

Innovation Resistance In a Smart Phone Environment : A Technology Acceptance Model Approach

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Abstract

The study developed the ideas of innovation resistance attitude in view of innovation delay, rejection, and objection. Authors developed the idea of innovation resistance attitudes of customers in view of innovation diffusion process. The study categorized the idea of resistance such as delay, rejection, and objection. The study hired the structural equation modeling to evaluate the relationships among the consumers' subjective variables such as incongruence, uncertainty, perceived performance, peer usage, and tradition orientation those were factored out by the survey test. These measured variables were analyzed into the innovation resistance related latent variables. The study provides the basic treatment to introduce new technologies and products to the superficially resisting customers. Those resisting customers might be future late adopters. The research results provide the basic arguments for prerequisite treatment to introduce smart phone in the global market place.

Keywords : Innovation Resistance, Smart Phone Industry, Customer Attitude

1. Introduction

Global phone manufacturers have launched smart phones as their strategic weapon especially for new market penetrations increase of profit per customer. Handheld smart phones are utilized as a new medium for accessing mobile contents in the global market replacing notebook computers and PDAs. Especially, the new paradigm of market structure has accelerated by application stores of Apple for smart phone users.

The new paradigm of market evoked the new digital ecology in three waves. The first wave is the software oriented but not hardware based development. As Apple's app stores has launched new markets and new ecology, the first wave is mainly based on the new software environment. The power of hardware manufacturers has shrunk as the market power shifted to the software manufacturers in the new ecology.

The second one is the exponential increases of customer demand for smart media. For example, when Korea has introduced the first smart phones in 2007, in less than three years, the number of users has increased to the 4 million [Samsung Economic Research Institute, 2010]. The speed and quantity of demand for smart media has been an exceptional case compare to other new technological products. The color television market waited more than 20 years to cover more than 80% of customers replace their old black and white television to the color television.

The third wave is the increasing power and knowledge of customers. The customers equipped with smart media shifted the power struc-

ture in the telecommunication market from the producers and government agencies to the knowledge customers and coalitions of customer groups. The customers equipped with the coalition power sometimes press and implicate the government agencies to shift the price policies.

These waves provide both opportunities and threats to the industry participants. The innovations of technologies provide higher level of sales volume and market opportunities. In the same vein, the customers' resistance to the new products and technologies also generated potential threat to the market participants.

We believe that resistance and acceptance of innovative product should not be treated as a mutually exclusive concept but be considered as a continuum from the innovation resistance to the innovation acceptance. In the similar vein, the company should deal the innovation resistance of customers as a dynamic mechanism of customers' new technology acceptance process. We believe that smart media manufacturers need to understand the dynamics of customers' new technology and product acceptance processes and to cultivate the fruit of innovative products especially in the smart phone market. The study is structured in two processes. Firstly, the study develops the theory of resistance of innovation in view of innovation processes. Secondly, we developed the variables of innovation resistance in the smart phone market based on the prior research. Those variables were analyzed as independent factors for customers' behavior such as delay, rejection, and objection.

2. Theoretical Background

2.1 Innovation Resistance

As innovation requires change of past behavior to the users, it inevitably brings resistance [Ram, 1987]. Customers hesitate to buy or use a new product by their fear, uncertainty, and suspicion. In this view, innovation acceptance and expansion requires overcoming the innovation resistance. Most researches however, treated the innovation process as a new product development or market penetration. The new product and new market is assumed as a positive good. Zaltman and Wallendorf [1983] referred innovation resistance as actions to keep the status quo. Rao [2007] mentioned the resistance as the effect of horror to the unknown area.

Ram [1987] mentioned the resistance as a provided resistance by customers because the level of resistance is strongly related with personal characteristics. He also believed that innovation acceptance should occur after overcoming the innovation resistance. If the resistance is high enough to overcome, innovation acceptance and spread will not occur.

