaced to cope with the fast growing demand for high processing with minimum loss of time, money, and manpower. Cloud Computing, which relies on virtualization in its core, uses hardware efficiently and reliably (Bose & Luo, 2011; Durkee, 2010); therefore, it reduces the power consumption, the emission of CO_2, and the need to frequent purchase of hardware to cope with performance-hungry programs. The Cloud Computing concept, hence, aligns with the Green IT concept in meeting the demand and safeguard the environment. These two concepts, however, got less scholarly attention and empirical investigation at developing countries, Higher education sector, besides the attitude's mediating effect towards intention to use innovative technology of SaaS services. Hence, the objective is to fill this gap empirically. More importantly, the relationship between attitude and behaviour intention and subjective norm with behaviour intention have been covered extensively in literature, (Hartshorne & Ajjan, 2009; Hung, Ku, & Chien, 2012; Kim & Qu, 2014) and (Picazo-Vela, Chou, Melcher, & Pearson, 2010; Shiau & Chau, 2016; Yang & Zhou, 2011), respectively; however, the role of attitude as a mediator between subjective norms and behaviour intention has been overlooked in the academia. Therefore, the study sheds more focus on the attitude's mediating effect to use SaaS CC services from the individuals' perception. Different direct and indirect paths are investigated to provide empirical and statistical evidence of the mediating role of attitude on the relationship between subjective norms and accepting SaaS Cloud Computing as a means of Green IT.

The following sections are organized as follows. Literature review of Cloud Computing and Green IT, followed by explanation of the latent constructs posited in the model. Next, methodology is presented, giving special focus on the mediating effect and the measures to consider the mediation of the hypothesized construct, i.e. attitude. The findings and discussion are explained thoroughly with accompanying tables and figures; and lastly, the conclusion is presented.

Literature review

Green IT and Cloud Computing

Green IT area of research still has a dearth of empirical studies that needs further investigation (Abdul Rahim & Abdul Rahman, 2013; Bose & Luo, 2013; Tushi, Sedera, & Recker, 2014). Also, Cloud Computing (CC) is an emerging innovative technology that did not reach the maturity level that needs further exploration of different aspects (Khajeh-Hosseini, Sommerville, & Sriram, 2010; Marston, Li, Bandyopadhyay, Zhang, & Ghalsasi, 2011; Saedi & Iahad, 2013). In higher education (HE) sector, the Universities are challenged to have better technology standards to help students in the learning process with latest teaching methods,

and to provide a good technical environment to help researchers and academics. Additionally, the HE institutes have to have good reputation to gain good image and be one of the pioneers in Higher Education sector that have the latest technologies not only for research purposes, but also to attract more students from the globe. Furthermore, Universities by adopting CC, such as SaaS services, can overcome financial issues (Massadeh & Mesleh, 2013) and, therefore, can facilitate the adoption of Green Technologies(Okai, Uddin, Arshad, Alsaqour, & Shah, 2014). Besides, Green IT is as any device, tool, or practices that uses technology in its core, which does not harm nature, and preserve nature and human (Al-Madhagy, Yusof, Hashim, & Alaswadi, 2015). Additionally, Cloud Computing can be identified as a model of shared pool of computer resources by means of network access that can be provisioned as in-demand resources and released rapidly with minimum service provider interaction (Mell & Grance, 2011). On the other hand, Software as a Service (SaaS), which is the focus of the study, is simply using the applications on the Cloud infrastructure of the service provider by the consumer (Mell & Grance, 2011).

It is worth mentioning that technological market is urging users to adopt SaaS CC services and applications in an aim to familiarize them with this novel technology with less effort and knowledge at their fingertips. For example, the new smart devices of different types give free space as a storage for consumers of their technological devices. Also, many service companies offer their services by means of on-line applications to place the orders, make reservations, pay their bills, update their personal information, or use on-demand computer resources in pay-per-use paradigm. This new paradigm is a way to go for SaaS CC services and applications in which consumer can use these services from any device, anywhere, and at any time. Universities were not away of this market change. They offered students, academics, and researchers with SaaS CC in different forms. For example, the use of University portals, the e-library services, the provision of learning and teaching materials, the provision of free space and applications through Microsoft and Google SaaS CC services. This paradigm shift made Universities academic activities move to clouds, and consequently, can reduce carbon footprint emissions up to 90 percent (i.e., Large corporations can save 30-60 percent and mid-size businesses 60-90 percent) (Kumar & Buyya, 2012). Though SaaS CC services have all these benefits, the research on it still at the early stage as indicated by previous work (Klug, 2014; Marston et al., 2011; Saedi & Iahad, 2013) and is limited to business side effects, while factors influencing its acceptance from the perspective of individuals at HE sectors is still limited and needs further investigation (Klug, 2014). Hence, this article attempts to fill this gap on the area of SaaS CC and Green IT jointly in a single study by focusing on the attitudinal, normative, and technological aspects that influence the intention the actual use of SaaS CC applications and services.

