Int. J. Advance Soft Compu. Appl, Vol. 6, No. 3, November 2014
ISSN 2074-8523

Impacts of Personal, Social and Culture Factors on User Acceptance of ASMD N-Screen Cloud Contents and Services

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Abstract

The N-screen service has evolved from the OSMU (One Source Multi-Use) method of using a same content on various devices to the ASMD (Adaptive Source Multi-Device) method of different using contents suitable for different devices. Although there is an increase in consumers' need, there is dearth of academic research dealing with ASMD. Thus, this research aims to develop a theoretical model and research hypothesis about user acceptance of N-screen service from the perspective of consumer behavior. We performed a sample survey to verify our research hypothesis, by proposing and exploring the variables that have direct effect on N-screen service users, including classification of N-screen service user's characteristics, technical specifications, and social effect categories. The results of our empirical study were achieved by a PLS analysis tool through Structural Equation Model (SEM). Ultimately, it was proved that engagement and acceptability of N-screen service users has a statistically significant causal relationship with self-efficacy, innovation, timeliness, operational convenience, and collective intelligence variables. This research is meaningful as it presents a theoretical framework and idea that is useful as an advanced research for future consumer behavior research about new IT service acceptance such as N-screen service, in terms of academic and practical methods.

Keywords: *N-Screen, OSMU (One Source Multi Use), ASMD (Adaptive Source Multi Device), Cloud, Structural Equation Model, Empirical Study*

1 Introduction

Today, we can obtain any information we want by using smart devices whenever and wherever we want it, thus satisfying our appetite for information. For this request, the N-screen service receives attention as it allows the sharing of information and content, as well as communication without disconnection, through multiple-channels such as TV, PC, mobile phone, and tablet [1]. According to KIST (2012), N-screen service market size is predicted to grow from 419.7 billion Won in 2012 to 2,398.9 billion Won in 2016 [2]. N-screen service is normally classified as being of two different types, and currently it is evolving from the OSMU method to the ASMD type. Initially the OSMU (one source multi use) method a service that allows the use of content while transferring between different smart devices such as TV and smartphone was used mainly; however, the ASMD (Adaptive Source Multi-Device) method, which considers the effectiveness of a content or devices as the number of different smart devices keeps increasing at the same time, has also been receiving a great amount of attention [3]. While the research on N-screen OSMU method was done actively, however, existing researches on ASMD have been limited to classification and case analysis in relation to the market expansion and importance of ASMD [1, 4-7, 9-10].

Therefore, this research aims to identify the variables that influence the acceptance of N-screen service usage, based on ASMD related literatures. As analyzed through demographic analysis, frequency and descriptive statistics analysis are performed for the derived variables. The suitability of this research model is then evaluated by PLS analysis. Lastly, as per the structural equation and analysis results, the research hypothesis is verified the path is analyzed, and the results are presented.

2 Theoretical Background

2.1 N-screen service

It is difficult to define the N-screen ASMD method, but it is a way of supplying a screen connection and a cooperative service among several smart devices [1]. As we examine the trends of domestic N-screen service, it becomes clear that N-screen service is now evolving from the old approach of using on device at on location into a way of effectively receiving much more information using various devices at the same time in one place [4]. W.S. Kim et al. (2011) wrote that contents given to smart devices are not simple videos or web-pages but will be developed according to the concept of cooperation among screens, as they become multi-part contents that spread and/or unite [5]. As a result of the advanced research on N-screen service, the N-screen market is currently developing from the existing OSMU method to the ASMD method, and many other research developments are predicted to ensue.

