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Gifted Innovation: An Examination Using Different Business Theories

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Drawing on insights from an extensive business literature review such as marketing, management, and accounting, a model which incorporates important factors that enhance customers' intention to adopt technology is proposed. The factors examined in this study include customers' attitude toward technology, innovativeness, technology familiarity/knowledge, and technology apprehension. Results indicated that attitude and technology apprehension are predictors of technology adoption intention. Surprisingly, innovators, while behaviorally did adopt high technology, were not found to have the intention to adopt it. The article concludes with managerial implications, limitations, and future research.

Keywords: Gifted Innovation, Technology Adoption, Adoption Intention

JEL Classification: O14

I. Introduction

The emergence of high-technology, such as the PDA, iPod, TReO and cell phones, is proclaimed as gifted innovation. Such innovation has enhanced the eagerness of both scholars and practitioners to understand the factors that drive consumers to adopt high-tech products. The area of high-technology commands considerable importance and has received much attention from scholars. However, the rapid development of new technology brings about an increased need for continued examination of changes in consumer behavior. Drawing on insights from an extensive literature review of high-technology theories, such as technology adoption model (TAM) (Davis, 1989), diffusion of innovation theory (DIT) (Rogers, 1983 and 1995), and theory of planned behavior (TPB) (Azjen, 1985 and 1991), a model is proposed. The proposed model incorporates important factors which enhance customers' intention to adopt technology. The factors examined in this study include customers' attitude toward technology, innovativeness, technology familiarity/knowledge, and technology apprehension. The consequence of *intention* is actual *adoption* of technological products.

Most researchers would not disagree that the factors presented here are related to technology adoption intention; however, to the best of our knowledge there is a lack of scholarly

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work empirically showing all these predictors within a single framework. The objective of this study is to fill that void in the literature and ascertain the predictors of technology adoption intention. In addition, our model attempts to explain whether or not technology adoption intention actually leads to technology adoption. Building on the proposed model, research hypotheses are developed and tested.

II. Literature Review

A. Theory of Planned Behavior

The *theory of planned behavior* (TPB) (Azjen, 1988 and 1991) extended the theory of reasoned action (TRA) (Fishbein and Azjen, 1975) by adding another individual determinant of intention on behavior: perceived behavioral control to the attitude and subjective norm constructs. Both theories (e.g., TPB and TRA) are used to explain an individual's behavior (Oh *et al.*, 2003). The TPB theory posits that an individual's attitude toward the behavior, subjective norms and perceived behavioral control lead to intention toward the behavior. It is this intention that leads to actual behavioral actions. TPB has been used in past research to explain and understand an individual's acceptance of new technologies (e.g. Oh *et al.*, 2003; Venkatesh *et al.*, 2000; Mathieson, 1991). A more recent study by Hsu *et al*. (2006) used the theory of planned behavior to examine the individual's intention to continue purchasing (continuance intention) in an online environment. In their cross-cultural study of online social interactions, Bagozzi *et al*. (2006) found that attitudes and perceived behavioral control significantly led to intentions, which led to behavior as posited by the TPB. However, contrary to the theory, subjective norms did not significantly affect intention.

In this study, we focus on the factors which influence the consumer's willingness/ intention to adopt new technologies. According to TPB (Azjen, 1988 and 1991), strong customer attitude toward a product and/or a service influences his/her intention to adopt it. Morris and Venkatesh's (2000) study on technology adoption intention in the work force indicated that "compared to older workers, younger workers' technology usage decisions were more strongly influenced by attitude toward using the technology" (p. 375). Our study extends TPB by incorporating other individual factors, besides attitude, that enhance customer willingness to adopt technology, which in turn influences actual technology adoption.

B. Technology Acceptance Model

According to the *technology acceptance model* (TAM) (Davis, 1989), two important factors that drive a customer's intention/willingness to adopt a new technological gadget are *perceived ease of use* and *perceived usefulness.* According to Davis (1989), perceived ease of use and perceived usefulness of the technology are the antecedents for technology adoption. However, in a study on lecturer adoption of internet teaching aids, Darsono (2005) found that perceived usefulness and perceived ease of use were significant predictors of *attitude* toward using the internet aid but <u>not</u> of the actual *intention* to use it, which should lead to adoption. In the present study, if a customer is familiar with and knowledgeable of an innovative product, it is assumed that s/he will find the technology to be more useful and easier to use, thereby reducing her/his fear and uncertainty in using the technology. The result of the decreased uncertainty and fear is the enhancement of intention to adopt the technology, leading to actually adoption behavior.

