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Experimental

## ATTITUDE OF SURVEYING PRACTITIONERS BASED ON PERCEIVED EASE AND USEFULNESS OF TECHNOLOGICAL INNOVATION

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### ABSTRACT

This study examines Nigerian surveyors' attitudes and perceptions on the ease of use and usefulness of technological innovation using the Technology Acceptance Model and Unified Theory of Acceptance and Use of Technology. The manifests of the psychometric response scale questionnaires were converted into numbers through Microsoft Excel and then analyzed using structural equation modelling (SEM) in SmartPLS 3v. The population used for this research are mainly two categories of professionals within the states of Lagos, Ogun, and Oyo. A stratified random sampling was used to sample the eight-two (82) questionnaires returned. The measurement establishes the casual effect of the indicators and variables on the latent construct and the relationship between endogenous variables and exogenous variables. For this study, the model fit statistics were obtained where the standardized root mean square residual (SRMR) was 0.068, which was accepted as a good fit. The item loadings are well above 0.7, with the AVE above 0.5 as a measure of the effects. The construct reliability and validity have values higher than 0.7. As a result, attitude is influenced more by perceived usefulness than perceived ease of use. Two (2) hypotheses were tested, but only PUP-ATT was significant with a P-value of 0.000. PSP-ATT has a P-value of 0.4 on attitude. The results reveal the impact of perception on surveyors' attitudes toward using modern technology in their professional practice. This has limited the use of sophisticated surveying instruments and IT techniques to automate mapping processes by many practitioners.

**Keywords:** Attitude, modelling, smartPLS, perceived usefulness, technology,

### 1.0 INTRODUCTION

In Nigerian parlance, surveyors are qualified practitioners who engage in the scientific measurements and delineation of spatially referenced features for proper description, representation, and definition that aid planning and decision-making (Ben and Ashang, 2010). A surveyor is required to be skilled in these arts to deliver such services to the required standard or specification. However, a professional in this context requires a level of knowledge and expertise to accomplish such tasks as defined by the International Federation of Surveyors (FIG). Advancement in technology has aided faster and more reliable measurement due to the automation and electronic capacities of surveying instruments such as the Global Positioning System (GPS), laser scanners, smart stations, etc. (Roberts, Dodson, and Ashkenazi, 1999) and mosques (Moselhi, Bardareh, and Zhu, 2020). This study has a tendency to assess the extent of proficiency of surveyors to apprehend how using technology and its perceived usefulness and ease of use have influenced their attitudes and behaviours toward practice (Altawalbeh, Fong, Thiam, and Alshourah, 2019). In a bid to encourage surveyors' participation in the current technological processes, the bodies regulating the

profession engage in quarterly mandatory continuing development programs to give surveying practitioners state-of-the-art training on the automated surveying processes. It was, however, discovered that not so many surveyors are interested in the innovations. In ongoing research, it was encouraged to study the interest of these practitioners by evaluating their attitudes while considering causes or factors driving such a disposition towards technological innovations. A review of past literature revealed that there are a few studies on the attitude of practitioners towards accepting a technology; although some studies have identified factors causing attitudinal behaviours, none have expressly discussed the attitude of surveying practitioners toward the use of technological innovations. Consequently, the main objective of this paper is to examine factors affecting the attitude of surveying practitioners towards the use of technological innovations. Structural Equation Modelling (SEM) is a statistical tool proficient in examining the correlation and impact of indicators on the variables they measure. Variables measured in this study: attitude (dependent), perceived ease of use, and perceived usefulness (independent) were examined for correlation, causal

effect, and validity to ascertain hierarchically indicators that influence them.

### Research Hypotheses

Grounded in the theoretical components and parameters of the Technology Acceptance Model (TAM), this research has the following hypotheses with major concerns for the attitude of practitioners based on PUP and PSP:

H1. Perceived ease of use (PSP) has a positive effect on attitudes towards using technological innovation.

