

A Structural Equation Model to Assess the Factors Influencing Employee's Attitude & Intention to Adopt BYOD (Bring Your Own Device)



Ruchika Gupta, Siddharth Varma, Garima Bhardwaj

Abstract: *Bring Your Own Device (BYOD) is an emerging trend whereby employees are allowed to use their own mobile devices to access organizational data from anywhere and anytime. It helps increasing employee productivity and reducing capital cost for the organization. To formalize and implement BYOD policy, it is imperative to understand the employee's attitude and intention since the success of this policy highly depends on their attitude and intention. Therefore, this study proposes an insight on the factors influencing employees' attitude towards BYOD & their intentions to use their own devices for organizational purpose. A research model have been developed based on Technology Acceptance Model(TAM) which is tested for reliability and validity through Structured Equation Modeling using sample collected from 332 employees. The results of this study indicate that decision by employees to adopt BYOD is indeed a complex interplay of a number of variables and while some of them may affect attitude towards BYOD they may not have a positive effect on intention to adopt BYOD. The study also brings forward several implications which can be a valuable reference for practitioners and other researchers.*

Keywords: Bring Your Own Device, Demographics, Employee Attitude, Intention to Adopt, Structural Equation Model, Technology Acceptance Model

I. INTRODUCTION

Bring Your Own Device (BYOD) is one of the emerging trends adopted by modern IT/ITES companies whereby employees are allowed to use their own technological devices like smart phones, tabs, I pads, laptops etc. which enable them perform their work inside or outside the workplace. BYOD work policy permits employees and other associated persons to access exclusive information and applications of the company they are working for through their personal devices. This technical evolution will possibly facilitate strong

relationship between employee and the organization's IT department.

BYOD adoption decision has a positive effect on financial cost of large scale organization and recommended that financial cost has direct effect on adoption decision. It helps in reducing capital costs by permitting employees to bring own devices and use for smooth functioning of work [3]. Similar study by Brodin, Rose [4] shows that 96% IT companies permit their employees to use their personal devices, that show 36% employees support for all personal devices, and that 49% employees support for some selected devices. Some studies also reveal that BYOD has several constructive positive indications from employee's outlook with regard to productivity, mobility, efficiency and overall satisfaction from their work life. It also reduces running cost [3].

Gartner Research shows that in employee survey 39% employees depend on their personal devices at the workplace. In this study only 10% employees have supported working on organizational owned devices. This shows that overall employees are less interested to use corporate devices over personal devices for work which saves high cost of organization [32]. Tech Pro Research also conducted a survey of 206 IT professionals to find out how BYOD is impacting their organization around the world. Their findings revealed that 57% employees are interested and their organization are also supporting own device working system [33]. Similar study by Capgemini shows that 19% of organizations admits that BYOD plays great role to enable employee satisfaction on the other hand 17% perceived that its helps to raise productivity at workplace [6].

Literature on BYOD shows that employees like this approach and large number of employees prefer to use their own devices for official purpose [31]. Organizations have created formal policies for BYOD. Intel is an example which started BYOD journey in 2010 with 19,000 employees. Despite offering numerous benefits, BYOD policy still has several loopholes which need to be addressed. Emotional reactions and observance of employees regarding BYOD policies with regard to privacy, security and confidentiality creates challenge for organizations to continuously monitor and maintain.

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Polices are guidelines and strategies for management of organization in which employee resists, using personal mobile phones for personal activities or challenges comes at the time of adjustment with technological changes. This is a tendency of staff not to follow policies set by management. Employees, who are not interested or against with limitations imposed by BYOD security policies, will find loopholes to exploit [15]. Various experts in the field [18], [23], [27], opine that the success or failure of implementing such a policy depends heavily on the attitude of the employees. The employees may have negative perceptions or attitude towards BYOD. For that reason, it becomes essential to know the employee's attitude and intention towards BYOD while formalizing implementation policies regarding BYOD. Therefore, this paper proposes an insight on the factors influencing employees' attitude towards BYOD & their intentions to use their own devices for organizational purpose.

