

# Online Privacy Concerns and Service Use (A comparison of social network service, cloud service, and mobile banking service)

Jaecheol Lee, Sundong Kwon, Tae-Sung Kim

**Abstract**—The main purpose of this study is to reveal how the factors influence the level of using online services (i.e., social network services, cloud services, and mobile banking services). We focus on differences in the degree of influencing factors by the kinds of services used. We suggest that five influencing factors to level of using online services are concerns about personal information leakage, awareness of information leakage issues, ability to control one's information, policy trust and policy interest. Awareness of information leakage issues is an antecedent variable to concerns about personal information leakage. Policy interest is used as a moderation variable between policy trust and the level of using online services. The result of this study can be summarized as follows. Concerns about personal information leakage had a negative relation with the level of using mobile banking services (not with social network services and cloud services). Awareness of information leakage issues had a positive relation with concerns about personal information leakage in all the three services. Ability to control one's information had positive relation with the level of using social network services and cloud services (not with mobile banking services). Policy trust had a positive relation with the level of using all the three services. Policy interest had a positive effect between policy trust and the level of using all the three services.

**Keywords**—Ability to Control One's Information, Concerns about Personal Information Leakage, Policy Trust, Level of Using Online Services

## I. INTRODUCTION

Privacy concerns are among the major considerations of Internet users, whether they use online services (i.e., social network service, cloud service, and mobile banking service) or not. Such concerns are on the rise because users are becoming more aware of the importance of their digital privacy. Because of increasing concerns, the perceived risk of Internet users is

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Internet users must offer their personal information to the providers of online services. For example, Facebook users must give an e-mail address when setting up an account, and they have to disclose their real name, school name, and workplace on the profile section to make relationships easier to form. In addition, in order to give third-party companies users' personal data, Facebook requires their personal data, when using Facebook-related applications.

In 2013, Stefan Stieger and his team investigated whether Facebook quitters (n=310) differ from Facebook users (n=321) by examining privacy concerns, Internet addiction scores, and personality. They found Facebook quitters were significantly more cautious about their privacy, had higher Internet addiction scores, and were more conscientious than Facebook users. The main self-stated reason for committing virtual identity suicide was privacy concerns (48%) [1].

Feuerlicht and Margaris investigated companies that have not adopted any cloud services have identified data security and privacy (68%) as the main inhibitors of cloud computing adoption in Czech Republic. In Australia, the main adoption barriers were concerns about data security and privacy, and concerns about IT governance [2].

In this study, we suggest that five factors related to online privacy concerns will influence level of using online services.

The users who are high in privacy concerns will be reluctant to use online services. Privacy concerns that influence level of using services will be determined by some factors: awareness of privacy issues, perceived ability to control data collection, and perceived vulnerability to the data being misused [6, 8, 13].

Privacy concerns can be relatively high when using mobile banking services. However the concerns can be relatively low when using social network services or cloud services. This is the focus of our study we will investigate.

The paper is organized as follows: Section 2 provides the overview of the privacy's definition and privacy concerns. Our research model is discussed in section 3, followed by a detailed description of the model and the constructs. Finally, we will discuss our analysis result.

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## II. LITERATURE REVIEW

In 1890, Warren and Brandeis defined privacy as “the right to be let alone” [3]. Privacy has been redefined over time, and now online privacy can entail either Personally Identifying Information (PII) or non-PII information, such as a site visitor’s behavior. According to NIST (National Institute of Standards and Technology), PII is any information about an individual maintained by an agency, including (1) any information that can be used to distinguish or trace an individual’s identity, such as name, social security number, date and place of birth, mother’s maiden name, or biometric records; and (2) any other information that is linked or linkable to an individual, such as medical, educational, financial, and employment information [4].

The privacy concerns of Internet users have been addressed in many studies (see Table 1). For example, when people use online services they may be concerned about their personal information being leaked and misused or that someone could find private information about them online.

A survey in Canada indicated that two-thirds of Canadians are concerned about the protection of their privacy, with a quarter revealing they are extremely concerned about the problem. In terms of the risks to personal privacy that concern Canadians most, financial information/bank fraud tops the list, with nearly a quarter citing it (23%), while 10% mentioned credit card fraud. Following this, the top concerns identified were computer privacy/Internet security (21%) and identity theft (20%) [5].