*This will reveal the causal effect of how one's opinion about the ease involved in using technology in professional practice. It will further establish the weight of PSP on attitude towards use.*

H2. Perceived usefulness (PUP) has a positive effect on the attitude towards using technological innovation.

*In this hypothesis we look forward to seeing the influence of perceived usefulness (PUP) on attitudinal behaviour towards use.*

Surveying, on the other hand, is a geosciences branch used to determine the location of features on the surface of the earth, the storing, retrieving, and managing of geographically referenced data, and the graphical and visual representation of such features on maps in digital or hard copy format. In addition, the determination of the earth's figure and gravity field uses applied mathematics and physics as a basic tool (Nwilo, 1999). A basic tool to collect and evaluate spatially referenced and geographic-related data, to use such data to represent, plan, and implement effective land, sea, and structure management, and also to promote the improvement and progress of such practices." (NIS, 1997).

### Practitioners

To define "professional" or professionalism," many authors have different views and definitions as an argument on consensus that professionals are persons in organizations who have attained professional status of higher powers and levels due to specific skills and proficiency in corporate bodies of knowledge (Oduwale, 2021) (Larson 1977; Sharma). Therefore, the major distinctive characteristic of professionals is the authorization they solely possess and utilize.

A land professional is an individual authorized and enlisted by recognized laws to practice the acts of land surveying. A professional surveyor may be required to carry out engineering surveys but delimited from other branches of engineering (Ezeomodo, 2019).

Formal study in surveying education for intending surveyors is now generally considered, but it is not always so. An alternate route to this is apprenticeship training, a practical way to become a surveyor. Many other trainees chose apprenticeship because of the monetary gains it offered even without formal education, so they remain unqualified. (Fajemirokun, 1976).

Different authors emphasized other aspects of professionalism. An example was Larry Bell, who claimed that generally, the context of professionalism revolves around standards, status, character, and

approaches. Hence, professionalism goes by ethics and the rules of law (Oates, 1993). Hanlon, a proficient writer on the theme, uses the notion to examine the tussles and agitations in careers (e.g., law, medicine) and within other societies, mostly the state province and private capital.

The use of information technology necessitates a high level of understanding, which has limited the scope of many individual practitioners. The rejection of information technology can be linked to a number of variables, including ease of use, usefulness, and attitude (Awosejo, Kekwaletswe, Pretorius, and Zuva, 2013).

Using a variety of models and theories, many studies have discovered the elements that influence one's intention and perception of engaging in professional activity. Intention and perception in surveying parlance have not been adequately captured to determine their influence on actual behavior towards practice. Structural Equation Modeling, as an ideal analytical method, has opened up new avenues in research, attracting a lot of interest.

### Technological Innovations in Surveying

Space science and technology have changed conventional spatial information gathering, and internet technology helps to disseminate huge amounts of information in real-time. The advent of communication technology, especially personal communication, has improved life and service delivery. Multimedia systems offer the opportunity to obtain structured information in new and innovative ways. Automated systems free the workforce for other, more productive actions. The geomatics engineering or surveying profession has been ominously impacted by these new technologies (Trinder and Han, 1999).

With such a sound foundation and professional history, someone could expect the highest professionalism and strict compliance with principles from the new-age surveyors. Conversely, this is hardly the situation. Recently, the behavior and conduct of the new day surveyor in Nigeria have been queried, mostly in areas of cadastre and service delivery (Akinola and Ojo, 2014).

Continuous Professional development and technical knowledge equip anyone with opportunities for skill acquisition and update at any later stage in their career, but the theoretical problem-solving skills and application achieved are mainly achieved through academic training at higher institutions of learning. Advancement, preservation, and improvement of professionalism ought to be a complete development expedited through an effective collaboration of research, educational skill, and professional practice (Adeoye, 2007).