II. LITERATURE REVIEW & HYPOTHESES DEVELOPMENT

Literature review begins with the basic research question, "What factors influence employees' adoption intention towards BYOD in the organization?" This requires evaluating employee's intention to adopt BYOD as a dependent variable. Technology Acceptance Model (TAM) conceptualised by Davis [12], [13] would serve the purpose as it is one of the most parsimonious models for demonstrating and understanding behavioural intention to accept/ reject innovative technology. In several research studies it has been found that TAM and its tools and techniques have immense quality and proven statistically reliable results [9], [10], [25]. TAM has broad significance in demonstrating professional's response about the use and way of adoption of new technology. The utilization and applications of TAM in regular way is acceptable and justifiable. Over the last few decades, it is well established model in the research area of Information system for the researchers [9]. It is a widely used model for assessment of user's intention for technology adoption due to its simplicity, adaptability, parsimony and robustness [1], [10], [26]. Therefore, this model has been used as foundation for developing the conceptual model of this study. The various constructs of the conceptual model and associated hypotheses are given below.

A. Perceived Ease of Use (PEOU)

It is the supposition towards ease of using a particular technology. It is believed that an application seemingly easy to use is having higher probability of acceptance by the user in comparison to those which are not. PEOU have been used in a number of studies as a construct which demonstrated direct or indirect impact on attitude and adoption intention for specific technology [7], [9], [36]. Therefore, to study the employee's attitude and intention to adopt BYOD, it is hypothesized that:-

H1: Perceived Ease of Use positively influence Perceived Usefulness.

H2: Perceived Ease of Use positively influence Attitude.

H3: Perceived Ease of Use positively influence Intention to Adopt BYOD.

B. Perceived Usefulness (PU)

It is the predisposition that using a particular technology will enhance the performance. This has been used by various researchers in number of studies as a factor determining the behavioral intention which directly affects the attitude of the individual [8], [19], [24], [36]. Therefore, in this study it is hypothesized that:-

H4: Perceived Usefulness positively influence Attitude.

C. Attitude (ATT)

Attitude is the positive or negative response of an individual towards adoption of specific technology. The attitude is formed by the prominent beliefs of an individual about the consequences of a given behavior and their assessment of the given consequences. In the literature, there are extensive substantiation validating the impact of attitude on the user's intention to adopt different technologies [16], [21], [22], [36]. Therefore, this study hypothesizes that employee's attitude positively influence the adoption intention for BYOD:-

H5: Attitude positively influence Intention to Adopt BYOD

D. Intention to Adopt (INTADOPT)

TAM validated that attitude, perceived usefulness and perceived ease of use affects the adoption intention either directly or indirectly. After this, several other researchers had applied the model and provided similar results [7], [8], [9], [35].

E. Demographic Constructs

In addition to the above given basic constructs of TAM, there is a need to identify several other constructs which could influence the BYOD adoption intention of the employees. For the purpose, demographic constructs like Age, Gender and Income have been added to the basic research model and the following hypotheses have been formulated:-

H6: Gender positively influence Intention to Adopt BYOD

H7: Age positively influence Attitude

H8: Age positively influence Intention to Adopt BYOD

H9: Income positively influence Attitude

H10: Income positively influence Intention to Adopt BYOD

All these hypotheses are summarized in Table 1.