Adopting or Using SaaS Cloud Computing (AUSaaS)

Adoption, usage, actual behaviour or acceptance of innovative technology is the process that extends over time and under the will of individual in which it takes different phases to drive the individual to perform or not an action or certain behaviour (Rogers, 1983). In the context of the current study, it can be defined as the process of using/accepting (or not) SaaS Cloud Computing Services as a means toward Green IT by the individuals in their daily academic studies or communications inside/outside campus, which is under their will and develops over time. The low rate adoption rate and incline of the acceptance of Cloud Computing in a wide scale is underscored by many studies over time in literature (Banerjee, 2009; Buyya, Yeo, Venugopal, Broberg, & Brandic, 2009; Low, Chen, & Wu, 2011; Okai et al., 2014). The

dearth and depth in studying its salient factors in developing countries, as is the case of the current study in Malaysia and in Higher Education sector (HE) specifically, is indicated in previous work (Joglekar, 2014; Klug, 2014). Based on this argumentations, and the scarcity of research at HE sector in Malaysia utilizing individuals at University level as respondents, this study aims to probe the perceptions of students and lecturers, at Public Universities in Northern Malaysia, in accepting or adopting SaaS CC as a means of Green IT (AUSaaS). The endogenous latent construct of the current study is referred to as AUSaaS. The study adapts TPB to investigate this issue to suit the hypotheses of the current study and using the following constructs:

Behaviour intention (BI)

Definitions of BI latent construct varies in literature depending on the contexts of studies. For instance, BI can be defined as, "*the degree to which a person has formulated conscious plans to perform or not perform some specified future behaviour.*" (Warshaw & Davis, 1985, , p.214). Another definition in Cloud Computing context (CC), it is "*the degree to which a student has formulated conscious plans to use or not use cloud services in the future.*" (Arpaci, Kilicer, & Bardakci, 2015; p.95). In the current study, it is defined as the degree in which the individual, student & academic staff, using SaaS CC services has formulated conscious plans to use/accept or SaaS CC services in their academic studies or communications with others inside or outside the campus. It is found to be a crucial predictor of the actual behaviour and exerts a positive and significant relationship with the acceptance, usage, or adoption of a certain behaviour or technology in different contexts (Alalwan, Dwivedi, & Rana, 2017; Arpaci et al., 2015; Taylor, 1995; Yang & Zhou, 2011). Therefore, the following hypothesis is formulated:

H1. Behaviour Intention a salient predictor of AUSaaS and has a positive and significant relationship with Adopting & Using SaaS CC services as a means towards Green IT.

Attitude (ATT) and Subjective Norms (SN)

Attitude latent construct can be defined as, "the degree to which a person has a favourable or unfavourable evaluation of the behaviour in question."(Ajzen & Madden, 1986). For the purpose of the study, it is defined as the degree to which an individual at a University level has a favourable or unfavourable evaluation of using, accepting, or adopting SaaS CC as a means of Green IT. Different contexts and models in literature give support to its significant and strong positive relationship with BI (Hartshorne & Ajjan, 2009; Hung et al., 2012; Kim & Qu, 2014). Therefore, the following hypothesis is formulated:

H2-a. ATT is a salient predictor of BI and exerts a significance positive relationship with the intention of individuals to accept or use SaaS CC as a means of Green IT.

Besides, SN exogenous latent construct can be said to be," the perception that the significant referent desire the individual to perform a behaviour or not" (Taylor & Todd, 1995, p.149). In this study, it is defined as the perception of colleagues or lecturers in which they desire the individual to adopt, use, or accept SaaS CC services as a means towards Green it in their daily academic work or in their communications with each other. In literature, some studies investigated the relationship between SN and BI. The results revealed that SN has a nonsignificant relationship with BI (Picazo-Vela et al., 2010; Shiau & Chau, 2016; Yang &

Zhou, 2011). In other studies, the relationship between SN and ATT was investigated empirically and the results revealed a positive and significant relationship between them (Hernandez, Montaner, Sese, & Urquizu, 2011; Huang, 2016; Yang & Zhou, 2011). These findings suggest a mediating role of ATT in the relationship between SN and BI. Further, there are lack of studies, to the best of the researchers' knowledge, probing this mediating effect in the context of Cloud and Green Computing specifically, or in other novel technologies in the adoption process. Hence, the following two hypotheses are articulated:

H2-b. SN has a statistically significant and positive relationship with ATT that drives individuals' intention to use or adopt SaaS CC as a means towards Green IT.

