

The determinants of increasing privacy concerns in the mobile apps

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ABSTRACT

This study identifies the determinants of increasing privacy concerns in the mobile apps. The privacy affecting factors will be divided into the 3 categories on the basis of both users' and developers' perspective. First, this study explores whether the users' seeking value affects concern of the mobile apps privacy. Second, gender gap on the mobile privacy sensitivity will be tested. Third, this study identifies the meaning of apps developers' providing toolkit in the users' sensitivity on the privacy. The result showed that innovation among the customer's characteristics was identified the most significant factor to affect the mobile app privacy sensitivity. Ethical norm related variables (ethical identity, subjective norm and utilitarian value) were also identified as the meaningful variables in the mobile app privacy. Toolkits provided by app developers are also appeared a significant variable to affect the customer's app privacy sensitivity negatively. Finally gender also appears the meaningful factor in the mobile app privacy sensitivity.

Keywords: mobile apps, online privacy, privacy concerns, ethical identity, consumer value

1. INTRODUCTION

Facebook IPO in May 2012 boosted the privacy discussion of the SNS user all over the world in the Internet age. Since 2007 controversy over Beacon, privacy problem was repeatedly hot issue in the online community. Since 2010, the fast increase of smart-phone user and the popularity about mobile application boost the concerns on the mobile privacy. Mobile applications generally collect the users' address book information, call logs, calendar appointments and location information, and then utilize them for advertising. Therefore, app developers and publishers on the apple and android platform have the obligation to notify the data collection policy and then get the consent about it to users. However, the users of apps don't often get the notice how the information will be used or how the company plans to store it. Because of becoming worse tendency on the mobile and online privacy disturbance, Euro zone recently regulates the new rule on privacy. The law would apply across 27 countries of EU and restrict the way Internet company gather, use and retain the volumes of personal data that their user post online. It is along with slow-moving privacy legislation in Washington.

This social movement is originated from the mobile apps developers' profit seeking through feeding the customers' information seeking needs and ad-supported work. However, these firms provide the consumers time saving and information to intensify the relationship with their friends and family. Thus, consumers are likely to increase the intensity of using mobile apps when the apps evolve with more developed tool-kit and the contents.

According to be filed calls for strict regulation of mobile and online privacy from the public, even digital advertising industry supports the self-regulation. As the actions, the AdChoices icon-based system, which allows users opt out of having their behavior tracked online, was introduced in October 2010. In addition, the Interactive Advertising bureau introduced a campaign in an attempt to educate consumers. American association of advertising agency also urges advertiser attending the association conference about privacy because advertiser's creativity would be also increasingly threatened without self-regulation.

The issues of online privacy researched the recent decade in the marketing studies according to increase the concerns on the online advertising in the community, blog, search engine, and social network sites. However, the topic is generally limited to the privacy measure, and the gender gap

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Manuscript received Apr.13, 2012 ; revised Jun 15, 2012;
accepted Jun.17, 2012

This research was supported by BK21 department of Sogang Business School at Sogang University

in the privacy concerns on the online users' perspective. On the online advertisers' perspective, the privacy trust-marks related studies were prominent in the privacy literature. Although advertising studies adopted the privacy concerns, the literatures dealt the privacy issue as the small one among affecting factors on the attitude of SNS advertising. Furthermore, mobile application privacy issue recently started to get interest so that there is no academic research. Thus, it is necessary to study the privacy problem on the mobile application market as the main topic. The objective of this study is identifying the determinants of increasing privacy concerns in the mobile apps. The affecting factors on app privacy can be divided into the 3 categories on the basis of both users' and developers' perspective. First, this study analyses whether the users' seeking value, which are ethics, utilitarianism and subjective norm, affects concern of the mobile apps privacy. Second, gender gap on the mobile privacy sensitivity is tested. Third, this study identifies the meaning of apps developers' providing toolkit in the users' sensitivity on the privacy.