Innovation resistance in the smart phone market can be inferred as negative reaction and attitude to the new type of product. Ram and Sheth [1989] wrote that customers resist when they perceive the risk related with the innovation. The perceived risks can be categorized as usage block, image block, and tradition block. The innovation is relatively easier when the innovation provides representative advantages and it does not inhibit traditional value. How-

ever, if the innovation is complex and requires more learning, innovation resistance will increase.

2.2 Literature Reviews in Innovation Resistance

Sheth [1987] proposed that innovation acceptance and spread require personal psychological variables such as habit toward existing bias and habit toward perceived risk. Ram and Sheth [1987] also provided various typologies toward resistances such as customer characteristics, product characteristics, and environmental characteristics.

They proposed that the variables related with customers' innovation resistance are perceived resistance characteristics, customer characteristics, and innovation diffusion path. Perceived innovation characteristics are composed with two sub factors such as customer's dependence factors and customer's independence factors. Customer's dependence factors are relative advantage, fit, perceived risk, complexity, and anti-innovative effect. Customer's independence factors are timeliness, diversity, communicability, return ability, and feasibility [Rogers, 1983; Zaltman and Duncan, 1977]. The customer characteristics are related with relatively psychological factors such as attitude, value, and innovation experiences. Innovation diffusion path is related with marketing mechanism such as advertisement and words of mouth.

Szmigin and Gordon [1981] proposed that customers' innovation resistance can be categorized in three phases such as rejection, postponement, and opposition. They also developed the idea that rejection and acceptance are not

opposite but the continuum of cognitive process. Rejection means the user believes the benefit of the innovation is meaningless. Once rejected, the customer won't accept till the innovation shows major change. Postponement stage sees some understanding and positive evaluation to the innovation. However, still customers hesitate to purchase. Opposition means the users already tested and experienced the innovation and still reject the innovation. Mainly these opposition cases are based on cognitive style and attitude. Kleijnen and others [2009] explains that the innovation resistance is composed with layers such as delay, reject, and oppose. Every layer has significant relationship with factors referred before.

2.3 Innovation Resistance by the Level of Innovation Acceptance

Rogers [1983] analyzed the psychological process of innovation acceptance in five stages. The stages are from the perception stage and through persuasion, decision, execution, and to confirmation stage. In the perception stage, customers recognize the innovation a little and gather some information concerning the innovation. In the persuasion stage, the customers build the attitude to the innovation either positive or negative way. Customers are strongly influenced by the perceived characteristics. In the decision stage, customers decide either to accept the innovation or reject it. In the execution stage, customers practically use the innovation. In the confirmation stage, customers either fortify their decision or change their prior decision by the negative in-

formation from the outside.

Rogers [1983] categorized the customers by the speed of new product acceptance as innovators, adopters, early majority, late majority and laggards. Moore and Lehmann [1980] proposed technology adoption life cycle similar to Rogers. He categorized customer's new technology adoption similar to Rogers such as technological enthusiasts, visionaries, pragmatists, conservatives, and skeptics.

Reference price is another factor to influence customer's purchase decision. Most reference price research covers internal reference price that is an abstract price in human mentality. This can be referred as aspiration price, market price, historical price, and adjustment price. The reference price is utilized as a comparison point that can tell the price is high or low. Kaplan and others [1974] utilized choice modeling to demonstrate customers' internal acceptance price is set by the customer's reference price. Moreover, customers' knowledge level concerning the product is a key factor for strong internal reference price.

