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Affective Technology Acceptance Model: Extending Technology Acceptance Model with Positive and Negative Affect

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<http://dx.doi.org/10.5772/intechopen.70351>

Abstract

Research works on TAM, TAM2, TAM3 and UTAUT has always focused on cognitive aspect of technology acceptance in the past two decades. Acceptance of technologies such as eCommerce, Mobile and ERP that considered emotion and affect are still less. This creates a gap in the technology acceptance research, which consider the role of affect into technology acceptance model. This study considers the role of affect of a knowledge worker that work in Multimedia Super Corridor (MSC)-status organizations in Malaysia on their behavioural intention to use knowledge sharing tools (KS tools) in their day-to-day tasks. Hence, Affective Technology Acceptance (A.T.A) model has been proposed. The behavioural intention on the acceptance of KS tools will be hypothesize in the Affective Technology Acceptance (A.T.A) model. Positive (PA) and Negative (NA) affect as the role of affect construct were introduce in this model to investigate its influence on KS tools usefulness and ease of use among employees in Multimedia Super Corridor organizations. The findings of this study highlighted that NA has no impact on perceive usefulness. The findings also showed that PA has very significant positive influence on PU, PEOU and BI with impact on PEOU being the greatest.

Keywords: positive affect, negative affect, TAM, knowledge sharing tools, knowledge workers, affective technology acceptance model

1. Introduction

In the past few decades, works on technology acceptance research have always focused on cognitive instead of emotional factors to predict acceptance of technologies. The role of affect influence, state of mind, and feelings are not comprehended as comprehension

and wordings utilized as a part of this range has dependably been utilized conversely by specialists. Numerous conflicting reports and clashing discoveries from past investigations that consider influence have brought about modest number of research endeavors here. Nonetheless, inquiry about them has demonstrated that reflexes, social judgment, discernment, and conduct [1, 2] are impacted by influence, mind-set, and feeling that constitute the major parts of individuals.

In the information systems' (IS) area, client assessment or client acknowledgment of information technology (IT) is considered as a volitional conduct [3] and has been examined basically with an intellectual introduction [4–6]. Research in this area has dependably been vigorously affected by the insight state of mind conduct models, from Theory of Reasoned Action and the Theory of Planned Behavior [7]. Even though some works on affect, affectivity, playfulness, enjoyment, and emotion have been studied, the affective aspects are less central in most of these studies, with some exceptions, such as studies on aesthetics [8], computer playfulness [9], flow [10], and users' experiences in technology acceptance [11]. Therefore, if the roles of affect indeed play a role in technology acceptance, what aspect of study should be examined and in what relationships of role of affect toward other constructs in the technology acceptance model.

2. Research gaps

Due to conflicting findings and inconsistent terminologies used in the research that considers affect, moods, emotions, and feelings, and the role of affect has been very much ignored by researchers in general. However, recent research has found that the inclusion of affective constructs is able to explain attitude and behavior more extensively in their models. Nevertheless, research that examines role of affect from the perception of the knowledge workers on the KS tools' characteristics in terms of features and functions to induce positive or negative affective (PA and NA) states is lacking. This study extends technology acceptance model (TAM) with PA and NA on perceived ease of use (PEOU), perceived usefulness (PU), and BI to predict the behavioral intention to use KS tools by knowledge workers in MSC-status organizations.

3. Literature review

3.1. Related works on technology acceptance

Davis [4] develops technology acceptance model (**Figure 1**) to determine factors that influence the acceptance of technology. Two most important individual beliefs about using information technology are perceived usefulness (PU) and perceived ease of use (PEOU) that are able to explain individual's intention to use the technology. Davis [4] concluded that

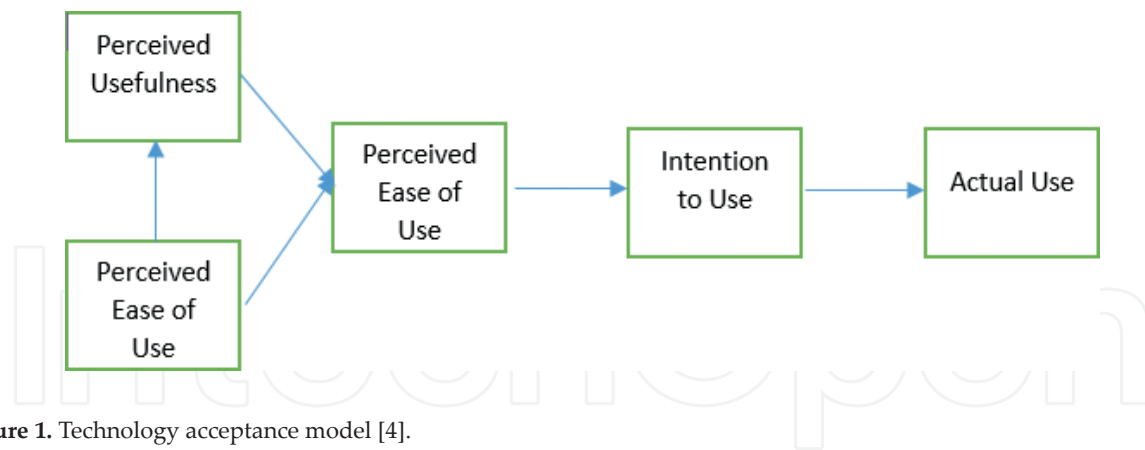


Figure 1. Technology acceptance model [4].

perceived usefulness was the strongest predictor to one's intention to use an information technology.

