A Study on Continuous Intention to Use Smartwatch ECG and PPG Applications on Mediating Effects of TAM Model

Tabé Ekouka Elvis¹, Ha-Kyun Kim²

¹ Doctoral Student, Graduate School of Information Systems, Pukyong National University, Republic of Korea, elvis.tabe@yahoo.com

² Professor, Division of Business Administration, Pukyong National University, Republic of Korea, kimhk@pknu.ac.kr

Corresponding author: Ha-Kyun Kim

Abstract: Smartwatches are wrist-mounted, therefore hold strong advantages because of their connection to the wrist and mount location. These characteristics have given smartwatches great opportunities in today's health care and other applications market. The purpose of this study is to inspect the mediating effects of perceived ease of use, and perceived usefulness between important antecedent variables, and continuous intention to use smartwatch Electrocardiography (ECG) and Photoplethysmography (PPG) applications. The framework was extended by including Safety, Convenience, Affective Trust, and Cognitive trust. For this research, 340 samples were collected from Amazon Mechanical Turk, via an online survey and 331 respondents were found valid. The structural equation modeling technique was used since it allows simultaneous analysis. The results suggest that User Safety should be considered beyond experiential value and intention. This work robustly explores the continuous intention to use smartwatch ECG and PPG applications. But the primary purpose is to explore the affiliation among antecedents (i.e., Safety, Convenience, Affective Trust, Cognitive trust, perceived ease of use, perceived usefulness and continues intention to use). The results of the analyses show that Safety, Convenience, and Cognitive trust have positive impacts on perceived usefulness. Safety, Convenience, and Cognitive trust have positive impacts on perceived ease of use. A satisfactory overall model fit index supports most of the proposed hypotheses. The empirical findings of this research is intended to provide a new understanding and explain the fundamental mechanism under users' decision-making process to trust and intention to use smartwatch ECG and PPG application.

Keywords: Electrocardiography ECG, Photoplethysmography PPG, Healthcare, Applications, Cognitive trust, Convenience, Safety, Smartwatch

1. Introduction

Wearable technology has become an extensively discussed topic in smart technology outlines, the smartwatch is unity of the strong-growing invention outlines[1]. Almost all the key major information technology manufacturers have launched a smartwatch or wrist wearable device. The worldwide smart wearable market is forecast to ship a total of 396.0 million units in 2020 according to the report from International Data Corporation. Smartwatch Privacy and trust have to be considered, smartwatch and other smart wearables are being used by some corporations to procedure client data for advert and marketing[2]. Smartwatches are common in a global variety with good submissions, from biomedical nursing arrangements to healthcare, which allows constant dimension of vital biomarkers for health

Received: April 16, 2021; 1st Review Result: June 1, 2021; 2nd Review Result: July 20, 2021
Accepted: August 30, 2021

diagnostics, evaluation and physiological health monitoring, the health business is moving noticeably owed to the essential for the real-time monitoring, point-of-care analysis and long-term health conditions, most smartwatch manufacturers are changing noticeably focusing on health care applications[3][4]. The drive of this research is to investigate the roles of users' Perceived Ease of Use and Perceived Usefulness value as mediators in the serial relationships among relative advantages and continuous intention to use smartwatch Electrocardiography (ECG) and Photoplethysmography (PPG) applications. Therefore, the study will first analyze the causal relationships between relative advantages (e.g., Safety, convenience, Affective and Cognitive trust) and continuous intention to use. Second, it will examine the roles of Perceived Ease of Use and Perceived Usefulness values as underlying mechanisms for mediating relationships. This research is aimed to provide positive observation for smartwatch (ECG) and (PPG) applications manufacturers to understand and embrace the revolution, it also examines the continuous intention of using ECG and PPG applications on smartwatches from Technology Acceptance Model (TAM) point of view[5][6].

2. Theoretical Background

2.1 Safety

Smart wearables provide less security associated to other figuring policies[7]. Smart wearable device technologies are not yet mature in terms of privacy and security. There are some security weaknesses that prompts smart wearable devices vulnerable, one of the critical issues in smart wearable technology is an authentication issue[8].

2.2 Convenience

To establish whether a service or product is convenient depends on effort and time, Smart technology or Service convenience is the user's effort and time perceptions related when using a service. Convenience is a prevalent construct[9]. It is prevalent because most technology performances that need the user's effort and time are within its domain. It is important since effort and time are what people give up to become users. Effort and time are non-renewable. Technological advances have created more entertainment, information, and communications these options have added pressure on the user's effort and time resources[9].

