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An Analysis of Consuming Behavior Model for Adopting Knowledge Intensive Technological Product: The Case of MDA

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Abstract

The objective of this research is to analyze the correlation between consumers' adoption of MDA and some of its influential variables, namely innovativeness, procurement types, involvement, the degree of Internet used and the basic characteristics of consumers. This paper provides a new model to explain the influent effects between consumers' adoption of MDA and its influential factors mentioned above. The conclusions of this study are: (1) the curves of consumers' basic characteristics versus adoption of MDA are convex-type. (2) The consumers' age, name-list size, innovation adoption, goal-oriented and Internet usage frequency attributes have direct and positive effects on PDA adoption. (3) The innovativeness of consumers may be used to explain the reason of Consumers' procurement style. (4) The innovativeness of consumers may be used to exploit and design the product differentiation strategy. (5) The basic characteristics of consumers may be used to exploit and design the promotion and market segmentation strategies.

1. Introduction

As Internet gets widely used and digital devices get smaller and smarter, information appliances (IA) that are mobile, lightweight, versatile become popular and essential in market to suit for knowledge users daily usage. Although many products are named information appliances, the mobile digit assistant (MDA) is the representative category.

Consumer behavior is defined as the consumers' behavior to search, evaluate, procure, use and process some products, services and ideas. However consumers have many facets which affect the consumer adopting the MDA, like sex, education, occupation, innovativeness, attitude for impulsive or planning buying, the degree of Internet usage, etc. Many scholars apply single perspective to discuss consumer behavior. Like perspective of innovativeness [17], impulsive buying perspective [18] and information search perspective [21]. However since the fast progress of technology, the shorting of product life cycle, the highly changeability of consumers' demand, using single perspective to explain consumer behavior is not enough. Based on the consumer-oriented trend, this paper hopes to construct an integrated model to exploit the adoption MDA of consumer behavior. Besides to understand more the consumer behavior when facing fast changeable or upgraded products, the conclusion of this paper also can provide more significant marketing strategy for the suppliers of MDA business.

2. Theory and Hypotheses

At past, some researchers view consumer behavior with focus on the action process of consuming [1] [14] [19]. Some other researchers refer consumer behavior as both the action process and the decision making process of consuming [3] [4] [24]. We may define the consumer behavior as "in order to satisfy ones need, consumers make consuming decision and take procurement action for some products or services". The processes include searching, evaluating, purchasing, and post purchase reevaluating. We may use the modified consumer decision model to describe the consumer procurement processes. And the basic characters of consumers (like sex, ages, education…) will affect the adoption of MDA.

Consumers' innovativeness and risk aversion also are very important factors for adoption of innovation products [2] [9] [15] [17]. Since Internet is a new channel for information search and procurement, the higher the perceived knowledge of Internet, the higher degree of Internet usage, and the higher the degree of MDA adoption. So the Internet perceived trend and Internet usage frequency are significant factors for adoption of MDA [11].

Impulsive buying is referring to impulsive, out of control and guilty procurement behavior [5] [16] [18] [22] [23]. Although the MDA procurement is also involved the impulsive character, the MDA buying behavior is based on need and affected by the mood at selling places, as well as sales and promotion strategy. We call this procurement behavior as "shopping around". The opposite procurement type is goal oriented buying [8]. Our research shows that both affect the adoption of MDA. The consumer's involvement is also an important factor on procurement of products and services [6] [13]. Especially from the perspective of information search [20] [21], the number of shopping mall, the number of brand and the number of product attributes are important factors of adoption MDA [10]. So, this paper uses

"brand-channel involvement" to represent the consumer involvement concept.

Mobile digital assistant (MDA) is referred to "the mobile digital equipment to assist and satisfy the customers' life and work need". In this research, we investigate the most technology and fashion influential products, namely, personal digital assistant (PDA) and cellular phone (CP). The objective of this research is to analyze the correlation between consumers' adoption of MDA and some of its influential variables, namely innovativeness, procurement types, involvement, the degree of Internet usage and the basic characteristics of consumers.