In TAM, the goal is to utilize the primary determinant of use to accept or not to accept a new tool. The intention to utilize is controlled by the individual's personality toward utilizing a specific tool. Perceived usefulness (PU) and perceived ease of use (PEOU) impact a person's state of mind toward utilizing a specific tool. Perceived usefulness (PU) is characterized as how much individuals trust that utilizing a specific tool would improve his or her task execution [4]. Perceived usefulness is the key determinant that emphatically influences users' convictions and expectation to utilize the innovation. Perceived ease of use (PEOU) is characterized as how much the user utilizes a specific tool, and it is free of effort [4]. Past research has demonstrated that perceived ease of use (PEOU) impacts aim in two ways: direct and indirect impact through usefulness of the tool [4]. As indicated by Davis [4], PEOU has no critical impact on behavioral expectation to utilize in light of the fact that PU intervened its impact. PEOU does not affect straightforwardly on user's behavioral goal since it affects behavioral expectation through PU.

Venkatesh and Davis [12] extended TAM by calling it TAM2 with social influence and cognitive processes on the Perceived Usefulness and intention usage (**Figure 2**). In TAM2, subjective norm [7] is hypothesized to have a direct effect on the intention of an individual to choose to perform a certain behavior even if he/she is not favorable toward that behavior, but due to other referents think he/she should; hence, the individual complies with these referents. In mandatory system usage settings, subjective norms were found to have direct effect on intention over PU and PEOU. The model posits voluntariness as a moderating variable to distinguish between mandatory versus voluntary. Nevertheless, subjective norms can influence intention indirectly through perceived usefulness that is called internalization. Therefore, according to TAM2, the direct compliance-based effect of subjective norm on intention over PU and PEOU will occur in mandatory but not voluntary system usage settings [12]. Job relevancy, output quality, and result demonstrability are determinants for cognitive instruments on PU.

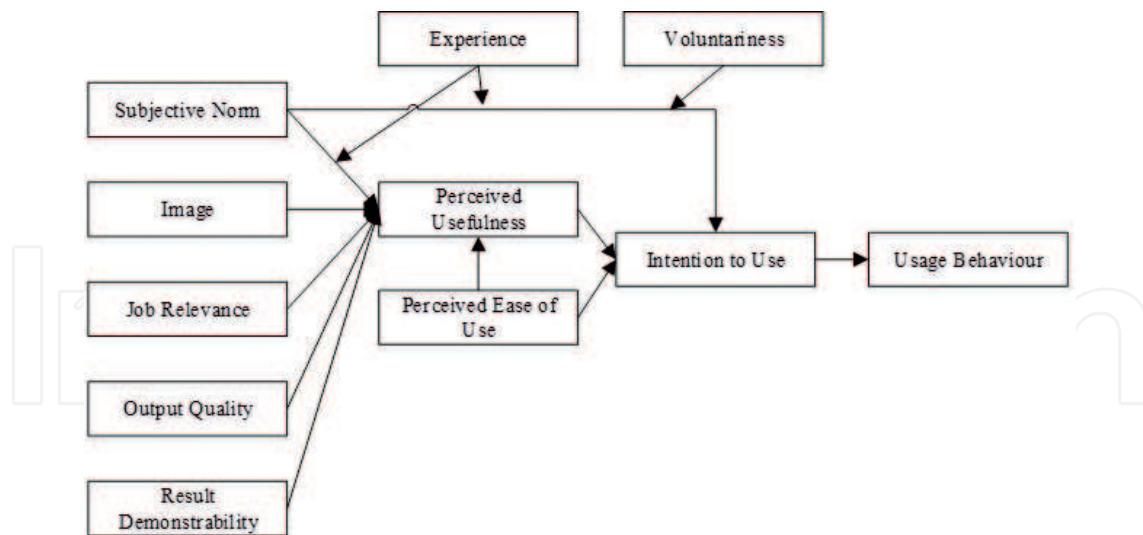


Figure 2. Extended technology acceptance model (TAM 2) [12].

TAM2 proposes that individuals rely on the fit between their job and the performance outcomes of using the system. This will determine their perceived usefulness of the system based on the job relevancy. It was defined as an individual's perception regarding the degree to which the target system is applicable to his or her job. Output quality is the quality of the end result produced by the system to the individual. An individual will take into account on how well the system performs those tasks. If the system does not produce any desirable output to enhance individual performance, it is deemed to believe that the user acceptance rate will drop. Therefore, TAM2 theorizes that result demonstrability defined by Moore and Benbasat [13] as "tangibility of the results of using the innovation" will directly influence perceived usefulness. TAM3 [12] is an extension of TAM where anchors and adjustments are hypothesized to influence PEOU in the model. Anchors are the degree to have general beliefs about computers and its usage, whereas adjustments are the degree of belief that is shaped based on direct experience with the target technology. The results indicate that there are strong correlations for these variables to PEOU. The antecedents for perceived ease of use include computer self-efficacy, perceptions of external control, computer anxiety, computer playfulness, perceived enjoyment, and objective usability. Unified theory of acceptance and use of technology (UTAUT) was introduced by Venkatesh in 2003. UTAUT was developed through the consolidation of various construct of eight models applied to IS usage behavior. These eight models are TAM, TRA, TPB, motivational model, integration of TAM and TPB, PC utilization model, innovation diffusion theory, and social cognitive theory. Behavioral intention and usage behavior were the two dependent variables. On the other hand, eight independent variables include performance expectancy, effort expectancy, social influence, facilitating condition, gender, age, experience, and voluntariness of use. Three main constructs are the determinants of the intention to use and behavior usage (Figure 3): performance expectancy, effort expectancy, and social influence. Performance expectancy was the strongest predictor among the eight factors. UTAUT theorizes that social influence holds significance only in mandatory technology use of situations.