2. LITERATURE REVIEW

2.1 Online Privacy and application to mobile

Privacy is the right to prevent the disclosure of personal information to others [46]. In a legal context, privacy has been considered a right to be let alone [44]. There have been several attempts to define the privacy, but a unified definition has not yet emerged. [9] developed the multidimensional definitions of privacy, which are informational privacy, accessibility privacy and expressive privacy. In the online context, the most debated dimension is the information privacy, which is related to an individual's right to determine how, when and what extent information about self will be released to another person or to the organization. Online firms gather the information from Internet search and purchase so that this has raised customers fear about what companies actually do with collected information and who ultimately has access to it. Above all, the information may utilize the legitimated business use and transformed to detailed customer profiles on the online behavior [35]. In the mobile context, the privacy prevention is coincident to online. When the users purchase and register a new app, the information, which is from private profile to current location, has to be provided. The marketer access this information and even customers' movement record during the apps use without permission. However, the users can hardly aware of blocking option [30]. The FTC has made the protection provision of consumer privacy on the Internet with emphasis on ensuring personal data protection and keeping firm's security on the section 5 of the FTC Act. Especially for the protecting children from the disclosure risk, FTC implements a rule, which requires online service operator (including interactive mobile apps) directed to children under age 13 to provide notice and obtain parental consent before collecting "personal information" from children. In addition,

commission is recently engaged in a project to update existing guidance about online advertising disclosures. This project also deals with the mobile disclosures, including how they can be short, effective and accessible to consumers on small screen [15].

2.2 Mobile apps and private information disclosure

According to the 2011 Harris Interactive investigation on the mobile privacy, 98% of consumers have desire for better controls over how their personal information collected and used via mobile devices and apps. Three-quarter of consumers also express the uncomfortable feeling on the advertising tracking. In addition, majority of consumers don't want to share their location data with app publishers. However, only half of smartphone users have read the privacy of mobile apps. Less than half reads and understands disclosure regarding the use of their personal information before using an app.

TRUSTe Trust marks, which certificate the mobile privacy, help consumers prevent from the information disclosure. According to the survey result, this mark increases the comfort level, which smartphone users feel about their privacy. Even it is effective to those who had not heard of it before [41]. However, customers prefer the short and simply noticed privacy policy. Even they are more likely to read more easily navigated privacy policy. Thus, app developers should provide policy through simple and short disclosure or icons that are easy to find and understand on the small screen of a mobile device [15].

Integrating apps with social network is becoming a strategy to promote the app to other potential customers so that app promotion page indicates Facebook, Twitter and various other social network sites. Some apps have their own sharing functions like automatically sharing game results, usernames and other information with unknown users. The social features within apps are received to customers less sensitive so that the information disclosure via social network includes more risk of privacy disturbance.

In-app advertising typically involves a relationship between the app developer and an ad network. The ad network pays the app developer to incorporate the ad network's code into the developer's application. When the app is running, the ad software allows the ad network to send ads to the user's device. For addressing the ad to the appropriated target customer, the ad network may collect information from the user in order to provide targeted ads. Thus, the advertising and privacy on the apps becomes the sensitive issue after the online advertising issue, which had been discussed on the privacy protection debate last decade.

2.3 Gender difference on the mobile privacy

Previous research revealed that women are more protective on their online privacy than men [38]. Women and men concerns about advertisers' and marketers' use of personal information all together [18]. However, women consider information leakage more seriously on the online base and generally fell greater risk for online harassment

and stalking [47]. This gender difference appears on the mobile context. The main cause is found from the gap on the purpose of using mobile apps. Communication and navigating information are the dominant motivators to use Internet. A research from emarketer.com [11] revealed that women slightly prefer social network as their favorite site to men. This research showed that this tendency appears on the young women's more active behavior of updating profiles, post pictures and comment on someone's up-roads. These active participants on the social network and disclosure private information on the online and mobile interface make women more risky for using their personal information beyond the original intent [18]. Therefore, women are more sensitive to leak the privacy to the third party (someone who had never known or the other mobile app developers).

While men appeared less sensitivity on the privacy, they tended to show the aggressive behavior and adopted a wider range of behaviors in response to privacy concerns than women [37]. Javelin strategy and Research also observed that men were more likely to use tools that help detecting fraud more quickly whereas women took twice time in order to catch identity fraud [20]. On the other hand, Milne and Culnan's study found that men were less likely to read privacy notice and trust marks than women [24].

