

# WHEN INTERACTIVE TV MEETS ONLINE AUCTION: A STUDY ON FACTORS AFFECTING USER ADOPTION

(Completed academic paper)

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**Abstract:** This research has attempted to find the impact of information quality (IQ) and system quality (SQ) on users' attitude to adopt the interactive TV based auction service. The primary two factors, IQ and SQ, frequently have been found in a number of IS studies as significant factors affecting users' attitude toward innovative products or services. In this study, we adopted the two factors and trust as a mediated factor to explain how the factors affect users' attitude for the interactive TV based auction service, t-auction. In order to empirically verify our research model, we collected 1028 samples through online survey. By doing confirmatory factor analysis, we checked that the research model satisfied the convergent, discriminant validity and model fits. The results showed that all factors including IQ, SQ, and Trust have significant effects on users' attitude. Additionally, both IQ and SQ had greater direct influence on trust than their direct impact on attitude, and the direct effect of SQ on attitude was greater than the direct effect of IQ on attitude. We discussed the implications of this study in the last section of the paper.

**Key Words:** Online Auction, Interactive TV, Information Quality, System Quality, Home Shopping

## INTRODUCTION

Convergence has been rapidly being diffused especially in telecommunications and broadcasting industry worldwide. Creative contents which appeal to customer's need are more demanded by most companies in this dynamics market [1].

This paper suggested a converged service running on network-enabled interactive TV, named T-auction. T-auction service has adopted electronic auction which has been successfully settled and still growing business model. This service enables users participate in real-time bid via the interactive TV set and remote controller as an input device. This is expected to provide new values that overcome information uncertainty which is one of the major limitations of the existing electronic auction service. Users would enjoy the visible, vivid, and detailed information provided through users' interactions via the digital TV set. Thus, this paper has attempted to find some answers for the question; what kinds of factors affect users' adoption of the T-auction service model. This is a critical question for predicting the diffusion of the new converged service over the current e-auction market and TV-based home shopping market as well.

A research model was proposed to explain the factors. Through the literature reviews related factors affecting new technology acceptance, we adopted DeLone & McLean IS success model as a basis of our model [8]. An empirical study was conducted to verify this model with 1028 samples obtained through online survey. We analyzed the causal relations between each factor and attitude using SPSS10.0 and AMOS3.0.

## RESEARCH MODEL

### *Information Quality and System Quality*

DeLone & McLean's IS success model has been widely adopted in the field of information systems [8]. The model suggested two factors, information quality and system quality as the primary factors of the IS adoption. Though authors have tried to extend the model by adding other factor such as service quality, IQ and SQ continues to play a role as main components of this model. We adopted the information quality and system quality as a basis of our research model.

#### **Information Quality**

Today, the informational or knowledge factors have been becoming increasingly important part of business [16]. Studies related to consumer behavior show that a consumer typically goes through two sequential stages of information search in order to clarify the ambiguity about the product and seller and reduce uncertainty. In the first stage, consumers perform an internal search to retrieve product/seller information stored in memory. In the second stage, customers try to access external sources for more information. Therefore, quality of information about product/seller bears heavily on e-commerce success. A survey conducted by National Internet Fraud Center found that people were reluctant to bid on items if there is no information available on the auction site about a seller's track record. More than three-quarters (77%) of those who mostly sell on online auctions say that they would not bid on items in that case. Fifty-three percent of those who are mostly bidders are also reluctant to bid in these cases. Most bidders are willing to look for information from other sources like government agencies, consumers groups, or other reliable group of people before deciding whether to make a bid or not [3]. Many researches have attempted to measure the quality of information [7, 24, 25, 26]. For example, Kim et al. (2005) argued that IQ can be measured with its accuracy which is freedom from mistakes in the information contents, its relevance which is pertinence to users' interests of the information content and its completeness which is availability as needed of the conformation content [28]. DeLone and McLean highlighted the importance of relevance, timeliness, and accuracy of information [9]. A research conducted by Doll and Torkzadeh also emphasized three determinants of user satisfactions; content, accuracy, and timeliness [10]. Other various studies demonstrated that the usefulness of contents and adequacy of information affect user's positive perception on the service or product [11]. Thus, we can draw the following hypothesis.

