

Applying Theory of Reasoned Action and Technology Acceptance Model to Investigate Purchase Behavior on Smartphone

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ABSTRACT

Cell phone has become a popular product in recent years because of the high popularity of mobile communication. Not only is users' age decreasing but also it is an indispensable product in one's daily life. Therefore, this study applied theory of reasoned action and technology acceptance model to investigate the behavioral intention of smartphone users. The major findings of this study are as follows: (1) perceived ease of use has a significant and positive effect on perceived usefulness and consumer's attitude respectively, (2) perceived usefulness has a significant and positive effect on consumer's attitude, (3) both consumer's attitude and subjective norm have a significant and positive effect on behavioral intention respectively, (4) perceived risk has a significant and positive effect on behavioral intention, and perceived value has a significant and positive effect on purchase intention, (5) perceived usefulness has a partial mediating effect between perceived ease of use and purchase intention behavior; behavioral intention has a partial mediating effect between subjective norm and purchase intention; and behavioral intention and perceived value have no mediating effect between perceived risk and purchase intention.

Keywords: Smart Phone, Theory of Reasoned Action, Technology Acceptance Model, Behavioral intention

INTRODUCTION

According to data compiled by the National Communications Commission (NCC), as of the third quarter of 2008, the number of mobile phone subscribers in Taiwan stood at 24.6 million, equivalent to 107 mobile phone numbers for every 100 people in the population (FIND, 2009). In addition, Topology Research Institute (TRI) estimated that iPhone had 370 million users after Apple computer promoted iPhone 3G on the global market in 21 nations on July 11, 2008. It represents the innovative technology purchase fever for smartphones. Therefore, it is worthwhile to use Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975) and Technology Acceptance Model (TAM) (Davis, 1989) to examine consumers' purchase behavior on smartphone.

General speaking, a consumer will feel difficult to make purchase decisions when she or he can not perceive the results after using a product. In other words, a consumer may confront with perceived risk. If a consumer can not undertake this risk, she or he will not buy the product. Therefore, it is worthwhile to understand whether perceived risk will affect consumer purchase intention. In addition, consumer perceived value is considered as a source of business competitive advantage. Perceived value means the evaluation between what consumers give and what consumers get from a product (Dodds & Monroe, 1985; Sawyer & Dickson, 1984), and many researches show that consumers' perceived value will directly and significantly affect on purchase decision making (Dodds & Monroe, 1985; Dodds, Monroe, & Grewal, 1991; Teas &

Agarwal, 2000; Wan, 2006). Therefore, the purposes of the research are as follows: (1) using Technology Acceptance Model (TAM) and Theory of Reasoned Action (TRA) to examine the relationship between consumers' acceptance and behavioral intention on smartphones, (2) exploring whether consumers' perceived risk of smartphones will influence their purchase intention on smartphones, (3) exploring whether consumers' perceived risk value will influence their perceived value on smartphones, and (4) exploring whether consumers' perceived value will affect their purchase intention on smartphones .

LITERATURE REVIEW

Mobile Commerce

Mobile commerce means that people use mobile technologies to deal with business processes in their daily work (Heijden & Valiente, 2002). Liu (2000) identified that any activity using word or voice or using public or private internet to communicate, exchange data or make transactions through mobile devices is considered as mobile commerce. Shih and Shim (2002) divided mobile commerce into two purposes: for consumer and for business. The consumer purpose mobile commerce means to utilize wireless devices such as PDAs and cell phones to provide personal information or activities. The business purpose mobile commerce means utilize mobile devices to complete business operations or increase companies' productivities. Gunasekaran and Ngai (2003) also defined any direct or indirect transactions involving monetary value can be called m-commerce as long as they are completed on wireless telecommunication networks. Further, Tsalgaidou & Pitoura (2001) pointed out that "mobile electronic commerce (MEC) operates partially in a different environment than Internet e-commerce due to the special characteristics and constraints of mobile terminals and wireless networks and the context, situations and circumstances in which people use their hand-held terminals" (p.221).

