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Culture-Based TAM for Analyzing the Implementation of Building Management System

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Abstract. Management system (BMS) is used to control mechanical and electrical systems in a building. PT.XYZ is a company that has implemented BMS in a manufacturing industrial building. However, there are several problems in the use of BMS that affect the level of user acceptance in the organization. Therefore, this study aims to analyze the implementation of BMS using the technology acceptance model (TAM) aspect culture method at the PT.XYZ company. This research uses a qualitative approach with data collection techniques using interviews and questionnaires. Respondents in this study are BMS users in the PT.XYZ office building which consists of three floors with seven types of room, such as office, meeting, guest, FL production, BL production, packing, maintenance, and AHU rooms. The results show that cultural aspects of uncertainty avoidance affect the implementation of BMS, where cultural aspects of uncertainty avoidance have an influence on perceived usefulness which is a predictor of attitude towards usage along with behavioral intention. Cultural aspects of power distance, individualism, masculinity, and long-term orientation have no effect on the behavior of using BMS. The research shows that organizational culture factors affect the acceptance and use of BMS by users. In addition, it was found that difficulties in using the BMS were caused by the need for training and support from the company. Therefore, efforts are needed to improve the acceptance and use of the BMS through appropriate training and support approaches

Keywords: Building management systems, technology acceptance model, building automation systems, smart buildings.

1. Introduction

Important parameters that influence long-term vitality request are financial movement and vitality concentrated. Financial movement is closely related to human behavior, whereas vitality escalated is closely related to innovative improvements. The application of computerized innovation (or so-called computerized change) in people's day by day exercises can make disturbance and impact behavior. Computerized change can have an effect on changes in financial action and expanded effectiveness due to innovative changes (PwC 2016). The study comes about of building computerized ventures in different companies concluded that computerized change can diminish operational costs by 3.6% and increment productivity by 4.1% yearly (Jradi et al. 2021). Within the trade world, the Worldwide Computerized Change Benefits Report, Schneider Electric moreover reports that computerized change such as actualizing real-time observing in vitality administration can progress proficiency, unwavering quality, security, and supportability (Schneider 2019). The advanced change in trade that has been actualized by Schneider can decrease venture costs by an normal of 23%, diminish vitality utilization by 24%, and diminish vitality costs by almost 28% (Maqsoom et al. 2020). Worldwide electric vehicle (EV) Outlook 2019 "has conducted a particular consider on the effect of computerized transformation on vitality needs within the transportation, building (family and commercial), and mechanical sectors" (Outlook 2019). As of now, the transportation division has created network between modes, sharing of ventures, and computerization of transportation hardware. Smart buildings will increment consolation and alter designs of vitality utilize to be more effective (Priyadharsini et al. 2017). Vitality reserve funds within the mechanical segment can be accomplished through the utilize of progressed and coordinates prepare control frameworks with cleverly sensors and information processors to foresee gear failures.

Every nation around the world, as well as distinctive districts, needs vitality sources to meet their needs for distinctive purposes. Among them, three sections are said to be at the top in their vitality request and utilization. The business division is included within the best three and as a rule devours a lot of national vitality. In made nations, structures within the business sector utilize about 15-20% of the total vitality delivered. Energy efficiency is a hotly debated topic today in all areas of life around the world. Energy efficiency is essential for companies to operate and maintain their processes continuously. By properly controlling and managing usage, businesses can reduce energy consumption costs and move to greener buildings. To reach this level, numerous Asian nations have received or declared more up to date approaches to execute programs on vitality proficiency or preservation. In these programs, different focuses of center are on vitality administration in expansive buildings (Chatterjee, Sarker, and Valacich 2015). To form buildings shrewd and shrewdly, there are frameworks installed in buildings that are for the most part called building management systems (BMS) or building automation systems (BAS). BMS are for the most part introduced in different offices for vitality preservation and it has been appeared through a few writing that the application of this framework makes a difference diminish their vitality utilization altogether when compared to typical or routine ways of doing vitality lessening without utilizing BMS (Baranyai and Kistelegdi 2014; Chin and Lin 2015; Christiani and Hatane 2014). It has been watched that not numerous affiliations have presented this framework, expert knowledge has critical potential to move forward BMS (Doukas et al. 2007). BMS automating building functions can reduce building working costs by 15%–20%, according to vitality taken a toll examination the whole taken a toll per 2 a long time is 20.37 $/m which is lower than the yearly taken a toll (Yin 2010).

The implementation of the BMS has become increasingly important in promoting energy efficiency and sustainable practices in the business and building sectors. As energy consumption continues to rise, there is a growing need to adopt technological solutions that optimize energy usage and reduce operational costs. However, the successful implementation of BMS is not solely dependent on technological advancements. Cultural factors play a significant role in shaping users' attitudes, perceptions, and acceptance of technology within organizations.

