Factors Influencing the Adoption of Software-as-a-services (SAAS): A Gender Perspective

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Abstract

This study investigates the effects of influencing factors (Perceived Ease of Use, Perceived Usefulness and attitudes) on adoption of SaaS, and whether these effects differ between male and female. Data were collected from employees of the different sister concern of Daffodil family, and analyzed using partial least squares – structural equation modeling (PLS-SEM) and Multi-Group Analysis (MGA). The Important-Performance Matrix Analysis (IPMA) was also conducted to gain an insightful understanding of how these factors influence an employee's intention to Adopt SaaS at the gender level. The findings showed that significant differences between male and female employees for the effect of perceived usefulness and attitudes on employee's Adoption intention of Software-as-a-Services (SaaS). Further, there is a significant difference between perceived ease of use and perceived usefulness for both gender groups on SaaS adoption. However, the IPMA results exhibit that the most essential antecedent for both male and female employees' intentions on SaaS is perceived usefulness.

Keywords: SaaS, Adoption intention, Gender, PLS-SEM, MGA, IPMA, and TAM**.**

1. Introduction

Software-as-a-Service (SaaS) is an innovative system of providing software applications, based on cloud computing technology and allow organizations to save the expenses of Information Technology (IT) investment on infrastructure, networking, hardware, software and personnel, (Chou & Chou, 2007). SaaS is primarily used by end users, provides flexible and cost-effective access to information and software through online servers and active collaboration between individual users (Tan & Kim 2015; Wease et al. 2018). SaaS is multi-tenant software that allows users to access a variety of software items on demand (Benlian & Hess, 2011). SaaS applications are generally categorized by being easily accessible, feature-rich, and consumer-friendly

(Zorrilla & García-Saiz, 2013). Xin & Levina, (2008) stated that the maturity of a company's information technology plays a crucial role in adoption of SaaS. According to the Benlian et al., (2009) social influence, attitude toward SaaS-adoption, adoption uncertainty, and strategic value are the most powerful and reliable factors through all types of application. But firm size has no influence on SaaS adoption because previous research suggested that large corporation and small & medium-sized businesses adopted SaaS at equal rates. Heart, (2010) vendor's reputation and trust are critical for mitigating SaaS risks and encouraging enterprises to embrace it. Benlian, Koufaris, & Hess, (2011) service quality has a considerably greater influence on satisfaction than perceived usefulness. According to Lee et al. (2013), the most critical barriers for SaaS adoption are consumer and economic reasons, supplier attitude, and the environment.

Wu (2011) identified the significant influencing variables in adoption of SaaS in individual level by integrating diffusion of innovation theory and technology acceptance model (TAM). The research is limited in telecommunication industry, and may not adequately cover to other industries. From the previous studies, overall cost-saving motivation is insufficient to clarify the decisions to adopt SaaS. Rather, we need to address the behavioral influences of SaaS that are revolutionizing the way people acquire and use software (Klein, Conn, & Sorra, 2001). Organizations are unlikely to use SaaS unless and until the appropriate employees are in place (Yang et al., 2015). Senyo et al. (2018) recommended that there is still insufficient research directed on SaaS with utilizing the appropriate theories, research model and research methodology and further in depth research are required to enrich the understanding of this issue (Oliveira et al. 2019). Sabi et al. (2016) in educational institutions, the usage of SaaS collaboration solutions has not been comprehensively studied. Furthermore, Lopez-Nicolas et al. (2008) remarked that TAM is suitably used in an organizational perspective, rather than in an individual consumer perspective. Hossain and de Silva (2009) recommended that most studies have applied TAM in physical environments but there is limited research conducted on TAM into virtual environments, modern and complex technology. In particularly, exploring the importance level of adoption factors in the gender perspective and their relationships have been greatly neglected. This study looks at the key factors that distinguish their psychological propensity to adopt SaaS innovations across the genders.