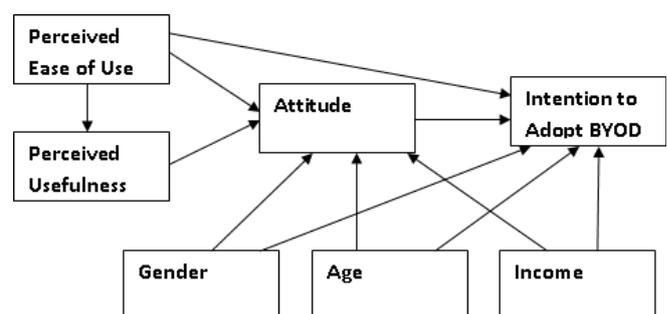


Figure 1: Proposed Model

Table 1: Definition of Research Hypotheses

Hypotheses	Description	Path
H1	Perceived Ease of Use positively influence Perceived Usefulness	PEOU→PU
H2	Perceived Ease of Use positively influence Attitude	PEOU→ATT
H3	Perceived Ease of Use positively influence Intention to Adopt BYOD	PEOU→INTADOPT
H4	Perceived Usefulness positively influence Attitude	PU→ATT
H5	Attitude positively influence Intention to Adopt BYOD	ATT→INTADOPT
H6	Gender positively influence Intention to Adopt BYOD	GENDER→INTADOPT
H7	Age positively influence Attitude	AGE→ATT
H8	Age positively influence Intention to Adopt BYOD	AGE→INTADOPT
H9	Income positively influence Attitude	INCOME→ATT
H10	Income positively influence Intention to Adopt BYOD	INCOME→INTADOPT

III. METHODOLOGY

Consistent with previous studies undertaken to assess the attitude and adoption intention towards specific technologies [1], [29], [34], a quantitative study using questionnaire have been conducted to test the hypothesized model. The questionnaire designed for the study comprises two parts. The first part includes demographic questions to examine the demographic profile of respondents and the second comprises questions pertaining to the various constructs of proposed research model namely- Perceived Usefulness (PU), Attitude (ATT), Perceived Ease of Use (PEOU), & Intention to Adopt (INTADOPT). For each variable of the constructs, 5 point Likert Scale was used.

Pretesting of the questionnaire was done using expert opinion from two officials who have formulated BYOD strategies for employees of their organizations. Also, the efficacy of questionnaire was done using pilot study. The changes suggested were then incorporated into the questionnaire and the Cronbach Alpha values were calculated. The items, for

which Cronbach Alpha values were less than 0.70, were dropped and the modified questionnaire was then utilized for the purpose of this study.

The population of interest in this study is employees working in IT/ITES Companies in India where BYOD policy is gaining momentum. However, since this study couldn't cover such a large population, a sample was used for collecting data. The employees of IT/ITES companies in Delhi/NCR have been chosen as sample respondents of this study. The data was collected both from online questionnaire as well as hard copy from. Total 351 filled questionnaires received out of which 19 responses found to be incomplete thus rejected; therefore in totality 332 responses were used for data analysis. Results from the sample were analyzed using SPSS AMOS v. 24.0 Software. SEM i.e Structural Equation Modeling been used for hypotheses testing so as to validate the proposed research model. SEM is sought to be a flexible and broad framework for analysing data. It is better considered as a group of similar methods instead of single data analysis technique. It is a two step approach- First, Factor analysis termed as Measurement Model and second, the validation of research hypotheses referred to as Structural Model [2].

IV. DATA ANALYSIS & FINDINGS

The demographic data of respondents as depicted in Table 2 represent fair gender wise proportion 48% males and 52% females. Young respondent i.e between the age group 21 to 40 years constitutes a major portion. Also, the respondents are diversely dispersed concerning their income level as summarized in Table 2 below.

Table 2: Sample Demographics of Respondents

Demographics		Frequency	Percentage (%)
Gender	Male	161	48
	Female	171	52
Age (Years)	21-30	215	65
	31-40	103	31
	41-50	14	4
Gross Monthly Income (Rs. in thousands)	Upto 25	59	18
	25-50	125	38
	50-100	95	28
	Exceed100	53	16
Educational Qualifications	Graduate	83	25
	Post Graduate	249	75

In order to analyze the interrelationship among constructs of the model, a two step approach for Structured Equation Model (SEM)-Measurement Model and then Structural Mode have been adopted [2].

A. Measurement Model

According to Hair [20], Measurement Model (CFA) helps assessing reliability, convergent & discriminant validity of the research model. In this study, firstly cronbach alpha has been used to test the reliability. All those construct whose cronbach alpha values are greater than 0.7 have been taken into consideration as recommended by Chin (1998).



A Structural Equation Model to Assess the Factors Influencing Employee's Attitude & Intention to Adopt BYOD (Bring Your Own Device)

Further, the convergent validity have been examined using Average Variance Extracted (AVE) & Composite Reliability (CR); whereas the discriminant validity was evaluated through the inter construct squared correlations as well as the square roots of AVE [11], [17], [20].