The technology acceptance model (TAM) has been widely used to study user behavior in various fields, including the use of the BMS for energy monitoring. This study focuses on examining the impact of cultural factors on BMS acceptance and utilization at PT.XYZ. Culture plays a crucial role in shaping users' perceptions and organizational norms regarding technology adoption. However, limited research exists on cultural dimensions specific to BMS acceptance. This research aims to fill this gap by investigating the influence of cultural dimensions on users' attitudes, identifying challenges and opportunities related to culture in BMS implementation, and providing practical recommendations to address cultural barriers. The findings will enhance our understanding of cultural complexities and contribute to successful BMS implementation in diverse contexts.

The motivation behind this research stems from the need to enhance our understanding of the cultural complexities associated with BMS implementation. By examining how cultural dimensions motivate users' attitudes towards BMS and identifying challenges and opportunities related to culture, practical recommendations for successful BMS implementation in diverse organizational contexts are provided. The specific objectives of this study are three. Firstly, to explore the influence of cultural dimensions on users' attitudes and perceptions regarding BMS acceptance and utilization. Secondly, to identify the challenges and opportunities arising from cultural factors in BMS implementation. Finally, to provide practical recommendations to address cultural barriers and facilitate successful BMS adoption.

By addressing these objectives, the existing body of knowledge on the influence of culture in technology acceptance and adoption is a study contribution. Furthermore, the findings of this study provides valuable insights for organizations seeking to implement BMS, helping them navigate the cultural complexities and achieve effective technology adoption within their unique contexts.

2. Theoretical View

2.1. Building Management System

The building management system (BMS) “is a computer-based control system installed in buildings that controls and monitors building mechanical and electrical equipment such as ventilation, lighting, power systems, fire systems, and security systems” (Sayed and Gabbar 2018). The purpose of implementing BMS is to be able to organize all forms of centralized monitoring information, quickly detect problems, and facilitate maintenance and energy efficiency.

BMS consists of software and hardware, software programs, usually configured hierarchically, and independently, using three standard network protocols that can be used, namely: BACnet, LonWorks, and Modbus. Building Automation Controls Network (BACnet) is a network protocol used by system users and building system manufacturers specifically for multiple devices to communicate between building automation systems. Modbus is a network protocol best used in industrial automation systems, especially for connecting electronic devices. Although Modbus is best suited for industrial applications, its simplicity allows it to be a useful tool for building automation as well.

2.2. Technology Acceptance Model

First introduced by Davis, the technology acceptance model (TAM) (Davis 1989), is an application and development of the theory of rational behavior (TRA) dedicated to model user acceptance of information systems. The purpose of the TAM is to describe the determinants of acceptance of information-based technologies in general and to describe the behavior of information technology end-users with sizeable variations and user populations. Ideally, the model should be the user and the model should be the prediction with an explanation. This requires researchers and practitioners to understand why a particular system is unacceptable and to implement revision procedures to take corrective action. to overcome them.

TAM aims to explain and predict user acceptance of technology. TAM is the development of TRA and is believed to be able to predict user acceptance of technology based on the impact of two factors, namely: Perceived usefulness and Perceived ease of use which affect attitudes towards user behavioral intentions (behavioral intention to use) and actual system usage as shown in Fig. 1 (Davis 1989). After the technology acceptance model is proposed, some scholars have confirmed in the research the attitude-intention-behavior model of residents' waste classification, and the moderating effect of supporting factors on the use of smart waste bins by citizens, indicating that high support can effectively promote the development of residents' waste classification from intention to behavior (Mu, Zhang, and Sun 2022).

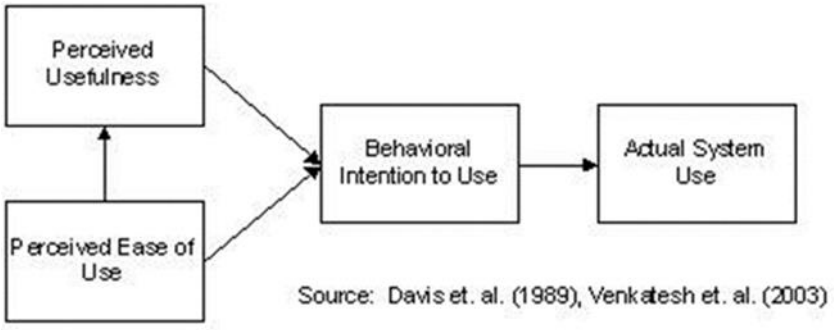

Fig 1: Technology Acceptance Model (TAM) (Davis, et al, 1989)

According to (Davis 1989) TAM is an information systems theory designed to explain how users understand and apply information technology. TAM adopts TRA from (Fishbein 1967) which is used to see the level of use of respondents in receiving information technology. TAM's own original construction formulated by Davis (1989), "is the perceived usefulness, perceived ease of use, attitude, behavioral intention, and actual use and added several external perspectives, namely experience and complexity" (Christiani and Hatane 2014).