2. Literature Review and Theoretical Framework

2.1. Theoretical Foundation

Technology Acceptance Model (TAM) model was initially developed to overcome the limitations of Theory of Reasoned Action (TRA) in 1986 by Davis. It is primarily used to study the behavioral intentions of individuals to use technology. TAM suggested that perceived ease of use and the perceived usefulness of technology are predictors of the user's attitude towards the use of technology, subsequent behavioral intentions, and actual use. TAM has a significant impact on the acceptance of new technology (Venkatesh & Bala, 2010). Lee, Li, Yen, and Huang (2010), established that TAM helps an organization to understand the influence of external variables on the causal link among perceived usefulness, perceived ease of use, and adoption intention. This assists the organization in the execution of any technology. Wu (2011) tested an improved form of TAM and measured the behavior of managers to adoption of SaaS. Du et al. (2013) is used the extended of TAM to examine the acceptance of SaaS by Chinese companies

and find that the usefulness, social influence and quality of electronic services as key factors in implementation of SaaS.

2.1. a. Perceived Usefulness

According to the TAM, perceived usefulness is a criterion that is frequently considered throughout the adoption process of an information system and is refers to as "the degree to which a person believes that using a particular system would improve their work performance" (Davis, 1986). Numerous empirical studies on the usage of information technology have exposed that the perceived usefulness have a significant effect on the users' intentions (Barakat & Hussainey, 2013; Featherman & Pavlou, 2003; Hong & Zhu, 2006). W.-W. Wu (2011) suggested that adoption of SaaS significantly affected by perceived ease of use and perceived usefulness.

2.1. b. Perceived Ease of Use

Another significant aspect in TAM is perceived ease of use, which is the level of effort needed in utilizing a certain system (Davis, 1986). Taylor et al. (1995) integrated and compared the three theories (technology acceptance model, theory of planned behavior and theory of reasoned action) in the context of computer resource center usages and exposed that perceived ease-of-use positively correlated with perceived usefulness. PEOU refers to the degree to which individuals believe that utilizing SaaS is simple to access, learn, and use (Wu, 2011). Several studies have revealed that PEOU can have an effect on both PU and BI (Lopez-Nicolas et al., 2008; Venkatesh & Bala, 2008; Venkatesh & Davis, 1996).

2.1. c. Attitudes

The term "attitude" refers to the user's subjective assessment or personal affinity towards something and behavioral intention is defined as the strength of the intent to carry out a particular action (Zhao, 2010). According to Technology Acceptance Model - positive attitude towards the innovative technology was the starting point for the intent to adopt it (Gupta & Arora, 2017). The usual TAM assumes that there is a significant positive relationship between consumers' views about a technology and their adoption intentions, which has been well proven in banking research (Aboelmaged & Gebba, 2013; Hsu et al., 2011). Attitudes refer to an individual's level of interest in learning about SaaS and their willingness to test out new technologies and services (Wu, 2011). According to Lopez-Nicolas et al. (2008), attitudes can have an impact on PU and BI. Chan & Chong (2013) suggested that there is systematic sequences have to follow for adopting any innovation. The subsequent step is adoption of SaaS, which denotes to make decision concerning SaaS (Chong & Chan, 2012).

2.2. *Factors influencing Adoption intention of SaaS and role of gender*

Research shows that males are more likely to be driven by Perceived Usefulness in terms of behavior intention, (Gefen & Straub, 1997; Sun & Zhang, 2006; Venkatesh & Morris, 2000) whereas women are more impacted by Perceived Ease of Use (Ong & Lai, 2006). People who are women should pay more attention to PEOU because men are more used to technology than women (Kim, 2010; Ong & Lai, 2006; Venkatesh et al., 2003). Compared to males, women will see a greater impact of PEOU on behavioral intention and PU. Other research, found the exact reverse or no dissimilarities between the two genders (Cheung, Lee, & Chen, 2002; Yuen & Ma,

2002). The use of technology is exposed to be more appropriate for males than females (Broos, 2005). Furthermore, earlier research has shown that gender has a modest influence on PU. That is, PU will have a greater impact on BI in males than in women (Ong & Lai, 2006; Venkatesh & Morris, 2000). PEOU and PU have substantial influence on behavioral intention of information system stronger for females than males. As well as for males, perceived ease of use has a stronger effect on perceived usefulness than for females (Yuen & Ma, 2002).