C. Diffusion of Innovation Theory

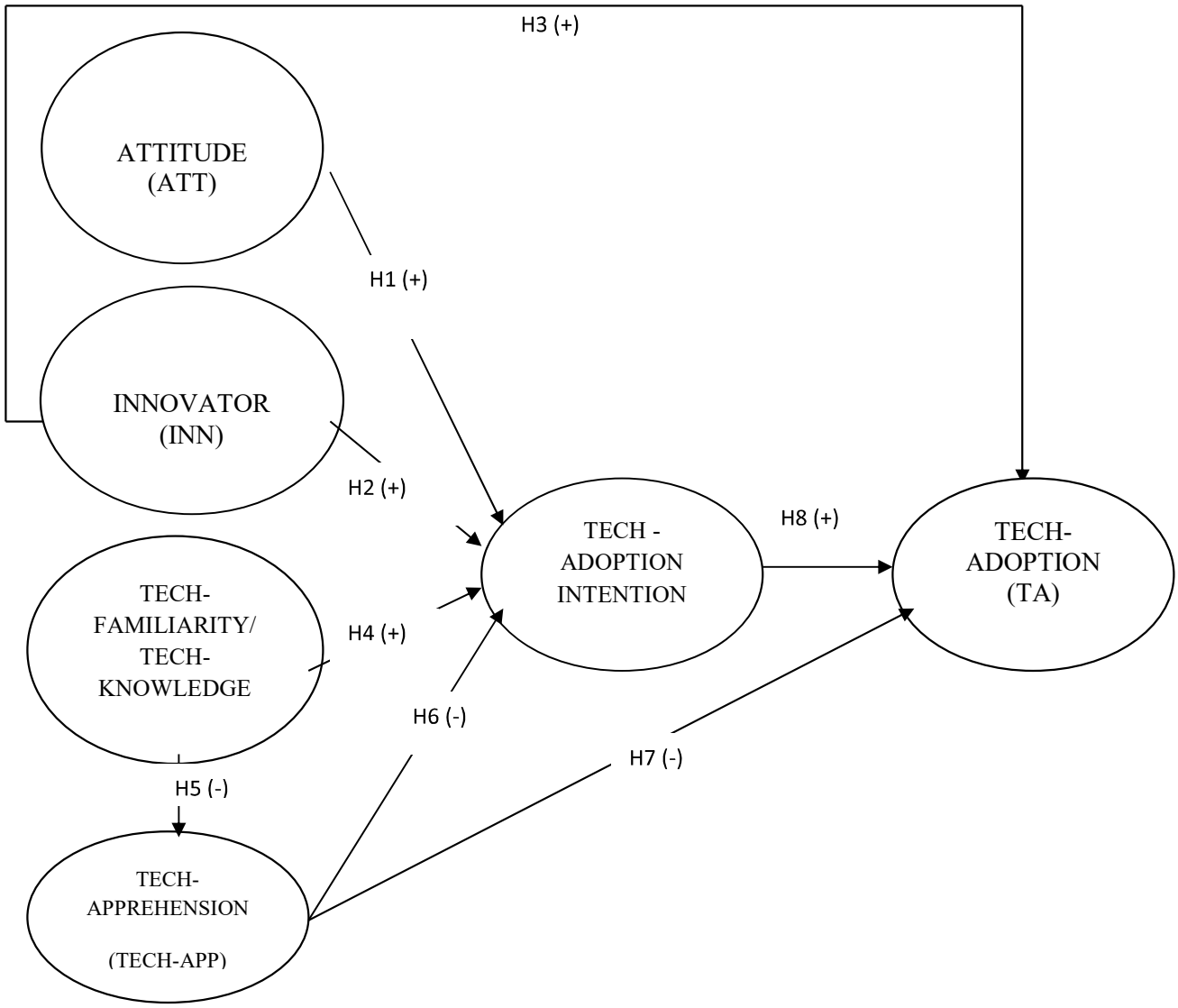
Diffusion of innovation theory (DIT) (Rogers, 1995; Zaltman *et al.*, 1973) also plays an important role in increasing customer adoption intention and actual adoption of a product. It has its root from sociology (Venkatesh *et al*., 2003). The theory of diffusion "has been used since the 1960s to study a variety of innovations ranging from agricultural tools to organizational innovations" (Venkatesh *et al,* 2003, p. 431). Zaltman *et al.* (1973) posited that customers will consider a product to be innovative if the product is perceived as new and relevant. If they consider the product to be new and relevant then innovators should be willing to experiment with the new technology either by purchase or by seeking additional information about the new technological products present in the market.

Recently, studies examining DIT have done so by combining the theory with the TAM and TPB theories in hopes of developing a more unified view of technology information acceptance (see Venkatesh *et al.*, 2003; Yi *et al.*, 2006). In the current study, elements of each theoretical framework are incorporated and extended to other factors that may influence customers' willingness to adopt and/or their actual adoption of new technology. The next section deals with the research framework and hypotheses development.

III. A Framework for Understanding Technology Adoption

The technology adoption framework (Figure 1) derived in this study is based on extensive review of marketing literature as well as the above three theories taken from social psychology and management. The present framework tries to explain the following research questions: (1) Are the customer's attitude (ATT), innovativeness (INN), technology familiarity/knowledge (TECH-KNOW), and technology apprehension (TECH-APP) predictors of technology adoption intention (TAI); (2) Is there a direct relationship between innovativeness (INN) and technology adoption (TA); (3) Does technology familiarity/knowledge (TECH-KNOW) result in a decrease in customer's apprehension in using technology; (4) Is technology apprehension (TECH-APP) the antecedent of technology adoption (TA) or is the relationship between the two mediated by technology adoption intention (TAI); (5) Is technology adoption intention (TAI) the predictor of actual adoption of technology (TA).