Results of this study as shown in Table 3 and 4, indicates a good convergent validity since the CR and AVE values of all items exceed 0.7 and 0.5 as recommended level by Fornell and Larcker [17]. Also, the discriminant validity was verified through a comparison of squared inter construct correlations with square root of AVE. For each construct, the AVE value exceed the squared inter construct correlation for that construct thus verifying the discriminant validity [17], [20].

Table 3: Reliability and Validity Measures

Construct	Items	Standardized Factor Loadings	Cronbach's Alpha	CR	AVE
PEOU	PEOU1	0.968	0.908	0.912	0.838
	PEOU2	0.860			
PU	PU1	0.930	0.836	0.843	0.731
	PU2	0.772			
ATT	ATT1	0.673	0.790	0.801	0.575
	ATT2	0.817			
	ATT3	0.777			
INTADOPT	INTADOPT1	0.817	0.807	0.807	0.677
	INTADOPT2	0.829			

Note: PEOU- Perceived Ease of Use; PU- Perceived Usefulness; ATT- Attitude; INTADOPT- Intention to adopt BYOD

Table 4: Discriminant Validity

	PEOU	PU	ATT	INTADOPT
PEOU	0.91			
PU	0.85	0.86		
ATT	0.83	0.56	0.76	
INTADOPT	0.80	0.59	0.73	0.83

Note: Diagonal (i.e. bold) values are square root of AVE and off diagonal are inter-construct squared correlations.

Further, the overall fitness of the research model have been analyzed using 7 most commonly recommended fit indices: "Ratio of chi square to Degrees of Freedom ($\chi^2/d.f$), Normalized Fit Index (NFI), Comparative Fit Index (CFI), Tucker- Lewis Index (TLI), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), and Root Mean Square Error of Approximation (RMSEA)" as recommended by various experts [5], [14], [20]. All the results go beyond the suggested level thereby justifying the validity of the MM (CFA) Model (Table 5).

B. Structural Model

It is used to establish relationship among the endogenous & exogenous variables thereby supporting hypotheses testing [11]. For this study, a path analysis was done to test the hypothesized model and the results are depicted in Table 6. As recommended by Hair, Black, Babin, Anderson and Tatham [20], the study makes use of Critical Ratio i.e t values since it helps to evaluate the effect of independent variable on the dependent variable.

Table 5: Goodness of Fit Statistics of MM (CFA) Model

Fit Indices	Recommended Value	Measurement Model
$\chi^2/d.f$	≤ 5	4.72
NFI	≥ 0.90	0.93
CFI	≥ 0.90	0.94
TLI	≥ 0.90	0.90
GFI	≥ 0.80	0.87
AGFI	≥ 0.80	0.82
RMSEA	≤ 0.08	0.06

Table 6: Report of Hypotheses Testing

Hypotheses	Relationship (Positive)	Critical Ratio (t-values)	Supported
H1	PEOU → PU	21.600	YES
H2	PEOU → ATT	3.423	YES
H3	PEOU → INTADOPT	-0.563	NO
H4	PU → ATT	-0.534	NO
H5	ATT → INTADOPT	9.074	YES
H6	GENDER → INTADOPT	-0.933	NO
H7	AGE → ATT	-4.862	NO
H8	AGE → INTADOPT	2.968	YES
H9	INCOME → ATT	5.032	YES
H10	INCOME → INTADOPT	-2.462	NO

Note: t-value > 2.33 significant at 0.01; t-value > 1.65 significant at 0.05 and t-value > 1.28 significant at 0.10.

V. DISCUSSION & IMPLICATIONS

The proposed model has tested a number of hypotheses regarding intention to adopt BYOD in organizations. The result of each of these hypotheses is discussed in the following section.

H1: Perceived Ease of Use has a positive effect on Perceived Usefulness-The result of hypotheses testing show a very high t-value of 21.6 for this hypothesis. This makes it significant at 0.01 level. BYOD concept is easy to adopt for organizations and it is natural that it would have a positive effect on perceived usefulness. Perceived Ease of Use clearly has a positive effect on Perceived Usefulness of BYOD. Ease of use enhances usefulness and this result is in line with past research done by many others [1], [11], [36].