The model suggested in this study is founded from previous research, and the research framework was made by modifying items borrowing from the technological & software-as-services (SaaS) research which is shown in the following figure.
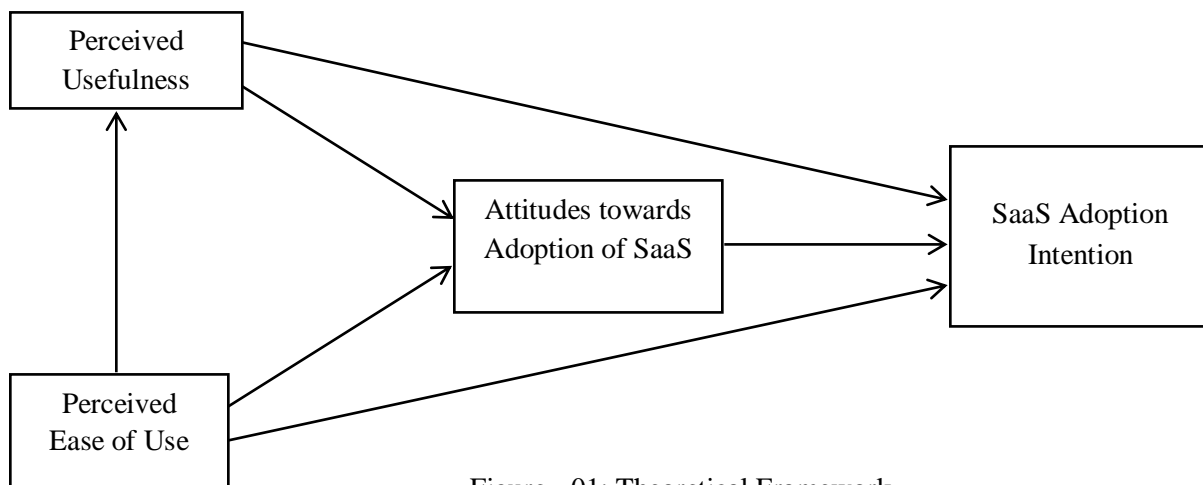

Figure - 01: Theoretical Framework

Therefore, based on the Technology Acceptance Model (TAM), there may be significant differences between the male and female employees for the effects of antecedent factors on SaaS Adoption intention. Thus:

H1: The influence of perceived ease of use on perceived usefulness differs significantly between male and female.
H2: There is a significant difference for the effect of perceived ease of use on attitudes between male and female
H3: There is a significant difference for the effect of perceived ease of use on Adoption intention between male and female
H4: There is a significant difference for the effect of perceived usefulness on attitudes between male and female
H5: There is a significant difference for the effect of perceived usefulness on Adoption intention between male and female
H6: There is a significant difference for the effect of attitudes on Adoption intention between male and female

3. Method

3.1. Data collection & Sample Size

Data were collected from all permanent employees of different sister concern of Daffodil Family. The effect size was set at 0.15 (moderate effect), α at 0.05, and power at 0.80 in the G* power calculator's input settings. For social and business science research, this is the most commonly suggested set-up (Hair et al., 2017). According to G* power, in this study a minimum sample size of 92 is required to make the study model statistically significant. A structured questionnaire was prepared using Google form that comprise with a set of close-ended questions and link was shared through e-mail, a total of 750 permanent employees of Daffodil Family. A total of 235 employees fill-up the Google form i.e. response rate was 31.33%. There are two parts in the questionnaire. The first section covered demographic information, whereas the second section included items for measuring the constructs of our study model.

3.2. Research Instrument

The measures used to operationalize the constructs involved in the examined models and the questionnaires were mostly adopted from earlier studies, with slight wording modifications. The components or Items for PU and PEOU, and INT have been adopted from Davis (1989). Items for attitude were borrowed from Taylor and Todd (1995). 5-point Likert scales were used for measuring the all items.

3.3. Data analysis methods

The associations between the variables were checked using SEM with the SmartPLS3.0, and the data were analyzed using descriptive statistical analysis with the software SPSS version 20.0. The relevance of the path was tested using the bootstrap technique (500 resamples) (Hair et al., 2014).