H2-c. SN exerts a non-significant relationship with BI of individuals at University level to use or adopt SaaS CC as a means towards Green IT.

Also, at an early stage of the diffusion of a technology, service, or product development and growth, the social influence factor emerges as a crucial component in the adoption process (Schierz, Schilke, & Wirtz, 2010). Many studies covered and investigated the relationship between SN and BI and in different contexts as in (Hartshorne & Ajjan, 2009; Hung et al., 2012; Kim & Qu, 2014), among others. Also, some researchers pointed out to the importance of SN on the attitude of individual that in turn influence their continuous intention to use a services, application, entertainment facility or application, or any other innovative technology. For example, Hamari & Koivisto (2013) addressed the importance and significant role of social factors on attitudes towards gamification that in turn drive the continuance intentions to a service. Similarly, Hernandez et al. (2011) proved the significant role of SN on ATT of respondents toward the use of ICT interactive tools. Most recently, Huang (2016) proved the crucial and significant role of SN on ATT towards the usage of Cloud Computing. The significant path from SN to ATT and from ATT to BI found in previous work, combined by the insignificant path from SN to BI, suggests the mediating effect of ATT on the relationship of SN via ATT to AUSaaS. Also, this mediating role of ATT has received little scholarly attention and empirical investigation. Hence, this study probes this relationship thoroughly and posits the following hypothesis:

H2-d. ATT is expected to mediate the relationship between SN and BI of individuals at University level to use or adopt SaaS CC as a means towards Green IT.

Perceived behaviour control (PBC)

Perceived behaviour control (PBC) exogenous latent construct can be said to be, "the perceived ease or difficulty of performing the behaviour and it is assumed to reflect past experience as well as anticipated impediments and obstacles." (Ajzen, 1991, p.188). For the purpose of this research, PBC is defined as the perceived ease or difficulty of performing different tasks, in daily academic work or communications, using SaaS CC services and it is assumed to reflect past experience of the individuals in HE to use technology skills they possess in addition to the anticipated obstacles to perform such tasks with SaaS CC services and applications. Moreover, the literature lend support for the significant positive relationship between PBC and BI, theoretically (Ajzen, 1985; Taylor & Todd, 1995b), and empirically in different contexts and fields of study (Huh, Kim, & Law, 2009; Hung et al., 2012; Susanto & Goodwin, 2013). These contradicting results lead to include this construct in the suggested model to investigate its effect on BI. Hence the following hypothesis is assumed:

H3. PBC that individuals at University level possess exerts a statistically positive and significant relationship with BI towards using or adopting SaaS CC services as means of Green IT.

Methodology

The study's population is the individual of HE sector, in which it includes the public, private, and other institutions under the supervision of the Ministry of Higher Education. It not logical to include all of the population, therefore, the sample frame focuses on the Public Universities at Malaysian Peninsula. Further, the sample includes four Public Universities in the North of the Peninsula. Moreover, the unit of sampling is the individual at University level that encompasses students and lecturers. The minimum sample size is considered to be 384 based on Cohen (1988)'s statistical tables with regard to the total number of the population. Although the minimum sample is adequate for the analysis purposes, the researches articulate to include more respondents to gain better results (i.e., 800 respondents) and to face less sampling errors (Creswell, 2012; Sekaran, 2003; Tabachnic & Fidell, 2013). After the initial screening and removal of outliers, the remaining responses were 579 valid responses of different University levels, races, and age ranging. The first stage in the analysis process used the SPSS ver. 21 to clean data and to analyse the demographic section and then the Smart PLS 3 software by Ringle, Wende, and Becker (2015) was used. The self-administered sampling method was used for 3 months. The indicators were adapted from previous work with reliability and validity achieved. Each construct has four items anchored with five-point Likert scale ranging from strongly disagree, "1", strongly agree, "5", with total indicators of 20. The questionnaire started with an introduction of SaaS Cloud Computing and Green IT, followed by asking the consent of the respondents, and then ended with the assurance that the questionnaire is for academic research. The demographic questions were, then, presented, followed by the items of different latent constructs.