Theory of Reasoned Action

Theory of reasoned action (TRA) is a widely studied model from social psychology which is concerned with determinants of consciously intended behaviors (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). According to TRA, a person's will to perform a specific behavior is determined by his or her behavioral intention (Davis, Bagozzi, & Warshaw, 1989). Therefore, it is believed that this behavioral intention model can precisely measure and predict a person's actual behavior status (Fishbein & Ajzen, 1975). The basic hypothesis of TRA is whether a person to perform a specific behavior is based on his or her own will which is controlled under a systematic thinking. That is, a person will perform an action only after he or she acquires information and makes a systematic and reasonable thinking.

Technology Acceptance Model

On the basis of theory of reasoned action (TRA), Davis (1986) developed technology acceptance model (TAM) to explain computer usage behavior. The main conceptual framework of TAM are (1) perceived ease of use refers to the degree to which a prospective user expects that target system to be free of effort (Davis, 1986 ; Davis, 1989 ; Davis et al., 1989), (2) perceived usefulness is defined as a prospective user's subjective probability that using a specific application system will increase his or her job performance (Davis, 1986 ; Davis, 1989 ; Davis et al., 1989), (3) attitude toward using means that a user's feelings of favorableness or unfavorableness towards using the technology (Taylor & Todd, 1995), and (4) behavioral intention is viewed as being jointly determined by a person's attitude using the system and perceived usefulness (Davis et al., 1989; Taylor & Todd, 1995).

Perceived Risk

Perceived risk refers that consumer purchase behavior may cause some unexpected results and these results may cause unpleasant experience (Bauer, 1960). Cox (1967) continued Bauer's study and hypothesized that consumers have their purchase goal each time when they are buying a product. Hence, when consumers can not decide which purchase decision best fits their goal, it will cause unfavorable results and shape a risk consciousness. Cox (1967) further divided consciousness risk into two concepts: (1) consumers perceive the possibility of unfavorable results prior to purchase and (2) consumers subjectively perceive losses when an unfavorable result occurs. Cunningham (1967) extended Cox's concepts into uncertainty factor and result factor. Uncertainty factor means consumers' subjective view on the possible occurrence of a certain thing. Result factor means the risk is resulted from the occurrence of a certain thing. Bettman (1973) distinguished perceived risk into inherent risk and handled risk. "Inherent risk is the latent risk a product class holds for a consumer (the innate degree of conflict the product class is able to arouse), and handled risk is the amount of conflict the product class is able to arouse when the buyer chooses a brand from a product class in his usual buying situation (Bettman, 1973, p.184)." In addition, Jacoby and Kaplan (1972) proposed the concepts of perceived risk into five dimensions: financial risk, performance risk, social risk, physical risk, and psychological risk, and Kaplan (1974) found that the explanation ability of these five dimensions is up to 74%. Moreover, by adding time risk to Jacoby and Kaplan's proposals, Stone and Gronhaug (1993) found the explanation ability increase to 88.8%. Hence, time risk is an important and a not neglectful dimension. They further expresses that financial, performance, social, physical and time risk will influence psychological risk.

Perceived value

Perceived value means that an overall consumers' subjective evaluation between benefit (what is received) and cost (what is given) (Dodds & Monroe, 1985; Zeithaml, 1988). When consumers purchase a product or a service, they have their own measurement standard and they all expect to obtain more value than what they paid for. Accordingly, when businesses sell a product or a service, they have to consider a consumer's viewpoint. Monroe (1990) assumes that an increase in consumer perceived quality or a reduction in perceived sacrifice can promote consumer perceived value. Consumer perceived value is often regarded as the result of a tradeoff between relative quality and price (Gale, 1994; Johnson, Herrmann, & Huber, 2006). Thaler (1985) considered perceived value as a tradeoff between perceived benefits and perceived sacrifices. Slater and Narver (2000) maintained that "customer value is created when the benefits to the customer associated with a product or a service exceed the offering's life-cycle costs to the customer (p.120)." Lovelock (2001) stated that perceived value is perceived benefits subtract perceived costs, and the wider the gap between benefits and costs is, the more the perceived value will be. Sweeny and Soutar (2001) generalized perceived value into four dimensions: emotional value, social value (enhancement of social self-concept), functional value (price/value for money), and functional value (performance/quality). Parasuraman and Grewal (2000) proposed four types of perceived value: "acquisition value, transaction value, in-use value, and redemption value.