2.4 Ethical norm on the privacy

In the online context, numerous normative standards related to collecting personal information are existed. Representative norms are divided into 4 types, which are openness, information access, permission and honesty. First, norms of openness indicate that information collectors should provide consumers with the clear description of information collection and their intention [43]. Corresponding to this, Internet users are more willing to give their information to the extent to how the Internet firm provide where they use the information. Second, norm of information access means that customers are allowed to access the information and provide ability to change and delete it. Third, the norm of permission requires the information collector to ask the consent before they collect information. Fourth, the norm of honesty dictates that information collector should be truthful and avoid deception [3]. These four types of normative standards are designed to present the principal expectations that information collector might be satisfied. Therefore, these normative standards apply to the variable guidelines in numerous regulations. One of the representative example is the FTC's five provision related to the privacy. OECD also proposed similar guidelines (data accuracy, limit of use, specifying purpose, safeguards for security, information openness, and accountable of information) [24]. In addition, these become a guide when the customer estimates the information collector. Thus, the violation of these standards affects the customer's perception of trust related to the consumer's privacy protection. Because of the demand on the high ethical standard on online and related advertising market, firms employed trust-marks composed with a logo, symbol or picture on the site. The effectiveness (enhancing trust) of

mark to the customers has proved by several prior literatures [39], [2], [25].

After the fast expansion of the mobile app market and related advertising, ethical issue on the information collection and transfer is fiercely debating on private forum like FPF (Future Privacy Forum) and government office (eg. FTC). The extent of privacy disturbance is harder to prevent technically and the risk is more serious because of the mobility, especially which provides the circumstance to harm the children without parents' protection and detection. Therefore, the legislation similar to online privacy protection law and the normative guideline are on the process of building with great concern of customer protection group, press, and officials.

3. RESEARCH HYPOTHESIS

This study identifies determinants of the customers' privacy concern extent in mobile apps context. To find the meaning of determinants, this study applies the four types of perspective about the customer's characteristics. They are subjective value, demographics, innovativeness, and attitude on the toolkit provided by app developers. The model consists of the following parts. First, whether the users' seeking value, which are ethics, utilitarianism and subjective norm, affects concern of the mobile apps privacy will be verified. Second, this study identifies the meaning of customer's innovativeness on the privacy concerns. Third, gender gap on the mobile apps related privacy sensitivity is going to be tested. Fourth, how apps developers' providing toolkit affects on the customer's sensitivity about privacy will be verified.

3.1 Subjective value

3.1.1 Ethical identity

Individual's internalized ethical rules reflect the personal belief about right and wrong. In the context of ethical decision make, the customers may make ethical consumption because they consider ethical issue very important part of self-identity. Individual's internal reflection of ethical-identity and ethics obligation can impact an ability to act in accordance with ethical concern and responsibilities [36]. This tendency was explained in the prior studies through the theory of reasoned action. This can be adopted on the consumer's ethical behavior in the mobile context. Thus, the sensitive customers on high moral ethics may infer to show more strict behavior on the mobile privacy protection. This means that the customers, who have high ethical identity, consider private information leakage and transfer to third party on the mobile context more than others.

H1-1: The customer with high ethical identity may show more sensitive response on the privacy in the mobile app use.

3.1.2 Subjective norm

Subjective norm means a combination of people's perception that important others think they should or should not perform the behavior to comply with others' wishes [38]. [2] defined that subjective norm is a function of the normative belief that people relevant to the individual are perceived as having towards the behavior coupled with the motivation of the individual to comply with the expected norms of these relevant persons. This subjective norm not only affects on the behavior, but also is mediated by behavioral intention [1], [22]. In addition, the effect of subjective norm on the behavior is affected by social motive [33]. Therefore, effect of norms may be expected stronger when behaviors are more socially motivated [22]. Mobile privacy issue is debated fiercely as the social problem so that app developers, government and publics take an action all together to build privacy protection policy build and voluntarily protection movement. Thus, the customers who have strong subjective norm may consider privacy. The app privacy is the hot issue currently in the mobile context so that subjective norm may affect on the app privacy sensitivity of customers.

H1-2: The customer with high subjective norm may show more sensitive response on the privacy in the mobile app use.