2.2 OSMU and ASMD

In this section, the differences between OSMU and ASMD the two main methods of N-screen service are discussed. First, the OSMU method is defined as a way to choose and fabricate one source or content, regardless of personal device, place, and time, and supply that content on the N-screen device [6]. Presently supplied N-screen service uses the OSMU method, which shares the content across N number of devices that the user owns one content source [7]. The ASMD method is defined as a way to supply one service by combining various devices that a user owns, where the functions are divided and performed as per the characteristics of each device [6]. For example, it is a service where information or advertisements that are related to a certain scene of a drama on TV is linked to an iPad or smartphone [9]. In sum, the OSMU method supplies the connectivity to enjoy the contents without disconnection, and supplies the same experience on any devices. In contrast, the ASMD method utilizes various smart devices, such as TV, PC, and smartphone, at the same time to supply a same content with differentiated information that is optimized to each device through different platforms or devices [10].

Table 1: Comparison of N-screen OSMU and ASMD service method [3]

OSMU(One Source Multi Use)	Use one same content in various devices
ASMD(Adaptive Source Multi Device)	Use the content suitable for characteristic of each device

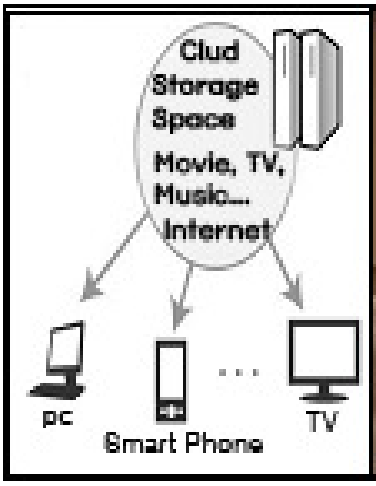

Fig. 1 OSMU [8]

Fig. 2 ASMD [10]

2.3 IT service acceptance

Many studies have derived variables through advanced research on IT service acceptance: J.H. Lee et al.(2013)'s 'Self-efficacy', study on differences in relationships among smartphone users and nonusers [11]; A. Sun et al. (2012)'s 'Innovation', study on the effectiveness of intention to use mobile blog [12]; E.D. Kim et al.(2013)'s 'Timeliness', study on the difference of quality factor that affects mobile content satisfaction [13]; E.J. Jang et al.(2012)'s 'Pleasure', study on learner's educational application usage satisfaction and its effect on purchase decision [14]; Y.K. Song et al.(2011)'s 'Economics', a study of fourth-generation mobile communication evolution and confrontational policy direction [15]; C.H. Jung et al.(2012)'s 'Perceived utility', a study of satisfaction of IPTV service use and its effect on continuous usage intention [16]; J.H. Kim et al.(2013) 'Security Dangerousness', a study on safe banking application execution in the open smartphone environment [17]; MiRa Kim (2006)'s 'Control Convenience', a study about HDTV consumer satisfaction [18]; H.S. Youn et al.(2011) 'Collective Intelligence' A research on collective intelligence measurement using social network [19]. DongHoon Lee et al.(2008) 'Reference Group Influence', a study about the effect on Web-based cooperative learning system acceptance [20]; M.S. Suh et al.(2010)'s 'WOM behavior', a breach action in online brand community [21]; S.H. Cho et al.(2012)'s 'Involvement', a study on the effect of online market contents on information service satisfaction and purchase intention [22]; K.S. Oh(2012)'s 'Acceptance', a study on how acceptance intention affects N-screen service potential consumers [23]. Thus, thirteen variables were derived that will affect acceptance in existing IT service acceptance research.

3 Research Design and Hypotheses

3.1 Definition of the variables

In this research, independent variables were divided into three groups Personal Disposition, Technological Style, and Social Influence. Among these, Self-efficacy of Personal Disposition shows the confidence during the process of N-screen service's accept, we could organize and proceed the required action for acquiring the required result of consumers. Innovation refers to the tendency of an individual to accept the innovation more rapidly than other members of the social system, and Timeliness describes the degree to which individuals properly use information at the required time. Moreover, Economics shows the degree to which an individual prefers profitable things that cost little money, resources, effort, and time.