2.3 Affective Trust

Affective trust is the assurance spaces in extra base on the feelings created by the near of concern and care demonstrates, Affective trust is more sensitive than normal. With mark trust people when they have helpful emotional state for the other individual. Affective trust is when having mutual concern, interpersonal care and emotional bonds[10].

2.4 Cognitive Trust

Cognitive feature, the conscious and direct process based on evidence and reason, Cognitive trust incompetence and functionality means to trust in the ability to achieve an outcome[11]. In IoT context, cognitive trust is referred to the ability of smart devices to accomplish tasks. Cognitive trust in reliability means whether smart device applications can be reliable in conducting tasks. Cognitive trust in honor means routine fairness which refers to the conception of information honesty and users' observation that information will not change without notice[12].

2.5 Perceived Ease of Use:

It is a significant factor towards the intention of continuous use[12]. Defined perceived ease of use as a degree a consumer trusts using the technology would be allowed of sweat[13]. Explained that perceived ease of use can affect intent via two pathways, one path is direct and the other path is secondary effect on intent by perceived usefulness.

2.6 Perceived Usefulness:

The TAM framework, perceived usefulness is significant variables that reflect positive motivation. Perceived usefulness definite as the degree that a user trust by means of a technology will develop work presentation[14]. Stated that from an incentive viewpoint, perceived usefulness is portion by the user's level of outcome expectancy and extrinsic enthusiasm.

2.7 Continuous Intention to Use:

It is definite as an extent to which a consumer intent to continue using the product or service in the future[15]. According to TAM philosophy intention to use will predict a user's positive or negative valuation on using technology.

3. Empirical Analysis and Research Findings

The findings reported in this study focused on the evaluation of data involved in an online survey distributed to the current smartwatch ECG and PPG applications users. The methodologies adopted in this study are suitable to gather the information, sought after and analyze to answer the study questions. The methods are theoretically and practically aligned with this study. A quantitative methodology was used to address the study subject. Based upon the information gathered from literature review and analysis of other technological systems, the research model and associated hypotheses were driven. [Table 1] below states the variables operational definitions used in this study.

[Table 1] Functioning Definition of Constructs

Variable	Operational Definition	Previous Studies
Safety	A degree to believes in the safety.	[8]
Convenience	The degree to which a smartwatch ECG and PPG application user feels convenience toward place and time when pursuing a task using the applications.	[9]
Affective trust	The degree to have positive emotions or feelings about his/her smartwatch ECG and PPG application for decision making.	[10]
Cognitive trust	A degree to which a smartwatch ECG and PPG application user feel confident and reliable while using the applications.	[11]
Perceived Ease of Use	A degree to believe that using smartwatch ECG and PPG application would be free of effort.	[15]
Perceived Usefulness	A degree to which a consumer believes that using the smartwatch ECG and PPG application would enhance the job performance.	[15]
Continuous Intention to Use	A degree to believes that they would continue to use the smartwatch ECG and PPG application in future.	[15]

3.1 Characteristics of Respondents

The findings reported in this study focused on the evaluation of data involved in an online survey distributed to the current smartwatch ECG and PPG applications users. Amazon Mechanical Turk (MTurk) is becoming popular in experimental and survey-based social science research. Individuals can register as task creators or as workers being paid for tasks complete. Members can also create and post a task that can be done by other

workers via computer (i.e., writing, experiments, surveys, etc.) using scripts or templates or just connect workers to an external online survey (e.g., Google form, SurveyMonkey). Amazon's Mechanical Turk was used for the sample collection. In the survey, the respondents are current smartwatch ECG and PPG application users, 340 responses were collected in total and 331 responses were used for the analyses after 9 invalid responses were eliminated.