The mediating effect

In the methodological aspect, the mediating effect has gained popularity in research for more than three decades by using Baron and Kenny (1989)'s approach in which it has number of drawbacks (Hayes, 2009). The most recent approach is builds upon (Zhao, Lynch, & Chen, 2010) with the following guidelines: a) if the direct effect is significant and the indirect is not, it is called "Direct-only non-mediation"; b) if both the direct and indirect are not significant, there is a "No-effect non-mediation"; c)if both, the direct and indirect, are significant with the same sign (- or +) values, this can be called "Complementary mediation"; d) if the direct effect is not significant, and the indirect effect is significant, in this case we assume a "Competitive mediation"; and finally e) if the direct effect is not significant and the indirect effect is significant, we then assume the "full mediation or Indirect-only mediation" (Hair Jr, Hult, Ringle, & Sarstedt, 2017; Zhao et al., 2010). Another recent assessment is currently come to the surface to validate the mediation effect of any relationship. It depends on the value of Variance Accounted For (VAF); where VAF < 20% (no mediating effect), VAF in the range between 20% and less than 80% (partial mediation), and VAF 80% and above (full mediation) (Nitzl, Roldan, & Cepeda, 2016).

Findings and discussion

Demographic analysis

As mentioned previously, valid responses were 578. Starting with gender, males found to represent (36.7%), while show to be the dominant respondent with a total percentage of (63.3%). Next, age was examined and different group-age are represented in the following: Group I (18-26) with majority of respondents (62.6%), group II (27-35) accomplished (10.7%), group III obtained (17.3%), group IV (45-53) obtained (6.2 %), and finally group V (age above 53) accomplished (3.2%) of the total valid responses. Educational level of the respondents is as follows: Group I (Certificate) with percentage of (2%), group II (Diploma) with (2.5%), group III (Bachelor) with (57.3%), group IV (Master) with (16.6%), and finally group V (PhD.) obtained (21.6%) of the total responses.

Measurement model assessment

In the process of the measurement model assessment, there are three steps: firstly, the convergent validity assessment is conducted by examining Loadings of items on respective constructs and the Average Variance Extracted (AVE); secondly, the internal consistency and reliability (i.e., the composite reliability (CR) and Cronbach's alpha); thirdly, the discriminant validity by examining the Cross-Loadings and Fornell-Larker criterion (Hair Jr et al., 2017). In the first step, the loadings of items were examined and found to be above the threshold (0.7) except for items (AUSaaS1 and AUSaaS) in which they are slightly below the cut-off value of 0.7. These two items are kept, however, as they are not far from the threshold of 0.7 (Hair, J. F., Hult, G. T. M., Ringle, C. M., 2014), to retain the content validity of the construct (Hair Jr et al., 2017), and they are newly developed to suit the context of this explorative study (Hair Jr et al., 2017; Hulland, 1999). Additionally, they are retained because CR and AVE were meeting the cut-off values (Hair Jr et al., 2017). Besides, AVE is found to be above 0.5; therefore, the convergent validity is established; refer to Table 1.

Step two was performed and CR found to be perfectly highly above the range 0.6-0.95, and Cronbach's alpha in the range of (0.6-0.9) (Hair, J. F., Hult, G. T. M., Ringle, C. M., 2014; Hair Jr et al., 2017). Hence, establishing the internal consistency reliability; refer to Table 1.

The third step is to examine the discriminant validity. As shown in Table 2, the cross-loading of items shows not violations this criteria and each items loads highly on its respective latent construct than other constructs (Hair, J. F., Hult, G. T. M., Ringle, C. M., 2014). After that, Fornell-Larker criterion (Fornell & Larker, 1981) is examined, and the results revealed no violations of this criterion.

Finally, Heterotrait-Monotrait inference ratio (HTMT$_{inference}$) criterion by Henseler, Ringle, & Sarstedt (2015) was checked, in which no value exist in either of the two bounds of the Confidence Interval Bias Corrected ranges; refer to Table 4. Accomplishing the four criteria above, there is no violation to the discriminant validity and the model affirm that the constructs are discriminant from each other. It is now possible to proceed with the structural modelling evaluation for the model estimated. Refer to Figure 1 for visualized results.

Table 1: Measurement model assessment (Convergent reliability & Internal consistency reliability)

Latent Variable	Indicators	Loadings > = 0.7	AVE > = 0.5	CR >= 0.7	Cronbach's alpha (0.6-0.9)
AUSaaS	AUSaaS1	0.68	**0.54**	**0.82**	**0.71**
	AUSaaS2	0.78			
	AUSaaS3	0.80			
	AUSaaS4	0.67			
BI	BI1	0.84	**0.75**	**0.92**	**0.89**
	BI2	0.86			
	BI3	0.91			
	BI4	0.86			
ATT	ATT1	0.86	**0.68**	**0.89**	**0.84**
	ATT2	0.75			
	ATT3	0.87			
	ATT4	0.81			
SN	SN1	0.84	**0.78**	**0.93**	**0.91**
	SN2	0.90			
	SN3	0.90			
	SN4	0.88			
PBC	PBC1	0.82	**0.68**	**0.89**	**0.84**
	PBC 2	0.82			
	PBC 3	0.87			
	PBC 4	0.78			