Security Dangerousness describes the degree to which an individual feels fears and worry during usage, and Control Convenience describes the degree to which the individual believe that using the information technology system requires less effort than not using the system. Theoretically, Descriptive Tendency is an

abstract idea that is difficult to measure objectively due to the characteristic of unique service, so the method that companies use to evaluate service quality is through 'consumer awareness'. In the last type of independent variables namely, Social Influence, Collective Intelligence is shown to be a form of universally distributed intelligence, constantly enhanced, coordinated in real time, and resulting in the effective mobilization of skills. Reference Group describes the degree to which consumers are concerned about the opinion of the reference group when purchasing. In this research, the above mentioned independent variables were considered to have an influence on N-screen service involvement. Therefore, the involvement variables were selected and operationally defined. Involvement shows an individual's degree of relevancy awareness, and importance awareness or interest towards a certain subject in a given situation.

Acceptance, which is the last variable, is a dependent variable. As the independent variables influence service involvement and consumers show high involvement, consumers will eventually accept the services. Therefore, Acceptance was selected as a dependent variable. Acceptance is the degree to which individual's willingness to accept something or the degree of reaction to convenience and cost according to the change. The research hypothesis for the variables is as follows.

3.2 Research model

In this research, we seek to determine whether N-screen service is worthy of notice for various consumers without N-screen service experience, and whether they are likely to accept it if N-screen service involvement is high, based on the relationship between Involvement and Acceptance variables. The research model for this research is shown in Fig.3.

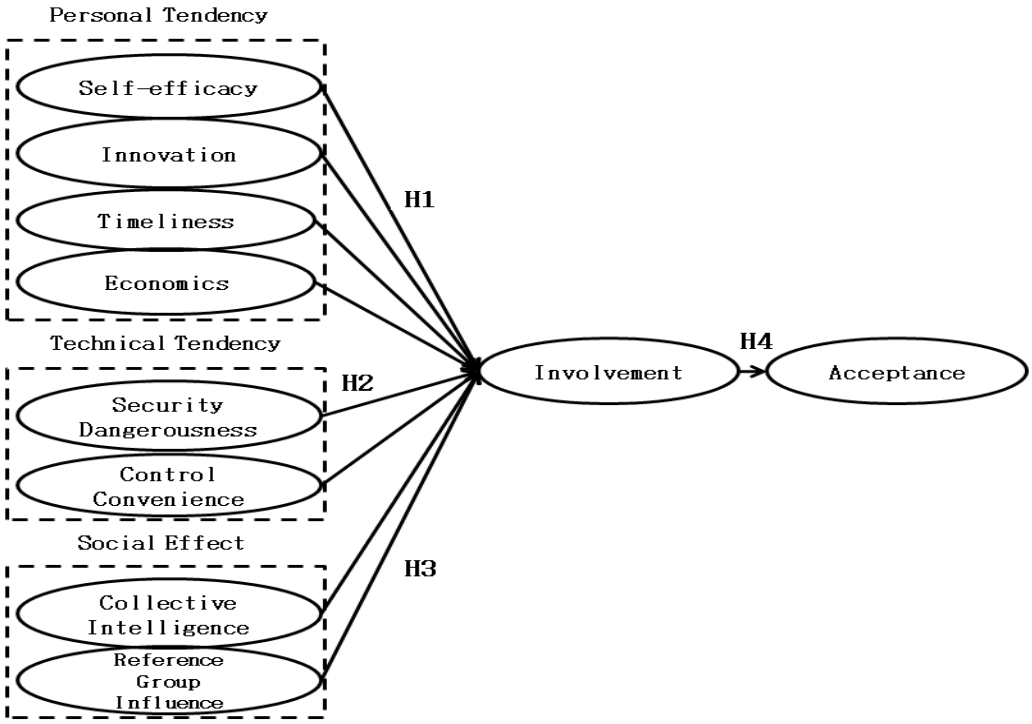

Fig. 3 Research Model

H1. Personal disposition has a positive affect on consumer involvement.
H2. Technological Style has a positive affect on consumer involvement.
H3. Social Influence has a positive affect on consumer involvement.
H4. Consumer involvement has a positive affect on consumer acceptance.