4. Analysis and Results

4.1. Demographic profile of the respondents:

A total of 235 completed questionnaires were used in this study's analysis. Table 1 summarizes the demographic profile of respondents. Majority of the respondents (i.e. 54.47%) were faculty members, while the remaining 45.53% of the sample were administrative personnel. Majority of the respondents (53.19%) are aged less 35 years.

Table 1 Demographic features of respondents (N = 235)

Characteristic		Frequency	Percentage (%)
Gender	Male	152	64.68%
	Female	83	35.32%
Age	15-24	19	8.08%
	25-34	106	45.11%
	35-44	72	30.64%
	45-55	29	12.34%
	Above 55	9	3.83%
Department	Faculty	128	54.47%
	Administrative	107	45.53%

4.2. *Assessment of Measurement Model:*

PLS-SEM was employed to measure both the measurement and structural models as the framework is relatively complex, composed of both reflective and composite constructs (Hair et al. 2017).

Table 2 Results of measurement model

Constructs/Associated Items	Loading		CR		AVE	
	Male	Female	Male	Female	Male	Female
Perceived Ease of Use (PEOU)			0.878	0.811	0.708	0.590
I think the operation interface of SaaS is understandable.	0.755	0.721				
I think Saas is very user friendly.	0.875	0.755				
The use of SaaS requires a lot of mental effort.	0.888	0.824				
Perceived Usefulness (PU)			0.837	0.838	0.633	0.633
The use of SaaS services improves the quality of operations.	0.826	0.806				
SaaS platform can improve efficiency.	0.833	0.781				
SaaS saves time and effort.	0.722	0.80				
Attitudes Towards Adoption of SaaS			0.887	0.790	0.704	0.556
I believe using SaaS platform is a good idea.	0.806	0.711				
Using SaaS platform is an enjoyable experience.	0.840	0.778				
I am interested in SaaS platform.	0.871	0.748				
Intention to Adopt			0.763	0.796	0.523	0.568
I have used SaaS services	0.573	0.628				
I am willing to continue using the SaaS.	0.730	0.775				
I will recommend SaaS services to my friends.	0.842	0.843				

The convergent validity and discriminant validity were used to assess the measurement model. As suggested by Hair et al. (2014), factor loading, average variances extract (AVE) and composite reliability (CR) are to be considered in determining convergent validity. To assess indicator reliability, the loading of the associated items for each construct should be checked and the loadings must be greater than 0.7 (Hair et al., 2017). If CR and AVE exceed the threshold, a loading of 0.4 to 0.7 is considered acceptable (Hair et al., 2017). Table 2, shows the results of measurement model that indicate the composite reliability (CR) and average variance extracted (AVE) is higher than 0.7 and 0.5 respectively, showing the acceptable reliability and convergent validity for both gender groups. Based on the results of initial measurement model, two (2) items were dropped due to poor factor loading, remaining total 14 items for the final analysis (Table 2). Moreover, we checked the discriminant validity for female and male employees using the

Fornell-Larcker criterion and heterotrait-monotrait (HTMT) approach (Henseler et al., 2015). Therefore, both the Fornell-Larcker criterion and HTMT 0.85 demonstrate acceptable discriminant validity for both groups.

4.3 Structural Model Assessment and Multi-group Analysis:

For assessing the structural model R^2, standard beta, t-values through a bootstrapping process with a resample of 5,000, and the effect sizes (f^2) were examined as recommended by Hair et al. (2017). Multi-collinearity was assessed via variance inflation factors (VIF) and significance of path coefficient.

Table 3 hypothesis testing results

Hypothesis	Relationships	Path Coefficients		t-value		P-value difference		Supported	
		Male	**Female**	**Male**	**Female**	**Henseler's MGA**	**Permutation test**	**Male**	**Female**
H1	PEOU -> PU	0.424	0.305	4.554	2.173	0.986	0.021	Yes	Yes
H2	PEOU -> ATT	0.256	0.053	1.881	0.317	0.357	0.612	No	No
H3	PEOU -> INT	0.093	-0.158	1.007	1.108	0.129	0.564	No	No
H4	PU -> ATT	0.287	0.363	2.167	3.443	0.961	0.042	Yes	Yes
H5	ATT -> INT	0.370	0.352	4.361	2.747	0.971	0.030	Yes	Yes
H6	PU -> INT	0.318	0.296	4.225	2.127	0.964	0.036	Yes	Yes