Figure 1: Proposed Model



A. Attitude to Technology Adoption Intention

Two theories in social psychology literature, the theory of reasoned action (Fishbein and Azjen, 1975) and the theory of planned behavior (Azjen, 1985) have suggested that customer's positive belief helps in generating positive customer attitude. In turn, attitude drives customer intention (e.g., Fishbein and Azjen, 1975; Hillhouse *et al.*, 1997), which leads to the occurrence of the final behavior (Azjen, 1985 and 1991). According to Oh *et al.* (2003), both TPB and TAM have indicated the importance of customers' attitude toward the technology as an important determinant in explaining behavioral intention. Similarly, in the context of technology adoption, it can be said that if customers find a new technology gadget to be useful, they will have a positive attitude toward that technology and will be more likely to have greater willingness to try it. If satisfied, the consumer is more likely to adopt technology.

An empirical study by Curran *et al.* (2003), in the context of self-service technology (SST), found that a consumer's positive attitude toward a service provider and its technologies influenced customer's intention to use the SSTs. Wu (2006) further demonstrated the existence of a positive relationship between attitude and purchase intention. This leads to the following hypothesis:

H1*: Customer attitude toward the technology is positively related to customer intention to adopt new technology.*

B. Innovator to Technology Adoption Intention and Technology Adoption

According to Rogers' (1995) theory of innovation, innovators are those people who not only have the intention to adopt a new technology, but actually are ready to take the risk by being the first to purchase it. They are the customers who "decide to adopt an innovation independently of the decisions of other individuals in a social system" (Demand Forecasting, 2017; Lafferty and Goldsmith, 2004). Innovation literature has argued that customers will consider a product to be innovative if the product has the following five characteristics: relative advantage, compatibility, complexity, costs, and observability (Rogers, 1995 and 1983). If customers perceive the innovative product to be useful, then at least the first 2.5% of the customers who are considered to be *innovators* (Rogers, 1995) will have the intention and readiness to adopt and purchase new technological products. In alignment with the above result, Thompson *et al.* (2006) in their recent study posited that customers' personal innovativeness plays an important role in explaining intentions to use information technology. Therefore, marketers have been interested in those individuals who enjoy trying new products (e.g., innovators) because "they are most likely to enhance the diffusion of the new products (e.g., Lafferty and Goldsmith, 2004, p. 26)

The diffusion model (Bass, 1969), also known as the growth model, has indicated that the speed of adoption of new technology depends on how customers perceive it. If the new technological product is perceived by customers to have characteristics noted by Rogers (1995), the speed of adoption of the technology should be accelerated (Bass, 1969). Diffusion model helps in the understanding of the initial purchase (adoption) of the product (Mahajan *et al.*, 1995). This leads to the following hypotheses:

H2: *Innovators, compared to all other consumers, have greater intention to adopt a new technological product.*

H3: *Innovators, compared to all other consumers, are more likely to actually adopt a new technological product.*

C. Tech-Knowledge and Tech-Apprehension to Technology Adoption Intention

Tech-familiarity and/or *tech-knowledge* is defined as a customer's skill and/or expertise in using the technology. In other words, it is defined as a customer's awareness of the presence of new technological products in the market. For example, if the customer is knowledgeable and somewhat familiar with new technology, such as a TReO, then he/she will have some intention to use the technology in the future. Chen and He (2003), in the context of online retailing, have empirically shown that customers' knowledge about the brand is positively related to their

intention to adopt an online retailer. It is because of familiarity with the brand that risk uncertainty of the retailer was decreased.

Studies in the context of online shopping have indicated that "consumers – particularly inexperienced surfers – worry about what might happen if they send their credit card data over the internet. The obstacle cited most often by merchants and consumers alike is fear" (Chen and He, 2003, p. 677). Apprehension or fear of disclosing credit card information online reduces inexperienced surfers willingness to shop online. A past study by Alba and Chattopadhyay (1985) indicted the importance of customer knowledge about the product and its impact on the customer's decision-making process. As Rossiter and Percy (1987) have mentioned, familiarity and/or knowledge about the brand enhances customer brand identification ability under different conditions due to the *trace* of the brand in memory. In the context of medical science, a seminal study by Gaggioli *et al.* (2005) posited physicians' current telemedicine technology knowledge to have a positive impact on their intention to use telemedicine. Similarly, in this study, it can be said that customers' knowledge about the new technology will reduce their apprehension, which in turn will enhance their intention to adopt the new technology. Thus, we posit the following hypotheses:

H4: *Customer familiarity and/or knowledge about new technology are positively related to adoption intention.*

H5: *Customer familiarity and/or knowledge about new technology are inversely related to technology apprehension.*

H6*: Customer apprehension in using technology is inversely related to technology adoption intention.*

H7: *Customer apprehension in using new technology is inversely related to the chance of actual technology adoption.*

D. Technology Adoption Intention to Technology Adoption

We have *defined technology adoption intention*, in this study, as the customers' determination/endurance to use the technology in the future. Our definition of technology adoption intention is in line with the definition as given by Kumar *et al.* (2003). According to Kumar *et al.* (2003), intention is defined as a customer's willingness to engage in a relationship. Two important theories in the social psychology literature, specifically theory of planned behavior (Azjen, 1991) and theory of reasoned action (Fishbein and Azjen, 1975), have shown customer intention toward a behavior to be the predictor of actual occurrence of the behavior. These findings are consistent with the findings of several other studies in the domain of technology acceptance, whereby researchers have indicated customer intention to adopt a technology to be the antecedent of technology adoption (e.g., Venkatesh *et al.*, 2003; Davis *et al.*, 1989). Besides the above studies there is research in the information systems and other disciplines which have indicated intention to be the dependent variable of behavior (e.g., adoption) (see Venkatesh *et al.*, 2003; Azjen, 1991; Sheppard *et al.*, 1988). Thus, we hypothesize:

H8: *Customer technology adoption intention is positively related to actual adoption of new technology.*

IV. Methodology

To test the proposed framework, measured items were created to tap the underlying six constructs used in this study. First, the instrument was pre-tested and once the instrument was finalized, data were collected from business undergraduate students at a Midwestern university. Two hundred and thirty-five questionnaires were distributed and collected; one questionnaire could not be used due to missing or incomplete data. More than 51% (n = 120) of the subjects used in this study were female. Approximately 91% (n = 213) subjects were below 24 years and 67.9% (N=159) had a household income below $10,000. About 73.1% (n = 171) were Caucasian, while the remaining 26.9% (n = 73) belonged to other ethnic groups. The demographic characteristics were expected based on the use of a homogeneous convenience sample.

A. Item Measurement

All together 21 items were used to measure the six underlying constructs [attitude (ATT), innovator (INN), technology knowledge (TECK-KNOW), technology apprehension (TECH-APP), technology adoption intention (TAI), and technology adoption (TA)]. (See Appendix A). As suggested by Hair *et al.* (1998), construct reliability for all these constructs was calculated. Results indicated that the construct reliability for all of the six constructs was in the range of 0.701 to 0.933.

B. Model Evaluation

EQS 6.1 was used to conduct structural equation modeling using a two-stage analysis, with raw data as input. A two-step process of structural equation modeling, measurement model and structural model, was used for model evaluation (Anderson and Gerbing, 1982).

B.1 Measurement Model:

Confirmatory factor analysis (CFA) was used to ensure reliability and validity of the six underlying constructs. The results of the CFA indicated that the normalized estimate of multivariate kurtosis was 17.71, which exceeded the recommended cutoff point of 3. As suggested by Bentler (1990a; 1990b) if the normalized estimate of multivariate kurtosis is greater than the recommended cut-off point then the researcher should use a robust maximum likelihood (ML) estimation method. This provides more accurate and reliable information than the standard ML method. Finally, each construct was assessed for unidimensionality, reliability, convergent, and discriminant validity (see tables 2 and 3).

B.2 Unidimensionality and Reliability

The standardized loadings of all the items measuring the six underlying constructs were found to be in the range of 0.576 to 0.941; hence, meeting the threshold of unidimensionality, which is above 0.50 (Bollen, 1990). According to Hair *et al.* (1998) “reliability is a degree of internal consistency of the construct indicators,” therefore, “the more reliable measures such as composite reliability and average variance extracted (AVE) provide researchers with greater confidence that the individual indicators are all consistent in their measurement” (p. 612). Results

indicated that the composite and/or construct reliability for all the constructs were above 0.701. Thus, indicating that the indicators of the six underlying constructs were valid and accurately measure the underlying constructs (see Table 1).

Table 1: Measurement Model, Reliability, and Average Variance Extracted Result

Construct	Items	Standardized Loadings	*t*-value*	S.E.	Construct/ Composite Reliability	Average Variance Extracted (AVE)
Attitude (ATT)	ATT 1 ATT 2 ATT 3	0.873 0.941 0.910	n/a 9.962* 10.211*	n/a 0.129 0.123	0.933	0.823
Innovator (INN)	INN 1 INN 2 INN 3	0.720 0.837 0.708	n/a 5.993* 5.939*	n/a 0.241 0.159	0.802	0.576
Technology Knowledge (TECH-KNOW)	TECH-KNOW 1 TECH-KNOW 2 TECH-KNOW 3	0.677 0.816 0.811	n/a 5.743* 6.421*	n/a 0.419 0.433	0.815	0.597
Technology Apprehension (TECH-APP)	TECH-APP 1 TECH-APP 2 TECH-APP 3 TECH-APP 4 TECH-APP 5	0.637 0.775 0.747 0.784 0.574	n/a 6.288* 6.598* 6.572* 5.739*	n/a 0.216 0.214 0.198 0.208	0.833	0.502
Technology Adoption Intention (TAI)	TAI 1 TAI 2 TAI 3 TAI 4	0.880 0.901 0.878 0.666	n/a 10.502* 9.363* 6.977*	n/a 0.107 0.107 0.098	0.902	0.700
Technology Adoption (TA)	TA 1 TA 2 TA 3	0.761 0.643 0.576	n/a 3.047* 1.845*	n/a 0.109 0.139	0.701	0.443

Convergent validity helps ensure that the concepts that should be related theoretically are actually related. According to Fornel and Lacker (1981a and 1981b) convergent validity exists if the loadings and AVE estimates are higher than the recommended cut-off value. The results indicated in Table 2 illustrate that all of the constructs under investigation surpass the acceptable level, showing good convergent validity. *Discriminant validity* conveys the degree to which

concepts that should not be related theoretically are, in fact, not related (Campbell and Fiske, 1959). Discriminant validity is shown when the correlation between any two constructs is less than the square root of the AVE and when the items measuring the construct in the diagonal elements of the matrix are greater than corresponding off-diagonal elements. Table 2 shows evidence of discriminant validity among the present constructs.