3.3 Data collecting and measurement items

Domestic users were selected as research objects, and the required data for analysis was collected from a survey that took place over, September 24-30, 2013. Sampling was distributed using a Google Docs Online questionnaire through e-mail and SNS (e.g., Kakaotalk, Tik-tok). The total number of respondents was 200, and the total of valid responses was one hundred. The measurement items of this research covered ten areas: Self-efficacy based on usability (4 questions); Innovation based on innovative product or service (4 questions); Timeliness based on tendency of wanting to know immediately (3 questions); Economics based on economic concerns when using service (4 questions); Security Dangerousness based on security problem (4 questions); Control Convenience based on convenience of using service (3 questions); Collective Intelligence based on doing together (3 questions); Reference Group Influence based on trust towards acquaintances (3 questions); Involvement based on interest in service (4 questions); and Acceptance based on intention to use service (3 questions). Data analysis was performed using the SPSS 12.0 statistics package on frequency analysis, factor analysis, and regression analysis. As for the order of analyses, after exploratory factor analysis, reliability verification was performed to evaluate the suitability of the measurement items and thereby analyze whether the 10 items were accurately and evenly measured (Sung et al., 2012).

4 Results

4.1 Samples

As per the frequency and descriptive statistics of the demographics of respondents, women comprised a relatively high amount, as the Gender shows 95 men (47.5%), 105 women (52.5%). The Age factor was broken down as follow: 163 people in their 20s (81.5%), 23 people in their 30s (11.5%), 11 in their 40s (5.5%), and 3 people in their 50s (1.5%). Moreover, in terms of the Occupation, Students (125 people, 62.5%) were found to comprise the highest portion, followed by Workers (46 people, 23%), Professionals (15 people, 7.5%), Housewives (5 people, 2.5%), Education-related (2 people, 1%) and Private business (2 person, 1%). In terms of Level of education, most people fell into the category of Attending University (104 people, 52%), followed by University Graduate (64 people, 32%), and Attending Graduate School (23 people, 11.5%) and High School Graduate and Lower(9 people, 4.5%). Daejeon/Choongchungdo (134 people, 67%) showed the highest distribution in the Residence factor, followed by Incheon/Gyeonggido (36 people, 18%), Seoul (13 people, 6.5%),

Gangwondo (9 people, 4.5%), Busan/Gyeongsangdo (4 people, 2%), Gwangju/Jeonlado(3 person, 1.5%) and Other (1 person, 1%). Lastly, the highest distribution of Main IT device Used was found to be Smartphones (106 people, 53%), followed by Computers (23 people, 11.5%), Smart/IP TV (14 people, 7%), Existing TV (11 people, 5.5%), Notebook/Netbook (11 people, 5.5%) and Tablet PC (8 people, 4%) and Other (27 people, 13.5%). The Demographic properties of respondents are shown in Table 2.

Table 2: Demographic property of samples

Section	Freq.(%)	Section	Freq.(%)
Gender		Residence	
Male	95(47.5)	Seoul	13(6.5)
Female	105(52.5)	Incheon/Gyeonggi	36(18)
Age		Daejeon/Chugchung	134(67)
20's	163(81.5)	Gwangwon	9(4.5)
30's	23(11.5)	Gwangju/Jeonla	3(1.5)
40's	11(5.5)	Busan/Gyeongsang	4(2)
50's and over	3(1.5)	Etc.	1(0.5)
Occupation			
Student	125(62.5)		
Office worker	46(23)		
Educational worker	2(1)	Favorite Device	
Professions	15(7.5)	Existing TV	11(5.5)
Private business	2(1)	Smart TV/IPTV	14(7)
Housewife	5(2.5)	Computer	23(11.5)
Unemployed/Retired	5(2.5)	Notebook/Netbook	11(5.5)
Education		Tablet PC	8(4)
High graduate	9(4.5)	Smartphone	106(53)
University student	104(52)	Etc.	27(13.5)
University graduate	64(32)		
Graduate student	23(11.5)		