Table 2: Cross-Loadings assessment

Item/Construct	ATT	AUSaaS	BI	PBC	SN
ATT1	**0.86**	0.49	0.61	0.47	0.35
ATT2	**0.75**	0.29	0.49	0.32	0.24
ATT3	**0.87**	0.45	0.62	0.46	0.33
ATT4	**0.81**	0.45	0.63	0.47	0.34
AUSaaS1	0.36	**0.68**	0.39	0.32	0.23
AUSaaS2	0.37	**0.78**	0.48	0.40	0.24
AUSaaS3	0.46	**0.80**	0.52	0.39	0.33
AUSaaS4	0.30	**0.67**	0.36	0.36	0.27
BI1	0.59	0.53	**0.84**	0.46	0.29
BI2	0.61	0.52	**0.86**	0.49	0.38
BI3	0.65	0.54	**0.91**	0.48	0.32
BI4	0.65	0.50	**0.86**	0.48	0.31
PBC1	0.46	0.41	0.48	**0.82**	0.41
PBC2	0.43	0.39	0.43	**0.82**	0.42
PBC3	0.45	0.45	0.48	**0.87**	0.42
PBC4	0.38	0.40	0.41	**0.78**	0.36
SN1	0.33	0.32	0.32	0.43	**0.84**
SN2	0.35	0.31	0.31	0.42	**0.90**
SN3	0.32	0.29	0.32	0.43	**0.90**
SN4	0.37	0.35	0.36	0.45	**0.88**

Table 3: Fornell-Larker criterion

	ATT	AUSaaS	BI	PBC	SN
ATT	**0.82**				
AUSaaS	0.52	**0.73**			
BI	0.72	0.60	**0.87**		
PBC	0.53	0.50	0.55	**0.82**	
SN	0.39	0.36	0.37	0.49	**0.88**

Table 4: HTMT criterion

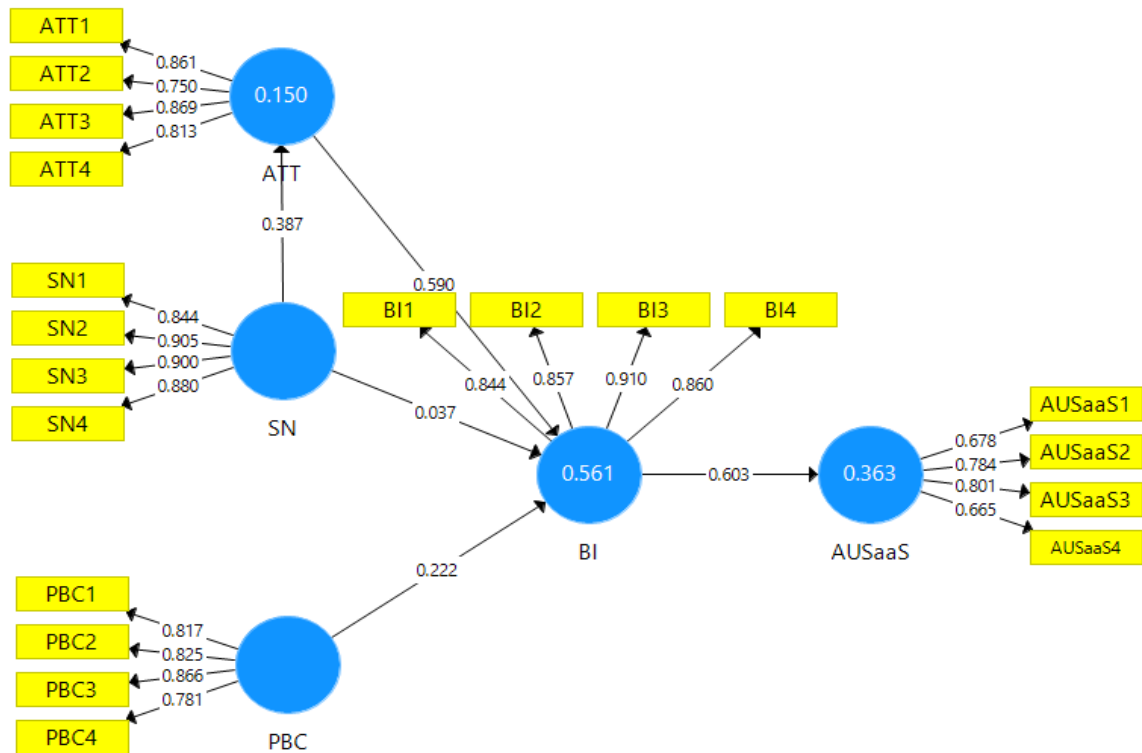| Path	Path Coefficients	CI at 2.50%	CI at 97.50%
AUSaaS -> ATT	0.62	0.49	0.73
BI -> ATT	0.84	0.79	0.89
BI -> AUSaaS	0.71	0.61	0.81
PBC -> ATT	0.52	0.41	0.61
PBC -> AUSaaS	0.37	0.25	0.5
PBC -> BI	0.47	0.36	0.57
SN -> ATT	0.37	0.25	0.49
SN -> AUSaaS	0.43	0.32	0.53
SN -> BI	0.36	0.23	0.47
SN -> PBC	0.57	0.47	0.67