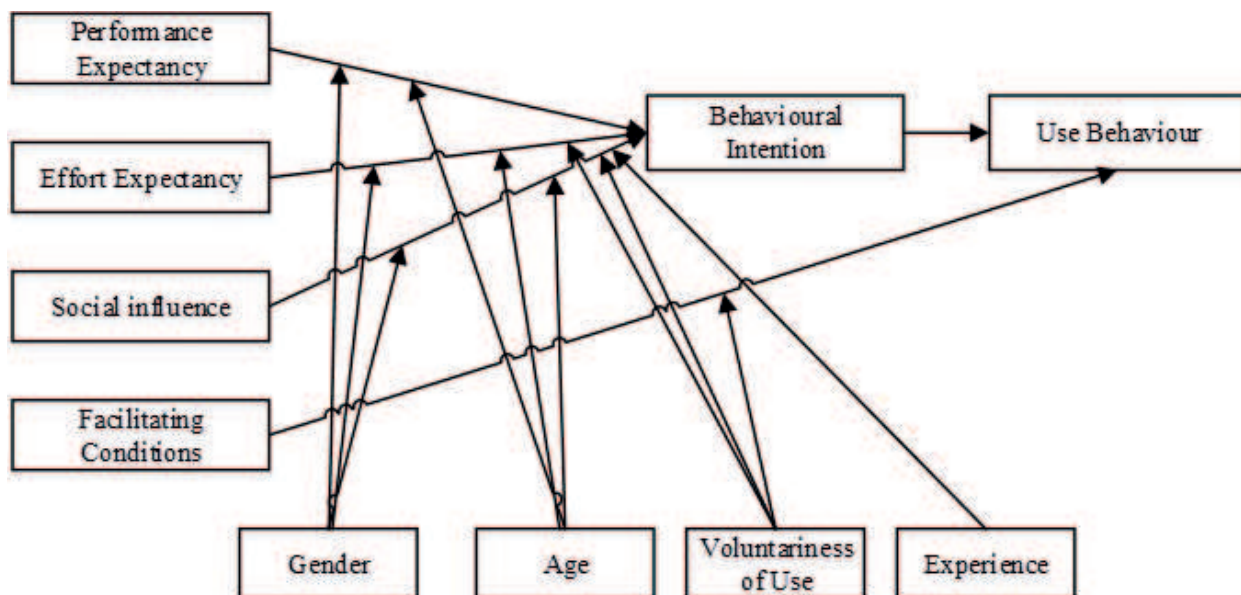


Figure 3. The unified theory of Acceptance and Use of Technology [6].

3.2. Affect, mood, emotion, sentiment, and feeling

Every single sociology shares an interest to attempt, to clarify, and to foresee individual's behaviors, where these behaviors are impacted by subjective procedures. Most theories derived from behavioral often ignore role of affect factors. Role of affect refers to one's feeling or how an individual feels when performing tasks [14, 15]. Affect also refers to one's emotions, moods, and feelings, and they are used interchangeably [2, 16–18].

Dispositional affect is defined as a person's affective predisposition toward perceiving the world around him or herself either positively or negatively [17, 19]. It has strong influences on individual behavior [20, 21]. Many related information systems research uses different terms to represent the role of affect such as "anxiety" when using computers, "computer playfulness," "affect" toward computers, the influence of emotions toward users' attitudes, and use of specific IT [9, 22–24]. Mood is an intra-individual change, generally nonintentional which is not associated with explicit intentions to act [25, 26]. Lazarus [17] defined mood as an affective state that comes and goes depending on particular conditions. Mood is low intensity, diffuse feeling states that usually do not have a clear antecedent [27]. Mood can be characterized as relatively unstable short term intra-individual changes [28]. Mood can be evoked by both dispositional affect and emotions. Unlike emotions, people may not realize that they are experiencing a "mood" and may also not realize that mood is influencing their behavior [27]. Emotions differ from both dispositional affect and mood. Emotions have a clear cause or object, usually are shorter in duration and more focused and intense [29]. Emotions are more likely to change beliefs than mood [30, 31]. Emotions are more likely to disrupt activity [17]. It is also said as an intense feeling; a complex and usually strong subjective response that typically accompanied by physiological and behavioral changes in body [32]. Emotions can occur during the impact period