The overall conceptual model of this paper is as figure.1. According to literature review, conceptual model and experience, we get two parts of hypotheses. One part is logic inference and the other is about conceptual model.

(1). Logic inference:

H1: The curves of consumers' ages versus adoption of MDA (PDA and CP) are first increasing then decreasing (convex-type), which should have a peak. The curve of consumers' adoption of CP is higher than that of PDA.

H2: The curves of consumers' name-list-size versus adoption of MDA are convex-type. As consumers' name-list-size increases, the number of PDA consumer is higher than that of CP consumer.

H3: The growth curve of innovativeness of MDA is from bottom to up (market-oriented). The curve of CP adoption is closer to the diffusion of innovation theoretic curve than that of PDA.

H4: For Internet users, the curve of consumers' ages versus Internet usage frequency is convex-type, which should has a peak. But for non-Internet customers, the degree of Internet usage frequency decreases as the customers' age increases.

H5: As the degree of consumers' goal-oriented increases, the Internet usage frequency increases. As the degree of consumers' shopping-around increases, the Internet usage frequency increases.

(2). Conceptual model:

H6: The adoption of MDA (PDA and CP) is no related with the consumers' basic characteristics.

H7: The adoption of MDA (PDA and CP) is no related with the consumer's innovativeness.

H8: The adoption of MDA (PDA and CP) is no related with the consumers' procurement types.

H9: The adoption of MDA (PDA and CP) is no related with the consumers' Internet using frequency.

H10: The adoption of MDA (PDA and CP) is no related with the consumers' brand-channel involvement.

H11: When adoption the MDA, the consumers' innovativeness is no related with their Internet using frequency.

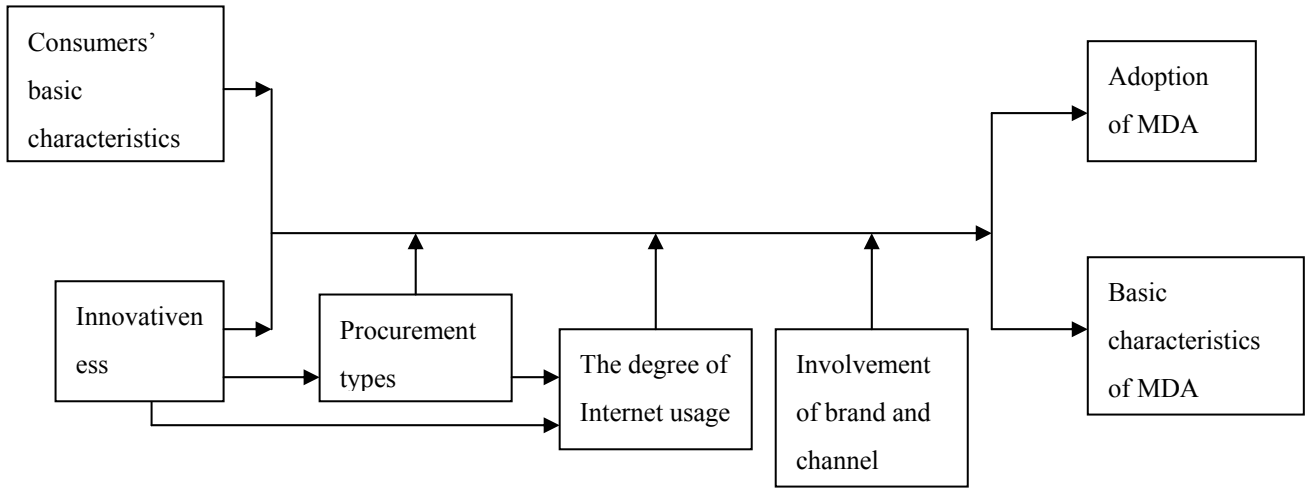
H12: When adoption the MDA, the consumers' innovativeness is no related with their procurement types.