Figure 1: Measurement model assessment

Structural model assessment

First of all, collinearity issues are checked in which Variance Inflation Factor (VIF) should not be greater than 5 (Hair Jr et al., 2017) between the exogenous constructs and the endogenous constructs. As shown in Table 5, ATT, PBC, and SN has values of VIF against BI (1.43, 1.60, and 1.36, respectively), SN with ATT (1), and BI with AUSaaS (1). Hence, no violations of collinearity found.

As shown in Table 5, different paths were examined with their strengths and significance and the following results are: ATT (β = 0.59, t =17.68, P<0.05) and PBC (β = 0.22, t =6.05, P<0.05) found to be significant and positive with BI, which lend support for hypothesis **H2-a** and **H3**. While inspecting the 95% Confidence Interval (CI), the results speak in favour of the significant relationship between ATT and PBC with BI, as CI did not include zero in its range. The results revealed goes in line with previous findings for the relationship between ATT & BI (Hartshorne & Ajjan, 2009; Hung et al., 2012; Kim & Qu, 2014), and between PBC and BI (Huh et al., 2009; Hung et al., 2012; Susanto & Goodwin, 2013).

The findings shed more light on the crucial role of these two constructs in the area of Cloud Computing and Green IT at Malaysian Public Universities. That is, ATT is created by a belief based on the judgment of a certain behaviour or outcome, that in turn creates a motivation to perform an action as a result of this salient belief (Ajzen, 1991), which is the case of the current study. Additionally, PBC can be interpreted as the perceived ease or difficulty to performing different tasks using SaaS CC services and based on his/her former experience and anticipated obstacles to use technology skills (s)he possesses, develops and creates a motivation or intention to use, accept, or adopt the SaaS CC in their academic work or communications. Consequently, this intention drives them to use, accept, or adopt SaaS CC applications and services as a means toward Green IT. Also, SN exposed a significant and positive relationship with ATT, which is in line with previous works (Hernandez et al., 2011; Huang, 2016; Yang & Zhou, 2011) . Therefore, hypothesis **H2-b** is supported empirically.

In addition, CI confirms the significant relationship between SN and BI in which zero is not included in its range (Hair Jr et al., 2017), refer to Table 5. Unlike the previous results, SN exerts a non-significant relationship with BI, which this result goes in accord with past findings (Picazo-Vela et al., 2010; Shiau & Chau, 2016; Yang & Zhou, 2011) and affirms that Hypothesis **H2-c** is supported. Furthermore, CI confirms the non-significant relationship between SN and BI in which zero is included in its range (Hair Jr et al., 2017), refer to Table 5. This can be interpreted that individuals have their own strategy in future plans that builds upon their own perceptions of future use of innovative technology, such as SaaS CC, and not much affected by the social circle inside or outside campus. That is, the weak correlation between SN and BI warrants the minor effect of social beliefs in formulating the behaviour of AUSaaS CC and gives more room for individuals to decide their usage or not of this technology away from the influence, recommendations, or perceptions of others in their social community.

Furthermore, the variance explained by ATT, SN, and PBC is 56%, which is reflected by the coefficient of determination (R^2) of BI, which regarded as highly moderate. Also, the variance explained by SN on ATT is 15%, which regarded as weak (Chin, 1998). Moreover, the effect size f^2 of ATT is the largest among other antecedents of BI (f^2 =0.56), where PBC exerts a

weak effect on BI (f^2 =0.07). Not surprisingly, there is no effect size of SN on BI (f^2 =0). This result gives further support of the previous findings in explaining the path coefficients of different antecedent of BI.