Purchase Intention

Purchase intention is composed of a consumer's evaluation and attitude toward a product and other external factors (Fishbein & Ajzen, 1975). Purchase intention is regarded as a subjective tendency for a consumer to choose a product, and it is an important indicator to predict commuter purchase behavior (Fishbein & Ajzen, 1975). Purchase intention is a most precise item to predict shoppers' behavior

(Morwitz & Schmittlein, 1992). Purchase intention refers to the possibility of consumers' willingness to buy a product (Zeithaml, 1988; Dodds et al., 1991; Schiffman & Kanuk, 2000). Spears and Singh (2004) proposed that "purchase intentions are an individual's conscious plan to make an effort to purchase a brand (p.56)." In brief, if consumers have a good impression and attitude toward a brand or a product, they will have purchase intentions. Zeithaml (1988) measured purchase intention by using possible to buy, desirable to buy, and deliberate to buy. Engel, Blackwell, and Miniard (1995) separated purchase intentions into unplanned purchase behavior, partial planned purchase behavior, and complete planned purchase behavior. Sirohi, McLaughlin and Wittink (1998) indicated that the measurement of consumer purchase intention should be from the view of customers' loyalty including repurchase intention, the willingness to purchase more in the future, and the willingness to recommend others to buy.

Technology Acceptance Model and Theory of Reasoned Action

When users perceive that a new information technology tool can help them to finish work efficiently, their perceived usefulness toward will be higher. That is, the higher a product usefulness perception is, the higher adoption of it is. On the same token, when users have high perceived ease of use of a product, they will have a positive attitude to adopt it. Therefore, perceived usefulness and perceived ease of use are assumed as external variables to influence users' acceptance behavior on an information technology tool, and perceived ease of use will influence perceived usefulness (Davis, 1986; Davis, 1989; Davis et al., 1989; Henderson & Divett, 2003; Hsiao & Hung, 2004). Additionally, users' attitude and perceived usefulness will positively affect their behavior intention and further affect users' acceptance. Perceived usefulness and perceived ease of use will influence users' attitude, and behavioral intention will be influenced by of perceived usefulness and perceived ease of use (Davis, 1986; Davis, 1989; Davis et al., 1989; Hsiao & Hung, 2004). When subjective norm causes affection to certain users, such as peer or social pressure, it will urge them to perform a certain behavior. When users' subjective norm to adopt a certain behavior becomes more positive, the influence on their behavioral intention will be more intensive (Harrison, Peter, Mykytyn, & Riemenschneider, 1997; Chang & Shen, 2005). Hence, the study proposes hypothesis one to hypothesis seven as follows:

- H1: Consumer perceived ease of use will be positively and significantly affected to perceived usefulness.
- H2: Consumer perceived usefulness will be positively and significantly affected to attitude.
- H3: Consumer perceived ease of use will be positively and significantly affected to attitude.
- H4: Consumer attitude will be positively and significantly affected to behavioral intention.
- H5: Consumer subjective norm will be positively and significantly affected to behavioral intention.
- H6: Consumer perceived usefulness will be positively and significantly affected to behavioral intention.
- H7: Consumers behavioral intention will be positively and significantly affected to purchase intention.

Perceived risk, Behavioral Intention and Perceived Value

In Swaminathan, Vanitha, Elzbieta and Bharat's (1999) study of the electronic transaction behavior, they concluded that the lower users' the perceived transaction safety is, the higher the perceived risk is. The results reveal that the intention on internet transaction will become lower. Sathye (1999) discovered that most consumers are unwilling to adopt internet banking because of the concern on safety. So, the higher the consumers perceived risk is, the lower the intention to adopt internet banking. Wang (2001) also pinpointed that consumers perceived risk will influence the intention of internet banking adoption. Nevertheless, consumers may cause a psychological worry when a product can not demonstrate its

function and its quality well. In addition, some researches indicate that perceived risk will negatively affect technology acceptance behavior and further disturb consumers' intention to buy a smartphone. Perceived value means a tradeoff between benefits and sacrifices of a product or service from consumers' point of view (Dodds & Monroe, 1985; Sawyer & Dickson, 1984). Perceived value will be affected by sacrifices and sacrifices equals to perceived risk. Thus, customer perceived risk can be recognized as one of factors to influence customer perceived value. Moreover, many scholars suggest that perceived risk will reduce perceived value (Sweeney, Soutar, & Johnson, 1999; Agarwal & Teas, 2001; Chen & Dubinsky, 2003; Chih, Yang, & Su, 2007). Thus, the study proposes hypothesis eight and hypothesis nine as follows:

H8: Consumers perceived risk will be negatively and significantly affected to behavioral intention.