Perceived usefulness is a section wherein someone believes that the consumer of a specific machine may be capable of growth that individual's paintings overall performance. Based on that definition, it is able to be interpreted that the usefulness the usage of facts and conversation generation (ICT) can grow the overall performance, paintings overall performance of each person who makes use of it (Thompson, Higgins, and Howell 1991) then put forward the conclusion that the benefits of information technology are the expected impact by users of information technology in carrying out their duties also states that "individuals will use information technology if the person has a good understanding of the benefits or usefulness of its use" (Nugroho, Sugiono, and Sugiono 2010). Ease of use is also one of the points in the TAM model, which has been tested in research (Davis 1989). The results of the study show that this factor is empirically proven, can explain the reasons for end users in using information systems, and explain that the new system which was currently being developed was accepted by end users.

Perceived Ease of Use can convince users that the information technology to be applied is an easy thing and not a burden for them. Information technology that is not difficult to use will continue to be applied by the company. "The perspective of perceived ease of use is a level where a person believes that the use of a particular system can reduce a person's effort in doing something" (Christiani and Hatane 2014; Davis 1989; Maqsoom et al. 2020). The frequency of use and interaction between the user and the system is also able to show the ease of use. The system that is used more often shows that the system is better known, easier to operate, and easier to use by its users (Davis 1989).

2.3. Modeling TAM aspects of Culture Technology Acceptance Model

In the system implementation stage, the system will design and manufacture illustrated in the flow diagram. The specifications carried out will be adjusted to aspects of the cultural dimension assessment based on TAM modeling, which can be seen in Fig. 2 which is a TAM model that was developed according to the needs in this study which was previously described.

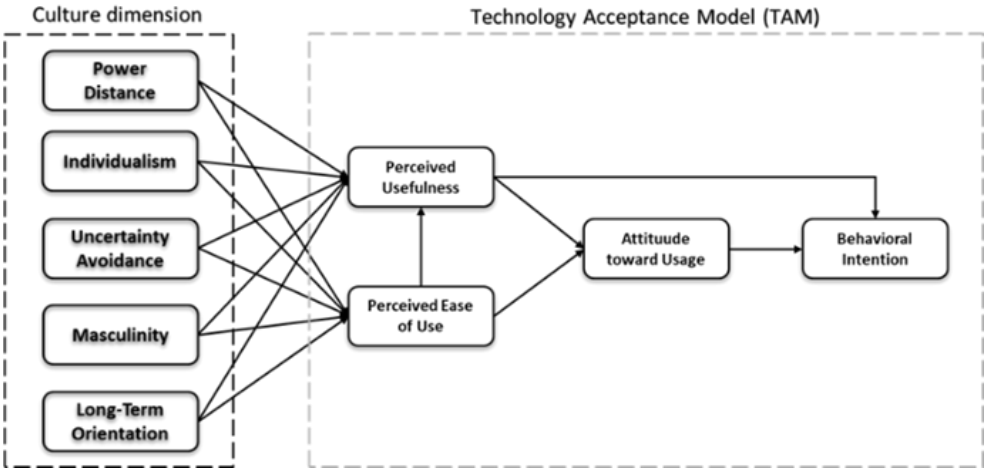

Fig 2. TAM aspect Culture

The cultural dimension is known as a collective programming that distinguishes individuals from one group from another (Demeester 1999; Hofstede 1984). This dimension is inherent in every individual in an environment. The presence of a cultural dimension in an individual can be through past events that shape the character and behavior of the individual. According to (Hofstede 1984), culture consists of five dimensions, which are power distance, individualism, masculinity, uncertainty avoidance and long-term orientation. The following is an explanation of each cultural dimension

Power distance is is a control separate may be a social measurement that measures the degree to which people in a social environment acknowledge incongruities in social status. High power distance will tend to see that power is held by the highest position in a hierarchy. “Meanwhile, low power distance has more democratic thinking and respects each individual's opinion” (Hofstede 2015).

Individualism is independence may be a social measurement that measures how people see themselves as autonomous people or as people who are part of a group (Liu and Tang 2007). Individuals who are in an environment with a high cultural dimension of individualism have the assumption that the relationship between the social environment and the individual is not bound so that individuals can easily make decisions without having to look at the social point of view around them. “Collectivism represents low individualism, namely individuals are more concerned with the interests of groups or communities” (Hofstede 1984). In this condition, “the individual has a close relationship with his environment, so when the individual wants to make a decision, the surrounding environment becomes one of the factors that influence the decision” (Chatterjee et al. 2015).

Masculinity is a manliness could be a social measurement that measures the degree to which people are more arranged towards accomplishing victory, competition, and desire as a comparison between people (Hofstede 1984; Vatanasakdakul, Tibben, and Cooper 2004). “Meanwhile, the low cultural dimension of masculinity is called femininity which represents individuals who are more oriented towards caring between individuals and more emphasis on achieving a good and harmonious quality of life” (Demeester 1999).