(i.e., when the new information technology (IT) had been deployed and was being used). In this period, emotions are generated based on individuals' perceptions on the features of the new technology and on their usage of the new technology resources. Individuals will assess whether the technology constitutes a threat or an opportunity and how it can adapt into their daily tasks by changing their working behaviors [33]. Some specific emotion terms such as pleasure, arousal, and enjoyment are used to relate users' attitude toward actual use of a technology [6]. Feelings are sensations perceived by the sense of touch; an affective state of consciousness that resulted from emotions, sentiments, or desires. On the other hand, cognition arises on the human beings' perception toward using technologies [16, 34]. Behavioral aspect would be from the individual's reactions toward using the information technologies [11]. Emotional Intelligence is a variable with a multifactor individual difference [35] that meets the traditional standards of intelligence. Being emotionally intelligent involves being actively able to identify, understand, process, and influence one's own emotions and those of other to guide feeling, thinking, and action. Sentiments are valence appraisals of an object that involves evaluation of whether something is liked or disliked. These evaluations were evoked by phenomena. It can come from previous experience with the object or situation or through social learning [29]. Satisfaction has been the most widely studied sentiment. Most of the work conducted has focused on satisfaction at the individual level either because of workplace events or as a predictor of workplace outcomes [19].

Zhang and Li [36] examined the affects of emotional assessments of IT on IT utilized choices. Refer to Zhang and Li [36], two protest based full of feeling assessment builds: recognition on IT's ability to incite positive affect and impression of the IT's capacity to prompt negative affect able to influence. Their investigation demonstrated that positive affect and negative affect are particular ideas that affect perceived usefulness (PU), perceived ease of use (PEOU), and attitude toward utilizing IT tools. These impacts remain constant amid individuals in using and utilizing IT tools (ATT). Positive affect impacts PU, PEOU, and ATT, yet it turns out to be less critical to PU after some time, and positive affect just impacts PEOU; however, it turns out to be more vital to PEOU over the long run. Therefore, Zhang and Li [37] presumed that affect influence a key part in individuals' connections in using IT tools.

Loiacono and Djasmasbi [15] also found that positive mood played a significant role in the adoption of a new technology. Their study looked at the effects of positive mood, and to understand how individual's characteristics affect an individual's cognition and behavior on the acceptance of a Decision Support System. The objective of their research is to investigate how affect can be a vital component for technology acceptance to make rational decision making. Based on Isen et al. [38], qualities of task characteristics impact one's certain state of mind particularly on tolerating another innovation, for example, Decision Support Systems (DSS) which requires subjective capacities to deal with troublesome/complex task. Association can control one's state of mind by encouraging positive temperament inside the association, and it can enhance association's results [16]. From their findings, Loiacono and Djasmasbi [15] reported that positive mood could bring improvements in new technology acceptance.

4. The proposed affective technology acceptance (ATA) model

Based on the literature findings, affective technology acceptance model involves PA and NA that were used to induce positive and negative affect states on the individuals who uses the technology were proposed. Zhang and Li [36] adapted these constructs and defined them as the perception of IT's capability to induce these feelings. It was said that the technology functions and features are capable of inducing these feelings in the individuals. Therefore, this research proposed an extension on the technology acceptance model by including this two affect states on the use of KS tools by the knowledge workers in the MSC-status organizations in Malaysia. Indication of the respondent's feelings was recorded at eight different points in times on the instrument to gather the different affective states of the knowledge workers on using the knowledge sharing tools. The measurement scale was adapted from Perlusz [39]. Two groups of undergraduate students were used to validate the scale, and it was found that the technology affect scale were consistent and valid in Perlusz studies.

In this research, PA and NA are defined as the perception on KS tools' characteristics in terms of features and functions to induce positive or negative affective states [36, 37, 40]. PA and NA were adapted from Zhang and Li [36], where they defined PA and NA as the perception of an IT's capability to induce positive or negative affect. It is an individual's perception or evaluation that an IT has the features and functions to induce positive or negative affect in him or her. In this study, the external stimulus is KS tools used by the knowledge workers in the MSC-status organizations in Malaysia. The respondents were asked to indicate the extent of how he/she feels on the usefulness, ease of use, and intention to use the KS tools in eight different points in times in the instrument. The different affective states of the knowledge workers were self-reported on the survey form. The measurement scale for PA and NA is adopted from Technology Affect Scale [39] where Perlusz [39] adapted the 10-item scale from Watson and Tellegen [41]. The scale was validated using two groups of undergraduate students who were exposed to several types of affects before interacting with mobile technologies. The Technology Affect Scale is found to be consistent and valid in his experiments.

4.1. PU, PEOU, ATT, and BI in technology acceptance model

The relationships among PU, PEOU, ATT, and BI are consistent with the literature. TAM originally included attitude as a mediator between the personal beliefs constructs, and behavioral intention [4]. Individual's actual usage of the technology is dictated by behavioral goal, which is determined by perceived usefulness and perceived ease of use. The value of perceived usefulness is the degree to which an individual trusts that utilizing the innovation will upgrade his or her employment performance, and perceived ease of use is the degree to which individual trusts that utilizing the technology will be free of effort [4].

H7: There is a significant relationship between PEOU and PU.

H8: There is a significant relationship between PU and ATT.

H9: There is a significant relationship between PEOU and ATT.

H10: There is a significant relationship between ATT and BI.