Information system development is vital to every discipline. The power of an information system is determined by its capability to spread widely enough to reach individuals for whom the information is useful. Consequently, the development of information systems requires expertise from many disciplines. Due to the influence of IT, equipment will become smarter, conserving energy, and people will be freer to accomplish more intelligent and menial goals. However, this means there will be new

employment opportunities that will increase exponentially usefulness, and its characteristics. Attitude measures and significantly in scope or interest (Evangelista and the possible result of engaging in a particular behavior, Savona, 2003; Bermant, 1995).

Advances in technology and globalization have obligated measures of such behavior. This reveals whether an surveying to take a multi-disciplinary approach. Nowadays individual's perception of technology is negative or one do profession do encroach into others due to positive.

globalization as there no definite professional boundaries Received Ease of Use plausible anymore (Liu, 2008).

Regulatory and professional authorities should work to expand the breadth of surveyor training in Nigerian educational institutions to include new courses in digital instrumentation, computerization, geographic-based information technology, satellite and image technologies, and environmental analysis and modelling. This improvement will promote surveying in Nigeria to align with the technological trends of the world, transforming it from an orthodox and customary practice to a modern system.

### Theoretical Framework

#### UTAUT

The unified theory of acceptance and use of technology (Chao, 2019) is a body of knowledge that aids in examining indicators and factors that affect intention and perception through models designed and theorized with TAM (Technology Acceptance Model) Theory of Reasoned Action (TRA), and TPB (Theory of Planned Behavior) (Idoga, Toycan, Nadiri, and Elebi, 2019).

This study is imperative in contextualizing the behavioral intentions of surveying practitioners to understand their views on technological innovations and their usefulness to surveying activities.

The unified theory of acceptance and use of technology (UTAUT) model is universally accepted. Venkatesh et al. (2003) developed it by reviewing studies on technology adoption theoretical models. Moreover, the theoretical model is extensively used to explain perceptions of technological innovation.

#### Technology Acceptance Model (TAM)

TAM, developed by Davis in 1989, is an icon among the latest research models employed to examine the acceptability of information systems (IS) and technology. In TAM structure, the two (2) major factors that affect the intention to use information technology are perceived ease of use and perceived usefulness (Echchabi, Al-Hajri, and Tanas, 2019).

#### Attitude

Attitude is a indicator used to predict BI (Muñoz-Leiva, Climent-Climent, Liébana-Cabanillas 2017; Zolait, 2010). Attitude (ATT) is different from behavioral intention (BI) in terms of realization, but both consist of disposition (Rummel, 1976). Attitude has proof that it has strong relationship with Behavioral intention. Attitude is the user's behavior towards the new behavior or technology and his or her acceptance of it positively or negatively. Ajzen and Fishbein (1991) showed that a person's perception influences his or her behavior towards using a system at first time. As said earlier, attitude indicates how an individual thinks about the benefits of technological innovation, its perceived

Davis (1993) described Perceived ease of use as "the degree to which using a specific technology will be free from effort". In this study, perceived ease of use is said to be "the degree to which the perception of practitioners influences their attitude and behavior towards using technological innovations in surveying practice." Previous works supported the idea that there are constructive relationships between PSP and ATT, PSP and PUP, and behavioral intention to use. In addition, perceived ease of use is an outstanding element of perceived usefulness and attitude towards using technological innovations (Joo and Choi, 2015). Furthermore, Sheikhshoaei and Oloumi (2011) found the same for librarians' IT acceptance.

Perceived ease of use explains the degree to which it is believed that a system type would be stress-free when used (Davis, 1989). In other words, perceived ease of use refers to the conviction that a system is not cumbersome or requires little effort when used.

The distinguishing feature between the PUP and PSP is the user affability of the technology and the perceived usefulness is the acceptability of the fact that the system helps in achieving daily tasks.