Note – 01: Henseler's MGA technique, p value lower than 5% or higher than 95% shows significant differences between specific paths at the 5% level. Note - 02: ATT- Attitudes, INT – Intentions, PEOU – Perceived Ease of Use, PU – Perceived Usefulness

The results for both female and male employees showed that (see table 3) VIF were < 3.30 with significance value of all underlying items. This study has developed a total of six hypotheses. The statistical results presented that four hypotheses were accepted (see table 3). Measurement invariance must be tested prior to comparing the path coefficient between two groups (i.e. male and female employees), using Multi-group Analysis (MGA) to test the proposed hypotheses (Henseler et al., 2016). The measurement invariance of composites approach (MICOM) was employed, as per current literature (Henseler et al., 2016). MICOM contains three steps: (a) configural invariance assessment (b) compositional invariance assessment (c) composite equality i.e the assessment of equal means and variances (Rasoolimanesh et al., 2017). Using MICOM, partial measurement invariance was established via configural and compositional invariance; a requirement for MGA (Rasoolimanesh et al., 2019). Further, MICOM demonstrated equal means for constructs (Perceived ease of use, perceived usefulness, and attitudes towards SaaS) alongside, SaaS adoption intentions, for both male and female groups of employees.

4.4. Results of Multi-Group Analysis (MGA):

Multi-group analysis (MGA) aids researchers to measure whether two or more variables have the same/diverse relation across groups (MacKinnon, 2011). Specifically, when the moderator variable is categorical, such as Gender (male & female group), faculty and administrative group, nationalities or industry types, the suitable analysis technique would be MGA if the moderation effect is on the whole model. In other words, test and compare the effect of each structural path on different groups (Aguinis et al., 2017; Ting, Fam, Hwa, Richard, & Xing, 2019). Tables 3 illustrate the results of proposition testing and MGA for both gender groups. Two nonparametric approaches were applied to test the proposed hypotheses: one is Henseler's MGA (Henseler et al., 2009) and another one is the permutation test (Chin & Dibbern, 2010). This facilitated the comparison of the effect of perceived ease of use, perceived usefulness, attitudes and Adoption intention of SaaS between male and female employees. Conversely, the findings do not underpin the effect of perceived ease of use on attitudes and behavioral intention to Adoption of SaaS for both groups (H2, & H3). Further, MGA results identified that perceived ease of use has a positive influence on perceived usefulness for both male and female employees (H1). However, as the results shown perceived usefulness have positive stimulus to form attitudes towards SaaS and intention to SaaS for both gender groups (H4, H6). The findings suggest that attitudes towards SaaS have positive effect on intention to use SaaS between two gender groups of employees (H5).