Authors	Antecedent, Independent, and Intervening Variables	Dependent Variables
Soumava Bandyopadhyay (2009, 2012)	<ul style="list-style-type: none"> <li>Internet Literacy</li> <li>Social Awareness</li> <li>Perceived Vulnerability</li> <li>Perceived Ability to Control</li> <li>Cultural Factors</li> <li>Online Privacy Concerns</li> </ul>	<ul style="list-style-type: none"> <li>Willingness to Provide Personal Information</li> <li>Acceptance of E-Commerce</li> <li>Willingness to Use the Internet</li> </ul>
Heng Xu, Tamara Dinev, H. Jeff Smith, Paul Hart (2008)	<ul style="list-style-type: none"> <li>Privacy Awareness</li> <li>Privacy Social Norm</li> <li>Perceived Effectiveness of Privacy Policy</li> <li>Perceived Effectiveness of Industry</li> <li>Self-regulation</li> <li>Privacy Risk</li> <li>Disposition to Value Privacy</li> <li>Privacy Control</li> </ul>	<ul style="list-style-type: none"> <li>Privacy Concerns</li> </ul>
Tamara Dinev and Paul Hart (2006)	<ul style="list-style-type: none"> <li>Internet Literacy</li> <li>Social Awareness</li> <li>Privacy Concerns</li> </ul>	<ul style="list-style-type: none"> <li>Intention to Transact</li> </ul>
Tamara Dinev and Paul Hart (2004)	<ul style="list-style-type: none"> <li>Internet Technical Literacy</li> <li>Social Awareness</li> </ul>	<ul style="list-style-type: none"> <li>Internet Privacy Concerns</li> </ul>
Xiao Jiang (2011)	<ul style="list-style-type: none"> <li>Institutional Assurance</li> <li>Privacy Awareness</li> <li>Disposition to Trust</li> <li>Online Privacy</li> </ul>	<ul style="list-style-type: none"> <li>Intention to Use SNS</li> </ul>
Tamara Dinev and Paul Hart (2003)	<ul style="list-style-type: none"> <li>Perceptions of Vulnerability</li> <li>Ability to control</li> <li>Trust</li> <li>Interest</li> <li>Privacy Concerns</li> </ul>	<ul style="list-style-type: none"> <li>Internet Use</li> </ul>
Tamara Dinev and Paul Hart (2006)	<ul style="list-style-type: none"> <li>Privacy Concerns related to Information Finding</li> <li>Privacy Concerns related to Information Abuse</li> </ul>	<ul style="list-style-type: none"> <li>Levels of Information Exchange</li> </ul>
Catherine Dwyer, Starr Roxanne Hiltz, Katia Passerini (2007)	<ul style="list-style-type: none"> <li>Internet Privacy Concern</li> <li>Trust in social networking site</li> <li>Trust in other members of social networking site</li> </ul>	<ul style="list-style-type: none"> <li>Information sharing</li> <li>Development of new relationships</li> </ul>
Jochen Wirtz, May O. Lwin and Jerome D. Williams (2007)	<ul style="list-style-type: none"> <li>Policy</li> <li>Regulation</li> <li>Concern</li> </ul>	<ul style="list-style-type: none"> <li>Fabricate</li> <li>Protect</li> <li>Withhold</li> </ul>
Changi Nam, Chanhoo Song, Euehun Lee, Chan Ik Park (2006)	<ul style="list-style-type: none"> <li>Convenience</li> <li>Reputation</li> <li>Third-party certificate</li> <li>Privacy concerns</li> </ul>	<ul style="list-style-type: none"> <li>Willingness to disclose information</li> </ul>
Shu Yang, Yuan Wang, Kan-liang Wang (2009)	<ul style="list-style-type: none"> <li>Information Sensitivity</li> <li>Compensation</li> <li>Privacy Concern</li> </ul>	<ul style="list-style-type: none"> <li>Information Disclosure</li> <li>Protection Intention</li> <li>Transaction Intention</li> </ul>

Table 1 Literature Review

## III. RESEARCH MODEL

We focus on users’ privacy concerns in social network services, cloud services, and mobile banking services. Our research model is shown in Figure 1. It is based on the theory of reasoned action (TRA). In our research model, concerns about personal information leakage, ability to control one’s information, and policy trust will influence the level of using services. Awareness of information leakage issues will influence concerns about personal information leakage. Policy interest will influence as a moderating variable between policy trust and level of using services. The effect of the influencing factors will be different by the kinds of the services used.