4.2 Factor analysis

In the social science field, for reliability verification, if Cronbach's alpha value and the loading factor are higher than 0.6, then the factors are considered to be reliable variables [24]. As shown in Table 3, the Cronbach's alpha values of all factors in this research were found to be higher than 0.6. In other words, all factors show reliability.

Table 3: Exploratory factor analysis (EFA)

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Involvement	.836	.232	.165	.086	.153	.221	.117
	.853	.164	.151	.174	.188	.130	.094
	.848	.108	.213	.138	.244	.046	.162
	.797	.257	.180	.040	.142	.212	.130
Self-efficacy	.172	.794	.224	.117	.160	-.094	.079
	.187	.707	.320	.128	.178	.283	.073
	.291	.844	.193	.148	.015	.101	.120
	.128	.861	.122	.126	.087	.253	.055
Innovation	.141	.141	.809	.261	.061	.145	.115
	.313	.222	.694	-.035	.055	-.154	.268
	.137	.358	.673	.386	.221	.112	.057
	.221	.284	.711	.151	.051	.203	-.093
Timeliness	.182	.140	.105	.875	.036	.169	.038
	.139	.026	.169	.895	.103	.057	.118
	-.017	.345	.209	.705	.084	.192	.078
Acceptance	.317	.149	.121	-.049	.705	.239	.097
	.190	.111	.012	.173	.776	.125	.232
	.130	.092	.107	.079	.864	.162	.078
Control Convenience	.203	.219	.012	.091	.231	.821	.127
	.209	.080	.139	.276	.422	.713	.149
	.218	.163	.192	.265	.136	.673	.312
Collective Intelligence	.106	.003	.281	-.055	-.014	.290	.696
	.073	.261	-.092	.071	.218	.097	.740
	.216	-.002	.081	.216	.192	.055	.743

4.3 Model fit

For the suitability index of the SEM, there is a Redundancy index of Stone-Geisser Q^2 test statistics that is cross-verified. This index statistically estimates the volume of the structure model, which shows the quality of the structural model, and the value should be positive (Chin, 1988; Tenenhaus & Esposito Vinzi, 2005). In this research, all variables show positive values with independent variables, as shown in Table 4, therefore, it is possible to confirm the suitability of the structural model's predictions. Moreover, the average suitability evaluation for the PLS structural model is intended to consider the evaluation for the dependent variable path model, which is done with the R^2 value of the dependent variable. According to Cohen (1988), the effectiveness of the R^2 value is divided into High (0.26 and higher), Middle (0.13-0.26), and Low (0.02-0.13). With this as the

basis, it was found that the suitability of the research model in this research satisfies the standard value.

Lastly, the suitability of the PLS path model is defined as the multiplication of R^2 average value of all dependent variables and the average value of Communality, and square root this value (Chin, 1988: Tenenhaus & Esposito Vinzi, 2005). The value of this suitability should be a minimum of 0.1, and can be divided into three groups, High (0.36 and higher), Middle (0.25-0.36), and Low (0.1-0.25). From the measurement of the PLS path model total suitability of this research, the average value of R^2 of all dependent variables was found to be 0.32, the average value of Communality was 0.75, and the square root of the multiplication of these values is found to be 0.39, indicating that the total suitability of the model is very high. Therefore, the suitability of this research model is confirmed, which makes it is possible to verify and analyze the result of hypothesis. As we examine the T-values of this structural model, most of the values are higher than 1.654, thereby the significance level of 90%; thus, there is focus validity. However, Collective Intelligence and Acceptance, Self-efficacy and Acceptance, Self-efficacy and Involvement did not achieve the significance level of influence in the structural model. The detailed values are shown in Table 5.