H1: High information quality will positively affect users' attitude on T-auction service.

#### **System Quality**

This refers to users' perception of the service capability in order to provide efficient and secure interactions and transactions. Among various instruments to measure the system quality, the ease of use has been regarded as the most frequently quoted factor. Other studies also found variables affecting the quality of system such as interactivity, security/privacy, navigation, accessibility, and entertainment [11]. Yoo and Donthu developed a measurement model for Internet shopping site. They used the four factors to represent the system quality of the shopping sites: ease of use, aesthetic design, processing speed, and security [12]. Especially, the security and privacy related factors highly mentioned in online commerce services such as B2C retailing, online auction, and B2B. Moreover, the privacy and security features of a system have become a serious concern [13]

While the perceived ease of use was recognized as the main component of the system quality, other variables such as design for easy navigation, usability, free of errors, and its high availability were partly regarded as an instrument to measure the system quality. System quality can also increase if the system contributes to improve users' productivities and to reduce cost for certain purposes such as shopping [7]. Thus, we can come to the following hypothesis.

H2: High system quality will positively affect users' attitude on T-auction service.

## ***Trust***

Trust plays a mediating role in IS adoption models throughout various literatures [14,15,16,17]. Researchers have attempted to define trust in various contexts for many years. Psychologists define trust as a tendency to trust others [18]. Social psychologists define trust as cognition about the trustee. Sociologists define trust as a characteristic of the institutional environment. Trust is crucial in many such transactional buyer-seller relationships, especially those containing an element of risk, including interacting with an e-vendor [20]. This is extremely true that trust plays a critical role in the online business environment where physical touching, seeing, smelling and interaction with personnel are impossible. Trust is generally defined as an expectation that others one chooses to trust will not behave opportunistically by taking advantage of the situation or it is one's belief that the other party will behave in a dependable, ethical, and socially desirable manner. Trust deals with the belief that the trusted party will fulfill its commitments despite the trusting party's dependence and vulnerability [21]. Researchers view trust as a set of specific beliefs dealing primarily with the integrity, benevolence, and ability of another party or a general belief that another party can be trusted, sometimes also called trusting intentions or "the willingness" of a party to be vulnerable to the actions of another. It is reflected in "feelings of confidence and security" in the caring response of the other party, or trust is simply a combination of these elements [14]. Trust can be conceptualized as a combination of trustworthiness, integrity, honesty and benevolence of e-vendors that increases behavioral intentions through reduced risk among potential but inexperienced consumers [22]. As trust has demonstrated its significant role in the traditional offline market, it is also expected to reveal its importance in the interactive TV based commerce to reduce uncertainty of the electronic environment.

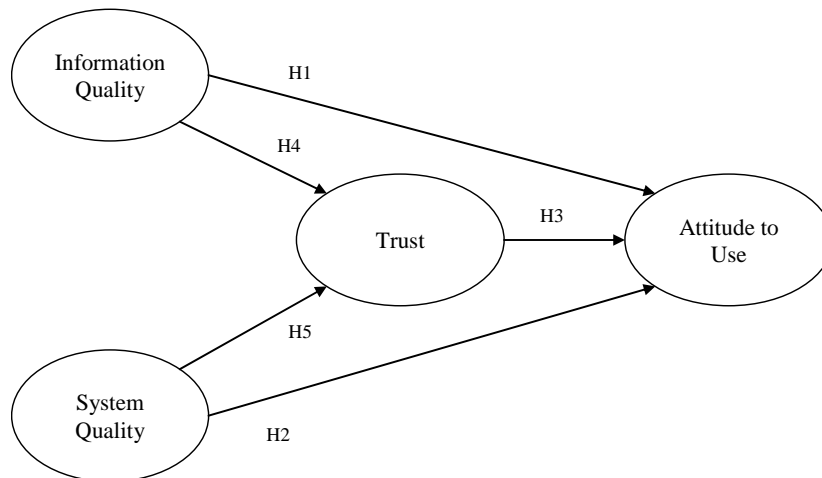
Finally, the following hypotheses are derived.