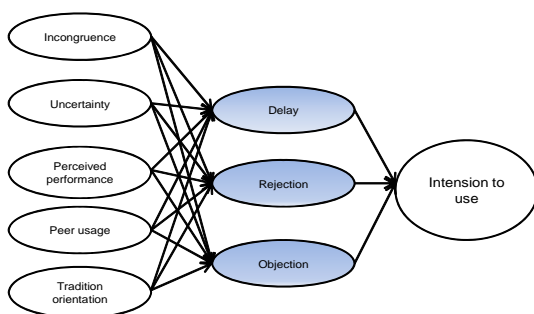
2.4 Research Variables Extracted From the Previous Research

We developed the research idea based on the five stage model of Rogers [1983] and Szmigin and Gordon's [1981] innovation resistance phases. The five stage model provided basic argument concerning the dynamic perception process for innovation. The model shed a light concerning the change of customers' attitude and perception to the newly developed ideas and products. The

variable of incongruence, uncertainty, and perceived performance were derived by the research of Bell [1967]. Peer usage and tradition orientation variables were followed by Gibson [1999].

Szmigin and Gordon's [1981] idea infers the behavior of customers to the newly developed ideas and product such as rejection, postponement, and opposition. In the development phase of independent variables, Ram and Sheth's [1987] research concerning various typologies toward resistances provides the basic idea to categorize the independent factors such as incongruence, uncertainty, perceived performance, peer usage, and tradition orientation.

3. Research Model and Hypotheses



〈Figure 1〉 Research Model

3.1 Incongruence

Cognitive incongruence is experienced when the advantages of unselected alternative overwhelm the selected alternative. Bell [1967] defined the cognitive incongruence as the level of anxiety for purchase decision and service level compared to others with the same price. People feel cognitive incongruence when they meet negative information for the product they purchased. The complexity of smart phone can gen-

erate the cognitive anxiety for the customers.

Hypothesis 1-1 : The perceived cognitive incongruence has positive effect to the innovation delay.

Hypothesis 1-2 : The perceived cognitive incongruence has positive effect to the innovation rejection.

Hypothesis 1-3 : The perceived cognitive incongruence has positive effect to the innovation objection

3.2 Uncertainty

Uncertainty can be categorized into two areas such as product related and technology related uncertainties. Product related uncertainty includes loss of interest to the product, unexpected functional error, and uncomfortable usage and functions. Technology related uncertainty includes shortened product life cycle related problems. Sheth [1981] proposed that considering innovation diffusion and acceptance, they need to calculate the psychological variables related with personal resistance. As the level of innovativeness is stronger, the resistance level increases. Customers are apt to regret strongly especially when they purchase the product that contains higher level of innovativeness.

Hypothesis 2-1 : Uncertainties of smart phone have a positive relationship with innovation delay.

Hypothesis 2-2 : Uncertainties of smart phone have a positive relationship with innovation rejection.

Hypothesis 2-3 : Uncertainties of smart phone have a positive relationship with innovation

objection.

3.3 Perceived Performance

Internal motivation theory can explain the relationship between perceived performance of the smart phone and innovation resistance [Bassett-Jones and Lloyd, 2005]. Internal motivation theory proposes that perceived performance can increase the level of satisfaction to the product. The increased level of satisfaction eventually stimulates the compensation about the new product. This kind of relative subjective factor motivates the level of positive acceptance of smart phone. Based on the discussions about the perceived performance, the hypotheses were generated below.

Hypothesis 3-1 : The perceived performance to the smart phone has a positive relationship with innovation delay.

Hypothesis 3-2 : The perceived performance to the smart phone has a positive relationship with innovation rejection.

Hypothesis 3-3 : The perceived performance to the smart phone has a positive relationship with innovation objection.

3.4 Peer usage

The peer pressure and social implication affects decreasing innovation resistance [Pan Hui and Buchegger, 2009]. They also found out social structure, support from the boss, and peer group usage have a positive implication to accept the innovative product. Especially, Confucius culture areas such as Korea and China have stronger impact for innovation usage [Gibson,

1999]. Innovation acceptance perspective provides an implication concerning internalization of social pressure. If the peers or bosses suggest an innovative product, individuals buy the idea without hesitation. Based on the argument, the hypotheses below were generated.

Hypothesis 4-1 : The usage of peers has a negative relationship with innovation delay.

Hypothesis 4-2 : The usage of peers has a negative relationship with innovation rejection.