H9: Consumers perceived risk will be negatively and significantly affected to perceived value.

Perceived Value and Purchase Intention

If consumers pay a lower price with a higher quality product, their perceived value will increase and further raise their purchase intention (Bellizzi, 1981). If consumers have a positive perceived value to a product or service, their purchase intention will also raise (Monroe & Krishnan, 1985). Zeithaml (1988) applies perceived value to measure purchase intention by using possible to buy, desirable to buy and deliberate to buy as questionnaire items and finds that the higher perceived value is, the higher purchase intention is. In brief, the level of perceived value decides consumer purchase intention. Grewal, Monroe and Krishnan (1998) conclude that the higher the perceived value is, the higher the purchase intention. Furthermore, more evidences show that the feelings of consumer perceived value will directly and significantly affect to purchase intention (Dodds & Monroe, 1985; Dodds et al., 1991; Teas & Agarwal, 2000; Wan, 2006). Thus, the study proposes hypothesis ten as below:

H10: Consumer perceived value will be positively and significantly affected to purchase intention.

METHODOLOGY

Research Sampling

The study adopts 7-point Likert scale "1-very disagree /7-very agree" to measure each research items, and applies convenience sampling to collect data from cell phone users living in Chayi. 320 copies of questionnaires were dispatched in train station, fast food restaurants, and 3C shopping malls from February 18th, 2009 to March 11th, 2009. Excluding 38 invalid questionnaires, 282 copies were collected. The effective response rate is 88.13%.

Measurement Model

Measurement model is to examine the relationship between observed variables and the latent variables. Before evaluate whether the theoretical framework of the measurement model is sustained, one should first to examine whether the model has a good reliability and validity (Chen, 2007), and use construct reliability (CR) and variance extracted (VE) to evaluate whether the model has a goodness of fit. Fornell and Larcker (1981) suggested that if CR is higher than 0.6, it means the reliability is high and has a higher internal consistency. VE stands for the rate of explained variance to the latent construct. If VE is higher than 0.5, it represents that the latent construct has a better reliability and convergent validity (Fornell and Larcker, 1981). The results show that CR value of all endogenous and exogenous variables is between 0.79 and 0.81. It is higher than the suggested value 0.6 and all Cronbach's α is over 0.7. It

demonstrates that the model has a good reliability, and VE value of all endogenous and exogenous variables are greater than 0.5. In addition, the results of the standard loading of all endogenous and exogenous observed variable is greater than 0.5. It represents that the latent construct has a better reliability and convergent validity. The value is acceptable and has significant level (Tabachnicka & Fidell, 2007). It also indicates both endogenous and exogenous latent variable have not against estimation rules. Thus, all measurement items in endogenous and exogenous latent variable can reflect convergent validity to each variable.

Overall Model's Goodness-of-Fit

The study uses six indices to measure the overall model's goodness-of-fit. Evaluation standard for overall model fit are as follows: the smaller the χ^2 , the better the model-fit is, χ^2/df (normed chi-square) is less than 3.0, goodness of fit index (GFI) is greater than 0.9, adjusted goodness of fit index is greater than 0.9, root mean square error of approximation (RMSEA) is less than 0.8, and comparative fit index is greater than 0.9. As shown in Table 1, the results show that χ^2/df in Model 1 and Model 2 is greater than 3.0, and Model 3 and Model 4 are less than 3 (1.154 and 1.392 respectively). Therefore, Model 3 and Model 4 are acceptable. In addition, the other four measurement indices in Model 3 and Model 4 accord with or approach the suggestion standard. Overall, the model fit is within acceptable range. Besides, χ^2 in Model 4 is less than model 3, and model fit indices in Model 4 all accord with or are close to the suggestion standard. Thus, model 4 is an acceptable model among these four test models.