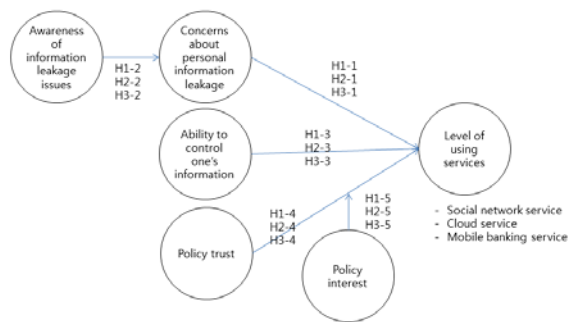


Fig. 1 Research Model

#### A. Relationship Between Concerns about Personal Information Leakage And Level of Using Online Services

Dinev and Hart proposed that a perceived vulnerability to the misuse of personal information obtained online was a major antecedent of online privacy concerns [6], and suggested that Internet users' perceived vulnerability increased privacy concerns [8]. Generally, users who have high privacy concerns are reluctant to use the services.

Previous studies have shown that privacy concerns are related to Internet use.

Bandyopadhyay concluded that Internet users who are extremely concerned about online privacy may feel they could be unknowingly and involuntarily disclosing sensitive information online. To protect their privacy, these consumers may be unwilling to use the Internet altogether in extreme cases [7].

Dinev and Hart concluded that low Internet literacy, and an inability to manage security risks and privacy invasions, may impede Internet usage due to higher privacy concerns [6].

Thus, we propose that concerns about personal information leakage directly and negatively impacts level of using services. The above considerations suggest the following:

- 1) Hypothesis 1-1: Concerns about personal information leakage directly and negatively impacts level of using social network services.
- 2) Hypothesis 2-1: Concerns about personal information leakage directly and negatively impacts level of using cloud services.
- 3) Hypothesis 3-1: Concerns about personal information leakage directly and negatively impacts level of using mobile banking services.

#### B. Relationship Between Awareness of Information Leakage Issues And Concerns about Personal Information Leakage

The role of social awareness in influencing online privacy concerns was proposed by Dinev and Hart. According to them, individuals with high social (privacy) awareness will in general closely follow privacy issues, the possible consequences of a loss of privacy due to accidental, malicious, or intentional leaks

of personal information, and the development of privacy policies. In our research, awareness of privacy issues is described as the extent to which consumers are knowledgeable about the social issues involving Internet usage [6].

Thus, we propose awareness of information leakage issues directly and positively impacts concerns about personal information leakage. The above considerations suggest the following 3:

- 1) Hypothesis 1-2: When using social network services, awareness of information leakage issues directly and positively impacts concerns about personal information leakage.
- 2) Hypothesis 2-2: When using cloud services, awareness of information leakage issues directly and positively impacts concerns about personal information leakage.
- 3) Hypothesis 3-2: When using mobile banking services, awareness of information leakage issues directly and positively impacts concerns about personal information leakage

#### C. Relationship Between Ability to Control One's Information And Level of Using Online Services

Dinev and Hart defined the perceived ability to control as the extent to which consumers believe they can stop personal information being disclosed online, which allows them to exercise their right to privacy. Also, Dinev and Hart concluded that if people have a greater sense that they can control the use of their information, they will have fewer privacy concerns [8, 13].

Generally, users who have fewer privacy concerns are more willing to provide their personal information.

According to Norjihan Abdul et al. (2008), people have less control over what types of information about them have been collected, used, stored and disclosed by various agencies and the ability to protect their information and enforce privacy polices becomes more important [27].