4.2. PA and NA on the perceived usefulness, perceived ease of use, and behavioral intention to accept KS tools

This research considers PA and NA based on evidences obtained by Zhang and Li [36]. They found that PA strongly influences PEOU, PU, and ATT, while NA only influences PEOU at the initial stage of usage. In their work, BI is mediated by ATT, but the direct influence of PA and NA on BI was not being investigated (Figure 4). Isen [42] presented his findings by stating that positive affect state such as joy and elation will lead a person to be creative, playful, and explore innovative ideas and think broadly. Another piece of work conducted by Isen et al. [38] using four experiments on positive and negative affects induced by a series of activities such as watching comedy films for few minutes, receiving a small bag of candy, or showing film of unpleasant feelings. They found that positive affect induced by a comedy film or a small gift of candy facilitates creativity on tasks given. At the same time, activities that designed to induce negative affect using primitive arousal devoid of any affective tone (exercise) had no effect on these measures. In their findings, negative affect neither facilitates nor impairs creativity. However, they pointed out that one of their experiments showed that negative affect was only induced by showing subjects film that induces unpleasant feelings. The proposed work in this research hypothesized the extent of how a person feels in his perception on the KS tools' features and functions (or characteristics) in their day-to-day tasks that induce positive or negative affect. This research fills the gap by examining the relationship of PA and NA and the behavioral intention to accept KS tools in the organizations. The affect induced by the perception toward how knowledge workers evaluate KS tools' affective quality is believed to be able to influence an individual's behavior and intention to accept a

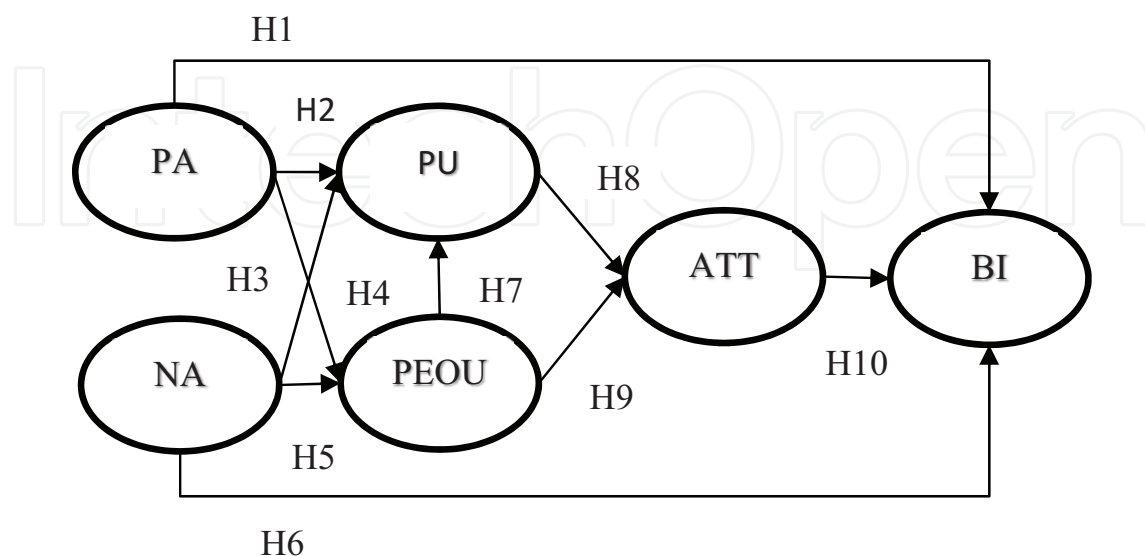


Figure 4. ATA model.

tool. Affect construct included in the proposed Affective Technology Acceptance Model, the hypothesis is as follow:

- H1: There is a significant relationship between PA and BI.
- H2: There is a significant relationship between PA and PU.
- H3: There is a significant relationship between PA and PEOU.
- H4: There is a significant relationship between NA and PU.
- H5: There is a significant relationship between NA and PEOU.
- H6: There is a significant relationship between NA and BI.

5. Methods

5.1. Study contexts and samples

The population where sample will be drawn in this research consists of knowledge workers who work in MSC-status organizations in Malaysia. The samples are individuals who deal with information, require developing, or using knowledge to solve problems in their jobs. About 2500 MSC-status organizations from the MSC directory (http://www.mscmalaysia.my/company_directory) have been invited to participate in this research. Two thousands and five invitations were sent out to these organizations and 300 forms were received. Two hundred ninety-five forms were usable. A response rate of 11.87% was gathered from the self-administered questionnaire. **Figure 5** illustrates KS tools that are highly utilized by the respondents, and **Figure 6** presents those that are not used at all in the activities that are carried out by the respondents.