H3: High Trust will positively affect users' attitude on T-auction service

H4: High Trust will be positively affected by information quality

H5: High Trust will be positively affected by system quality.

Figure 1. Research Model



## DATA COLLECTION AND ANALYSIS

### *Data Collection*

A survey agency conducted an online survey to collect samples. For one week, we collected 1200 samples. After dropping some insincere samples, we used only 1028 samples for analysis. Each question in the survey was measured on a seven-point Likert scale with the end points of “strongly agree (7)” and “strongly disagree (1).” For further investigation, we separated users into two groups: e-shopping preferred group (e-shoppers) and home-shopping preferred group (home-shoppers) based on the users’ preferred channel for shopping. We directly asked their preferred channel for shopping with the question, “which way of shopping do you prefer, online shopping or home-shopping?” Among 888 respondents who selected online shopping, we dropped 87 samples who never participated in online auction, so we finally gathered 801 samples for e-shoppers. Only 233 people chose home-shopping, but 6 samples that never purchased via home-shopping were deleted, so 227 samples were used for analysis. Overall 1028 samples were used for hypothesis tests.

Table 1. Demographic information of the respondents

Category		Whole group (N = 1028)	e-shopper (N = 801)	Home-shopper (N = 227)
Gender	Male	606 (58.9%)	484 (60.4%)	122 (53.7%)
	female	422 (41.1%)	317 (39.6%)	105 (46.3%)
Age	Under 19	33 (3.2%)	31 (3.9%)	2 (0.9%)
	19 ~ 25	172 (16.7%)	155 (19.4%)	17 (7.5%)
	26 ~ 30	233 (22.7%)	207 (25.8%)	26 (11.5%)
	31 ~ 40	380 (37.0%)	277 (34.6%)	103 (45.4%)
	41 ~ 50	166 (16.1%)	108 (13.5%)	58 (25.6%)
	Over 50	44 (4.3%)	23 (2.9%)	21 (9.3%)
Marital status	Single	499 (48.5%)	436 (54.4%)	63 (27.8%)
	Married	527 (51.3%)	363 (45.3%)	164 (72.2%)
Most frequently used way of shopping	Dept./Discount. stores	475 (46.2%)	334 (41.7%)	141 (62.1%)
	Online shopping	441 (42.9%)	425 (53.1%)	17 (7.0%)
	Home shopping	63 (6.1%)	11 (1.4%)	52 (22.9%)
	Traditional market	42 (4.1%)	25 (3.1%)	17 (7.5%)
	Others*	7 (0.7%)	6 (0.7%)	1 (0.4%)

\*Others include; mobile shopping, small stores near home, and no answer

The demographic information shows that the overall samples are well distributed in terms of gender, age, and marital status. It shows that the e-shoppers include relatively younger people than home-shoppers; almost sixty percent of e-shoppers are aged from 26 to 40, but seventy percent of home-shoppers are aged from 31 to 50. In addition, over 72% home-shoppers are married while e-shoppers are 45% married. In some extent, this fact reflects the general fact that relatively younger people preferred to use the Internet while the old who have family likely to enjoy TV program. They usually preferred to use offline market such as departments and discount stores. However, e-shoppers clearly showed their preference for online channel. Over half of them (53.1%) frequently used online market as a primary shopping channel. This is the same for home-shoppers. Among e-shopping preferred users, only 1.4% people told that they frequently use home-shopping. However, over 20% of home-shopping preferred users adopted home-shopping as their primary shopping channel.