H13: When adoption the MDA, the consumers' innovativeness is no related with the product and channel characters of MDA.

H14: The consumers' basic characteristics are not related with the product and channel characters of MDA.

3. Data and Research Method

This paper provides a new model to explain the influence effects between consumers' adoption of MDA and its influential factors mentioned above. For effectiveness and cost consideration, this research using convenience sample. We totally sent 477 questionnaires and received 352 effective ones since 2001/4/20 to 2001/5/11. From 86 of these (24.4%), we received questionnaires from customers who both use the PDA and CP. From 307 of these (87.2%), we received questionnaires from customers who only use the CP.



Figuer1： The overall conceptual model

The coefficients of reliability (Cronbach' α) for the variables (innovativeness, procurement types, etc.) are above 0.7 [12]. To test the construct validity of questionnaire perceptual measure, we use regression analysis and ANOVA. The coefficients of these relations are significant ($p < .05$).

To test the conceptual model and corresponding hypothesis, we use LISREL model ($\eta = \Gamma \xi + B \eta + \zeta$, significant with GFI=.88, CFI=.93 and NNFI=.89), factor analysis, ANOVA and canonical correlation analysis.

4. Results and Discussions

The results of testing hypotheses are summarized in tables 1 and 2.

Table1 Logic inference hypotheses testing table

Hypo	Relation	Results	Commend / Explanation
H1	Consumers' age vs. the adoption of MDA	Partial support	(1) Peaks are all at ages of 26~30； (2) Cp is higher than PDA； But (3)peaks of CP and PDA at the same age level。
H2	Consumers' name-list-size vs. the adoption of MDA	Support	(1) Cp peak at no.25~34，PDA peak at no.21； (2)The name-list-size larger, the percentage of adoption PDA higher。
H3	Consumers' innovativeness vs. the adoption of MDA	Support	(1) The growth curve of innovativeness of MDA is market-oriented； (2) The curve of CP adoption is closer to the diffusion of innovation theoretic curve than that of PDA.
H4	Consumers' age vs. Internet using frequency	Support	(1) For Internet users, the curve is convex-type and the peak at ages of 25~35 years old； (2) For non-Internet users, the degree of Internet using frequency decreases as the customers' age increases。
H5	Consumers' procurement type vs. Internet using frequency	Partial support	(1) The goal-oriented users' Internet using frequency is higher than the shopping around users； (2) The higher the degree of goal-oriented, the higher the Internet using frequency； (3) But as the degree of consumers' shopping-around increases, the Internet usage frequency first increases then decreases.

Table2 Conceptual model hypotheses testing table

Hypo	Details	Relations	Results	Commend / Explanation
H6	H6	Basic characteristics→adoption of MDA	Support	Significant effect to PDA
	H6-1	Basic characteristics→adoption of PDA	Support	Significant effect of age, name-list-size
	H6-2	Basic characteristics→adoption of CP	Not support	Cp is a popular product
H7	H7	Innovativeness→adoption of MDA	Support	Significant effect to PDA
	H7-1	Innovativeness→adoption of PDA	Support	Significant effect of Innovativeness adoption
	H7-2	Innovativeness→adoption of CP	Not support	CP is a popular product
H8	H8	Procurement type→adoption of MDA	Support	Significant effect to PDA and CP
	H8-1	Procurement type→adoption of PDA	Support	Goal-oriented has significant effect to PDA
	H8-2	Procurement type→adoption of CP	Support	Shopping around has significant effect to CP
H9	H9	The degree of using Internet→adoption of MDA	Support	Significant effect to PDA
	H9-1	The degree of using Internet→adoption of PDA	Support	Significant effect to PDA
	H9-2	The degree of using Internet→adoption of CP	Not support	Internet is no business with CP's function