The previous studies on the relationship between PSP and ATT are very clear. Davis, Bagozzi, Warshaw (1989) postulate that increase in perception of ease of use results in positive attitude towards use of technology (Wang, Wang, Lin, Tang, 2003 and Celik, 2008). However, in some others studies this assertions are negative as there are no support for such relationship (Tan, Chong, Ooi, Chong 2010; Ernovianti, NM Kamariah, Rashid and Meor Shaari 2012). This basically means the sample is already versed in using the aforesaid technology.

In mobile banking, the PSP (perceived ease of use) is related closely to the establishment of definite and user friendly features on mobile banking application and website. An uninterrupted banking services outside regulated banking periods is a highly valuable development. Other features in the banking applications are effectiveness, reliability, responsiveness, friendliness and operability. Individual user's confidence can be boosted through effective security and policies. Therefore, reliability and benefits in these applications will definitely increase adoption of technological innovations. This invariably means that user's attitude and intentions are dependent on the applications' feature usability.

#### Perceived Usefulness

Perceived usefulness as a TAM construct was introduced by Davis (1993); it was stated as "the perceived extent at which it is believed that using a particular system or service will enhance their job

performance" (Davis, 1989). Chang (2013) acknowledged perceived usefulness as performance expectancy. This was confirmed in his mobile library apps work that was used to find university libraries' data and to know how improvement in work performance can be effected. Consequently, their use intention is stronger. Kim (2014) reported that there is a positive relationship between perceived usefulness and the intention to use mobile library services.

According to Sondakh (2017) the TAM model shows that a person accepts a system if they believe in it, the construct of perceived ease is then confirmed to be a significant construct affecting the adoption of any system.

The description of PUP by Davis et al. (1989) was also broadly replicated and adapted. PUP was described as one's subjective assessment on the viability of using a technology in boosting individual's performance in their jobs. Perceived usefulness (PUP) entails the user's perception on how online banking applications enhance profit and banking performance (Davis, Bagozzi, and Warshaw, 1989, Davis, 1989). Similarly, online banking improves banking performance through uninterrupted and easy access to banking features which saves energy, time and money among others.

### 2.5 Structural Equation Modeling

Structural equation modeling (SEM) is a statistical method that permits the evaluation of causal relationships that exist between variables (independent and dependent) in one-many or many-many scenarios. There are different ways to define SEM, but it is generally perceived as a hybrid tool for analysis of variance (ANOVA), regression, and factor analysis (Tarka, 2018).

## 2.0 RESEARCH METHODS

This paper evaluates surveyors' behavioral intentions to use technological innovations available for surveying practice. To achieve this, questionnaires were distributed to target groups in the surveying society, and the responses were transformed (coded) to fit the software for analysis.

### Materials Used

The main material used is responses and primary data obtained from questionnaires distributed to a targeted audience. Google form was used to distribute

questionnaires to respondents through mails. Many mails were returned half completed and others completed. The data obtained were then refined through Microsoft excel package, this was done to format the data and input in to SEM statistical tool for further processing.. The study engaged selected surveyors in some southwest Nigerian states. The sampling method used to administer the questionnaire was stratified random sampling and divided into firms. Consequently, about ninety copies of the questionnaire were returned, and after sorting and filtering, only eight-four (84) responses were utilized. This was found to be adequate since the number of arrows to the latent variable was less than eight (8) (Wong, 2013).

This study combined the qualitative and quantitative reporting techniques; it involves statistical and explanatory notes attached specified constructs and results obtained. SmartPLS was utilized to analyze the data obtained through the path modelling partial least square structural equation modeling (PLS-SEM) tool.

In the survey, the participants are  $n = 97$  comprising academic and practicing surveyors within the three (3) states with ages ranging from 18 to 84 years plus. The class with the largest age group is 24 to 44 years old as 68.6%. They were well educated with moderate income.

Marcoulides and Saunders (2006) stated the minimum sample size required in study ultimately depends on the maximum number of arrows indicating a latent variable as specified by the structural equation model. So, in this study 91 respondents was adopted as sample size due to the number of arrows. This was based on a 95% confidence interval and an alpha level of 5%.