Table 2: Mean, Standard Deviation, Convergent and Discriminant Validity Matrix

Construct	**Mean**	**Standard Deviation**	ATT	INN	TECH-KNOW	TECH-APP	TAI	TA
ATT	4.690	1.197	**0.907**	-0.161	0.155	-0.198	0.143	-0.003
INN	2.271	0.820		**0.759**	-0.514	0.417	-0.091	0.085
TECH-KNOW	3.807	0.755			**0.773**	-0.352	0.171	-0.080
TECH-APP	2.131	0.651				**0.708**	-0.147	0.122
TAI	4.198	0.671					**0.837**	0.065
TA	4.190	0.559						**0.665**

ATT = Attitude; INN = Innovator; TECH-KNOW = Technology knowledge; TECH-APP = Technology apprehension; TAI = Technology adoption intention; TA = Technology adoption.

Besides assessing the unidimensionality, reliability, convergent, and discriminant validity, the overall fit of the proposed model was also assessed. The CFA analysis result indicated that the Satorra-Bentler Scaled Chi-Square index (S-Bχ2) was significant (S-Bχ2 = 261.605, df = 182, p > 0.0001). Past studies by Bagozzi and Yi (1988) and Byrne (1994) have shown Chi-Square index to be sensitive to sample size; hence, alternative fit indices were also taken into consideration (Baumgartner and Homburg, 1996).

The alternative fit indices indicated that the data closely fit the model with Root Mean Square Error of Approximation (RMSEA) of 0.051 (Browne and Cudeck, 1989). Other fit indices, such as Bentler's (1990b) Comparative Fit Index (CFI) of 0.937, Bentler and Bonnet's (1980) Non-Normed Fit Index (NNFI) of 0.927 and an incremental fit index (IFI) of 0.938, were all higher than the acceptable fit threshold of 0.90 to indicate good fit (Hair *et al.*, 1998). Indices for the proposed model are summarized in Table 3.

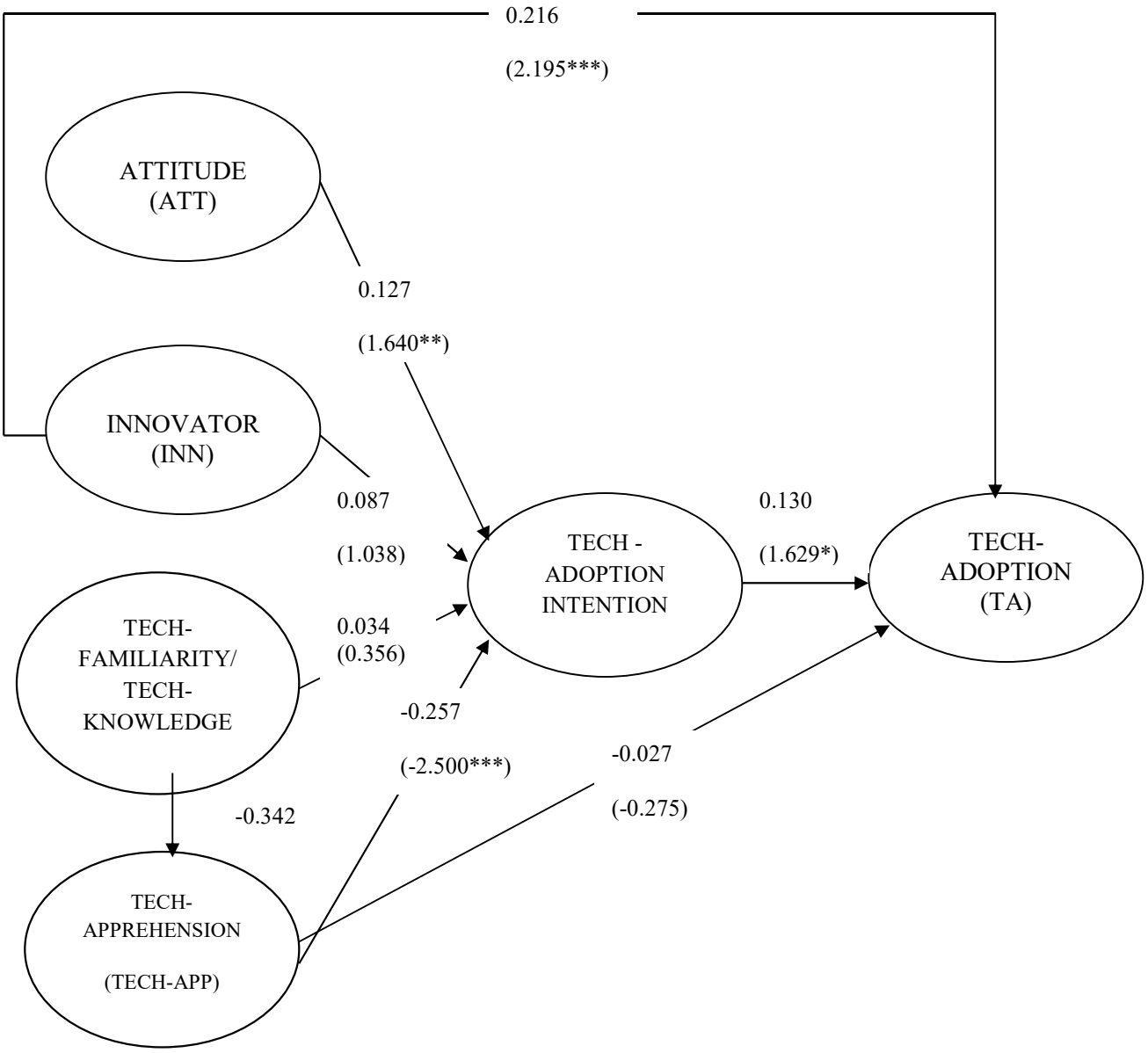
Table 3: Model Fit Indices – For The Proposed Model