3.1.3 Utilitarian value

Value is generally recognized as (1) the utilitarian outcome resulting from conscious pursuit of an intended consequence and (2) the output related to spontaneous hedonic response. It reflects the distinction between performing act "for getting something" and doing it "because I like it". People can get extrinsic rewards like prize and monetary award from participating in event. They can also get a more intrinsic, personal and emotional rewards from competitively derived [10]. Utilitarian consumers is just finishing the necessary work or mission so that they spend minimum time but don't think information searching time as a waste of time [4]. This utilitarian value may result from situational involved customer collecting information out of necessity [7], [4]. However, utilitarian value seeking customers can spend much time on information collection for achieving the purpose, which they become in the better reasonable decision. This characteristic of utilitarian value reflects to the behavior on the information privacy related issue. Thus, utilitarian customers may be more sensitive on the privacy protection because they are seeking rationalism and applied this tendency to choice and decision. In the mobile context, highly utilitarian value seeking customers consider privacy more than the opposite party.

H 1-3: The high utilitarian value-seeking customers may show more sensitive response on the privacy in the mobile app use.

3.2 Innovativeness

Innovation is defined on the two broad views in the past literature. According to Rogers and Shoemaker [34], innovativeness is the degree of early adopting an innovation than other members of one's social system. This is the adoptive innovativeness. [12] mentioned that people seek the innovation as a means of building the social differentiation. In the other perspective, innovativeness is defined as the degree of receiving new ideas and making innovative decision independently of the communicated experience of others [23]. Through this innovativeness, the individual can adopt the product concept and knowledge without adopting product itself. This is the vicarious innovativeness. Vicarious innovators can enter into novel information in the memory and have it available for consumption decision-make, but avoid the expense and risk inherent in adopting actual product. Even they enlarge the knowledge without real consumption experience [17]. This means that vicarious consumers are generous on receiving new information, but very conservative on experiencing risky situation. This risk avoidance behavior of vicarious innovators may appear on the privacy disturbance problem. Thus, it is inferred that vicarious innovators concern private information leakage in the mobile app more.

H2: The vicarious innovative customers may show more sensitive response on the privacy in the mobile app use.

3.3 Gender difference

Previous literatures [45], [48] found that male and female are different in the motivation of Internet use. Male are more likely to use Internet for entertainment, leisure and functional purpose whereas females are more likely to use the Internet for communication and social interaction. On the privacy disturbance problem, [37] found that women were more concern on the online privacy and at greater risk for online harassment and stalking. In addition, his research showed that women were more protective of online privacy than men. In terms of privacy protection, women are more likely than men to provide incomplete information when registering on the web site. These behavioral differences of gender about the online privacy may apply to the mobile app context. Thus, it is assumed that women are more sensitive on the private information leakage in the mobile market. In addition, they consider app privacy in the mobile context.

H3: Women may show more sensitive response on the privacy in the mobile app use than men.

3.4 Toolkit provided by app developer

Ability and predictability possessed by the online users enhance the trust on online activities [16]. [26] emphasized the positive role of trust in the knowledge sharing. [19] expected that innovative online user with high level of trust attributed to their higher degree of capabilities will increase the knowledge sharing in the web space through operation innovative functions and toolkits provided by websites. In

this research, various toolkits to support getting information and being innovative were preferred by the generals. One of the reasons is the innovative translation toolkit and user-friendly toolkit help the general users being in the leading edge without prohibited transformation cost. Especially, innovation translation toolkit may drive user community to innovate further under broadening solution space via the user's spontaneous posting, articulating and sharing of personal opinion and experience and operation [42]. User-friendly toolkit provides the environment, which user facilitates the function sooner. Therefore, it make possible to personalize the mash-up function that they want in a coincidence with the assertions out of user-friendly toolkits [42]. These two kinds of toolkits give the users information and the base of innovation via general sharing with no cost and less effort. Thus, the customers, who are familiar with toolkits provided by app developer, may express less sensitive feeling on the information leakage during using mobile apps.

H4-1: The customers, who are familiar to the user-friendly toolkit, may show less sensitive response on privacy in the mobile app use.

H4-2: The customers, who are familiar to the innovation translation toolkit, may show less sensitive response on privacy in the mobile app use.

4. SAMPLING AND MEASURES

4.1 Sampling and Sample Characteristic

This study surveyed to smart phone users in South Korea over a time frame of 3 weeks. The questionnaire was delivered directly to the respondents and they were briefly given an explanation about the questions before checking their answer. 191 samples were collected and used for the hypothesis analysis.