### The Structural Equation Modelling – Model Quality Evaluation

The Partial Least Squares Structural Equation The modelling system, comprising the modelling workspace, algorithm, and system packages, is a second-generation multivariate statistical tool. It is a variance-based system employed in instituting structural relationships between exogenous and endogenous latent constructs. In other words, it evaluates relationships within research constructs and variables, tests research propositions, and makes scientific interpretations with empirical conclusions (Oduwole, 2021).

## 3.0 RESULTS

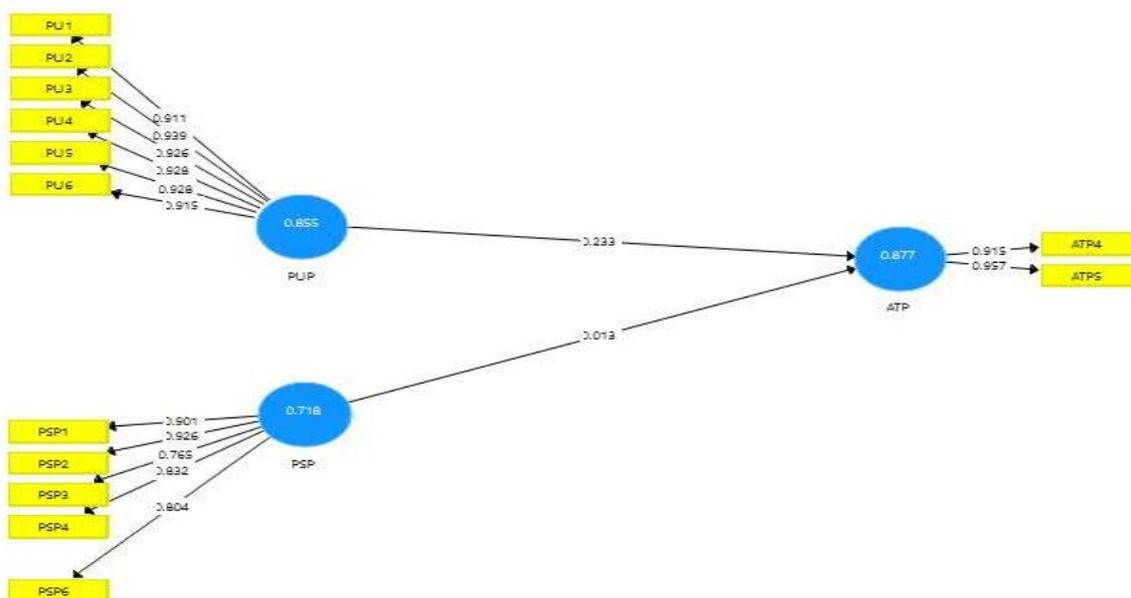


Figure 1: Measurement model

According to past literature, the measurement model is tested through the item’s reliability using loadings, internal consistency using Cronbach’s alpha (α) and composite reliability (CR), convergent and discriminant validity using Fornell Larcker, and heterotrait-monotrait ratio (HTMT) (Abdul Rahman et al., 2013; Hair, Sarstedt, Ringle, and Mena, 2011; Murtala, Onukwube, and Yahaya, 2019; Wong, 2013), while the path coefficients, the coefficient of determination (R<sup>2</sup>), predictive relevance (Q), the effect size (f<sup>2</sup>), and goodness-of-fit (GoF) of the structural model (Murtala et al., 2019; Wong, 2013); while the path coefficients, the coefficient of determination (R<sup>2</sup>), the coefficient of determination (R<sup>2</sup>), predictive relevance (Q), predictive relevance (Q), predictive relevance (Q), the effect size (f<sup>2</sup>), and goodness-of-fit

The following tables are the results from the SEM operation on the above listed tests;