Fit Indices	Acceptable Fit Thresholds	Fit Indices of Proposed Model
χ^2 / df	≤ 3	1.445
RMSEA	≤ 0.08	0.051
CFI	> 0.90	0.937
NFI	> 0.90	0.824
IFI	> 0.90	0.938
NNFI	> 0.90	0.927
90% CI of RMSEA	Between 0 and 1	(0.036, 0.064)

B.3 Structural Model

In the structural model eight hypothesized paths between the six underlying constructs were tested for significance. Figure 2 shows the structural model result. Results indicated that out of the eight paths five were significant.

Figure 2: Result of the Proposed Model



* p < 0.15; ** p < 0.10; *** p < 0.05; **** p < 0.01

Fit Indices of Proposed Model

RMSEA =	0.051
CFI =	0.937
NNFI =	0.927
IFI =	0.938
S-B $\chi 2$ =	261.605

V. Results

EQS results for the proposed structural model indicated that customer attitude toward technology (ATT) was a significant predictor of customer technology adoption intention (TAI) with a standardized path coefficient of 0.127, $p < 0.10$. Therefore, *Hypothesis 1* is *supported*. However, innovativeness (INN) was not an antecedent of technology adoption intention (TAI), providing *no support* for *Hypothesis 2*. Innovativeness (INN) was found to be a significant predictor of technology adoption (TA) (standardized path coefficient of 0.216, $p < 0.05$), which *supported Hypothesis 3*. Results also indicated that technology familiarity/ knowledge (TECH-KNOW) was not a predictor of technology adoption intention (TAI), providing *no support* for *hypothesis 4*. However, it was found to be a significant predictor of technology apprehension (TECH-APP) (standardized path coefficient of -0.342, $p < 0.01$) and was in the expected direction, *supporting Hypothesis 5*.

This study also indicated that technology apprehension (TECH-APP) was an antecedent of technology adoption intention (TAI) (standardized path coefficient of -0.257, $p < 0.05$), but not a predictor of technology adoption (TA). Therefore, *support* was found for *Hypothesis 6* but *not for Hypothesis 7*. However, technology adoption intention (TAI) was a significant predictor of technology adoption (TA) (standardized path coefficient of 0.130, $p < 0.15$), supporting *Hypothesis 8*.

To test if technology adoption intention (TAI) mediates the relationship between innovator (INN), technology apprehension (TECH-APP) and technology adoption (TA), multiple regression was used. To test the mediation effect, as suggested by Baron and Kenny (1986), the dependent variable (technology adoption) was regressed on the independent variables (innovator and technology apprehension). As posited, results indicated that technology adoption intention (TAI) fully mediated the effect between INN and TA ($\beta = 0.041$, $t = 0.550$, $p = 0.583$; ns). TAI was also found to mediate the relationship between TECH-APP and TA ($\beta = 0.105$, $t = 1.390$, $p = 0.116$; ns). Additionally, technology apprehension (TECH-APP) fully mediated the relationship between technology familiarity/knowledge (TECH-KNOW) and technology adoption intention (TAI). Thus, our results indicated that the relationship between innovator (INN) and technology adoption (TA) is direct as well as it is also mediated through technology adoption intention (TAI).

A. Model Comparison

To see if the fit indices of the proposed model can further be improved, a nested model test was performed. In the nested model approach, the number of constructs and indicators remains constant, but the number of estimated relationships changes.

As suggested by the Wald test, the most non-significant path (e.g., path from TECH-APP -> TA) in the proposed model was deleted to see if there is any improvement in the fit indices compared to the proposed model. Results indicated that there was no statistically significant change in the Satorra-Bentler Scaled Chi-Square (Δ S-Bχ2) value between the proposed model and Nested Model 1 (model after deleting the path from TECH-APP -> TA). Hence, Nested Model 1 was better than the proposed model. Then again as suggested by Wald statistics, the non-significant path from TECH-KNOW to TAI was deleted and Nested Model 1 was compared with Nested Model 2 to see the improvement in fit indices. Results indicated no significant difference between Nested models 1 and 2. Hence Nested Model 2 was considered over Nested Model 1.