Hypothesis 4-3 : The usage of peers has a negative relationship with innovation objection.

3.5 Tradition Orientation

Tichy [1983] and Watson [1971] proposed that the resistance to give up traditional behavior is a general characteristic of resistance to the change. Most researchers concerning tradition oriented customers agree that the rejection to change mainly come from the situation that familiarity breeds comfort. Tradition oriented customers prefer familiar product environment than the new product environment [Oreg, 2003]. Oreg [2006] also found out that tradition orientation has a positive relationship with innovation resistance.

Hypothesis 5-1 : The tradition orientation tendency has a positive relationship with innovation delay.

Hypothesis 5-2 : The tradition orientation tendency has a positive relationship with innovation rejection.

Hypothesis 5-3 : The tradition orientation tendency has a positive relationship with innovation objection.

3.6 Innovation Resistance and Intention to Use

Ram [1987] proposed the strong relationships between innovation resistance and purchase decision. He also asserted that proposing the merits of the product and minimizing customer resistance increased the level of product acceptance and expansion of the product. The innovation resistance and acceptance are constantly changing during the innovation process. As Ram [1987] proposed, the customers who resisted the innovation may accept the innovation when the level of market acceptance has passed the critical point or critical mass. However, the innovation resistance decreases the level of intention to use.

Hypothesis 6-1 : The customers' resistance to the smart phone usage that led to the innovation delay has a negative relationship

with intention to use.

Hypothesis 6-2 : The customers' resistance to the smart phone usage that led to the innovation rejection has a negative relationship with intention to use.

Hypothesis 6-3 : The customers' resistance to the smart phone usage that led to the innovation objection has a negative relationship with intention to use.

4. Methods

4.1 Data Collection and Research Methodology

The study employed survey research method in order to find out factors for smart phone usage resistance and to develop strategy for increasing acceptance. The questionnaires were first pilot tested by 4 academic members and 3 public people. After pilot test, questionnaires

<Table 1> Definitions of Variables, Operational Definitions, and References

		Operational definition		References	# of questionnaire
Independent factors	Incongruence	The level of psychological conflicts that old phone may be better than the new one		Festinger [1957], Bell [1967]	3
	Uncertainty	The level of fear for the possible problems from the new technology product		Moore and Lehmann [1980], Reilly and Conover [1983]	2
	Perceived performance	The level of performance (quality)		Christen et al., [2006], Netemeye et al. [2005]	2
	Peer usage	The level of implication by use of peers		Schillewaert et al. [2005], Ahearn et al. [2005], Gatignon and Robertson [1985], Bechererand and Richard [1978]	3
	Tradition orientation	The level of resistance to give up the old paradigm		Oreg [2003]	3
Dependent factors	Innovation resistance	Delay	Intention to purchase later	Szmigin and Foxall [1998]	3
		Rejection	No intention to purchase without serious level of improvement		3
		Objection	No intention to purchase		3
	Intension to use	The level of desire to purchase and use the smart phone		Rogers and Shoemaker [1971], Agarwal and Prasad [1997]	4

<Table 2> Factor Loadings

Dimension	Item	Std. Loading	Compound Reliability	Average	Cronbach's α
Incongruence	A1	0.817	0.857	0.668	0.851
	A2	0.707			
	A3	0.915			
Uncertainty	B1	0.733	0.751	0.502	0.751
	B2	0.662			
	B3	0.729			
Perceived performance	C1	0.827	0.838	0.722	0.837
	C2	0.872			
Peer usage	D1	0.786	0.879	0.708	0.878
	D2	0.861			
	D3	0.874			
Tradition orientation	E1	0.985	0.966	0.934	0.965
	E2	0.947			
Innovation resistance Delay	G1	0.869	0.883	0.719	0.876
	G2	0.944			
	G3	0.715			
Innovation resistance Reject	H1	0.818	0.839	0.640	0.824
	H2	0.928			
	H3	0.625			
Innovation resistance Object	I1	0.853	0.845	0.645	0.845
	I2	0.768			
	I3	0.785			
Intension to use	J1	0.938	0.929	0.768	0.928
	J2	0.916			
	J3	0.852			
	J4	0.793			