H2: Perceived Ease of Use has a positive effect on Attitude- The t value for the hypothesis is greater than 2.33 making it statistically significant at 0.01 level meaning thereby that the perceived ease of following a BYOD practice in an organization has a positive attitude among the employees to adopt BYOD. The positive relationship between Perceived Ease of Use and Attitude has also been confirmed by many researchers [1], [29], [34].

H3: Perceived Ease of Use has a positive effect on Intention to Adopt-The t value is very low and hence this hypothesis is statistically insignificant. Employees do not adopt BYOD merely because they may perceive it to be useful. Other factors may be more important in their intention to adopt BYOD. For example, adopting BYOD requires that an employee should purchase his own device. Many employees may not like to do this or may not be able to afford this. Cost, therefore, may become a deterrent for adopting BYOD even though employees may perceive that BYOD is easy to adopt.

H4: Perceived Usefulness has a positive effect on Attitude-Since the t value is very small it is statistically insignificant. Attitude of employees towards BYOD is not likely to be affected merely because BYOD is perceived to be useful. Similar to H3, cost might have a negative influence on Attitude despite Perceived Usefulness of adopting BYOD.

H5: Attitude has a positive effect on Intention to Adopt-The t value is much larger than 2.33 confirming that a positive attitude towards BYOD supports the Intention to Adopt BYOD practice by employees of an organization. This hypothesis has been confirmed by many researchers earlier also [16], [21], [22], [36].

H6: Gender has a positive effect on Intention to Adopt-The t value is very low and hence statistically insignificant. Both men and women are equally likely to adopt BYOD, all other things remaining same. This seems to be reasonable as there does not seem to be any likely connection of gender with intention to adopt BYOD.

H7: Age has a positive effect on Attitude-Since the t value is -4.862 it is negative but significant. It seems that age has a negative effect on Attitude. In other words, as age increases employee attitude towards BYOD becomes negative. Older employees may feel it is more convenient to use a device provided by the organization rather than carrying their own device.

H8: Age has a positive effect on Intention to Adopt- A t value of 2.968 shows that the hypothesis is statistically significant at 0.01 level. The age of employees in an organization affects the intention to adopt BYOD practice. Employees of higher age group have more intention to adopt the BYOD practice. Perhaps employees of higher age group are also more financially capable to purchase their own device and hence this behavior.

H9: Income has a positive effect on Attitude- The t value for this hypothesis is 5.032 which make it statistically significant at 0.01 level. This implies that employees with higher income would prefer to adopt the BYOD practice. This seems logical since adopting BYOD required purchasing your own device.

H10: Income has a positive effect on Intention to Adopt-With a t value which is negative the hypothesis is rejected. It seems that income does not trigger an intention to adopt even though it may have a positive effect on Attitude.

VI. CONCLUSION

The concept of BYOD has not reached maturity yet and many organizations are trying to experiment with this idea. The concept can be an effective cost cutting measure for companies though the flip side of the coin is the compromise on secrecy and data confidentiality. Though IT/ITES companies are likely to turn out to be really interested in this concept computers are being used in every organization for day to day work and many other organizations outside the IT/ITES sector are also potential BYOD candidates.

This research study has attempted to study adoption of BYOD concept in IT/ITES companies in and around Delhi. The study had some interesting results. Perceived Usefulness in itself did not have a positive effect on Attitude whereas Perceived Ease of Use affected attitude positively. Demographic variables like age and gender also did not positively affect attitude. Income, however, definitely had a positive effect on attitude but did not positively affect the intention to adopt

BYOD. However, age positively affected attitude toward BYOD. It seems that decision by employees to adopt BYOD is indeed a complex interplay of a number of variables and while some of them may affect attitude towards BYOD they may not have a positive effect on intention to adopt BYOD.

VII. LIMITATIONS & FUTURE RESEARCH

This study is limited to the National Capital Region of Delhi. It can be further extended to include IT/ITES companies in other part of the country. Alternatively, companies outside the IT/ITES sector could also be included in the study. A reasonable sample size of 332 respondents was used to apply SEM using AMOS to this problem. A larger sample size could provide more robust results. The sample for this study does not include a large number of people in the age group 40+ years. Including a larger percentage of employees of this age group could give different insights into adoption of BYOD.

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