Finally, the non-significant path between innovators to technology adoption intention was also deleted, as recommended by the Wald test. The nested model comparison results indicated

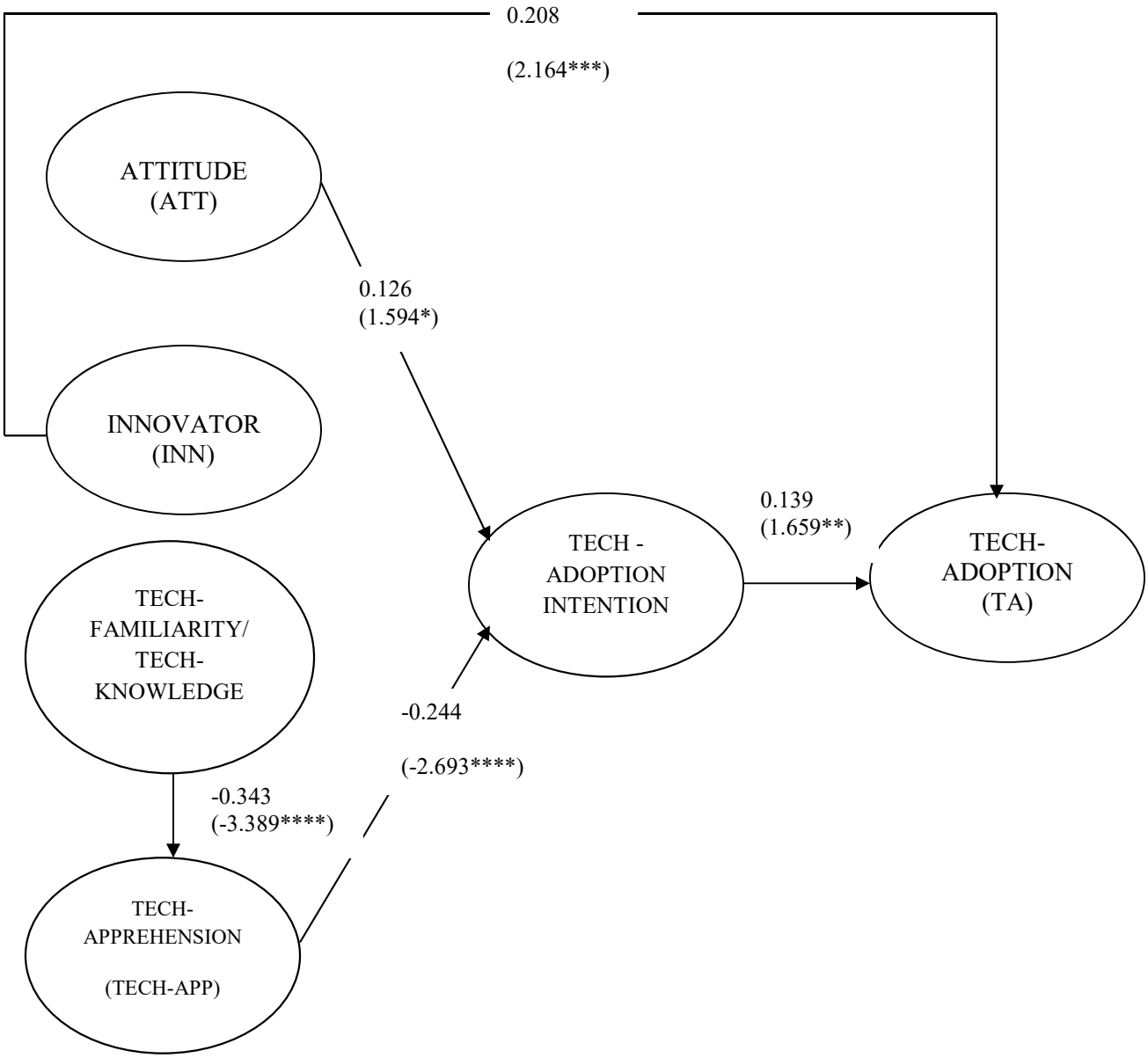
that the change in the Satorra-Bentler Scaled Chi-Square (Δ S-Bχ2) between Nested Model 2 and Nested Model 3 at 1 degree of freedom was less than the critical value of 3.84. Hence Nested Model 3 was considered as the final model (Figure 3) because it is the most parsimonious.

Table 4: Nested Model Result

Model	Satorra-Bentler Scaled Chi-Square Index	Degrees of Freedom	Change in the Satorra-Bentler Scaled Chi-Square (Δ S-Bχ2)	Change in Degrees of Freedom (Δdf)	Sig. (p)
Proposed	261.605	181			
Nested 1	261.594	182	Δ S-Bχ2 = S-Bχ2 $_{(Nested1)}$ – S-Bχ2 $_{(proposed)}$ = 0.011	Δ df = df$_{(Nested\ 1)}$ – df $_{(proposed)}$ = 1	n.s.
Nested 2	261.737	183	Δ S-Bχ2 = S-Bχ2 $_{(Nested\ 2)}$ – S-Bχ2 $_{(Nested\ 1)}$ = 0.143	Δ df = df$_{(Nested\ 2)}$ – df $_{(Nested\ 1)}$ = 1	n.s.
Nested 3	262.419	184	Δ S-Bχ2 = S-Bχ2 $_{(Nested\ 3)}$ – S-Bχ2 $_{(Nested\ 2)}$ = 0.682	Δ df = df$_{(Nested\ 3)}$ – df $_{(Nested\ 2)}$ = 1	n.s.