Table 2. Obstacles of online auction and home-shopping

Reasons to hesitate to decide	Whole group (N=1028)	e-shopper (N=801)	Home-shopper (N=227)
<i>In case of online auction</i>			
Have you ever purchased via online auction?	Yes (93.8%)	Yes (100.0%)	Yes (71.8%)
1) Uncertainty on product quality	515 (50.1%)	438 (54.7%)	77 (33.9%)
2) Doubt on sellers	138 (13.4%)	111 (13.9%)	27 (11.9%)
3) Lack of reliable information	173 (16.8%)	132 (16.5%)	41 (18.1%)
4) Budget constraint	109 (10.6%)	97 (12.1%)	12 (5.3%)
5) Other reasons*	29 (2.8%)	21 (2.6%)	1 (0.4%)
No answer	64 (6.2%)	2 (0.2%)	64 (28.2%)
<i>In case of home shopping</i>			
Have you ever purchased via home shopping?	Yes (84.4%)	Yes (80.0%)	Yes (100.0%)
1) Uncertainty on product quality	145 (14.1%)	109 (13.6%)	36 (15.9%)
2) Doubt on sellers	521 (50.7%)	376 (46.9%)	145 (63.9%)
3) Lack of reliable information	45 (4.4%)	38 (4.7%)	7 (3.1%)
4) Budget constraint	113 (11.0%)	85 (10.6%)	28 (12.3%)
5) Other reasons*	44 (4.3%)	21 (2.6%)	10 (4.4%)
No answer	160 (15.6%)	160 (20.0%)	1 (0.4%)

\* Other reasons include distrust on electronic payment system, and other people's opinions on the buyer's decision.

The Table 2 shows the reasons why people hesitate to purchase via online auction or TV home-shopping. Interestingly, the biggest obstacle is different from the user group. For e-shopper who prefers to use online market, the uncertainty on product quality was the main obstacle to decision making, but doubt on sellers was the most critical reason for home-shoppers. This fact implies that it is the most urgent work to develop some methods to deliver more reliable, accurate and detailed information on product as well as sellers. The following Table 3 reveals that users' experiences in the Internet usage and purchases, and it also shows the frequency to visit online auction site and frequency to watch shopping program on TV.

Table 3. Internet and shopping experiences of respondents

Category		Whole group (N = 1028)	e-shopper (N = 801)	Home-shopper (N = 227)
Internet Usage Years	Less than 1 yr	51 (5.0%)	33 (4.1%)	18 (7.9%)
	1 ~3 yrs	110 (10.7%)	88 (11.0%)	22 (9.7%)
	3 ~ 5 yrs	163 (15.9%)	112 (14.0)	51 (22.5%)
	Over 5 yrs	704 (68.5%)	568 (70.9%)	136 (59.9%)
Frequency to purchase via online auction	Once or twice for a month	308 (30.0%)	279 (34.8%)	29 (12.8%)
	Once or twice for 3 months	270 (26.3%)	230 (28.7%)	40 (17.6%)
	Once or twice for 6 months	125 (12.2%)	96 (12.0%)	29 (12.8%)
	Once or twice for a year	175 (17.0%)	132 (16.5%)	43 (18.9%)
	Very rarely	150 (14.6%)	64 (8.0%)	86 (37.9%)
Frequency of visit to online auction sites	Almost everyday	148 (14.4%)	125 (15.6%)	23 (10.1%)
	Once or twice for a week	373 (36.3%)	321 (40.1%)	52 (22.9%)
	Once or twice for a month	285 (27.7%)	220 (27.5%)	65 (28.6%)
	Once or twice for 6 months	128 (12.5%)	91 (11.4%)	37 (16.3%)
	Very rarely	94 (9.1%)	44 (5.5%)	50 (22.0%)
Frequency to purchase via home shopping	Once for a week	25 (2.4%)	19 (2.4%)	6 (2.6%)
	Once or twice for a month	167 (16.2%)	105 (13.1%)	62 (27.3%)
	Once or twice for 3 months	221 (21.5%)	149 (18.6%)	72 (31.7%)
	Once or twice for 6 months	266 (25.9%)	195 (24.3%)	71 (31.3%)
	Very rarely	349 (33.9%)	333 (41.6%)	16 (7.0%)

Frequency of watching shopping programs	Almost everyday	233 (22.7%)	146 (18.2%)	87 (38.3%)
	Once or twice for a week	350 (34.0%)	256 (33.1%)	85 (37.4%)
	Once or twice for a month	180 (17.5%)	144 (18.0%)	36 (15.9%)
	Once or twice for 6 months	51 (5.0%)	44 (5.5%)	7 (3.1%)
	Very rarely	214 (20.8%)	202 (25.2%)	12 (5.3%)

### ***Measurement Model***

First, we checked the internal consistency of the measurement items. As a result, every Cronbach alpha coefficients were good (show Table 4). All independent variables demonstrated acceptable values of Cronbach's alpha coefficients of the four constructs were above 0.6, which indicated reliable level. We then conducted a confirmatory factor analysis to check convergent validity and discriminant validity. As a result, all factor loadings of each construct were above 0.6, which satisfies the required level for convergent validity. For discriminant validity, the inter-correlation between constructs should be less than 0.7. Table 4 shows that the correlations between constructs satisfied the required level except one between Attitude and SQ of home-shopping group which shows slightly higher value than 0.7.