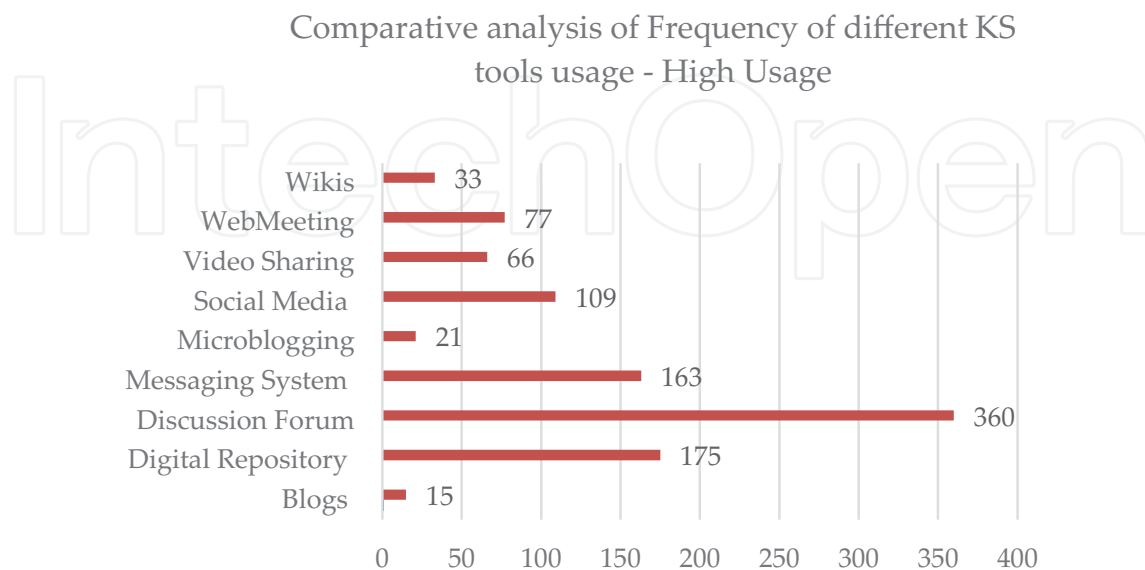


Figure 5. KS tools with high usage frequency.

Comparative Analysis on Frequency of different KS tools usage - Not at All

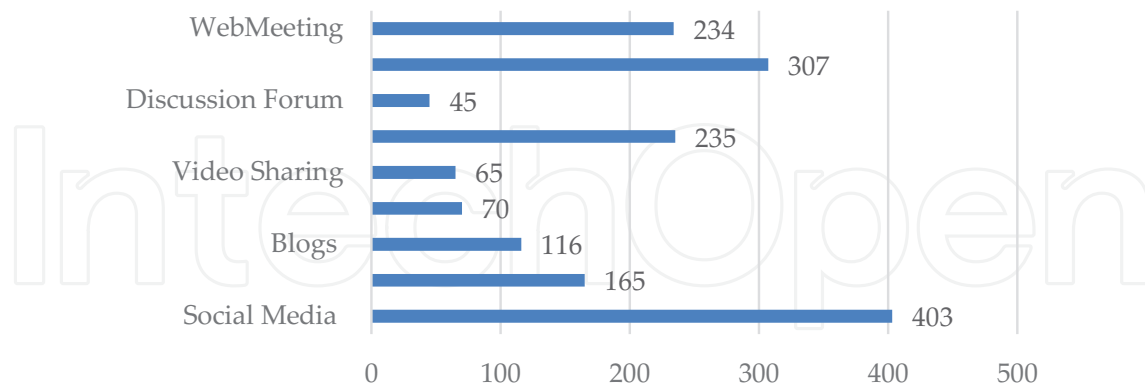


Figure 6. KS tools not used at all among knowledge workers in MSC organizations.

Most of these organizations are in their initial stages of tool implementation or tools have been implemented but with very minimum tools usage among knowledge workers in these organizations. This rationalized the importance to carry out a research on their intention to use KS tools in their day-to-day jobs.

5.2. Instrument and measures

All the constructs in the research model were measured with items adapted from prior research. All the items in the questionnaire used a five-point Likert-type scale ranging from “Strongly Agree” to “Strongly Disagree” (**Table 1**).

Sections	No. of items
General information	9
KS tools behavioral intention	30
Role of affect	24

Table 1. Instrument.

Respondents were asked to indicate to what extent one feels when one evaluates the KS tools when interacting and using the tools. The respondents were asked to record their feelings that were induced by the tools when they interacted with them. The positive and negative affect (PA and NA) are hypothesized to have an impact on PEOU, PU, and BI in the research model. Items for positive and negative affect (PANAS) were adapted from Perlusz [39], Tellegen [28], Watson [43], and Watson et al. [44]. Pre-test and pilot test were carried out before actual survey took place. A total of 30 respondents participated in these tests.

5.3. Data analysis

The proposed model and hypothesis testing was carried out using SmartPLS 3.0 software. The measurement and structural model analysis follows methodology described in Hair

et al. [45]. In this research, a sample size of 295 is sufficient using G*Power software to examine the predictive accuracy of constructs and path coefficients of relations in the proposed model. The analysis on the years of experience of the knowledge workers in these MSC-status organizations highlighted that most of them have been in their industry more than 10 years. The preliminary analysis highlights that long service in the industry gives knowledge workers more domain knowledge where majority of them possess an undergraduate degree.

6. Results

6.1. Measurement model analysis

This section discusses the measurement model, which consists of several analyses. **Table 2** illustrated the composite reliability on the results. Based on the analysis, it was shown that PU, PEOU, ATT, and BI all achieved the value of composite reliability higher than 0.90, which satisfy the threshold of composite reliability.