Uncertainty Avoidance is a vulnerability Shirking could be a social measurement that measures the degree to which people feel comfortable or not with uncertainty and how much confidence people have to dodge vulnerability (Hofstede 1984; Liu and Tang 2007). Advanced uncertainty avoidance is demonstrated by the way individuals apply laws and regulations to deal with changing situations and conditions and give individuals control over changes that occur. On the other hand, low uncertainty

avoidance creates an environment that is more tolerant of change. Environments shaped by low-uncertainty avoidance are more flexible and comfortable, so new ideas and changes in situations and conditions are natural (Hofstede 1984).

Long-term Orientation is a long-term Introduction may be a social measurement in which people think approximately the long-term results that will happen when they presently take an activity (Chatterjee et al. 2015; Hofstede 2015; Liu and Tang 2007). Individuals with low cultural dimensions of long-term orientation are called short-term orientations, which represent a short-term-oriented culture of society, which is more focused on the past and the present (Fishbein 1967; Hofstede 2015).

The five cultural aspects of power distance, individualism, masculinity, uncertainty avoidance, and long-term orientation are variables of the Culture-Based TAM. Variables of cultural aspects are also indicators in making the questionnaire in this case study.

3. Materials and Methods

The framework for research using the Technology Acceptance Model of the proposed Culture aspect is shown in Fig. 2. in this activity a workflow is made starting from the initial identification of problems, saving energy with the building management system, factors affecting the implementation of the building management system, evaluating BMS up to final conclusions and suggestions.

The research method used is quantitative. The researcher made a questionnaire as a measurement tool and collected data from BMS users from every section or department in the company. The following is a mapping of indicators and questionnaires used show Table 1.

Table 1: Variable Indicator

Variable		Questionnaire Question
Power Distance (PD) (Yoon 2009)	1	I listen and follow company rules
	2	I often give advice to superiors about decisions to be taken
	3	I follow my boss's decision
Individualism (ID) (Yoon 2009)	1	When I do something, I want to be recognized by others
	2	I find it easier to manage my own work (without interference from others)
	3	I am confident in the decisions I make, even without the opinions of others
Masculinity (MA) (Yoon 2009)	1	I consider gender/gender when going to create a work group
	2	When doing a job, I have to finish my work first then help other people's work
	3	I care more about the process than the result
Uncertainty avoidance (UA) (Yoon 2009)	1	I plan the activities that I will do
	2	I like a regular routine
	3	I easily adapt to a new environment
Long Term Orientation (LO) (Yoon 2009)	1	I plan my future well
	2	I save BMS information for unforeseen needs
	3	I save BMS information to prepare for future needs
Perceived Usefulness (PU) (Sembada and Ui 2012)	1	I get the data I require through BMS
	2	I get sufficient extra data through BMS
	3	The utilize of BMS increments adequacy at work
	4	The utilize of BMS can encourage regulatory completion
	5	I am mindful of the focal points of utilizing BMS

	6	I am mindful of the impediments of not utilizing BMS
Perceived ease of use (PEU) (Sembada and Ui 2012)	1	BMS Simple to access
	2	BMS Simple to learn
	3	BMS Simple to understand
	4	BMS Simple to utilize
	5	Flexible BMS system
Attitude Toward Usage (ATU) (Shroff, Deneen, and Ng 2011)	1	I think positively about using BMS
	2	I think using BMS is a good idea
	3	Introducing the use of BMS is a smart idea
	4	Using BMS is an interesting experience.
	5	Overall, I am comfortable using BMS
Behavioral Intention (BI) (Davis 1989)	1	I recommend BMS users
	2	BMS Appropriate system to use
	3	I save the BMS address in my bookmarks or I memorize it
	4	I agree that the BMS will continue to be used as a control and monitoring system

A research variable is an attribute or trait of a person or object that has a certain variation determined by research to be studied and drawn conclusions (Nugroho et al. 2010). The research tool used in data collection is a questionnaire. The variables of each type of strategy in the study were measured using a Likert scale (LSR) 1-5, each of which has the following meaning.

The research tool used in data collection is a questionnaire. The variables of each type of strategy in the study were measured using a Likert scale (LSR) 1-5, each of which has the following meaning; value 1 = Indicator has a performance strongly disagree, value 2 = Indicator has disagreed with performance, value 3 = Indicator has neutral performance, value 4 = Indicator has agreed on performance, value 5 = Indicator has a very agree performance.

In this study, the validity and reliability of the instrument were used to measure the level of truth of the questionnaire results. If the results of the validity and reliability test are valid, it will then be processed in the data analysis process. If it is not valid, it will be tested for validity and reliability again. Data analysis will be carried out by processing the data from the questionnaire results. The data analysis method used in data processing in this study is the SEM (Structural Equation Model) statistical method. Then it will be continued with the calculation of the Chi-Square hypothesis.

SEM is a statistical method used to construct and test statistical models, usually in the form of causal models. Structural equation modeling is a highly transversal, linear, and general statistical modeling technique. This SEM includes factor analysis, pathway analysis, and regression (Santoso 2021). Another definition states that Structural Equation Modeling (SEM) is a general and very useful multivariate analysis technique, and as a special case includes special versions of many other analysis techniques (Sarwono 2010).