H10	H10	Brand-channel involvement → adoption of MDA	Support	Significant effect to CP
	H10-1	Brand-channel involvement → adoption of PDA	Not support	To accumulate knowledge about new product, so not have to buy it
	H10-2	Brand-channel involvement→adoption of CP	Support	Significant effect to CP
H11	H11	Innovativeness→Internet using frequency	Support	Significant effect
H12	H12	Innovativeness→Procurement type	Support	Significant effect
H13	H13	Innovativeness→the attributes of MDA product and channel	Support	Significant effect to PDA, CP
	H13-1	Innovativeness→PDA product attributes	Support	Significant effect
	H13-2	Innovativeness→PDA channel attributes	Support	Significant effect
	H13-3	Innovativeness→PDA upgrade attributes	Support	Significant effect
	H13-4	Innovativeness→CP product attributes	Support	Significant effect
	H13-5	Innovativeness→CP channel attributes	Support	Significant effect
	H13-6	Innovativeness→CP upgrade attributes	Support	Significant effect
H14	H14	Consumers' basic characteristics→the attributes of MDA product and channel	Support	Significant effect to PDA, CP
	H14-1	Basic characteristics→PDA product attributes	Support	Significant effect
	H14-2	Basic characteristics→PDA channel attributes	Support	Significant effect
	H14-3	Basic characteristics→PDA upgrade attributes	Support	Significant effect
	H14-4	Basic characteristics→CP product attributes	Support	Significant effect
	H14-5	Basic characteristics→CP channel attributes	Support	Significant effect
	H14-6	Basic characteristics→CP upgrade attributes	Support	Significant effect

Some results of hypotheses test are not significant. We now discuss the results as follow:

(1)H1：The statistics results show not exactly consistent with hypothesis 1. The reasonable explanation is that the most frequently usage computer person is about 25-35 years old. So the percentage to use PDA is also higher. However Cp becomes a popular product. The age of 25-35 also becomes the highest fashion pursuing and friends-communication groups. So adoption of CP is also highest.

(2)H5：The statistics results show not exactly consistent with hypothesis 5. The reasonable explanation is that Internet benefits (ex. fast searching and quick ordering) are an essential incentive for goal-oriented consumers. Therefore the higher customers' degree of goal oriented, the higher which degree of Internet used. But for shopping around trend customers, Internet just one of many sources of information. Yet person-to-person interactions are more attractive for shopping around trend customers than Internet bothering problems (like long-run waiting time, security, no physical tying). Therefore the higher customers' degree of shopping around, the lower which degree of Internet used.

(3)H6-2：The statistics results not support hypothesis H6-2. According MIC [7] data shows that Taiwan customers use about eighteen million CPs. Almost everybody has over one CPs. Therefore CP become an ordinary and popular product. No some groups (like age, occupation, grade, or incomes) are special cases for adoption of CP.

(4)H7-2：The statistics results not support hypothesis H7-2. As (1), CP becomes an ordinary and popular product. There is no problem of adoption of CP. Yet there is a problem of adoption of CP about what type, what color and what special price. So innovativeness has nothing to do with adoption of CP.

(5)H9-2：The statistics results not support hypothesis H9-2. The reasonable explanation is that PDA functions are similar to PC or notebook. But CP main function is to communicate. The correlation about computer and Internet seems not significant. Especially using WAP to

download data is very slow and expansive. So the degree of Internet used has nothing to do with adoption of CP.

(6)H10-1：The statistics results not support hypothesis H10-1. We may from social-psychology perspective to explain this result. Since PDA is an innovation so far. Even many customers haven't the need to buy one. They also collect and search PDA information. They not only enjoy shopping but also gather new knowledge to become a market expert. Therefore the brand-channel involvement may not have direct effect in procurement of PDA.