4.5. Results of Importance-Performance Matrix Analysis (IPMA):

The quadrants were drawn using the average of performance and average of importance from the IPMA results. Ringle and Sarstedt (2016) suggested that IPA supports the interpretation of PLS-SEM results through generating Importance-Performance Map Analysis (IPMA) illustrated in figure 02. The performance of elements' is represented by the vertical axis, which ranges from bad performance to excellent performance. The horizontal line denotes the perceived importance of the elements, ranging between least important to most important. In this study, IPMA was used to detect the importance and performance of perceived ease of use, perceived usefulness and attitudes towards SaaS in forming behavioral intentions of male & female employees towards SaaS. Figure 02 shows the IPMA results for both gender groups. Accordingly, perceived usefulness was identified as the most important and performing constructs for both gender groups of employees but its performance is higher for female employees. Further, the importance of attitudes antecedent factor is high but performance is lower for female and for male importance – performance is low. Finally, the importance of Perceived ease of use is high but performance is low for male employees. On the hand, for female group performance is high but importance is very low.
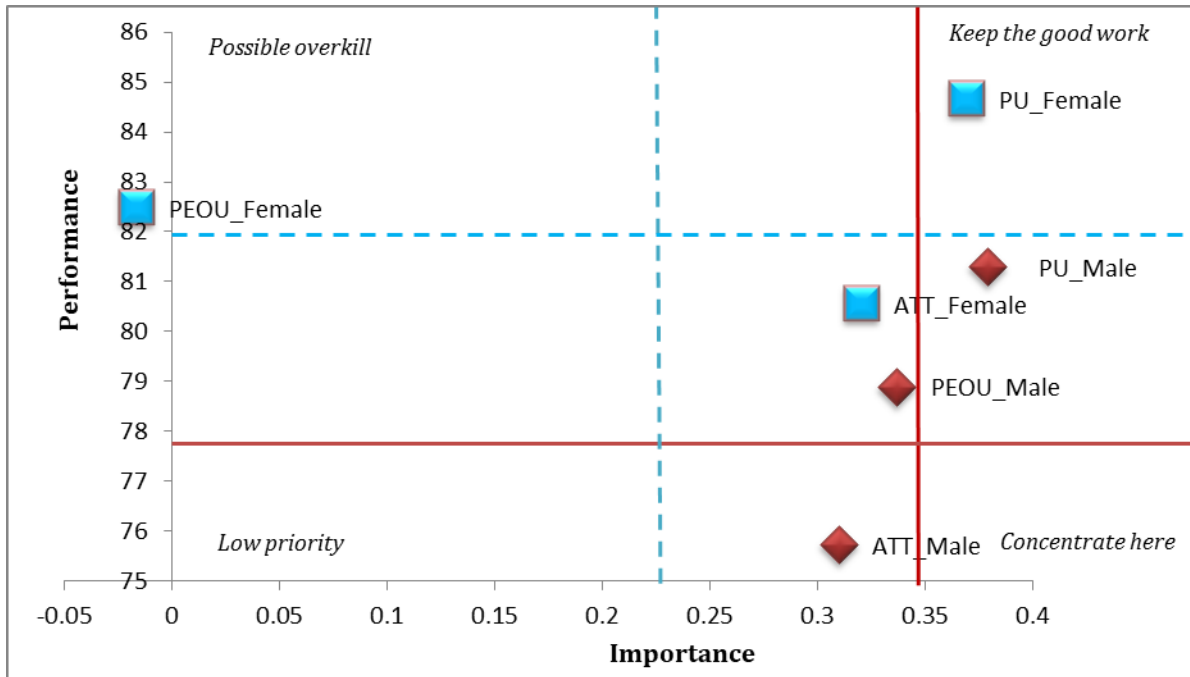
Figure 02: Gender based Importance Performance Matrix Analysis (IPMA)

Table 4: Categorization of INT factors in IPA quadrant

INT factor	IPA quadrant	
	Male	**Female**
ATT	Low priority	Concentrate here
PEOU	Concentrate here	Possible overkill
PU	Keep the good work	Keep the good work

5. Discussion and Conclusion

The study investigated whether the intentions of employees toward Adoption of SaaS differ across gender by examining the effects of influencing factors. There are significant disparities in the influence of perceived ease of use and perceived usefulness between male & female employees and attitudes on their Adoption intention SaaS, were hypothesized, and underpinned by Technology Acceptance Model (TAM). The results did not support H2 & H3, suggesting that perceived ease of use has no significant effect on attitudes towards SaaS and intention to adopt SaaS across the both gender groups. The effects of perceived usefulness and attitudes towards SaaS were high for male and female employees. Additionally, IPA results shows perceived usefulness holds the highest performance among all antecedents for both male and female employees, while the level of importance is higher for male employees. However, perceived ease of use is identified as the second most important antecedents for male employees conversely its performance is below average. However, importance of this construct is very low for female group of employees. As such, the results recommend that easiness has not influence the female employees towards Adoption of SaaS system. The study was limited to employees of one

organization and employees using this system around one year. In order to overcome this drawback, the future study should be conducted comparative research across different types of organizations and users (like, early Adopter, early majority and late majority etc.). Even so, this study extends various managerial implications for management to smooth the functioning of SaaS system. The MGA and IPA results exhibit that perceived usefulness has the highest effect and important on both male and female employees positive intentions towards SaaS. This variable should be considered and keep it long-term for the betterment of automation process of organization. However, the management must focus on improving the perceived ease of use for female in order to improve their intentions of and support for adopt SaaS system more generally. Also, authority gives more effort to reform the attitudes of male employees.

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