n.s. = Non-significant

Figure 3: Final Model Result of Nested Model 3



* p < 0.15; ** p < 0.10; *** p < 0.05; **** p < 0.01

Fit Indices of Nested Model 3

RMSEA =	0.050
CFI =	0.939
NNFI =	0.930
IFI =	0.940
S-B $\chi 2$ =	262.419

VI. Managerial Implication, Limitation, and Future Research

The technology acceptance model and diffusion of innovation theory have identified ease of use, compatibility, relative advantage, and complexity (Kleijnen *et al.*, 2004; Venkatesh *et al.*, 2003; Plouffe *et al.*, 2001; Karahanna *et al.*, 1999; Rogers, 1995) as the important factors that help explain the adoption of high technology products. However, our study extends the above theories by emphasizing that the customer's attitude, innovativeness, familiarity/knowledge about new technology, and technology apprehension should also be given attention by managers in order to increase customer willingness to adopt high technology products, which leads to actual adoption.

Results of our study indicated that customer positive attitude toward a high technology product is a significant predictor of customer technology adoption intention. Customer technology familiarity/knowledge helps in reducing customers' apprehension in using the technology; however, it may not have a direct effect on technology adoption. Our research suggests that the relationship between technology familiarity and adoption intention is fully mediated through customer technology apprehension. In other words, if a customer is familiar and knowledgeable about the high-technology gadgets, they will have less fear in using them. The reduced fear will enhance their willingness to adopt such "gifted innovation." Thus, it may be said that to increase customer adoption of high-technology products, managers should try to change the customer's mindset about the high-technology products by increasing familiarity/knowledge. Product familiarity/knowledge can result from advertising the benefits that the customer can derive from the products, increasing trial through instore displays, or by the use of realistic and prominent product placements. If customers are familiar with the high-technology products they will perceive the gadgets to be easy to use and useful, reducing their fear of using the high-tech products. Our study shows that this reduced fear may enhance overall intention to adopt the technology.

From our results, it may also be said that to increase the sales of high-technology products, managers should try to identify those customers who are innovators. Innovators perceive a high-technology product to be new and relevant and are ready to experiment with the new technology by actually adopting them. Furthermore, our results indicated that customer positive intention to adopt is an enabler for actual adoption of new technology. Thus, managers should try to find a way to increase customers' adoption intention to use a high-technology product because if a customer has a positive intention to adopt a technology then it is most likely that they will adopt the technology.

Some of the limitations of our study, which evoke opportunities for future research, are as follows: (1) A convenience sample of university business students was used in this study. (2) Participants for this study were only those who owned or had used high-technology products. Future research should be carried out to see what prevents other customer from adopting the high-technology products; (3) Sample size limited our ability to validate the findings by split sample, which leaves scope for validation of the final model.

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Appendix A

Items Used to Operationalize Constructs

Attitude (7-points scale) (Construct reliability = 0.923; AVE = 0.823)

Would you say your attitude toward new technology such as cell phones, PDA, etc. is:

ATT1	bad	--	--	--	good
ATT2	unfavorable	--	--	--	favorable
ATT3	negative	--	--	--	positive

Innovator (5-point scales anchored by totally disagree and totally agree) (Construct reliability = 0.802; AVE = 0.576)

INN 1	I experiment with new technologies.
INN 2	I like to be among the first to try new technologies.
INN 3	I seek information about new devices.

Tech-knowledge/Tech-familiarity (5-point scales anchored by strongly disagree and strongly agree) (Construct reliability = 0.815; AVE = 0.597)

How knowledgeable are you in using technology such as cell phones, PDA, etc.?

TECH-KNOW 1	I feel I am quite familiar with using a cell phone.
TECH-KNOW 2	Among my circle of friends, I am one of the "experts" in using cell phones.
TECH-KNOW 3	I know a lot about cell phones.

Tech-Apprehension (5-point scales anchored by totally disagree and totally agree) (Construct reliability = 0.833; AVE = 0.502)

TECH-APP 1	I have difficulty understanding most technological matters.
TECH-APP 2	When given the opportunity to use some form of technology, I fear that I might damage it in some way.
TECH-APP 3	Technological terminology sounds like confusing jargon to me.
TECH-APP 4	I have avoided technology because it is unfamiliar to me.
TECH-APP 5	I am unable to keep up with important technological advances.

Tech-Adoption (5-point scales anchored by completely unimportant to completely important) (Construct reliability = 0.701; AVE = 0.443)

Important reasons for adopting new technology such as cell phones, PDA, etc. are:

TA 1	Ease of use
TA 2	Security
TA 3	Cost

Tech-Adoption Intention (5-point scales anchored by strongly disagree and strongly agree) (Construct reliability = 0.902; AVE = 0.700)

How willing you are to use technology such as cell phones, PDA, etc. in the future (continue to use OR begin to use).

TAI 1	Once I have accepted usage of a cell phone, I will certainly use it in the future.
TAI 2	Once I use a cell phone, I will certainly use it in the future.
TAI 3	Once I have gained experience in using a cell phone, I will most probably use it in the future.
TAI 4	I will enjoy using a cell phone in the future.