<Table 3> Discriminant Validity and Correlations Coefficients

Var	Mean (SD)	A	C	E	B	D	J	G	H	I
Incongruence	3.885 (1.451)	0.817								
Uncertainty	3.752 (1.441)	0.681	0.850							
Perceived performance	3.349 (1.695)	0.267	0.401	0.966						
Peer usage	4.943 (1.355)	0.106	0.160	0.537	0.708					
Tradition orientation	3.956 (1.625)	-0.344	-0.293	-0.233	0.067	0.841				
Delay	4.005 (1.478)	-0.489	-0.531	-0.391	0.015	0.671	0.876			
Rejection	4.795 (1.544)	0.114	0.147	0.238	0.538	0.039	-0.068	0.848		
Objection	3.495 (1.420)	0.503	0.502	0.300	0.228	-0.251	-0.369	0.139	0.800	
Intension to use	3.260 (1.562)	0.515	0.519	0.486	0.110	-0.374	-0.591	0.079	0.567	0.803

were distributed and collected. The sample was collected from 159 respondents. The sample is composed of 54.1% of male, and 45.9% of female. Ages are mainly 20s that count for 49.7% and 30s (37.7%), 40s (9.4%) and 50s (1.3%). Most respondents had college graduation (55.3%), graduate school (20.8%), college (15.7%), and others (8.2%). The study hired structural equation modeling in order to evaluate the relationships among factors and latent variables. <Table 1> presents the variables, operational definitions, and references.

The study employed 2-level approaches [Bran-nick, 1990]. Firstly, we measured validity and then utilized structural equation modeling. The confirmatory factor analysis evaluates validity and reliability of variables. The factors were streamlined by confirmatory factor. The criteria for appropriate level of factor loading were 0.6 with higher level of t-value 2.0. <Table 2> describes the loadings.

<Table 3> presents discriminative validity by utilizing correlation coefficient among re-

search variables. The compound reliability of the research variables and Cronbach's alpha were both higher than 0.7. This means that the variables and the research construct constituted the internal validity [Hair et al., 1998].

4.2 Test the Hypotheses Using Structural Equation Modeling

The structural equation modeling came out the results such as $\chi^2 = 532.192$, $df = 271$, $\chi^2/df = 1.964$, $p = 0.00$, $RMR = 0.0951$, $GFI = 0.794$, $CFI = 0.952$, and $NNFI = 0.942$. Most researchers approve the results of structural equation modeling result such as $RMR < 1.0$, $GFI > 0.9$, $NNFI > 0.9$, and $CFI > 0.9$ [Zheng and Pavlou, 2010]. Tables below present the results of hypotheses.

The hypotheses testing (Hn-1) results show that only uncertainty has a significant relationship among 5 factors of innovation resistance. The hypotheses (Hn-2) shows incongruence has a significant relationship with innovation resistance. The hypotheses (Hn-3) shows incongruence,

<Table 4> Results of Innovation Delay

construct	Hypotheses	relationship	Path coefficient	Std. error	t-value	result
Incongruence	H1-1	+	0.034	0.124	0.272	reject
Uncertainty	H2-1	+	0.516	0.100	5.151	accept
Perceived performance	H3-1	+	0.031	0.131	0.234	reject
Peer usage	H4-1	-	0.037	0.089	0.418	reject
Tradition orientation	H5-1	+	0.036	0.092	0.389	reject