Structural model testing to determine the relationship between latent variables. In testing the structural model, the average variance extracted (AVE) and the reliability of all indicators on each variable are sought. Hypothesis testing is testing for all hypotheses that have been proposed. Hypothesis testing is carried out using respondent data from questionnaires that have been filled out. Respondent data collected was then analyzed using quantitative data analysis. The data analysis technique used SEM using the AMOS method to test the model and hypothesis.

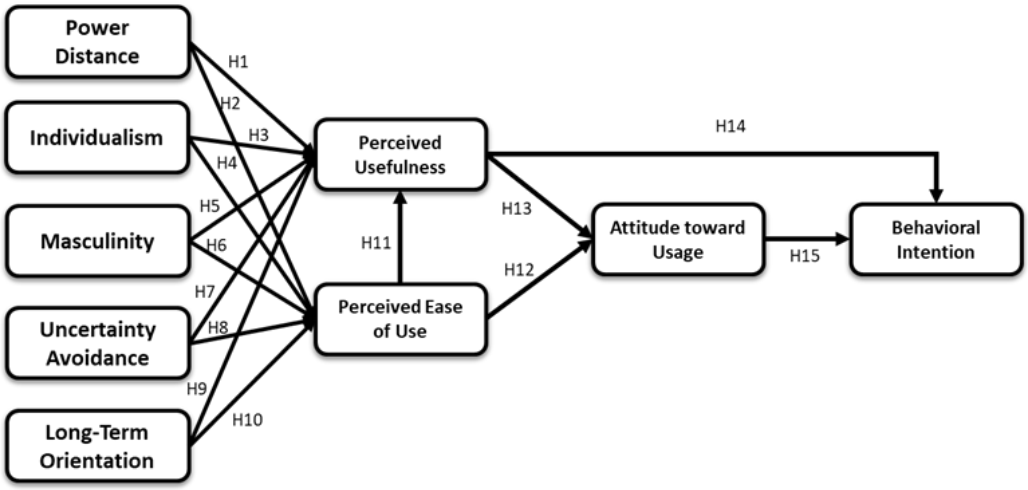

Fig 3: Research Hypothesis

The research hypotheses mentioned in Fig. 3. total 15 hypotheses consisting of 4 variables from TAM and 5 variables from the cultural dimension. The following are the hypotheses made in this study:

H1: Power Distance affects Perceived Usefulness.

H2: Power Distance affects Perceived ease of use.

H3: Individualism affects Perceived Usefulness.

H4: Individualism affects Perceived ease of use.

H5: Masculinity affects Perceived Usefulness.

H6: Masculinity affects Perceived ease of use.

H7: Uncertainty avoidance has an impact on Perceived Usefulness.

H8: Uncertainty avoidance has an effect on Perceived ease of use.

H9: Long-term orientation has an effect on Perceived Usefulness

H10: Long-term orientation has an effect on Perceived ease of use.

H11: Perceived ease of use has an effect on Perceived Usefulness.

H12: Perceived ease of use has an effect on Attitude towards Usage.

H13: Perceived Usefulness has an effect on Attitude towards Usage.

H14: Perceived Usefulness has an effect on Behavioral Intention.

H15: Attitude towards Usage affects Behavioral Intention.

4. Results and Discussion

4.1. Building Management System

Based on the questionnaire, the number of respondents was 100 respondents consisting of several departments and employees in Building A, Building B, and Building C as shown in Table 2 and Fig. 4. The data met the requirements for statistical tests using the SEM method.