Table 4: Convergent validity and internal consistency reliability (factor loading and average score)

	Overall group (N=1028)	e-shoppers (N=801)	Home-shoppers (N=227)
Information quality			
- It will provide accurate information.	0.714 (4.24)	0.693 (4.23)	0.789 (4.30)
- It will provide vivid information.	0.822 (4.61)	0.825 (4.63)	0.821 (4.54)
- It will provide up-to-dated information.	0.805 (4.59)	0.801 (4.58)	0.831 (4.61)
- It will provide detailed information.	0.785 (4.44)	0.769 (4.43)	0.842 (4.45)
<i>Cronbach's alpha</i>	<i>0.8612</i>	<i>0.8533</i>	<i>0.8914</i>
System quality			
-It will be easy to communicate with.	0.789 (4.22)	0.791 (4.20)	0.791 (4.26)
-It will be easy to use.	0.818 (4.32)	0.809 (4.30)	0.857 (4.40)
-It will save my cost and effort for shopping.	0.685 (4.25)	0.665 (4.21)	0.748 (4.40)
-It will provide secure way for transaction.	0.593 (4.09)	0.576 (4.07)	0.643 (4.15)
<i>Cronbach's alpha</i>	<i>0.8006</i>	<i>0.7906</i>	<i>0.8968</i>
Trust			
-The intermediary will introduce only reliable products.	0.812 (4.37)	0.800 (4.36)	0.862 (4.42)
-The intermediary will be honest when they deal with.	0.876 (4.26)	0.883 (4.24)	0.870 (4.33)
-Overall, the intermediary will be trustworthy.	0.856 (4.10)	0.851 (4.07)	0.855 (4.19)
<i>Cronbach's alpha</i>	<i>0.8833</i>	<i>0.8796</i>	<i>0.8324</i>
Attitude			
-I am positive about the service.	0.867 (4.23)	0.855 (4.22)	0.909 (4.28)
-I am favorable for the service.	0.909 (4.17)	0.903 (4.14)	0.928 (4.26)
-Overall, I think the service is good to try to use.	0.894 (4.18)	0.891 (4.16)	0.906 (4.24)
<i>Cronbach's alpha</i>	<i>0.9192</i>	<i>0.9136</i>	<i>0.9379</i>

Table 5: Correlation between constructs

	IQ	SQ	Trust	Attitude
<i>Overall group</i>				
IQ	1.000			
SQ	0.495	1.000		
Trust	0.561	0.571	1.000	
Attitude	0.535	0.650	0.646	1.000
<i>e-shopper</i>				
IQ	1.000			
SQ	0.475	1.000		
Trust	0.546	0.547	1.000	
Attitude	0.523	0.629	0.646	1.000
<i>Home-shopper</i>				
IQ	1.000			
SQ	0.566	1.000		
Trust	0.648	0.648	1.000	
Attitude	0.576	0.714	0.642	1.000

### Hypothesis Tests

We obtained all estimates of the five paths using AMOS3.0. The result of hypothesis tests in Figure 2 shows that all five hypotheses are supported. Both IQ and SQ significantly affect users' attitude, but the effect of SQ ( $\beta = .362$ ,  $p < 0.001$ ) is higher than IQ ( $\beta = .160$ ,  $p < 0.001$ ), and the effect of SQ on users' attitude is also higher than the effect of Trust ( $\beta = .310$ ,  $p < 0.001$ ). Finally, the IQ and SQ significantly affect on users' trust, which directly affect the dependent variable, Attitude, but the coefficients of each effect are not much different.