Table 1: Fit Indices for Confirmatory Factor Analysis

Research model	$\chi^2(df)$	χ^2/df	GFI	AGFI	RMSEA	CFI
0. Null Model	1269.9(454)	2.797	0.772	0.735	0.080	0.851
1. First-order CFA (one factor)	3725.6(464)	8.029	0.475	0.402	0.158	0.405
2. First-order CFA (no correlation)	1744.1(464)	3.759	0.682	0.638	0.099	0.766
3. First-order CFA (with correlation)	424.5(368)	1.154	0.916	0.880	0.023	0.990
4. Second-order CFA	368.8(265)	1.392	0.915	0.870	0.037	0.977

Structural Model

As shown in Table 2, the results of absolute model-fit measures indicate that χ^2 , normed chi-square, goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), root mean square residual (RMR), and root mean square error of approximation (RMSEA) all exceed their suggested acceptance levels, respectively. Moreover, the results of incremental fit measures show that all indices surpass their advised acceptance levels individually, and the value of comparative fit index (CFI), incremental fit index (IFI) and relative fit index (RFI) all reaches 0.999. Additionally, the results of parsimonious fit measures illustrate that parsimonious normed fit index (PNFI) and parsimonious goodness fit index (PGFI) are both over their recommended acceptance levels, 0.5. It expresses that all the model-fit indices of the structural model pass suggested acceptance levels, and the model has a fairly goodness fit.

Table 2: Fit Indices for Structural Model

Absolute model-fit measures	Recommended value	Results
χ^2	P-value > 0.05	369.5 (p=0.438)
χ^2/df	<3	1.010
Goodness-of-fit index (GFI)	>0.9	0.928

Adjusted goodness-of-fit index (AGFI)	>0.9	0.896
Root mean square residual (RMR)	<0.05	0.112
Root mean square error of approximation (RMSEA)	<0.05	0.006
Incremental fit measures		
Normed fit index (NFI)	>0.9	0.938
Non-normed fit index (NNFI)	>0.9	0.916
comparative fit index (CFI)	>0.9	0.999
Incremental fit index (IFI)	>0.9	0.999
Relative fit index (RFI)	>0.9	0.999
Parsimonious fit measures		
Parsimonious normed fit index (PNFI)	>0.5	0.692
parsimonious goodness fit index (PGFI)	>0.5	0.643

Further, the study proceeds to examine the hypotheses of the path coefficients of the structural model (see Figure 1). The results show that all hypotheses achieve the significant level except perceived usefulness → behavioral intention and perceived risk → perceived value. Perceived ease of use is positively affected to perceived usefulness ($\beta=0.39$). Perceived usefulness is positively affected to consumer attitude ($\beta= 0.55$). Perceived ease of use is positively affected to consumer attitude ($\beta= 0.14$). Consumer attitude is positively affected to behavioral intention ($\beta= 0.45$). Subjective norm is positively affected to behavioral intention ($\beta= 0.47$). Perceived risk is positively affected to behavioral intention ($\beta= 0.20$).

The study also measures the effects of among variables in each dimension. There are total effect, direct effect, and indirect effect, and total effect is equal to the sum of direct effect and indirect effect. The study examines indirect effect of dependent variable purchase intention in three paths including perceived usefulness → consumer attitude → behavioral intention, consumer attitude →behavioral intention and behavioral intention. The results show that the direct effect of purchase intention on behavioral intention and perceived value is 0.26 and 0.36, respectively (see Table 3).

Figure 1: Framework for Purchase Intention on Innovation Technology Smartphone

The results also show that there are no direct effects on exogenous variables, perceived ease of use, subjective norm and perceived risk, and indirect effects on purchase intention are 0.05, 0.12 and 0.05, respectively. Moreover, two endogenous variables: perceived usefulness and consumer attitude have no direct effect on purchase intention, and the indirect effects on purchase intention are 0.06 and 0.12.