[Table 2] Characteristics of Respondents

Characteristics		Responses	Percentage
Gender	Male	209	63.9%
	Female	122	36.1%
	Total	331	100%
Marital Status	Single	190	56.8%
	Married	141	42.3%
	Total	331	100%
	20-29 years old	180	56.9%
	30-39 years old	89	27.3%
	40-49 years old	27	7.1%
	50-59 years old	25	6.8%
	60 years old or more	10	1.9%
	Total	331	100%
	Total	331	100%
Educational Level	High School	23	6.1%
	Finished School	10	1.6%
	College / University	105	32.6%
	Graduate	163	51.3%
	Graduate School	30	8.4%
	Total	331	100%
Occupation	Student	20	5.5%
	Housewife/Househusband	16	4.2%
	White-collar	81	25.2%
	Blue-collar	31	8.7%
	Professionals	151	47.4%
	Others	32	9.0%
	Total	331	100%
Annual Income level	0 – \$10,000	29	8.1%
	\$10,000 – \$20,000	47	13.9%
	\$20,000 – \$30,000	84	25.8%
	\$30,000 – \$40,000	47	13.9%
	\$40,000 or more	124	38.4%
	Total	331	100%
Period of use of smartwatch	0-6 months	83	25.2%
	6-12 months	152	47.4%
	1-2 years	85	25.8%
	more than 2 years	11	1.8%
	Total	331	100%
Brand of smartwatch in use	Apple	104	32.6%
	Samsung	122	38.4%
	Fossil Sport	11	1.7%
	Polar Vantage	13	2.1%
	LG	30	5.6%
	Fitbit	22	4.0%
	TicWatch Pro	29	5.5%
	Total	331	100%

4. Research Design

4.1 Research Model

The core aims of this research are to observe the roles of users' perceived usefulness, and perceived ease of use as mediators in the relationships among antecedents and continuous intention to use smartwatch ECG and PPG applications. Therefore, this study will first analyze the causal relationships between Safety, Convenience, Affective Trust, Cognitive trust and continuous intention to use. Second, it will inspect the roles of perceived ease of use, perceived usefulness as underlying mechanisms for mediating the relationships.

[Fig. 1] Research Model

4.2 Research Hypothesis

This study refers to the smartwatch ECG and PPG application's ability to protect, verify and have a valid authentication for user's safety of personal information. Therefore, the safety phenomenon for smartwatch ECG and PPG applications shall be consistent with the user expectations and their satisfaction. The following hypotheses are set based on these findings.

Hypothesis 1: Safety is going to significant impact on perceived usefulness.

Hypothesis 2: Safety is going to significant impact perceived ease of use significantly.

Convenience in this contemporary research is defined as a smartwatch ECG & PPG health applications user feels convenience toward time and place when completing a task using the applications[16]. Constructed on these results, the following hypotheses are set.

Hypothesis 3: Convenience is going to significant effect on perceived usefulness.

Hypothesis 4: Convenience is going to significant effect on perceived ease of use.

Affective trust is expressively based trust, it is categorized by the security felt in the relationship. Therefore, the following hypotheses are set.

Hypothesis 5: Affective trust is going to significant effect on perceived usefulness.

Hypothesis 6: Affective trust is going to significant effect on perceived ease of use.

Cognitive and emotional trusts are related to reasoning and feeling respective. The cognitive proportion of the mind apprehend how humans evaluate and judge things based on evidence and facts[17]. Therefore, the following hypotheses are set.

Hypothesis 7: Cognitive Trust is going to significant effect on perceived usefulness.

Hypothesis 8: Cognitive Trust is going to significant effect on perceived ease of use.

[14] Stated that perceived usefulness measures the level of extrinsic inspiration and consequence expectation from a motivational perspective. Therefore, perceived usefulness is argued to influence the variables of the relative advantage of smartwatch ECG and PPG health applications. Earlier studies in a similar context establish positive relationships between perceived usefulness and intention of continuous use. The following hypothesis is set based on the above findings.

Hypothesis 9: There will be a positive relationship between perceived usefulness and continuous intention to use.

Perceived ease of use has two causal pathways to affect intention, the first path is direct effect and the second path is an indirect via perceived usefulness. The direct impact recommends that perceived ease of use is considered a potential method to increase the intention of continuous use [13]. In this research setting the more users thinks the smartwatch ECG and PPG health applications are easy to use, the more they would think it is useful for them. The following hypothesis is set.

Hypothesis 10: There will be a positive connection between perceived ease of use and continuous intention to use.

4.3 Analysis Method

The structural equation modeling analysis is a combination of multivariate statistical techniques, it's a strong analytical method. SEM analysis method is an efficient way of testing a model, SEM is one of the effective methods which explain cause and effect relationship of variables in assorted hypotheses related to the statistical models which have a theoretical foundation[18]. The model was examined using the data acquired for the research. This study used IBM AMOS version 20 and IBM SPSS version 20.