Figure 2. Results for structure model analysis (overall model)

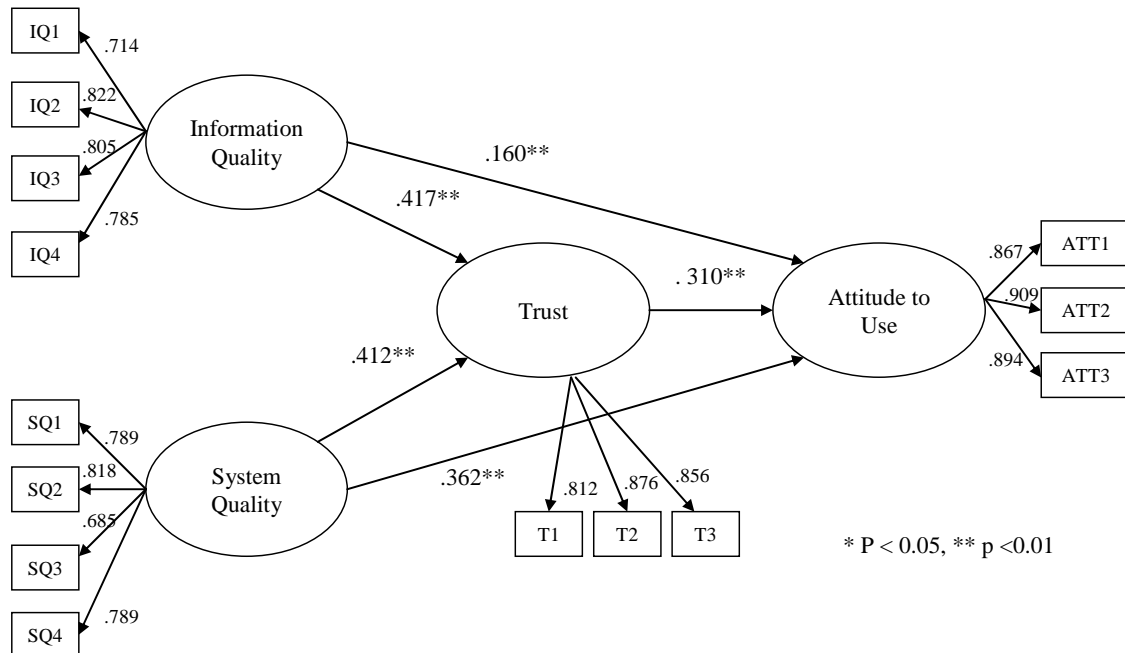


Table 6. The results of hypotheses test (overall model, N = 1028)

effect <sup>a</sup>	coefficient	S.E	Sig.	Remark
H1: IQ → ATT	0.417	0.035	0.000	Accepted
H2: SQ → ATT	0.412	0.035	0.000	Accepted
H3: Trust → ATT	0.310	0.033	0.000	Accepted
H4: IQ → Trust	0.160	0.042	0.000	Accepted
H5: SQ → Trust	0.362	0.040	0.000	Accepted

<sup>a</sup> ATT: Attitude; IQ: Information Quality; SQ: System Quality

In the Table 7, Goodness of fit for this model was reasonable [2]. The indices of model fits for each group satisfied the recommended level except the RMSEA. RMSEA was above the recommended level, but it was not in excess of the marginal acceptable level, 0.10.

Table 7. Model Fit indices of the research model

Fit Index	Recommended value	Overall group	e-shopper	Home-shopper
Goodness of fit (GFI)	> 0.80	0.915	0.916	0.873
Adjusted goodness of fit (AGFI)	> 0.80	0.874	0.876	0.813
Root mean square residual (RMSEA)*	< 0.08	0.089	0.087	0.097
Tucker-Lewis index (TLI)	> 0.90	0.918	0.918	0.909
Comparative fit index (CFI)	> 0.90	0.936	0.936	0.936

\*Except RMSEA index, all three models satisfied the recommended level. If RMSEA is less 0.8, the model is regarded as good one, and it is poor model if it is equal to and greater than 0.10.

Finally, we analyzed the difference of path coefficients between e-shopper group and home-shopper group. The results of t-test with the coefficient and standardized error of each path showed that any difference between two groups was not found. For example, we cannot say that the effect of SQ on trust ( $\beta = 0.469$ ) of home-shopper is greater than the effect of e-shopper ( $\beta = 0.392$ ).