<Table 5> Results of Innovation Resistance Rejection

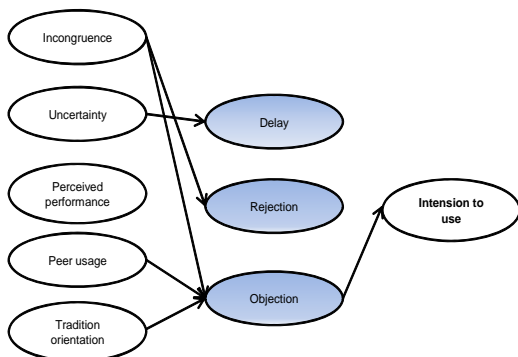
construct	Hypotheses	relationship	Path coefficient	Std. error	t-value	result
Incongruence	H1-2	+	0.288	0.120	2.398	accept
Uncertainty	H2-2	+	0.133	0.090	1.483	reject
Perceived performance	H3-2	+	0.243	0.126	1.925	reject
Peer usage	H4-2	-	-0.088	0.084	-1.048	reject
Tradition orientation	H5-2	+	0.052	0.087	0.597	reject

<Table 6> Results of Innovation Resistance Objection

construct	Hypotheses	relationship	Path coefficient	Std. error	t-value	result
Incongruence	H1-3	+	0.245	0.110	2.225	accept
Uncertainty	H2-3	+	-0.079	0.083	-0.943	reject
Perceived performance	H3-3	+	0.225	0.116	1.933	reject
Peer usage	H4-3	-	-0.236	0.079	-2.975	accept
Tradition orientation	H5-3	+	0.320	0.084	3.794	accept

<Table 7> Results of Innovation Resistance and Intension to use

construct	Hypotheses	Expected relationship	Path coefficient	Std. error	t-value	result
Delay	H7-1	-	-0.008	0.069	-0.117	reject
Object	H7-2	-	-0.653	0.087	-7.462	accept
Reject	H7-3	-	-0.049	0.076	-0.642	reject



<Figure 2> Significant Relationships of Research Model

peer usage, and tradition orientation have significant relationship with innovation resistance. Hypotheses 7 results that only objection shows significant relationship with intention to use. As the absolute value of t-value is important than the sign of the value, the study did not explain the sign part. Most signs are based on the coding in this kind of study. However, as the research cannot be without the measurement error, the result is insufficient to delete the variables annotated by the previous research.

5. Conclusions and Future Research

Smart phone emerges as a key medium in the mobile industry these days. The industry participants such as phone manufacturers, network providers, contents providers and phone retailers are apt to new business environment. The research will provide some ideas concerning innovation resistance to the smart phone environment. The empirical study provides the references for the innovation resistance and its control possibilities. As the study result shows innovation objection has a significant relationship with intention to use.

For the public acceptance of smart phone, the phones need to decrease the customers' resistance through user friendly user interface, representative attractiveness, and other advantages that feature phone cannot provide. Secondly, the phone needs to gain economy of scale. The important role of decreasing innovation resistance is peer usages. The Asian culture especially appreciates

peer evaluation and usage. Peer usage has a positive relationship with innovation acceptance [Gibson, 1999]. Thirdly, the industry participants need to induce interests to the smart phones through emphasizing changing environment such as social network and mobile functions. Most smart phone avoiders attribute to the habitual pursuit or uncomfortable situation to the change of old tradition.

The research is not without limitations. The limitations are mainly three folds. First, the possible biases of samples. The respondents are from the convenient sampling from the university, the income situation may affect the result. Secondly, the number of respondents is relatively small. The research construct requires at least 200 and more of respondents. However, the study employs only 159. Finally, the variables constructed in the research such as incongruence, uncertainty, usefulness, peer usage, and habits may not integrate the entire possible domain concerning innovation resistance.

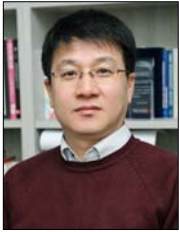
The future research needs to expand the sample size and integrate more representative samples for the real marketing purposes. The research domain also needs to expand to calculate possible variables concerning innovation resistance to the specific product market in the smart phone industry.

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