Therefore, we propose that ability to control one's information directly and positively impacts level of using services. The above considerations suggest the following 3:

- 1) Hypothesis 1-3: Ability to control one's information directly and positively impacts level of using social network services.
- 2) Hypothesis 2-3: Ability to control one's information directly and positively impacts level of using cloud services.
- 3) Hypothesis 3-3: Ability to control one's information directly and positively impacts level of using mobile banking services.

#### D. Relationship Between Policy Trust And Level of Using Online Services

According to Hoffman, about 95% consumers declined to provide their personal information to web sites, and 63% of them do not trust the data collecting [19].

Liu et al. (2004) concluded that trust is associated with an individual's belief in an organization based upon the organization's norms, regulations, policies, and procedures and trust is reflected in a customer's confidence in offering transactions [20].

McKnight et al. (2004) investigated that initial trust increases the consumers' behavioral intention which is defined as the consumers' intention to engage in sharing personal information with web sites and buying products or services from web sites [24].

According to the research by McKnight, Li-Ting et al. (2006) suggested that e-tailers may employ some trustworthy signals to give consumers hints about the reliability, creditability and quality of web site, such as information provided by trusted third parties, recommendations from experts and government institutions [24, 25].

According to Jayashree et al. (2010), to the marketers, understanding the degree of the influence of trust on the acceptance and the use of m-commerce is essential to its success and business longevity [26].

Thus, we propose policy trust directly and positively impacts level of using services. The above considerations suggest the following 3:

- 1) Hypothesis 1-4: Policy trust directly and positively impacts level of using social network services.
- 2) Hypothesis 2-4: Policy trust directly and positively impacts level of using cloud services.
- 3) Hypothesis 3-4: Policy trust directly and positively impacts level of using mobile banking services.

#### *E. Relationship among Policy Interest, Policy Trust And Level of Using Online Services*

According to Culnan and Armstrong (1999), when service users hear about how their information is managed from the service providers, they do not concern about their personal information used for marketing analysis [28].

Thus, we propose policy interest positively impacts between policy trust and level of using services. The above considerations suggest the following 3:

- 1) Hypothesis 1-5: Policy interest positively impacts between policy trust and level of using social network services.
- 2) Hypothesis 2-5: Policy interest positively impacts between policy trust and level of using cloud services.
- 3) Hypothesis 3-5: Policy interest positively impacts between policy trust and level of using mobile banking services..

#### IV. METHODOLOGY AND RESULTS

Our research model was empirically tested using data collected from a survey. We collected 201 samples from university students in South Korea and 75 samples were used for the data analysis. The items used in the survey were developed by the authors using a 5-point Likert scale. We used SPSS and SmartPLS for data analysis.

Constructs	Questionnaires
Concerns about personal information leakage	1. I think a person can access to the personal information that I submit to online services. 2. I think the personal information that I submit to online services can be used inappropriately. 3. I think the personal information that I submit to online services can be hacked. 4. I think the personal information that I submit to online services can be sold to 3rd party/person.
Awareness of information leakage issues	1. I frequently hear issues about personal information leakage. 2. I frequently hear that someone's personal information is leaked. 3. I frequently hear the importance of personal information.
Ability to control one's information	1. I think I can manage the information that I submit to online services. 2. I think I can control the information that I submit to online services not to be leaked. 3. I think I can control and manage how my personal information is used by online service providers. 4. I think I can make only allowed person able to access to my personal information.
Policy trust	1. I think personal information protect policies of online services are well established. 2. I think the government's regulations for personal information protect are well established. 3. I think online service providers do not use my personal information for other purpose that is not cited on their policy. 4. I think online service providers do not give my personal information to 3rd party/person without my permission.
Policy interest	1. I am interested personal information protect policies of online services that I use. 2. I am willing to see the personal information protect policies of online services that I use. 3. I am interested in personal information protect policies of companies and the government.
Level of using social network services	1. I frequently suggest my opinion to other's post in social network services. 2. I frequently write about my thought in social network services. 3. I frequently upload writings including my location information in social network services.
Level of using cloud services	1. I frequently upload and download files by using cloud services. 2. I frequently upload pictures on cloud services. 3. I synchronize files or folders between some devices by using cloud services.
Level of using mobile banking services	1. I frequently check my banking accounts by mobile phone. 2. I use deposit and savings services by using mobile banking services. 3. I pay utility bills by using mobile banking services.