4.3.1 Convergent and Discriminant Validation

In AMOS a contemplative measurement of model is measured by inner consistency, discriminant validity and convergent validity. The IBM AMOS software affords a composite reliability measure for internal consistency.

[Table 3] Convergent and Discriminant Validities

Factors	Items Name	Factor Loadings	Response		AVE	Composite Reliability (CR)	Cronbach's Alpha
			Mean	Standard Deviation			
Safety	SAF1	0.802	4.05	0.777	0.726	0.820	0.706
	SAF 2	0.801	4.07	0.817			
	SAF 3	0.743	4.02	0.894			
	SAF4	0.560	4.05	0.818			
Convenience	CON1	0.778	3.87	0.878	0.773	0.856	0.774
	CON2	0.755	3.93	0.922			
	CON3	0.727	3.78	1.031			
	CON4	0.834	3.82	0.977			
Affective trust	ATRUST1	0.743	3.66	1.038	0.785	0.865	0.794
	ATRUST2	0.820	3.46	1.136			

	ATRUST3	0.837	3.43	1.089			
	ATRUST4	0.740	3.58	0.979			
Cognitive trust	CTRUST1	0.732	4.06	0.835	0.732	0.822	0.710
	CTRUST2	0.726	3.95	0.939			
	CTRUST3	0.783	4.04	0.825			
	CTRUST4	0.687	4.02	0.759			
Perceived Ease of Use	PEUSE1	0.758	4.10	0.740	0.749	0.837	0.779
	PEUSE2	0.718	3.99	0.893			
	PEUSE3	0.731	4.01	0.763			
	PEUSE4	0.791	4.04	0.819			
Perceived Usefulness	PU1	0.730	3.90	0.856	0.775	0.858	0.737
	PU2	0.808	3.88	0.966			
	PU3	0.795	3.88	0.898			
	PU4	0.769	3.97	0.854			
Intention of Continuous Use	ICU1	0.714	3.95	0.672	0.701	0.795	0.658
	ICU2	0.774	3.91	0.862			
	ICU3	0.663	3.89	0.865			
	ICU4	0.656	3.98	0.858			

4.3.2 Pearson Correlations

The Pearson correlation test shows the strength between the variables involved. In conducting the analysis, the SPSS software package was the technique of analysis because of correlation and which factor gives the most significant effect on the variable.

[Table 4] Pearson Correlations of the Model

Factors	Safety	Convenience	Affective Trust	Cognitive Trust	Perceived Ease of Use	Perceived Usefulness	Intention of Continuous Use
Safety	a0.852						
Convenience	0.412**	a0.879					
Affective trust	0.303**	0.570**	a0.886				
Cognitive Trust	0.596**	0.297**	0.222**	a0.855			
Perceived Ease of Use	0.564**	0.528**	0.439**	0.515**	a0.865		
Perceived Usefulness	0.625**	0.350**	0.185**	0.705**	0.552**	a0.880	
Continuous Intention to Use	0.661**	0.462**	0.359**	0.483**	0.560**	0.612**	a0.837

**Correlation is significant at 0.01 level (2-tailed).

^a Diagonal element show the square root of AVE'

[Fig. 2] Representation of Research Model in Amos

4.3.3 Model Fit

[Table 5] Fit Indices

χ^2	df	p-value	CMIN/DF	GFI	AGFI	RMR	RMSEA	NFI	CFI	IFI
747.877	334	.000	2.239	.854	.823	.044	.061	.803	.879	.881

The above table shows the overall model fit. The result of the model gives an adequate fit, with the chi-square value of 747.877, degree of freedom 334 with a p-value of 0.000 significant. Other fit indices CMIN/DF=2.239, GFI=.854, AGFI=.823, RMR=.044, RMSEA=.061, NFI=.803, CFI=.879 and IFI=.881. NFI and CFI values are equally good bases on recommended 0.8 threshold levels. The RMSEA is below 0.08 as recommended.