Not surprising, by referring to the results revealed in Table 5, BI (β = 0.60, t =20.90, P<0.05) yielded to have a positive and significant relationship with AUSaaS, which is in line with the hypotheses imposed, **H1**. Moreover, CI confirms the findings aforementioned. These results line up with previous works (Arpaci et al., 2015; Pinheiro, Aparicio, & Costa, 2014; Taylor & Todd, 1995a). Also, AUSaaS has an explained variance of 36%, which regarded as moderate (Chin, 1998). Furthermore, the effect size f^2 of BI on AUSaaS is the largest among all constructs in the model (f^2 =0.57). Moreover, the findings of BI indicate that respondents have formulated their conscious plans to use, accept, or adopt SaaS CC as a means of Green IT in the future. That means the intention of individuals in HE sector, represented by University students and academic staff, is strong in terms of future use of the innovative technology of SaaS and confirms the strong predicting role of BI on accepting, using, or even adopting SaaS CC as a means of Green IT. Figure 2 illustrates structural model assessment.

Evaluation of the Mediating effect of ATT

The evaluation starts by examining the significance of the indirect effect from SN via ATT to BI, which is the product of the path coefficient of the SN to ATT and ATT to BI. The results obtained shows an indirect significant path (β = 0.23, t =9.34, CI= [0.18-0.28]). Then the direct path from SN to BI is tested and found to be insignificant (β = 0.04, t =1.02, CI= [-0.04-0.11]). Based on the results, we conclude that ATT fully mediates SN to BI relationship. Additionally, the more conservative approach is conducted to better support the obtained results. Therefore, the following values are identified to obtain VAF as follows: The indirect effect is found to be (0.23), the direct effect is (0.04), and the total effect is (0.23+0.04=0.0.27). By dividing the indirect effect value on the total effect, this yields (VAF= indirect/total effect; 0.23/0.27= 85.51%), which is above the cut-off value of 80% (Nitzl et al., 2016)

This, also, gives an empirical support for the mediating role of ATT on the respective relationship hypothesized, **H2-d**. This can be interpreted as ATT represent a mechanism that resides between SN and BI. That is, subjective norms influence the attitude of individuals, and attitude in turn influence the behaviour intention of the individuals to build their future plans to use, accept, or adopt SaaS CC services and applications in their academic work or for communication purposes and daily private work.

Table 5: path coefficients- significance of relationships

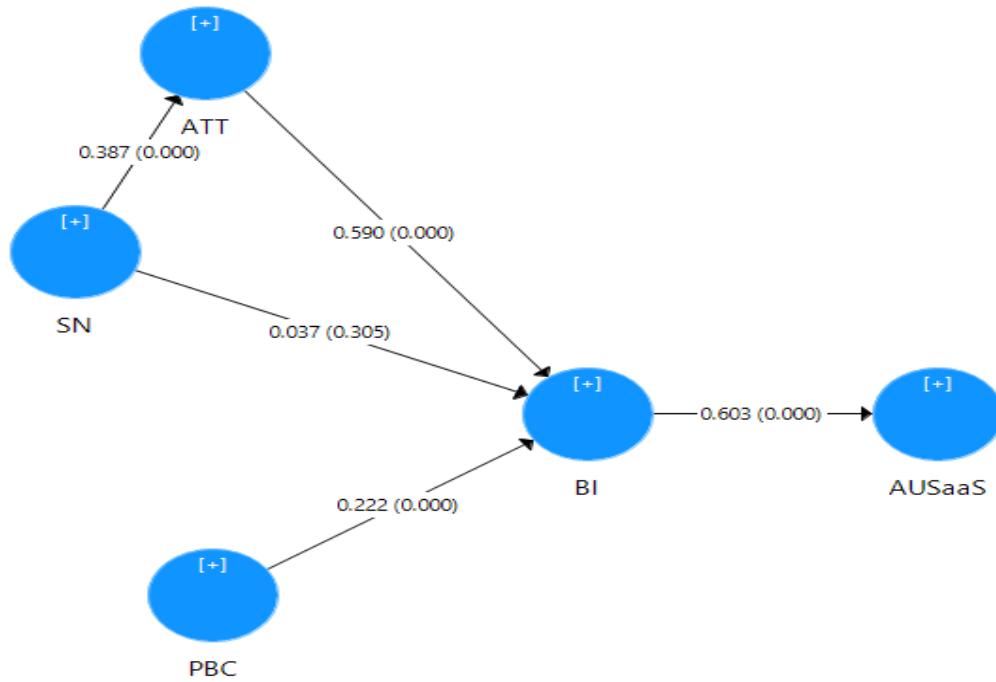| Path	Path Coefficients	t Statistics	P Values	CI at 2.50%	CI at 97.5%
ATT -> BI	0.59	17.68	0	0.52	0.65
BI -> AUSaaS	0.6	21.16	0	0.55	0.66
PBC -> BI	0.22	6.05	0	0.15	0.29
SN -> ATT	0.39	10.84	0	0.32	0.46
SN -> BI	0.04	1.03	**0.3**	**-0.03**	**0.11**

Figure 2: Structural Model Assessment

In other words, the higher the influence of SN, the higher the influence on ATT of individuals, and in turn, the higher effect on their intention to use or adopt SaaS CC as a Green IT practice.