Table 2 Items

	Concerns about personal information leakage	Awareness of information leakage issues	Ability to control one's information	Policy trust	Policy interest	Level of using social network services
1_1	0.870	0.401	-0.226	-0.322	0.064	-0.081
1_2	0.915	0.487	-0.200	-0.408	0.142	-0.134
1_3	0.878	0.377	-0.144	-0.378	0.093	-0.102
1_4	0.869	0.483	-0.162	-0.266	0.199	-0.133
2_1	0.457	0.858	-0.278	-0.288	0.210	-0.140
2_2	0.263	0.620	-0.226	-0.166	0.201	-0.111
2_3	0.356	0.708	0.119	-0.004	0.425	0.033
3_1	-0.045	-0.094	0.799	0.329	0.140	0.297
3_2	-0.139	-0.071	0.814	0.436	0.246	0.363
3_3	-0.178	-0.114	0.879	0.295	0.175	0.390
3_4	-0.316	-0.315	0.903	0.357	0.127	0.378
4_1	-0.195	-0.010	0.261	0.782	0.241	0.371
4_2	-0.414	-0.215	0.285	0.801	-0.051	0.135
4_3	-0.411	-0.328	0.441	0.850	-0.006	0.247
4_4	-0.348	-0.272	0.381	0.822	0.004	0.209
5_1	0.041	0.365	0.158	0.137	0.900	0.123
5_2	0.150	0.364	0.197	-0.018	0.901	0.121
5_3	0.209	0.264	0.191	0.169	0.888	0.112
6_1	-0.007	0.042	0.419	0.075	0.070	0.764
6_2	-0.167	0.014	0.289	0.319	0.184	0.849
6_3	-0.145	-0.269	0.322	0.411	0.082	0.833

Table 3 Confirmative Factor Analysis

Constructs	Composite Reliability	AVE	Cronbach's Alpha
Concerns about personal information leakage	0.934	0.780	0.906
Awareness of information leakage issues	0.912	0.722	0.871
Ability to control one's information	0.776	0.541	0.575
Policy trust	0.887	0.663	0.843
Policy interest	0.925	0.803	0.878
Level of using social network services	0.857	0.666	0.749

Table 4 Convergent Validity Analysis

	Level of using social network services	Concerns about personal information leakage	Ability to control one's information	Awareness of information leakage issues	Policy trust	Policy interest
Level of using social network services	0.816					
Concerns about personal information leakage	-0.130	0.883				
Ability to control one's information	0.423	-0.208	0.850			
Awareness of information leakage issues	-0.101	0.501	-0.179	0.736		
Policy trust	0.133	0.146	0.203	0.371	0.896	
Policy interest	0.334	-0.388	0.415	-0.219	0.105	0.814

Table 5 Discriminant Validity Analysis

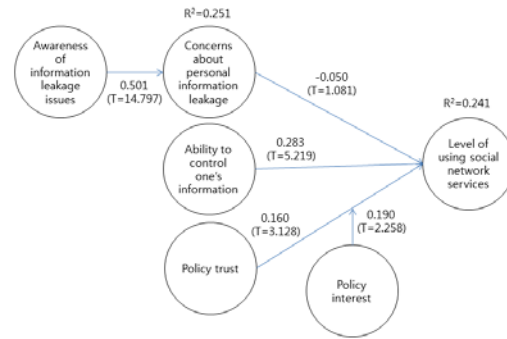


Fig. 2 Structural Equation Model with Parameter Estimates

A. Reliability and Validity

In PLS (Partial Least Squares) analysis, internal consistency, convergent validity, and discriminant validity are required to be analyzed for verifying reliability and validity of measurement items and constructs.

Cronbach's Alpha and is widely used for verifying reliability and is as measure of internal consistency. Nunnally (1978) has indicated 0.7 and above to be an acceptable reliability coefficient [29].

Composite Reliability is also a measure of internal consistency. It is usually required 0.7 and above for verifying reliability.