Table 4: Model fit indices

	AVE	Composite Reliability	R Square	Cronbachs' Alpha	Commun -ality	Redun -dancy
INV	.852	.958	.419	.942	.852	.144
ACC	.742	.896	.403	.827	.742	.152
SEL	.790	.938	.419	.911	.790	.061
TIM	.794	.920		.870	.794	
CON	.805	.925	.371	.879	.805	.145
COL	.620	.830	.125	.693	.620	.039
INN	.699	.902	.244	.855	.699	.166

SEL (Self-efficacy), INN (Innovation), TIM (Timeliness), CON (Control Convenience), COL (Collective Intelligence), INV (Involvement), ACC (Acceptance)

4.4 Path analysis

To understand the relationship among variables related to ASMD acceptance, the factors that may affect ASMD acceptance were selected namely, Personal Disposition (4), Technical Style (2), and Social Influence (2) and each property was measured for 200 people. Using the SMART PLS analysis tool, the analysis result for Self-efficacy, Timeliness, Innovation, Control Convenience, Collective Intelligence, Consumer Involvement and Acceptance were as followed. The relationship of variables with hypothesis was accepted in the significant level of

99% was found to be as follow. Involvement and Acceptance (t=3.232), Timeliness and Innovation (t=8.327), Timeliness and Control Convenience (t=3.334), Control Convenience and Acceptance (t=4.651), Control Convenience and Innovation (t=3.798), Control Convenience and Self-efficacy (t=3.565), Collective Intelligence and Control Convenience (t=5.751), Innovation and Self-efficacy (t=6.660), Innovation and Involvement (t=2.889), and Innovation and Collective Intelligence (t=2.815). The relationship of variables with hypothesis was accepted in the significant level of 95% was found to be as follow. Self-efficacy and Involvement (t=2.221), Innovation and Control Convenience (t=2.321), Timeliness and Collective Intelligence (t=2.392). Moreover, the hypothesis was accepted in the significant level of 90% in the relationship between Timeliness and Self-efficacy (t=1.692), Collective Intelligence (t=1.903), Collective Intelligence and Acceptance (t=1.691). Lastly, the relationship between Timeliness and Involvement was found to be in significant, as shown in Table 5.

Self-efficacy and Innovation are found to have positive effect on Involvement (H1).
Control Convenience is found to have positive effect on Involvement (H2).
Collective Intelligence is found to have positive effect on Involvement (H3).
Involvement is found to have positive effect on Acceptance (H4).

Table 5: Path analysis

	Original Sample	Mean	Standard Deviation	Standard Error	T-Value
INV←ACC	.274	.282	.089	.089	3.092
SEL←INV	.209	.202	.096	.096	2.180
SEL←ACC	.057	.058	.035	.035	1.655
TIM←INV	.341	.343	.065	.065	5.284
TIM←ACC	.300	.300	.053	.053	5.629
TIM←SEL	.429	.431	.056	.056	7.683
TIM←CON	.465	.467	.072	.072	6.503
TIM←COL	.280	.280	.067	.067	4.209
TIM←INN	.494	.494	.058	.058	8.570
CON←INV	.306	.309	.076	.076	4.012
CON←ACC	.450	.452	.059	.059	7.681
CON←SEL	.213	.210	.060	.060	3.550
COL←INV	.245	.244	.076	.076	3.213
COL←ACC	.322	.323	.071	.071	4.554
COL←SEL	.073	.072	.025	.025	2.928
COL←CON	.344	.342	.060	.060	5.762
INN←INV	.466	.467	.063	.063	7.345
INN←ACC	.255	.254	.054	.054	4.694
INN←SEL	.516	.520	.060	.060	8.620
INN←CON	.260	.259	.073	.073	3.561
INN←COL	.247	.247	.090	.090	2.753