Predictive relevance Q^2 analysis

After evaluating the predictive accuracy R2 values of the endogenous constructs, it is now time to test Predictive relevance Q^2 by evaluating the value of Stone-Geisser Q^2 (Geisser, 1974; Stone, 1974). This can be achieved by running the blindfolding procedure and using the obtained value of the omission distance (D= 7). If Q^2 values are greater than zero, it is an indication of the model's predictive relevance of the path model for the respective reflective endogenous construct (Chin, 1998; Hair Jr et al., 2017). As shown in Table 6, the cross-validated redundancy obtained indicate that AUSaaS, BI, and ATT reflective endogenous constructs possess the predictive ability over the model suggested as all the values above zero.

Table 6: construct cross-validated redundancy

	SSO	SSE	Q² (=1- SE/SSO)
ATT	2,316.00	2,095.66	0.10
AUSaaS	2,316.00	1,890.20	0.18
BI	2,316.00	1,395.85	0.40
PBC	2,316.00	2,316.00	
SN	2,316.00	2,316.00	

Conclusion

Since the beginning of the 21st century, technology development increased rapidly and the need for more powerful hardware is becoming a must to cope with these changes. Nonetheless, many side effects of technology emerged that affected human's life and environment, i.e. water, soil, and air. Therefore, Cloud Computing with its service model Software as a Service (SaaS) surfaced to cope with the fast growing demand for high processing and computing power that achieve business goals with minimum loss of time, money, and manpower. This direction of Cloud Computing aligns with the Green IT concept in meeting the demand for higher revenue, great performance, and lining with strategic financial plans, as well as safeguard the environment. These two concepts, however, got less scholarly attention and empirical investigation at developing countries, Higher education sector, and utilizing individuals at University level as respondents. Similarly, the attitude's mediating effect in the relationship between subjective norms and behaviour intention to use innovative technology such as SaaS Cloud Computing services has paucity of empirical results. Hence, the objective was to fill this gap empirically and focus on the attitude's mediating effect between SN and BI towards the use or adoption of SaaS CC services from the individuals' perception.

Results revealed the strongest effect of attitude towards intention, followed by Perceived Behaviour Control, while Subjective Norms show no significance towards BI. However, SN exerts significant role with attitude. Besides, attitude revealed to be a full mediator of the path SN to BI via ATT. Additionally, BI revealed to be a strong driver on Accepting and Using SaaS Cloud Computing as a means of Green IT.

Limitation resides as any empirical study as the case of this current research. That is, the cross-sectional survey and the employment of students and lecturers as respondents were among these limitations as not to include other segments of the University population. The private Universities and other institutional entities were not included in this study, which is considered as another limitation of the study. Besides, the antecedents of the three main behaviours, i.e. attitudinal, social norms, and control beliefs, were not used, in which they can be of valuable source of information in understanding the beliefs of individuals in this innovative technology, SaaS Cloud Computing services and applications.

Future studies are invited to extend the suggested model and test the mediating role of attitude in the area of Cloud and Green Computing, as well as different contexts studying innovative technologies or technological practices. In addition, SaaS CC and Green IT are wealthy areas of research that are still in its initial stage of research, implementation, and developments. Therefore, the researchers urge further investigations in future work of the different aspects of these two concepts and the probe of their relationships in terms of the individuals' perceptions and beliefs.

Findings, also, give more insights of attitude's mediating role and the significant effect of subjective norms on attitude to adopt or use SaaS Cloud Computing services. Future directions are recommended to take into account studying the mediating effects of BI as well as the moderating effects of socio-demographic variables on the different relationships posited in this research. Also, using advanced topics in analysis, such as: Importance

Performance MAP analysis, MGA analysis, and heterogeneity analysis are highly encouraged.

In sum, this study contributes to the knowledge and body of literature by affirming the mediating role of ATT. These findings can trigger more studies and give better insights of the role of subjective norms on individuals' attitude to create an intention to use, accept, or adopt a novel technology such as SaaS CC.

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