5. Conclusion and Suggestion

The main finding of this study are as follows：

5.1 The distribution of consumers behavior

(1)The curves of consumers' ages versus adoption of MDA are convex-type, which have peak at 26~30 ages. The curve of consumers' adoption of CP is higher than that of PDA. The curves are as figure 2.

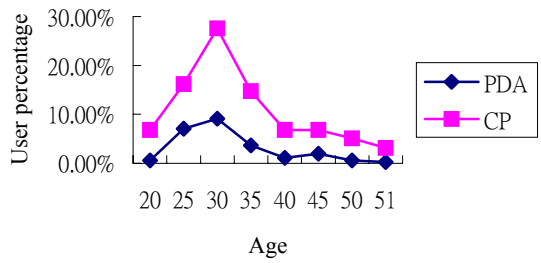


Figure 2. Consumer age and adoption of MDA

(2)The curves of consumers' name-list-size versus adoption of MDA are convex-type. As consumers' name-list-size increases, the number of PDA consumer increases, but that of CP consumer decreases. The curves are as figure 3.

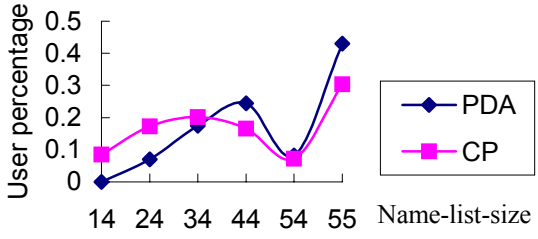


Figure 3. Consumers' name-list-size and adoption of MDA

(3)The growth curve of innovativeness of MDA is market-oriented. The curve of CP adoption is closer to the diffusion theoretic curve than that of PDA. The curves are as figure 4.

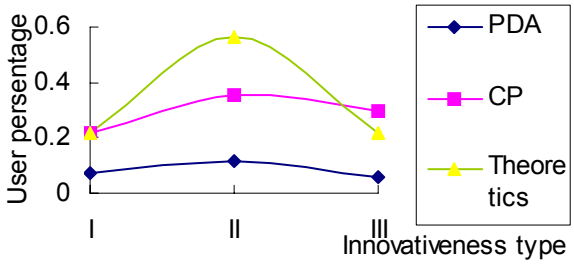


Figure 4. Consumers' innovativeness and adoption of MDA

(4)The curve of consumers' ages versus Internet using frequency is convex-type, which has peak at 26~35 ages. However, the elder age of consumers, the more rate of non-Internet user. The curves are as figure 5.

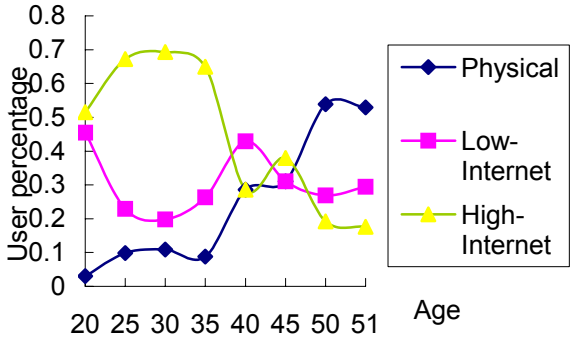


Figure 5. The customer's age and the Internet usage frequency

(5)The Internet usage frequency of the goal-oriented consumers is higher than that of the shopping-oriented. As the degree of consumers' goal-oriented increases, the Internet usage frequency increases. The curves are as figure 6.