In this study, 5 of 6 Cronbach's Alpha values are higher than 0.7 and all the values of Composite Reliability are higher than 0.7 on the Fig. 2 model.

Convergent Validity is verified by AVE (Average Variance Extracted) and the factor loadings of the constructs.

In this study, all the values of AVE are higher than 0.5 and all the values (except one) of factor loadings are higher than 0.7 that is required by Fomell and Larcker (1981).

Formell and Larcker (1981) indicated that discriminant validity is verified by comparing the correlation between the construct and the square root of AVE and the square root of AVE is required to be higher than the correlations between the other constructs [21].

In this study, all the values of the square root of AVE are higher than all the values of the correlations.

We implemented the same analysis on the other two research models (level of using cloud services, level of using mobile banking services) and reliability and validity are verified on the two models.

B. Model Fit

R square is a popular and intuitive index of goodness of fit in multivariate data analysis and is the percentage of explained variance: the higher the percentage of variance a proposed model manages to explain, the more valid the model seems to be [22].

As Fig. 2 shows, the values of r square are 25.1% and 24.1%. And the values of r square in the level of cloud service model are 25.0 and 22.8. The values of it in the level of mobile banking service model are 24.8 and 14.2.



Recently, a global fit measure for PLS path modeling has been suggested by Tenenhaus et al. (2005). GoF is defined as the geometric mean of the average communality and average  $R^2$ .

If the GoF equals 0.1, its' fit is small, the GoF equals 0.25, its' fit is medium, and the GoF equals 0.36, its' fit is large [23].

In this study, the values of GoF are 0.422, 0.416, and 0.364. Therefore, the goodness of fit in our research model is large.

### C. Moderating Effect

We analyzed moderating effect of policy interest between policy trust and level of using services. Generally, the effect is less than 0.02, which is small, and is about 0.15, which is medium, and is more than 0.35, which is large.

In our models, all the moderating effects of policy interest are less than 0.02 or above 0.02 slightly. Therefore, its' effect size is small. And all the t-values which can verify significance of the effect are more than 1.96. Therefore, the moderating effect is significant.

### D. Path Analysis

Hypothesis	Path Coefficient	T-value
Concerns about personal information leakage => Level of using social network services	-0.050	1.082
Awareness of information leakage issues => Concerns about personal information leakage in using social network services	0.501	13.492
Ability to control one's information => Level of using social network services	0.283	4.815
Policy trust => Level of using social network services	0.160	3.074
Policy interest * Policy trust => Level of using social network services	0.190	2.344
Concerns about personal information leakage => Level of using cloud services	-0.007	0.152
Awareness of information leakage issues => Concerns about personal information leakage in using cloud services	0.500	14.116
Ability to control one's information => Level of using cloud services	0.246	5.391
Policy trust => Level of using cloud services	0.153	2.984
Policy interest * Policy trust => Level of using cloud services	0.101	2.229
Concerns about personal information leakage => Level of using mobile banking services	-0.195	3.185
Awareness of information leakage issues => Concerns about personal information leakage in using mobile banking services	0.498	13.906
Ability to control one's information => Level of using mobile banking services	-0.047	0.425
Policy trust => Level of using mobile banking services	0.170	2.247
Policy interest * Policy trust => Level of using mobile banking services	0.188	2.280

Table 6 Path Analysis Result

## V. DISCUSSION

This study was conducted to derive the factors related to online privacy concerns through previous researches; analyze the effect of those factors on the level of service use; and furthermore determine the security threats in services and trust in individual services felt by users by assuming service users

have different levels of concerns about three services of different nature; and then analyze the effect of them on the level of the use of corresponding services.

The results of the research model of level of using social network services can be summarized as follows.

First, concerns about personal information leakage have no significant effect on the level of using social network services, indicating SNS users tend to aggressively expose themselves due to the nature of SNS- exposing personal information is helpful to the service use.

Second, ability to control one's information has significant effect on the level of using social network services and its effect is greater than other variables, indicating the appropriate control and management of personal information provided by SNS users is critical to service use.