Table 8. The results of moderate effect (user preference for shopping channel)

Path <sup>a</sup>	e-shopper (N <sup>e</sup> = 801) Path coefficient <sup>b</sup>	Home-shopper (N <sup>h</sup> = 227) Path coefficient	S.E. <sup>c</sup>	S.E. <sup>h</sup>	T-value
H1: IQ → ATT	0.158**	0.169*	0.040	0.073	-0.130
H2: SQ → ATT	0.333**	0.473**	0.039	0.084	-1.630
H3: Trust → ATT	0.327**	0.232**	0.037	0.078	1.175
H4: IQ → Trust	0.428**	0.374**	0.048	0.079	0.543
H5: SQ → Trust	0.392**	0.469**	0.045	0.083	-0.810

<sup>a</sup> ATT: Attitude; IQ: Information Quality; SQ: System Quality

<sup>b</sup> \*p < 0.05, \*\* p < 0.01

## CONCLUSION AND IMPLICATIONS

While several implications can be drawn from the results of this research, two major findings are of particular importance. First thing is related to the implications from a theoretical point of view and second thing gives implications for marketing strategies.

From a theoretical point of view, these results highlight the importance of service aspect of the auction intermediary. All factors including information quality, system quality and trust had significant effect on user's attitude. Among these factors, system quality was relatively higher impact on user's attitude, but the direct effect of IQ and SQ on user's trust was almost same. Information quality had greater direct impact to trust building rather than its direct effect on user's attitude. This finding implies that some



efforts to improve system quality are very important and more urgent especially in communications-based business environment. In order to improve the system quality of the interactive TV based auction, it is necessary to remember that TV is just ‘watch and enjoy’ tool for some people. For these people, the complicated interactions or controls by users may decrease the quality of system but oppositely the interactivity may deliver different fun and value to some other people [23]. In this study, we did not cover the hedonic benefits of the service.

Second, we classified the potential user groups, but could not find any significant differences between the path coefficients of the each group. However, we found that the each group has different concerns when they make the final decision to purchase via the either online auction or home-shopping. For e-shoppers, efforts to get rid of the uncertainty of product quality should be done. Current text and fixed image format of information have limitations to deliver the product information in depth. Video based real-time information may contribute to build users’ assurance for product quality and it is also expected to reduce potential doubt on sellers because the buyers can see the seller on TV screen and they can interact with the sellers if they want to communicate. A further study on the relation between information quality and the format of information should be followed.

Third, we adopted the attitude to use as the dependent variable. The attitude plays a role as a mediated variable to behavioral intention in the general TAM and it also shows strong direct impact on the behavioral intention. A study used the attitude as the dependent variable for this reason and parsimonious model [27]. Another reason to use the attitude as the dependent variable is that it is hard to obtain accurate users’ perception on an inexperienced service such as scenario-based future service. Even the perception might be biased with their experiences on similar current services or the way of interpretation of the scenario.

From a practical point of view, TV home shopping market has been being competitive. Traditional TV shopping provides just “see and order” system. However, T-auction provides interactivity so as for users to recognize different valuations of the item shown on the TV by multiple participations in the real-time bids. It could work as better signal for users to make a careful decision. Current channel providers or broadcast TV operators can provide T-auction service for diversity of shopping programs. For telecommunications companies that are preparing IPTV services can also consider T-auction as differentiated shopping application to compete with traditional e-auction and TV home shopping of cable TV companies. Moreover, T-auction content can be delivered through both fixed and mobile network such as wired Internet and digital mobile broadcasting (DMB). Different type of contents in terms of length of program, resolution, and items delivered can be developed. Traditional web-based auction service providers must cope with potential threats from T-auction which is expected to deliver more enhanced visual and reliable information and service. The online auction providers will face to severer competition not only with existing online shopping but also TV shopping channel providers. Of course, the diffusion of T-auction service depends on the deployment of related equipments such as digital TV, set-top boxes, and enhanced remote controllers.

## ACKNOWLEDGEMENT

This work was supported by the IT R&D programs of Korea under the ITRC program supervised by IITA.

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