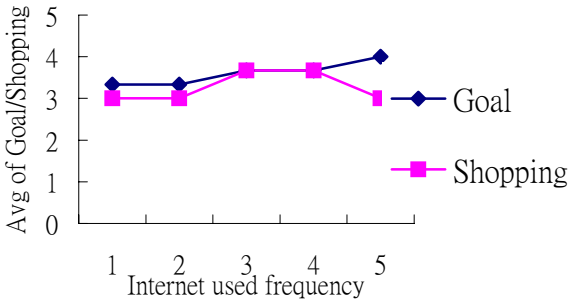


Figure 6. Procurement type and Internet usage

5.2 The results of statistics analysis

(1) The consumers' age, name-list size, innovation adoption, goal-oriented and Internet usage frequency attributes have direct and positive effects on PDA adoption. The consumers' occupation, shopping-oriented and brand-channel involvement attributes have direct effects on CP adoption. The conclusions are summary in table 3.

Table 3. The summary of directly affective factors of adoption MDA

	Adoption of PDA	Adoption of CP
Age	X	
Occupation		X
Name-list-value	X	
Innovation adoption	X	
Risk aversion		
Goal-oriented	X	
Shopping around		X
Brand-channel involvement		X
Internet used trend		
Internet used frequency	X	

(2) Innovativeness, procurement types and degree of Internet usage are intermediate variables.
(3) The innovativeness attribute of consumers has direct and positive effect on procurement type.
(4) The innovativeness and basic characteristics of consumers have statistical influence on MDA product attributes, channel attributes and upgrade attributes.

The above findings are significant to the theoretical and managerial implication in the following aspects：

(1) This research results are consistent with innovation diffusion theory, cost and efficiency theory and social-psychology theory of information searching.
(2) The innovativeness of consumers may be used to explain the reason of Consumers' procurement style.
(3) The innovativeness of consumers may be used to exploit and design the product differentiation strategy. Businesses may use new products, fashion style and high price strategy for consumers of high innovativeness, use brand-building, information service and advertise promotion for consumers of medium innovativeness and use brand-building, convenient procurement and low price strategy for consumers of low innovativeness. The conclusions are summary in table 4.
(4) The basic characteristics of consumers may be used to exploit and design the promotion and market segmentation strategies. For example, Businesses may offer high compatible and high expansive product for male or consumers of high innovativeness. Businesses may offer basic functional and integrated of hardware and software product for peoples ages from 46 to 50 or architects and builders or free-lancer or consumers of low innovativeness. Businesses may offer professional services and promotion for female or graduates or mouth incomes of seventy-eighty thousand or consumers of low innovativeness. Businesses may offer excellent repairs and guarantees for incomes of ninety-one hundred or consumers of low innovativeness, and offer additional information services and price discount which will produce more attractive effects for consumers of low innovativeness. The conclusions are summary in table 5.

Table 4. The summary of consumer's innovativeness and the degree of PDA product and channel attributes

PDA	Product attributes	Channel attributes	Upgrade attributes
Early adoption type	Product style (+) New/old machine (+) Chinese friendly (-)		
Early majority type	Famous (+) Size and function (+) Basic operation (-) Easy to use (-) Price (-)	Information service (+) Promotion (+)	Enlarging memory (+) Color LCD screen (-)
Late majority type	Price (+) Public praise of friends (+)	Price and discount (+) Store nearby (+) Convenience of return or exchange of goods (-)	

Table 5. The summary of consumers' basic characteristics and the degree of PDA product and channel attributes

PDA	Product attributes	Channel attributes	Upgrade attributes
Sex	Compatibility factor (male) Sources of information factor (female)		Compatibility factor (male)
Age	Function factor (46~50 years old)		
Education	Sources of information factor (graduate level)		Appearance and style factor (graduate level)
Occupation	Appearance and style factor (architects and builders) Function factor (architects and builders)		Compatibility factor (Bankers and insurer) Appearance and style factor (architects and builders)
Grade	Function factor (free-lancer)		
Income	Sources of information factor (70~80 thousand)	Excellent repairs and guarantees (90~100 thousand)	
Innovativeness	Compatibility factor (early majority) Function factor (Late majority) Sources of information factor (late majority)	Professional services and promotion (late majority) Excellent repairs and guarantees (late majority) Price discount (late majority)	

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