The Samples' demographic characteristics are follows. All respondents are between 20s to 40s age group. Thus, all of them are included in the X (26- 44) and Y (15-25) generation. Y generation respondents make up the 83% (159) of the total samples. 109 males (57%) and 176 single respondents (92%) are featured on the samples. In addition, 69% (131) of the samples are college student and salary man feature 26% of the survey.

4.2 Measures

All the variables measures are adopted from prior literature's methodological definition. The references of each variable are described in Table 1. The measures of each variable are described on the appendix 1 at the end of this article

Table 1. Reference list of measures

Variables	Reference
User friendly toolkit	Chia-Liang, Jerome and Tse-Ping(2011)
Translation transformation toolkit	Chia-Liang, Jerome and Tse-Ping(2011)
Privacy	Talyor, Lewin and Strutton(2011)
Innovation	Chia-Liang, Jerome and Tse-Ping(2011)
Gender	Hupfer and Deltlor(2006)
Ethical identity	Sparks, Rechard and Lynn (1995)
Subjective norm	Show and Edward (2003)
Utilitarian value	Bruner and A. Kumar (2005)

5. ANALYSIS RESULT

5.1 Reliability and validity

For testing reliability, this study applied the Cronbach's alpha and C.R. index to identify the consistency on the constructing indicators. Factor loading index is used for finding the composite validity of variable constructs. In addition, this study compares the correlation index and the root square of AVE index for identifying the discriminant validity,

In the reliability test result, all variables are shown to have more than .700 in the Cronbach's alpha index. In addition, all C.R indices of constructing variables have more than .800. Thus, all are fully satisfied the reliability.

In the construct validity test result, factor-loadings of all measures in the each variable have more than 0.700. In the discriminant validity test result, each square roots of AVE is shown to have more than related correlation indices. Thus, construct validity and discriminant validity test result are fully meet the standard index.

Each reliability and validity test result is shown the following Tables 2 and 3.

Table 2. Reliability and validity test result

	Factor loadings	C.R.	Cronbach's alpha	AVE
Toolkit1	0.773	0.898	0.857	0.637
Toolkit2	0.813			
Toolkit3	0.823			
Toolkit4	0.798			
Toolkit5	0.782			
Toolkit_1	0.887	0.857	0.748	0.669
Toolkit_2	0.842			
Toolkit_3	0.715			
Privacy1	0.883	0.935	0.912	0.741
Privacy2	0.905			
Privacy3	0.902			
Privacy4	0.793			
Privacy5	0.815			
Innov1	0.803	0.888	0.831	0.664
Innov2	0.834			
Innov3	0.838			
Innov4	0.783			
Gender	0.184	1.000	1.000	1.000
Ethics1	0.909	0.905	0.789	0.826
Ethics2	0.909			
Norm1	0.925	0.922	0.832	0.856
Norm2	0.925			
Value1	0.953	0.952	0.899	0.909
Value2	0.953			

Table 3. Correlation result (Default model)

	ToolkitA	ToolkitB	Privacy	Innovation	Gender
ToolkitA	0.798	0.635	0.232	0.461	0.030
ToolkitB	0.635	0.818	0.181	0.510	0.144
Privacy	0.232	0.181	0.861	0.169	-0.054
Innovation	0.461	0.510	0.169	0.815	0.184
Gender	0.030	0.144	-0.054	0.184	1.000

Square roots of average variances extracted (AVE's) shown on diagonal.

5.2 Hypothesis Test Result

For testing the research model, this study applied the PLS analysis. It is convenient to identify the basis test and hypothesis test result simultaneously. At the same time, multicollinearity of variables can be also shown. Thus, this study used WarpPLS 2.0 program.

The hypothesis test results are described on the Table 4. When the independent variables show high correlation indices, the significance of independent affecting dependent variables is disappeared. Thus, this study tested model 1 as the basic test, and then added one variable to model 1 step by step. Thus, the result of 4 test models showed in followings.