Table 2: Respondent data

Employee data		**Respondent**
Department	CI	2
	EHS	6
	Engineering	44
	Facility	7

	Finance	5
	HR	7
	IT	5
	Production	11
	QA	5
	SCM	8
Gender	Man	66
	Woman	34

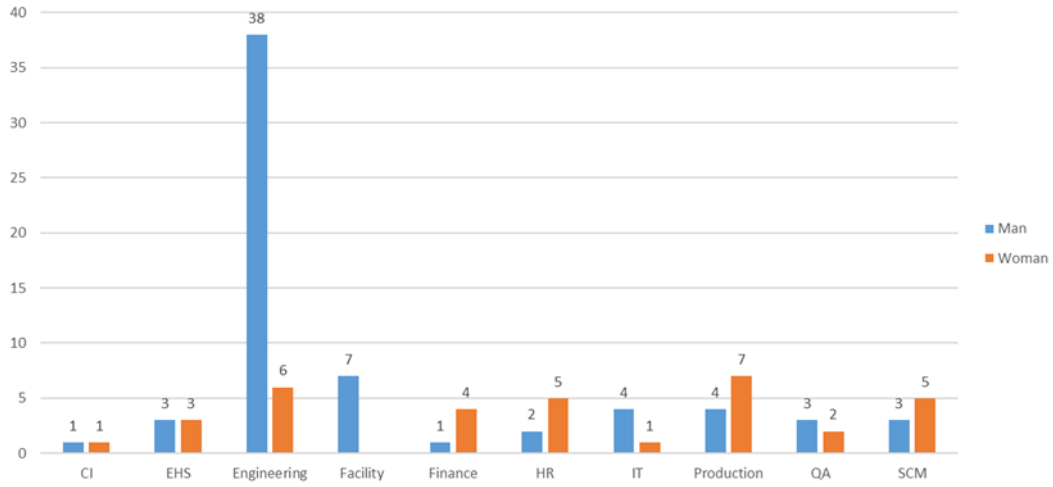

Fig 4: Respondent Data

4.2. Data Analysis

Based on the questionnaire, the number of respondents was 100 respondents consisting of several departments and employees in Building A, Building B, and Building C. The data met the requirements for statistical tests using the SEM method with SPSS AMOS. Validity test with r_{table} Value Distribution of 5% and 1% Significance, r_{table} = N = 100, the formula for r_{table} is df = N-2 so 100-2 = 98, so r_{table} = 0.196. Validity Test Decision: All questionnaires are declared valid. The results are shown in Table 3.

Table 3: Test the validity of product moment

Indicator	r_{Count}	r_{table}	Explanation
X1	0.49	0.19	Valid
X2	0.46	0.19	Valid
X3	0.38	0.19	Valid
X4	0.40	0.19	Valid
X5	0.30	0.19	Valid
X6	0.34	0.19	Valid
X7	0.33	0.19	Valid
X8	0.28	0.19	Valid
.	.	.	.
.	.	.	.
.	.	.	.
X29	0.74	0.19	Valid
X30	0.80	0.19	Valid

X31	0.85	0.19	Valid
X32	0.82	0.19	Valid
X33	0.84	0.19	Valid
X34	0.73	0.19	Valid
X35	0.70	0.19	Valid

Reliability test to measure the consistency or not of the questionnaires in the research used to measure the effect of indicators on variables or constructs. The aim is to determine the consistency of the questionnaire and the basis for decision-making; alpha > rtable = consistent, alpha < rtable = inconsistent. Reliability Test Decision: reliable or consistent questionnaire.

Table 4: Reliability Test

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.946	0.957	35

The results of the reliability test on the variables for the 35 questionnaire items can be seen that Cronbach's alpha is that this variable is higher than the baseline value of 0.946 > 0.60. These results are shown in Table 4, prove that all statements in the variable questionnaire are declared reliable.

Hypothesis testing of the model in Fig. 3 is performed using AMOS with the SPSS AMOS 23 application. So the relationship development model between the above constructs can be explained in the research hypothesis. There are 15 hypotheses to be tested, namely hypothesis H1 to hypothesis H15 which has 35 indicators of 9 variables from cultural aspects and the TAM will look like Fig. 5.