Table 1: Factor Loadings

	ATP	PSP	PUP
ATP4	<b>0.915</b>		
ATP5	<b>0.957</b>		
PSP1		<b>0.901</b>	
PSP2		<b>0.926</b>	
PSP3		<b>0.765</b>	
PSP4		<b>0.832</b>	
PSP6		<b>0.804</b>	
PUP1			<b>0.911</b>
PUP2			<b>0.939</b>
PUP3			<b>0.926</b>
PUP4			<b>0.928</b>

PUP5			<b>0.928</b>
PUP6			<b>0.915</b>

Table 2 Model Fit Fit Summary

	Saturated Model	Estimated Model
SRMR	0.068	0.068
d_ ULS	0.422	0.422
d_ G	0.342	0.342
Chi-Square	164.312	164.312
NFI	0.860	0.860

In the square root of the sum of the squared differences (SRMR), a zero value for SRMR suggests a perfect fit, but models can have SRMR values higher than 0.05 (Henseler et al., 2014). However, a cut-off value of less than 0.08, as proposed by Hu and Bentley (1999), therefore, in this study, the SRMR is 0.068 and is considered a good fit.

For the measurement model, the significance of loadings (see table 1) and the composite reliability should be >0.7 (see table 5). Also, the average variance extracted (Kaveckis and Bechtel, 2014) is > 0.5. Model validity was assessed using the Fornell and Larcker criterion and the Heterotrait-Monotrait Ratio (HTMT) (see tables 6 and 7).

According to the main objective, the measurement and assessment model validated the relationship. The result shows that the variables used in the questionnaire are adequate for reliability and adequacy. The Cronbach alpha ranges from 0.7 to

0.9 (see table 5). As it is widely accepted that Cronbach alpha greater than 0.60 is acceptable in social sciences research (Oduwale, 2021).

Table 3: Coefficient of determination (R<sup>2</sup>)

	R Square	R Square Adjusted
ATP	0.422	0.408

Table 4: Effect Size (f<sup>2</sup>)

	ATP	PSP	PUP
ATP			
PSP	0.013		
PUP	0.233		

Table 5: Construct reliability and validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted
ATP	0.863	0.933	0.934	0.877

PSP	0.902	0.922	0.927	0.718
PUP	0.966	0.967	0.972	0.855

Cronbach alpha value of 0.5 is taken unreliable, but a Cronbach alpha value of 0.5 or above is suggested to be reliable. Nonetheless, cronbach alpha with value closer to one (1), a more reliable the data set is achieved.

Table 6: Heterotrait-Monotrait Ratio (HTMT)

	ATP	PSP	PUP
ATP			
PSP	0.578		
PUP	0.686	0.784	

Table 7: Fornell-Larcker Criterion

	ATP	PSP	PUP
ATP	0.936		
PSP	0.536	0.848	
PUP	0.644	0.743	0.925

Table 8: Hypotheses Tested

Hypothesis	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
PSP -> ATP	0.128	0.132	0.164	0.782	0.434
PUP -> ATP	0.549	0.552	0.146	3.754	0.000

#### 4.0 CONCLUSION

The result has shown the effect of the attitude of practitioners towards technological innovations, the relationship between perceived usefulness and ease of use, and their effect on the attitude being modeled. The output shows the high validity and acceptability of the model. Therefore, it sufficiently explained the main objective of this study.

The result shows that the perceived ease of use of individuals has nothing to do with their attitude towards the use of technology for automating surveying practices, but it shows the high significance of perceived usefulness as an important indicator that measures attitude towards use. Perceived ease of use has no significance for attitude, showing a high P-value of 0.434 (see table 8).

However, we recommend that regulatory bodies increase visibility and showcase innovations in

technology and its usefulness to their members in order to boost their knowledge of the unlimited opportunities IT provides. They should enforce the usage of technological innovations by surveyors in order to increase their perceived usefulness through training and reviewing specifications that incorporate modern instruments for service delivery.

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