Firs of all, the 4 types of model are tested by WarpPLS analysis. In this program, APC, ARS, and AVIF indexes are used for the model fit index. When the p-value of APC and ARS is less than 0.05, model fit is met. AVIF index also have to be less than 5 simultaneously for meeting the model fit. 4 models in our study are met appropriately by having p-value of APC and ARS less than 0.05, and showing AVIF less than 5. Each model's fit result is shown the following Table 4.

The Hypothesis test results are follows. First, subjective norm and utilitarian value (coefficient = .181, .141) identified as the significant variables on the 95% confidence level. Ethical identity (coefficient=.079) also identified the significant on the 90% confidence level. Thus, H2-1 and H2-3 are supported strongly so that two variables among ethical value related in the mobile app privacy are verified as the important affecting factors. Even though the significance level is different, the meaning of ethical self-identity was approved in the test result. Thus, H1 is also supported.

Second, gender gap was appeared significant on the 90% confidence level in the default model, model 2 and model 4. On the other hand, this variable didn't show the significance in the model 3. Thus, H2 are partially supported. It refers that the meaning of gender gap as the determinants of mobile app privacy sensitivity appeared incompletely significant.

Third, innovation was identified significant on the 95% confidence level in all models. Thus, H3 is fully supported so that innovation is verified the strongly affecting variable to the mobile app privacy.

Fourth, two kinds of toolkits provided by app developer appeared different result in the each model test. User-friendly toolkit is identified as the significant variable on

the 95% confidence level in the model 1 and model 2, and on the 90% confidence level in the model3. On the other hand, this variable didn't show the significance in the model 4. Thus, H4-1 is supported in the model, which excluded ethical values. On the other hand, innovation transformation toolkit showed the significance on the 90% confidence level in the all research models. Thus, H4-2 is supported so that the meaning of innovation transformation on mobile app privacy is identified relatively significant in empirical test result.

6. CONCLUSION AND IMPLICATION

According to expand the mobile app market since 2008, the 2 billion apps had been downloaded until February, 2012. This fast growth of the app market in the all over the place brought the mobile privacy issue again in the Internet world such as the online privacy problem in the past 2000s. Thus, this study aims to find the important factor to affect the customer's privacy sensitivity during the mobile app consumption and utilization.

Table 4. Hypothesis analysis result

Model	Path coefficients					R-squared	Model fit
1	Toolkit1	Toolkit2	Innovation	Gender		0.113	APC=0.138, P=<0.001 ARS=0.113, P=0.016 AVIF=1.203, Good if < 5
	0.112**	0.166*	0.170**	-0.104*			
2	Toolkit1	Toolkit2	Innovation	Gender	Ethics	0.119	APC=0.121, P=<0.001 ARS=0.119, P=0.033 AVIF=1.182, Good if < 5
	0.105**	0.157*	0.160**	-0.101*	0.079*		
3	Toolkit1	Toolkit2	Innovatic	Gender	Norm	0.144	APC=0.134, P=<0.001 ARS=0.144, P=0.008 AVIF=1.178, Good if < 5
	0.092*	0.159*	0.160**	-0.079	.181**		
4	Toolkit1	Toolkit2	Innovation	Gender	Value	0.128	APC=0.125, P=<0.001 ARS=0.128, P=0.012 AVIF=1.320, Good if < 5
	0.035	0.167*	0.187**	-0.097*	0.141*		

Confidence level- *: p<0.1. **: p<0.05

This study chose the customer's characteristics and the developer providing toolkits as the affecting variables and then verified this variables significance via 4 types of research model test.

Innovation among the customer's characteristics was identified the most significant factor to affect the mobile app privacy sensitivity. This result is corresponding to [17], which the vicarious innovative people appear the conservative attitude on experiencing the risky situation even though they adopt concept and knowledge, and then make a consumption decision. It means that innovative customers have the high tendency of avoiding risky environment in the mobile world even if they are accustomed to receive new information and understand new