[Fig. 3] Results for the Research Model

4.3.4 Hypothesis Testing

The results in [Table 6] determine that Safety construct has a positive impact on perceived usefulness ($\beta=0.295$, $p=0.043$) and perceived ease of use ($\beta=0.301$, $p=0.036$), thereby confirming the

hypothesis H1 and H2, The Convenience has a positive effect on perceived usefulness ($\beta=0.330$, $p=0.001$) which support hypothesis H3 and positive effect on perceived ease of use ($\beta=0.200$, $p=0.039$) that supports H4 hypothesis respectively. The Affective trust construct has an insignificant relationship on perceived usefulness that is hypothesis H5 and the value is ($\beta=0.154$, $p=0.083$). On the other hand, the Affective trust has a negative estimate with perceived ease of use which is hypothesis H6 and the value is ($\beta= -0.188$, $p=0.022$). The analysis result shows that Cognitive trust has a positive impact on perceived usefulness ($\beta=0.278$, $p=0.032$) and perceived ease of use ($\beta=0.665$, $p=0.000$). This confirms the positivity of H7 and H8 hypotheses. Perceived ease of use with value ($\beta=0.563$, $p=0.000$) and perceived usefulness with value ($\beta= 0.410$, $p=0.000$) were positively significant on the continuous intention to use which supports H9 and H10 hypothesis respectively. The empirical evidence from the model states that Safety, Convenience and Cognitive trust are having significant influence on perceived usefulness and perceived ease of use of TAM. From the model, perceived usefulness and perceived ease of use have significant influence on continuous intention to use. But contrary to that, the findings of the model states that the Affective trust construct shows a weak and negative impact on both perceived usefulness and perceived ease of use.

[Table 6] Hypothesis Testing of Model

Paths				Hypothesis Results
	Estimate	CR	p	
H1: Safety $\rightarrow$ Perceived Usefulness	0.295	2.025	.043	Supported
H2: Safety $\rightarrow$ Perceived Ease of Use	0.301	2.092	.036	Supported
H3: Convenience $\rightarrow$ Perceived Usefulness	0.330	3.180	.001	Supported
H4: Convenience $\rightarrow$ Perceived Ease of Use	0.200	2.063	.039	Supported
H5: Affective trust $\rightarrow$ Perceived Usefulness	0.154	1.735	.083	Not Supported
H6: Affective trust $\rightarrow$ Perceived Ease of Use	-0.188	-2.297	.022	Not Supported
H7: Cognitive trust $\rightarrow$ Perceived Usefulness	0.278	2.139	.032	Supported
H8: Cognitive trust $\rightarrow$ Perceived Ease of Use	0.665	4.503	***	Supported
H9: Perceived Ease of Use $\rightarrow$ Continuous Intention to Use	0.563	5.410	***	Supported
H10: Perceived Usefulness $\rightarrow$ Continuous Intention to Use	0.410	4.084	***	Supported

***Probability level $p < 0.001$

5. Conclusions

This study examined smartwatch ECG and PPG application users' safety and convenience affective and cognitive trust were analyzed. Furthermore, it investigated the effects of users' safety, convenience and trust on continuous intention to use. Research outline was introduced. The research framework is the most widely used in consumer behavior research frameworks it investigates how consumers make decisions when purchasing products or services. The two constructs, perceived usefulness and perceived ease of use are the mediators relationships between antecedents (Cognitive trust, Affective trust, Safety, Convenience) and continuous intention to use. This study intends to create a positive perception for smartwatch ECG and PPG application users to embrace the applications. Also, it examined the continuous intention to use and the adoption of smartwatch ECG and PPG applications. In brief, the observed findings in this research provide the newest perceptive and explain how consumer Safety, Convenience, Affective trust, Cognitive trust can calculate continuous intention to use smartwatch ECG and PPG applications refereed. Specifically, this research found out that the safer and convenient a user becomes, the more they are likely going adopt smartwatch ECG and PPG applications and will intend to continue using them. The results from this research make two extraordinary contributions to the academic literature. The results show that Safety, Convenience and

Cognitive trust will influence the continuous intention to use smartwatch ECG and PPG applications. Secondly, these research results reveal that users may continue using the smartwatch ECG and PPG applications not just because of the perceived values but also because of their safety and convenience while using. The results show that there is a need to consider the consumer's Safety, Convenience and Cognitive trust to better understand user's continuous intention to use, which influences a strong level of intention by attractive perceived ease of use and perceived usefulness this may be a critical way of stimulating user's continuous intention to use. For fabricators and ICT organizations this study provides several guidelines in getting better services and products to attract and attain users. Additionally, in terms of academic roles, this study anticipates promoting smartwatch, ECG and PPG applications manufacturing industry. We believe that this research work could help facilitate health wearable technology organizations to find the correct item for marketing. Further study may look at two other directions. One, to integrate some useful variables, like perceived price. This could progress the explanatory power. For instance (a local user may refuse a product because the price is high, despite the constructive factor in perceived usefulness and perceived ease of use motivations. Another possible direction is to discover a digital standard of living effect, which involves investigating local consumer values. The SEM analyses confirm the hypotheses and the results also indicate several key findings.