Convergent validity looks at the extent to which a measure correlates positively with alternative measures of the same construct. In **Table 2**, it was found that all the constructs' AVE are significant with at least 0.50 and above.

Discriminant validity is the extent to which a construct is truly distinct from other constructs by empirical standards. This means a construct has captured the phenomena not represented by other constructs in a model. Cross loading and Fornell-Larcker criterion discriminant validities are used in this analysis. The analysis indicates that AVE of all constructs has high correlation. Formative measurement analysis conducts a separate set of validity and consistency test. The formative constructs in the proposed model consist of positive and negative affect for PU (NA_PU and PA_PU), positive and negative affect for PEOU (NA_PEOU and PA_PEOU), and positive and negative affect for BI (NA_BI and PA_BI). Convergence validity is the extent to which a measure correlates positively with other measures or indicators of the same construct. A redundancy analysis is used to perform the convergence validity test by

Constructs	Composite reliability (CR)	Cronbach's alpha	AVE (Convergent validity)	Discriminant validity	
				Cross loading	Fornell-Larcker criterion
Perceived usefulness (PU_I)	0.945	0.932	0.710	Y	Y
Perceived ease of use (PEOU_H)	0.928	0.913	0.591	Y	Y
Attribute toward use of KS tools (ATT_G)	0.925	0.906	0.639	Y	Y
Behavioral intention to use KS tools (BI_J)	0.937	0.922	0.682	Y	Y

Table 2. Composite reliability for reflective constructs.

evaluating formative measurement models; one must test whether the formatively measured construct is highly correlated with a reflective measure of the same construct. A global indicator is designed for this test. To conduct the convergent validity, a separate model is created with the global indicator for each formative construct. From the outcomes of the redundancy analysis, negative affect on perceive usefulness, negative affect on perceive ease of use, negative affect on behavioral intention, positive affect on perceive ease of use and positive affect on behavioral intention are 0.8 or above. Their formative indicators are significant enough to capture content that these constructs want to capture.

For collinearity assessment, when collinearity has high correlations between two formative indicators in a formative construct, it is a problematic indicator and it is unwanted for a formative construct. VIF is used to assess collinearity. Once the collinearity of formative indicators has been treated, outer weights in formative measurement models can then be interpreted. All formative indicators satisfy the requirement of VIF values uniformly with values below the threshold value of 5. There are five items used to test $PA \rightarrow PU$, $PA \rightarrow PEOU$, and $PA \rightarrow BI$. Similarly, five items were designed for $NA \rightarrow PU$, $NA \rightarrow PEOU$, and $NA \rightarrow BI$. The items that are labeled as AA1A..E, BB1A..E, and CC1A..E are positive affect items whereas AA1F..I, BB1F..I and CC1F..I are negative affect items. There is no collinearity problem found in the model except for the items AA1G and AA1H from negative affect on perceived usefulness, BB1G and BB1H from negative affect on perceived ease of use and CC1F and CC1J from negative affect on behavioral intention. Based on items AA1G, AA1H, BB1G, BB1H, BB1J, CC1F, and CC1J being important questions to measure negative affect on perceived usefulness, perceived ease of use, and behavioral intention in the instrument, therefore, these items will be retained. A formative indicator of its relevance is analyzed based on the values of its outer weight as it is compared with others to determine its relative contribution to the construct.

To determine whether an indicator is significant or not, each indicator's *t*-value must fulfill the critical value of 1.65 for two-tailed tests at a significant level = 10%. The indicator significance level analysis for positive affect and negative affect on perceived usefulness is significant. Positive and negative affect on perceived ease of use has ten formative items that measure the construct. Five items were chosen to measure positive and negative affect, respectively. One negative affect item is not significant. Its *t*-value is less than 1.65, and outer weight and outer loading do not fulfill the criteria. However, BB1J was not considered to be deleted from this construct because this item has been validated and tested in the previous instrument. Positive and negative affect on behavioral intention has ten formative items that measure the construct. Five items were chosen to measure positive and negative affect, respectively. Negative affect has one item that is not significant. The outer loading value of 0.482 for CC1J is rounded up to be 0.5. Hence, all items are significant. In short, based on the theoretical model and measurement scale used for the proposed research model, the existing items for each construct will be kept.

6.2. Structural model analysis

Collinearity assessment on a structural model involves examination of each set of predictor constructs for each part of the structural model. Collinearity is assessed based on those

constructs that have tolerance levels below 2.0 or VIF above 0.50. If such collinearity exists, one should consider eliminating the constructs, merging predictors into a single construct, or creating higher-order constructs to treat collinearity problem. **Table 3** shows that there is no collinearity problem encountered in the research model.

Structural model is used to calculate the estimates of the structural model relationships (path coefficient) that are represented as the hypothesized relationships among the constructs. For this research, we choose to take a significant level of 10% with a critical value of 1.65. Besides examining *t*-values, *p*-values are considered in this analysis. To obtain the *t*-values, a bootstrapping procedure with 5000 resamples was applied. Based on the analysis results, the hypothesis testing results are summarized as follows in **Table 4**.