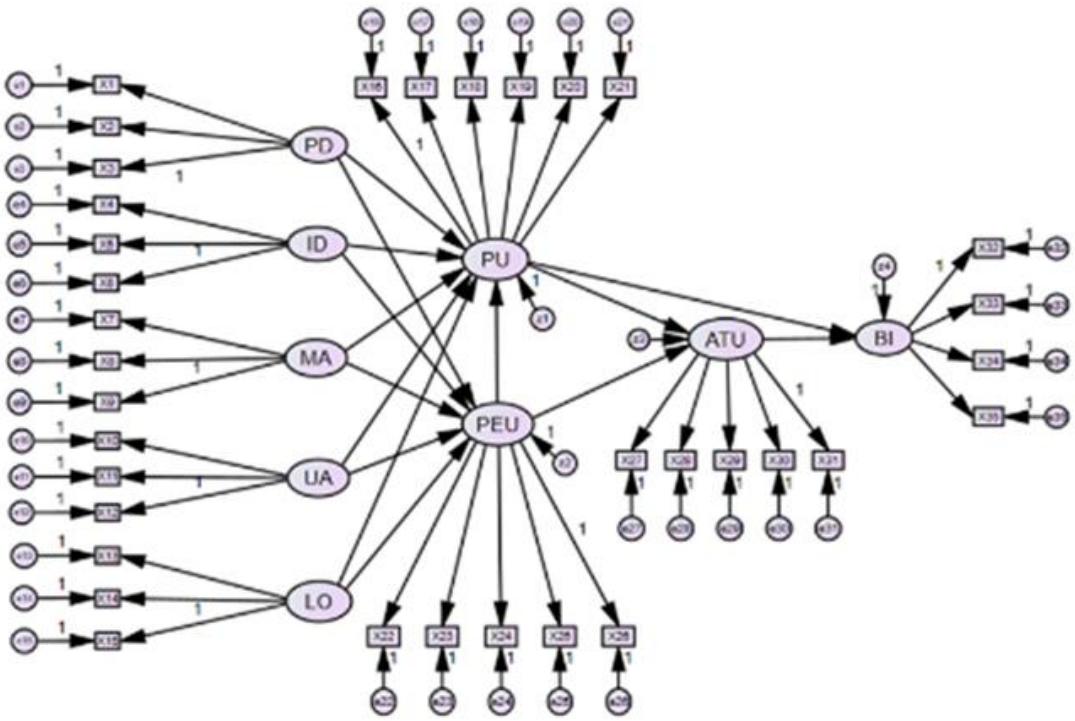

Fig 5: cultural dimensions of TAM with Amos

The hypothesis in this study looks at whether there is a significant and positive relationship between the independent variables in a structural model. Related to the model in this study, there are 9 relationships that form the constructs of the TAM model so that 15 hypotheses have been generated from Table 5 Hypothesis Test Results of Estimates, Scalar Estimates, Estimates of regression weights, and the probability of getting a critical ratio data analysis which is data processing Regression Weights Full Model.

Table 5: Hypothesis Test Results

Variable			Estimate	S.E.	C.R.	P	Label
PEU	<--	MA	0.404	0.242	1.670	0.095	par_9
PEU	<--	UA	-0.090	0.191	-0.473	0.636	par_12
PEU	<--	LO	0.274	0.146	1.876	0.061	par_13
PEU	<--	PD	0.463	0.323	1.434	0.151	par_14
PEU	<--	ID	0.176	0.313	0.562	0.574	par_15
PU	<--	PEU	0.372	0.074	5.003	0.001	par_1
PU	<--	PD	0.263	0.245	1.070	0.285	par_6
PU	<--	ID	-0.458	0.278	-1.648	0.099	par_7
PU	<--	MA	0.336	0.180	1.866	0.062	par_8
PU	<--	UA	0.273	0.125	2.194	0.028	par_10
PU	<--	LO	0.184	0.111	1.656	0.098	par_11
ATU	<--	PU	0.411	0.083	4.937	0.001	par_2
ATU	<--	PEU	0.646	0.074	8.753	0.001	par_3
BI	<--	ATU	0.736	0.090	8.167	0.001	par_4
BI	<--	PU	0.195	0.086	2.279	0.023	par_5

The results of the Full Model SEM test indicate that the Full Model SEM has good goodness of fit indices and meets statistical requirements (Poetri 2010), because the probability value of Chi-Square 0.0.96 is greater than 0.05 and the values of DF, CMIN/DF, GFI, AGFI, CFI, TLI or NNFI and RMSEA have met the recommended values. However, AGFI is still in the Marginal Fit criteria. However, this can already be said to be a model on the Fit criteria. The next step is to do a Full model fit test with a GOFI Table. As shown in Table 6.

Analysis of the influence of determination in SEM analysis is used to determine the contribution of exogenous variables to endogenous variables can be seen from the adjusted R square. The coefficient of determination can be seen in Table 7. Squared Multiple Correlations. The following is an analysis of the determination of the PEU, PU, ATU and BI variables in the SEM model.

Table 6: Full Model_Fit Test Results.

Goodness of fit index	Cut-off Value	Result	Explanation
X2 – Chi-square (df = 535, p = 0.05)	< 589.92	515.65	Meets
Sign.Probability	> 0.05	0.096	Meets
df	≥ 0	475	Meets
CMIN/DF	≤ 2.00	1	Meets
GFI	≥ 0.90	0.806	Meets

AGFI	≥ 0.90	0.743	Marginal
CFI	≥ 0.90	0.986	Meets
TLI/NNFI	≥ 0.90	0.983	Meets
NFI	≥ 0.90	0.855	Meets
IFI	≥ 0.90	0.987	Meets
RMSEA	≤ 0.08	0.029	Meets
RMR	≤ 0.05	0.028	Meets

Analysis of the influence of determination in SEM analysis is used to determine the contribution of exogenous variables to endogenous variables can be seen from the adjusted R square. The coefficient of determination can be seen in Table 7 Squared Multiple Correlations. The following is an analysis of the determination of the PEU, PU, ATU and BI variables in the SEM model.

Table 7: Squared Multiple Correlations

Variable	Estimate
PEU	0.453
PU	0.723
ATU	0.792
BI	0.917

Based on Table 7, the r-squared value of the PUE variable is 45.3%, the r-squared value of the PU variable is 72.3%, the r-squared value of the ATU variable is 79.2%, and the r -squared value of The value of the BI variable is 91.7%. A cultural aspect that affects the implementation of BMS is the Uncertainty Avoidance variable of perceived usefulness in the TAM model. The results of the hypothesis test showed that the cultural aspects that do not affect the perceived usefulness variable are power distance, masculinity and long-term orientation. The individualism variable has a negative effect on the perceived usefulness variable on BMS usage behavior.