Third, policy trust has significant effect on the level of using social network services as they were proved to be so in the previous studies and thereby users' trust in service policies will serve as a factor for increasing the level of service use, indicating it is essential that service providers continue to improve and supplement the policies relating to the personal information protection in order to increase the service reliability.

The results of the research model of level of using cloud services can be summarized as follows.

First, concerns about personal information leakage have no significant effect on the level of using cloud services, indicating the concerns on the leakage of files and information uploaded to cloud service have no significant effect on service use.

Second, ability to control one's information has significant effect on the level of using cloud services and its effect is greater than other variables, so does SNS. Thus the appropriate control and management of information and files uploaded to cloud service by users are critical to the service use.

Third, policy trust has significant effect on the level of using cloud services, indicating the policy trust is critical to increasing the level of service use.

The results of the research model of level of using mobile banking services can be summarized as follows.

First, concerns about personal information leakage have significant effect on the level of using mobile banking services, indicating users have greater concerns on the leakage of bank account and passwords they entered for using mobile banking services compared with the information they provided to use SNS or cloud services.

Second, ability to control one's information has no significant effect on the level of mobile banking services use, indicating the types of information user provided to use mobile banking services is limited and not selective, thus users cannot control the information leakage or its likelihood themselves.

Third, policy trust has significant effect on the level of using mobile banking services, and its effect is greater than other variable, indicating mobile banking service users have great concerns on the leakage of information they provided to service providers and they cannot control the exposure or leakage of that information themselves. Thus users' trust of the policies of service providers is critical to service use.

And awareness of information leakage issues, the preceding variable of concerns about personal information leakage, has significant effect on three services, indicating the recognition of personal information leakage increase concerns about personal information leakage.

Also, policy interest shows significant moderating effect between the policy trust and the level of the use of the above three service, indicating persons who have more interest in the policy of the corresponding services tend to trust their services more. Thus it is essential that service providers inform users of their policies well to increase users' trust in services even if its effect is not great.

Taken together, it is essential that SNS and could service users provide personal information at their discretion and control and manager them themselves rather than worry about the leakage of personal information they provided to service providers, and service providers, especially mobile banking service providers that increase concerns about personal information leakage of users, prepare privacy policies and technologies well and increase the security levels to prevent hacking or improper access to their information in order to build users' trust and thereby increase the level of service use.

User's concerns about personal information leakage and the factors affecting service use vary depending on the characteristics of services, and thus it is essential that service providers establish the security level of services accordingly.

## VI. IMPLICATIONS

The implications of this study are as follows:

First, this study has compared and analyzed three services, suggesting integrative perspectives on the privacy concerns and the level of service use. The important factors to users vary depending on service, and thus it is essential that service providers establish the security level accordingly.

Second, the important factors to users vary depending on the type of service. SNS and cloud service users tend to positively expose and provide their personal information to service providers rather than worry about personal information leakage and feel they can control and manage the personal information themselves, indicating it is essential service providers help users manage and control security setting themselves rather than increase the security level unnecessarily, which will serves as a measure to increase the number of service users.

Third, mobile banking service users are greatly concerned about the leakage of information they provided to use services, which influences the service use and shows low recognition of their information controllability and thereby it is critical that mobile banking service providers strengthen security level to prevent personal information leakage.

## VII. LIMITATIONS

This study has several limitations and thus suggests directions for future studies as follows.

First, the number of questionnaires used in this study was 75 and thus the reliability of research results is in doubt, indicating it is essential to increase the number of questionnaires for the future studies.

Second, the explanatory power of research model is not so strong in that the level of service use is also influenced by the factors other than the variables used in the research model of this study. Thus it is essential to investigate and analyze the factors that might have an effect on the level of service use other than privacy-related variables to increase the explanatory power of research models.

Third, the subjects of this study were the college students in their 20-30s and the analyzed results were verified, yet the subjects with different professions and in different age groups were not included. Most online service users are in their 2-30s, yet the number of users in their 40-50s is also increasing. Thus if the subjects of survey expands to other age groups, the results might vary.

Lastly, the subjects of this study are limited to college students, indicating the inclusion of the subjects with different professions may lead to different, yet also meaningful results

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