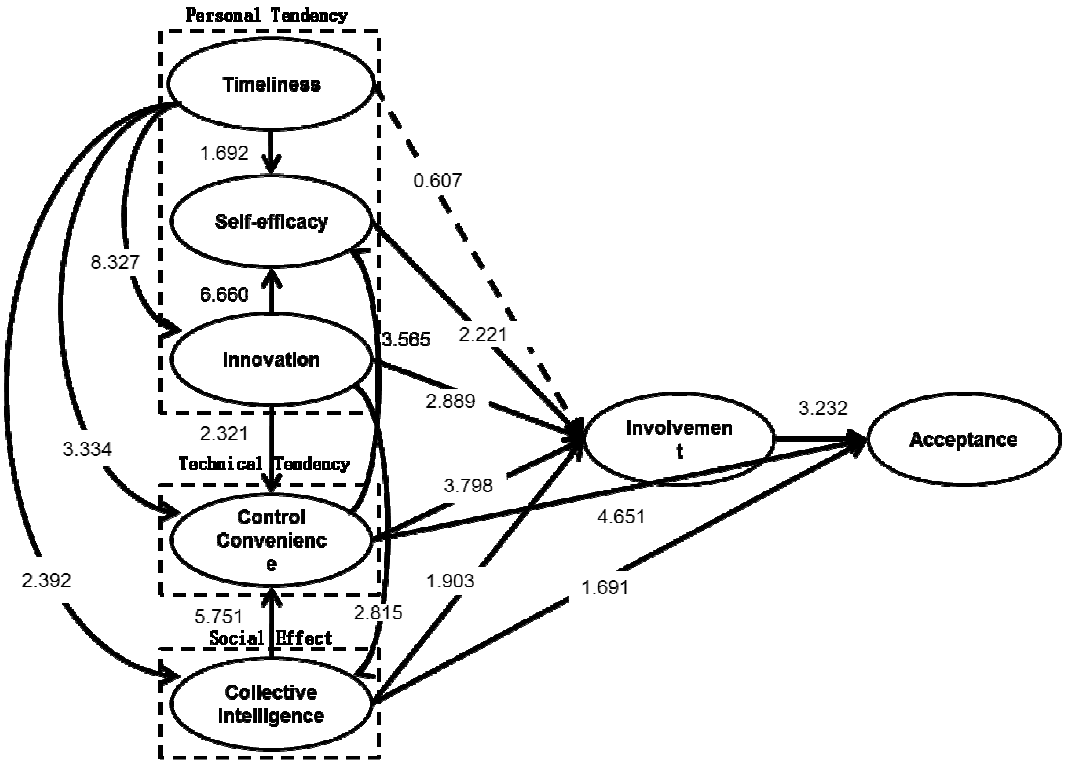

Fig. 4 Hypotheses testing

5 Conclusion

As per the analysis results, the consumer sample group in this research shows a tendency for individuals with relatively high levels of Control Convenience and Innovation to have high involvement when interested in ASMD service or making decisions about future acceptance. Moreover, when ASMD service operation is convenient, higher influence is on Acceptance than on Involvement. In other words, if the operation is convenient, there is a higher possibility that the individual will immediately accept than proceed to the acceptance stage with interest step by step. On the other hand, although high Timeliness had an effect on Innovation and Control Convenience, it had no direct effect on Involvement or Acceptance. In future research, it will be possible to search for variables that are effective in the verification of new hypothesis about this and re-use intention. Moreover, by considering this research as advanced marketing research in mainly young consumers, and standardizing the range of the sample analysis, additional academic insights could be achieved.

In this research, a survey was conducted on research hypothesis verification, limited to 200 samples. Since the results are derived from a small group of characteristics, future analyses result could possibly focus on a larger group.

Causal relationships among variables not considered in this research may show a different structural relationship. Therefore, in future research varying or expanding the range of the sample may reconfirm the relationship with variables other than those found in this thesis.

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