The cultural aspect that influences the implementation of BMS is the Uncertainty Avoidance variable on the Perceived Usefulness variable in the TAM model. The results of the hypothesis test showed that the cultural aspects that do not affect the Perceived Usefulness variable are Power Distance, Masculinity, and Long-term Orientation. The individualism variable has a negative effect on the Perceived Usefulness variable in carrying out the behavior of using BMS.

The influence of cultural aspects of Power Distance, Individualism, Masculinity, and Long-term Orientation variables does not affect Perceived ease of use. The influence of the cultural aspect of the Uncertainty Avoidance variable has a negative effect on Perceived ease of use in the behavior of using BMS. The cultural aspects that influence the behavior of using BMS can be seen in Fig. 6.

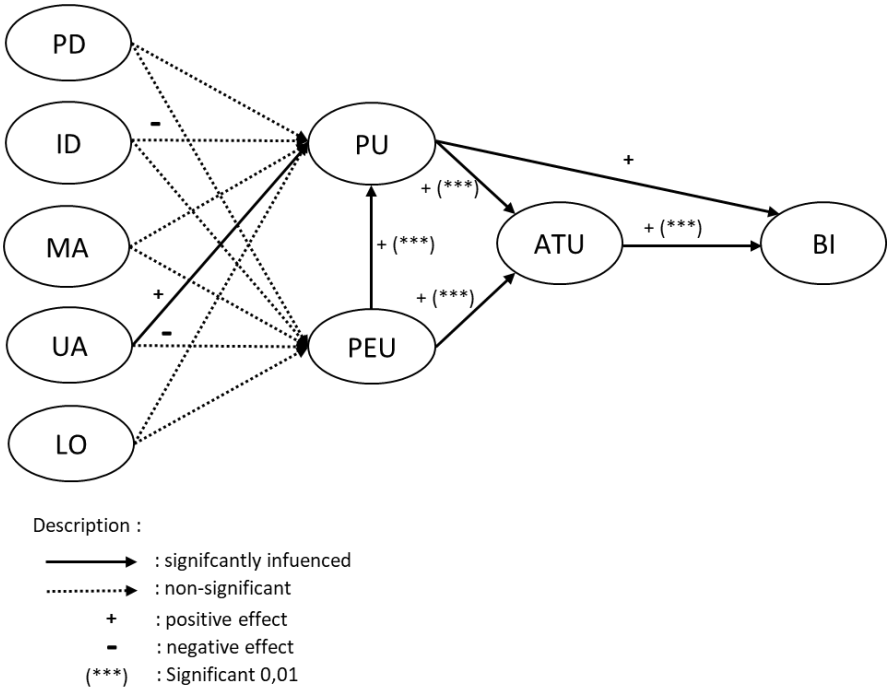

Fig 6: The influence of cultural aspects on TAM

4.3. Implication

Based on the BMS implementation survey conducted, company employees' acceptance of TAM technology and their trust in using the BMS led to the decision to implement. The trust of company employees is based on the simplicity and ease of use of the BMS implementation, making it easier for users to adapt to the technology. An implication feature that compares previous pre-implementation and post-implementation results. The advantage of this system is operating efficiency. Creating a positive environment increases employee productivity and reduces building operation and maintenance costs.

The building management system connects all networks in the building into one automated system. This allows administrators to not only monitor and analyze data but also access and control each area from a central location or remotely via cloud technology. The benefits of this centralized building management system make building management easier and more efficient. By planning and maintaining appropriate AC adjustments, we were able to reduce AC power consumption in Model A production by 14.6% from 10.9 kWh/pc to 9.3 kWh/pc by August 2022.

5. Conclusion

Building management systems allow you to monitor, control, and optimize building performance throughout the building lifecycle. Our room controllers ensure optimum comfort and our valves and actuators enable control of your facility. A property management system is also an invaluable resource for building owners. With building automation, you can identify the need for repair or maintenance and prevent equipment failures before an emergency.

This study was conducted to determine the cultural aspects that influence the behavior of using BMS. The cultural aspect that influences the implementation of BMS is the cultural aspect of Uncertainty avoidance. This cultural aspect affects perceived usefulness, which predicts both attitude towards use and behavioral intentions. Uncertainty avoidance is vulnerability shirking may be a social measurement that measures the degree to which individuals are comfortable or not with instability and the degree to which individuals believe to avoid uncertainty.

From the results of the SEM analysis, the major contribution of the cultural dimension to the TAM model was variable power distance, individualism, uncertainty avoidance, masculinity, and long-term orientation to 45.3% of perceived usefulness. can be concluded to indicate the influence of The main impacts of variables power distance, individualism, uncertainty avoidance, masculinity, and long-term orientation on user usability are 72.3%. The variables perceived usefulness and attitude toward usage on behavioral intention are 91.7%.

Suggestions for technology acceptance research on BMS implementation in this study look at the influence of five cultural aspects of the TAM Model, namely perceived usefulness, perceived ease of use, attitude toward usage, and behavioral intention. It is hoped that the research will conduct a further literature review that can be used to reconstruct the test model using the influence of cultural aspects on other constructs in the TAM model.

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