References

- [1] M. E. Cecchinato, A. I. Cox, J. Bird, Smartwatches: the good, the bad and the ugly? In Proceedings of the 33rd Annual ACM Conference extended abstracts on human factors in computing systems, (2015), October 15-19; Seoul, Korea, DOI: 10.1145/2702613.2732837
- [2] [https://www.idc.com/getdoc.jsp?containerId=prUS46885820#:~:text=FRAMINGHAM%2C%20Mass.%2C%20September%2025,million%20units%20shipped%20in%20,Jun%2025%20\(2019\)](https://www.idc.com/getdoc.jsp?containerId=prUS46885820#:~:text=FRAMINGHAM%2C%20Mass.%2C%20September%2025,million%20units%20shipped%20in%20,Jun%2025%20(2019))
- [3] K. Guk, G. Han, J. Lim, K. Jeong, T. Kang, E. Lim, J. Jung, Evolution of Wearable Devices with Real - Time Disease Monitoring for Personalized Healthcare, *Nanomaterials*, (2019), Vol.9, No.6, pp.813-823, DOI: 10.3390/nano9060813
- [4] <https://www.prnewswire.com/news-releases/the-worlds-first-health-smartwatch-with-breakthrough-biometric-technology-300740024.html>, May 5 (2019)
- [5] F. D. Davis, Perceived usefulness, perceived ease of use and user acceptance of information technology, *MIS Quarterly*, (1989), Vol.13, No.3, pp.319-340.
- [6] V. Venkatesh, F. D. Davis, A theoretical extension of the technology acceptance model: Four longitudinal field studies, *Management Science*, (2000), Vol.46, No.2, pp.186-204.
- [7] J. Al-Muhtadi, D. Mickunas, R. Campbell, Wearable security services. In Proceedings 21st International Conference on Distributed Computing Systems Workshops, (2001), May 14-17; Kyoto, Japan.
- [8] K. Ching, M. M. Singh, Wearable technology devices security and privacy vulnerability analysis, *International Journal of Network Security & Its Applications*, (2016), Vol.8, No.3, pp.19-30.
- [9] L. L. Berry, K. Seiders, D. Grewal, Understanding service convenience, *Journal of Marketing*, (2002), Vol.66, No.3, pp.1-17.
- [10] M. G. Washington, Trust and project Performance: The effects of cognitive-based and affective-based trust on client-project manager engagements, *MIS Quarterly*, (2013), Vol.21, No.54, pp.90-101.
- [11] J. Yi, The Effects of Perceived Interactivity on Intention of Continuous Use of Smartwatches: A New Perspective on the Mediating Roles of Cognitive and Affective Trusts, *Journal of Internet Commerce*, (2018), Vol.18, No.5, pp.167-186.

- [12] T. Harwood, T. Garry, Internet of Things: understanding trust in techno-service systems, *Journal of Service Management*, (2017), Vol.21, No.3, pp.99-113.
- [13] V. Venkatesh, M. G. Morris, Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior, *MIS quarterly*, (2017), Vol.32, No.1, pp.115-139.
- [14] V. Venkatesh, Creation of favorable user perceptions: Exploring the role of intrinsic motivation, *MIS Quarterly*, (2011), Vol.21, No.2, pp.239-260.
- [15] V. Venkatesh, Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model, *Information Systems Research*, (2000), Vol.11, No.4, pp.342-365.
- [16] S. C. Chang, L. C. Wu, Exploring Consumers' Intention to Accept the Smartwatch, *Asian Conference on Psychology and Behavioral Sciences*, (2015), May 5-9; Seoul, Korea.
- [17] R. Chua, P. Ingram, M. W. Morris, From the Head and the Heart: Locating Cognition- and Affect-Based Trust in Managers' Professional Networks, *Academy of Management Journal*, (2008), Vol.51, No.3, pp.436-452.
- [18] J. Tacq, Causality in qualitative and quantitative research, *Quality & Quantity*, (2011), Vol.45, No.2, pp.263-291.