Table 3: Direct Effect, Indirect Effect and Total Effect

Latent variables	Dependant variables	Indirect effect	Direct effect	Total effect
Perceived ease of use	Perceived usefulness	N.A.	0.39***	0.39
	Consumer attitude	0.21***	0.14*	0.35
	Behavioral intention	0.16***	N.A.	0.16
	Purchase intention	0.05***	N.A.	0.05
Subject norm	Behavioral intention	N.A.	0.47***	0.47
	Purchase intention	0.12***	N.A.	0.12
Perceived risk	Behavioral intention	N.A.	0.20***	0.20
	Perceived value	N.A.	N.A.	N.A.
	Purchase intention	0.05***	N.A.	0.05
Perceived usefulness	Consumer attitude	N.A.	0.55***	0.55
	Behavioral intention	N.A.	N.A.	N.A.
	Purchase intention	0.06***	N.A.	0.06
Consumer attitude	Behavioral intention	0.45***	N.A.	0.45
	Purchase intention	0.12***	N.A.	0.12
Behavioral Intention	Purchase intention	N.A.	0.26***	0.26
Perceived value	Purchase intention	N.A.	0.36***	0.36

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

CONCLUSION AND SUGGESTION

Based on TRA and TAM, this study used mobile phone users as research subject and structural equation modeling (SEM) to measure goodness-of-fit of the model. The results showed that the overall model has a goodness-of-fit. It demonstrates that the proposed theoretical model is supported. The study founds that perceived ease of use has a positive and significant effect on perceived usefulness and consumer attitude. It means that users do not have to spend too much effort on learning how to operate the innovation high tech smarhphone. In addition, the product can provide them with better learning or job efficiency and receive a very good evaluation from consumers. The study also revealed that perceived usefulness is positively and significantly affected to consumer attitude, and that consumer attitude is positively affected to behavioral intention. It implies that the provisions of functions and added value services of smartphone are of great helpful to users. However, perceived ease of use has no direct influence on behavioral intention. It can infer that users may think that smarphone is good of use on a variety of value added services, but the service fees are too high for them to afford it. Therefore, users may choose other alternatives to meet their need. That is why behavioral intention is not too high for mobile phone users. The results also exhibited that subjective norm has a positive effect on behavioral intention. It stands for that users may perceive if they do not have a smartphone it could mean that they can not fit in relatives, classmates, and friends' topic or they can not keep up with the fashion trends. Consequently, these situations will increase consumers' purchase intention.

Furthermore, the study discovered that perceived risk has a positive and significant effect on behavioral intention. Smartphone is a product with a novel technology. When its functions are too complex or quality is beyond expectation, consumers' perceived risk will arise. Hence, it is psychologically unavoidable for a consumer to worry about this new gimmick. However, a sales promotion from telecommunication companies may countervail consumers' perceived risk and increase their behavioral intention to own a smartphone. The results displayed perceived risk has no effect on perceived value. It can infer that perceived value is greater than perceived risk for a smartphone user. In other words, consumers will have perceived risk before buying a smartphone but the benefit of helping

their job efficiency balances off the cost of acquisition. Once consumers perceive the value of owning a smartphone is greater than their perceived risk and meet their expectation and requirement, they will go ahead to buy a smartphone. The study confirmed that perceived value has a positive and significant effect on purchase intention. It is the same as the findings of Teas and Agarwal (2000) and Wan (2006). That is, a smartphone can provide functions and value added services such as making conference calls, sending and receiving emails, watching stock market, weather report, and movie, shopping and buying tickets online, and global positioning system (GPS) which make consumers feel the utility to acquire a smartphone outpace the cost they pay. So, consumers purchase intention will increase.

The study finds that perceived usefulness has a positive and significant influence on consumer attitude, and the coefficient of the path is 0.55 which is the highest value among all hypothetical paths. It signifies that smartphone provides a variety of functions and easy to operate which can make a substantial help in life for users. For examples, mobile videos can make life full with joy. GPS can help users to better understand geographic location; Data transfer, wireless internet and online conference can advance work efficiency. All of these can receive a consumer's positive attitude and evaluation toward a smartphone. Thus, manufacturers are suggested to design a smartphone with a user friendly operational function in order to cater for consumers's requirement. In the meantime, if telecommunication operators can also reduce their value added service charges, it is believed that more and more consumers will be willing to purchase a smartphone. Moreover, the results exhibited that perceived value has the greatest direct effect on purchase intention. It can infer that perceived value can be a critical competitive advantage to a mobile manufacturer. Besides, most consumers will evaluate benefits they get and costs they pay. If mobile manufacturers and telecommunication operators can make their products and services more value than price, consumers will be more willing to purchase a smartphone.

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