product. Therefore, innovative customers showed high sensitive reaction on privacy disturbance in the mobile app consumption. Ethical norm related variables (ethical identity, subjective norm and utilitarian value) were also identified as the meaningful variables in the mobile app privacy. Above all, subjective norm among them was the most strongly affecting factor. Generally social motive activates to intensify the customers' behavior to the socially accepted direction. So when a social issue debated among the people as the hot issue, the effect of subjective norm is stronger in the each customer's choice. The mobile app privacy is most fiercely debated issue in the mobile world [22]. Thus, subjective norm may affect strongly on the customers' sensitivity about mobile app privacy. On the other hand, utilitarian value seekers pursue the rationalism and reasonable decision make [4]. This tendency can apply on the privacy issue. Thus, the utilitarian customers may have the high caution and sensitivity in the mobile app consumption. Ethical identity was also showed meaningful result in the mobile app privacy sensitivity in the test result. The people, who appear strong ethical self-identity, showed higher ethical concern and responsibility [36]. Thus, the high ethical identity may affect the customer's responsible behavior related to the mobile app privacy. Toolkits provided by app developers appeared a significant variable to affect the customer's app privacy sensitivity negatively. Past literature described that user's ability and innovation enhance the trust on the online activity [16]. This ability can be more intensified via app provider's useful toolkits. Thus, information sharing in the mobile app based on trust might be increased when the more valuable toolkits such as user-friendly or innovation transformation support toolkit are provided by app developer. This result is correspondent to [19], which innovative user increased knowledge sharing in the web space through innovative function and toolkits provided by websites. Gender appeared also the meaningful factor in the mobile app privacy sensitivity even though the significance was relatively weak. Basically men and women have different purpose when they surf Internet. The women's motivation of Internet usage is generally in the communication and social interaction so that they expose on the high privacy leakage environment [48]. Thus, women showed more sensitive response on the mobile app privacy.

The results from this study are noteworthy in two ways. First, this study is the first attempt to investigate the mobile apps privacy issue in the academic filed. Even though mobile application privacy issue got the interest strongly recently, there is no academic research. Therefore, findings from this study indicate the new way to understand the privacy problem on the mobile application market. Second, we identified the privacy affecting factors into the 4 categories on the basis of both users' and developers' perspective, so we can make some suggestions to public policy makers and the mobile application related companies.

Firstly, the public organization has to establish some policies within a short time to prevent consumer's privacy injury in mobile application use such as FTC's online privacy protection policies. Even though consumers in Korea have used mobile applications quite a short time, they

care privacy much in mobile application use and mobile privacy injury. Our study also shows innovative consumer responding highly sensitive on the privacy in the mobile application use. Thus, for the effective adoption, use and diffusion of mobile application adoption, we need consumer's privacy protection in mobile application use by public policy.

Secondly, the mobile application related company must not misuse consumer's privacy. Many people look at the wholesale privacy disclosures taking place on online so that people worry about a possible occurrence of consumer's privacy injury in mobile application use. Thus, the mobile application related company might be able to figure out how to maintain their customer's privacy while using them.

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APPENDIX



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	Measures
User friendly toolkit	1. I think that the interactive functions of this website are plentiful and useful to me. 2. I think that the operation instructions of this website are simple and direct. 3. I think that the information exploration process of this website is very easy. 4. I think that it is always exciting for me to handle the community functions provided by this website. 5. I think that the interaction interface on this website is completely user-friendly.
Translation transformation toolkit	1. I think that the related website services usually fulfill my specialized innovative activities. 2. I think that I usually realize and share my innovative ideas without difficulty on this website. 3. I think that it is easy to replicate others' innovations based my own IT capability and the toolkits provided by the website.
Privacy	1.Are you concerned about people you do not know obtaining personal information about you from your online activities? 2.Are you concerned that if you use your credit card to buy something on the internet your credit card number will obtain intercepted by someone else? 3.Are you concerned that if you use your credit card to buy something on the internet your card will be mischarged? 4.Are you concerned that an email you send may be read by someone else besides the person you sent it to? 5.Are you concerned that an email you send someone may be inappropriately forwarded to others?
Innovation	1. I get together with others online to provide opinions and solutions to problems. 2. I usually suggest innovative solutions to the community, which often considers my opinions. 3. I enjoy great popularity due to the incentive of community reciprocity. 4. I get together with others online to provide opinions and solutions to problems.
Gender	Male, Female
Ethical identity	1. I think of myself as someone who is concerned about ethical issues 2. I think of myself as an ethical consumer
Subjective norm	1.I am sensitive to which "important others" would approve or disapprove of their performing a given behavior. 2. How much the respondents cared whether the referent approved or disapproved of their leisure activities?