Another important measure is the total effect of each path. Direct effect for each path may not be very significant in some cases; hence, Total Effect is to assess the significant of paths in the model. The coefficient of determination is a measure of the model's predictive accuracy using R^2 where it represents the exogenous latent variables' combined effects on the endogenous latent variables. R^2 also represents the amount of variance in the endogenous constructs explained by all the exogenous constructs linked to it. In scholarly research that focuses on marketing issues R^2 values of 0.75, 0.50, and 0.25 for endogenous latent variables can be described as substantial, moderate, and weak, respectively.

Attitude toward using KS tools can predict with an accuracy that is close to value 1. Followed by behavioral intention to use KS tools with a R^2 value of 0.625 and Task Category-KS tools Fit of a R^2 value of 0.593. As for perceived usefulness, it has a R^2 value of 0.45 and perceived ease of use has the smallest R^2 value of 0.360. By examining *t*-values based on the critical values 1.65 for two-tailed tests at a significant level = 10%, all the *t*-values in the table are significant. Hence, all the predictive accuracy values are significant (**Table 5**). Hence, ATT_G and BI_I are substantial and PU_I and PEOU_H are moderate endogenous latent variables in the proposed model.

Constructs	ATT_G	BI_I	PU_I	PEOU_H
ATT_G		2.326		
NA_BI		1.075		
PA_PU			1.307	
NA_PU			1.062	
PEOU_H	1.421		1.492	
PU_I	1.421			
PA_BI		1.371		
PA_PEOU				1.211
NA_PEOU				1.051

Table 3. Summary of VIF for collinearity analysis.

No	Hypothesis	Results
1.	There is a significant relationship between PA and BI.	Supported
2.	There is a significant relationship between PA and PU.	Supported
3.	There is a significant relationship between PA and PEOU.	Supported
4.	There is a significant relationship between NA and PU.	Not supported
5.	There is a significant relationship between NA and PEOU.	Supported
6.	There is a significant relationship between NA and BI.	Supported
7.	There is a significant relationship between PEOU and PU.	Supported
8.	There is a significant relationship between PU and ATT.	Supported
9.	There is a significant relationship between PEOU and ATT.	Supported
10.	There is a significant relationship between ATT and BI.	Supported

Table 4. Summary of the hypothesis testing results.

Endogenous latent variable	R^2	t -values
ATT_G	0.628542	14.3111
BI_J	0.625851	16.30823
PU_I	0.450406	6.329501
PEOU_H	0.360258	6.716182

Table 5. R^2 .

7. Discussion and conclusion

Role of affect has been measured in this study to investigate on its relationship between positive and negative affect with knowledge workers' behavioral intention to use knowledge-sharing tools. The results show that these two constructs have significant relationship on behavioral intention to use and this was also supported by Zhang and Li's findings in 2007. Zhang and Li [36] pointed out that negative affect is easier to measure and investigate compared to positive affect. It was believed that negative affect creates impacts on knowledge worker's performance and their intention to use a technology. However, this study outcome produces a new finding where the results show that negative affect has no impact on individuals' perceived usefulness on the knowledge-sharing tools, whereas the results for attitude toward knowledge-sharing tools usage aligned with past literature works [4, 6]. Negative affect has a strong impact on behavioral intention usage of KS tools in the ATA model. From the findings, we know that knowledge workers use knowledge-sharing tools to perform their daily task in work, and the results gather their affect states after interacting with the tools. From the study, we conclude that if individuals have a strong negative influence on their behavioral

intention, they will show less interest in the use of knowledge-sharing tools. Therefore, negative affect has the strongest influence on perceived ease of use and perceived usefulness of the tools. On the other hand, positive affect shows significant impact on perceived ease of use, perceived usefulness and behavioral intention. This implies that positive affect plays a great role in behavioral intention to use a technology; therefore, constant improvement on the tools is needed to induce positive affect on the individuals in using the tools.

Positive and negative affects are a major determining factor in technology acceptance. Past review works in information systems show that the outcomes were inconclusive and inconsistent. Operationalization of affect and its related terms has been ambiguous. Many terms have been used interchangeably in a number of research; however, this is a growing field and interest among many researchers [12, 28, 37, 39, 40, 41, 46–56]. From the past related works, it has shown empirical evidence on the role of affect and it was used to explain better in a behavioral study. The proposed ATA model has hypothesized positive affect and negative affect in influencing PEOU, PU, and BI to use knowledge-sharing tools. Past research works has shown that affect has no significant impact on the usefulness of the tools. However, in this study, we found that positive affect has significant influence on the usefulness and ease of use on knowledge-sharing tools and subsequently influence individuals' behavioral intention to use. These findings are a new contribution to the theoretical aspect of affect relating technology acceptance area of study.

Practitioners and business operators can then maximize these findings by knowing what to do to their tools in order to encourage more usage of the tools. Software designers can consider affect element as they design new tools for knowledge workers. Unpleasant and uncomfortable feelings at the first glance on the tools may induce negative affect on the individuals, hence, impact of affect must be considered while designing user interface of a technology. Technology that induces positive affect will increase the tools acceptance. This study brings new implications to the top management on the factors that impact the knowledge workers' intention to use KS tools in their works. This study suggests that organizations should focus on knowledge workers' affective aspects besides other factors before implementing any KS tools in their organizations. The affective aspects of knowledge workers induced by the tools are found to be significant in this research. Therefore, top management should pay attention while formulating their knowledge-sharing tools implementation strategies in their organizations.

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