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An Empirical Analysis of Consumers' Concerns about Privacy through Using the Internet

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Abstract

In this research, an empirical analysis based on a questionnaire survey was carried out on these sorts of factors on the user side, and the effects that individual attributes and usage conditions have on concerns about privacy and on awareness and understanding of privacy policies were clarified.

In this research, specifically we attempt to analyze the kinds of effects that “individual attributes and service-usage characteristics” have on “concerns about individual privacy and the understanding of privacy policies.” Therefore, we established a model with the former as the dependent variables and the latter as the explanatory variables and carried out the estimates.

For the estimates, we used data from a Web questionnaire survey with a sample size of about 2,000, and used a binary logit model and ordered logit model to identify the factors that affect concerns about individual privacy and understanding of privacy policies.

1. Background and purpose of the analysis

In recent years, personal data has been utilized within the various services that use the Internet. On the one hand, we can expect the utilization of personal data to result in the diversification of services and improvements in service quality. But on the other hand, a certain level of concern exists about the provision of personal data among the service users, who are the providers of this personal data.

The degree of concern about privacy is not necessarily consistent with the level of technological security and it seems to be affected by factors such as consumer attributes and service-usage conditions (Ackerman et al. (1999), Earp and Baumer (2003)). Also, the setting of privacy policies exists as one framework for consumers to safely and securely use services that utilize personal data. But it is considered that consumers' understanding of the privacy policy system differs greatly depending on the consumer (Berendt et al. (2005), Metzger (2006)).

Therefore in this research, an empirical analysis based on a questionnaire survey was

carried out on these sorts of factors on the user side, and the effects that individual attributes and usage conditions have on concerns about privacy and on awareness and understanding of privacy policies were clarified.

2. Previous Studies

Takasaki, Koguchi, and Jitsuzumi (2014) classify previous studies on privacy concerns into three groups: (1) studies that examine the effect of privacy concerns on service usage and data disclosure, (2) studies that promote service usage and data disclosure, and (3) studies about protection measures taken by business operators.

(1) Studies that examine the effect of privacy concerns on service usage and data disclosure:

- Users are potentially concerned about privacy and are highly likely to provide false information when using an online service (Hoffman et al., 1999).
- The level of privacy concerns changes based on the type of data to be disclosed. While people are careful with sensitive data such as financial and health information, they are less worried about privacy, and are more open to disclosing information when it comes to simple demographic facts such as interests and preferences, age group, and gender (Ackerman et al., 1999; Chellappa and Sin, 2005).
- The level of privacy concerns varies by age group. The older age group exhibits greater potential concern and is careful about revealing information compared to the younger age group (Ackerman et al., 1999; Earp and Baumer, 2003).
- The amount and range of information disclosed change based on the level of concern (Ackerman et al., 1999; Hann et al., 2001; Spiekerman et al., 2001; Acquisti and Grossklags, 2005).

(2) Studies that promote service usage and data disclosure:

- Trust in the business operator encourages consumers to divulge personal information (Chellappa and Sin, 2005; Metzger, 2006; Schoenbachler and Gordon, 2002).
- Users are more likely to agree to release personal data when they can receive economic benefits, such as a monetary reward (Hann et al., 2001; Hui et al., 2007).

(3) Studies on protection measures taken by business operators:

- Privacy policies do not improve a company's credibility or promote service usage (Berendt and Spiekermann, 2005; Metzger, 2006).
- Privacy seals are not working as expected since users do not understand them (LaRose and Rifon, 2006).
- Many users do not even look at privacy policies in the first place (Kohavi, 2001).
- Business operators' protection measures have lost their substance. There is a strong need to find a new way to reach an agreement in order to truly gain an understanding of the user

(Solove, 2013).

This study was conducted by applying previous research to circumstances in Japan. While some prior investigations analyzed the effect of privacy policies on service usage, this study examined the relationship between users' awareness and understanding of privacy policies, as well as their demographics and characteristics. This study explains this particular issue, which previous scholars have not necessarily explored.

3. Study Overview and Design of the Analysis

A user questionnaire survey was conducted online from February 2015 and was based on a preliminary survey. After eliminating inconsistent and protest responses from those collected in the survey, 2,124 samples were ultimately obtained for analysis.

The following models were created.

Dependent variable:

- ① Whether users are aware of the fact that business operators establish a policy regarding the use of privacy information (binary variable where "I'm aware" = 1 and "I'm not aware" = 0)
- ② Level of understanding of privacy policies (ordinal variable on a five-point scale)
- ③ Level of trust in privacy policies (ordinal variable on a five-point scale)
- ④ Level of understanding of Personal Information Protection Law (ordinal variable on a four-point scale)

Independent variables:

[Personal attributes]

- Gender (dummy variable where female = 1 and male = 0)
- Age (real number)
- Marital status (dummy variable where married = 1 and single = 0)
- Household income (ordinal variable on a nine-point scale)

[Service usage]

(All dummy variables where selecting "not using" = 0 and not selecting "not using" = 1)

- Use of e-mail
- Use of 0AB-J IP phone
- Use of 050 IP phone
- Use of softphone
- Use of security services
- Web browsing
- Use of online stores
- Use of online payment systems

- Use of streaming music services (fee-charging)
- Use of streaming music services (fee-charging)
- Use of the other contents (fee-charging)
- Use of streaming music services (free)
- Use of streaming video services (free)
- Use of the other contents (free)
- Use of online games
- Establishing a blog (HTML)
- Establishing a blog (using online service)
- Use of SNS
- Use of microblog
- Use of personal clouds

As independent variables for these five models, only ① has a binary variable; the remaining three models have ordinal variables on a five or four-point scale.

Therefore, estimation was performed for ① by using a binomial probit model and for other models, estimation was performed by using an ordered probit model.

4. Estimation results

The estimation results are as follows:

	awareness of privacy policies		understanding of privacy policies		trust in privacy policies		understanding of Personal Information Protection Law	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Constant	-0.090	0.687	1.293	0.000	0.862	0.000	1.725	0.000
Gender	0.039	0.568	0.048	0.356	0.065	0.194	-0.147	0.006
Age	0.003	0.302	0.007	0.001	0.000	0.869	0.007	0.001
Marital status	-0.069	0.343	-0.081	0.142	0.111	0.039	0.004	0.944
Household income	0.036	0.094	0.054	0.001	0.030	0.054	0.124	0.000
e-mail	0.185	0.118	0.002	0.986	0.096	0.311	-0.014	0.890
0AB-J IP phone	0.139	0.245	0.127	0.138	0.100	0.231	0.138	0.118
050 IP phone	-0.041	0.691	0.057	0.464	-0.012	0.877	0.022	0.785
Softphone	0.213	0.117	0.252	0.006	0.126	0.157	0.041	0.665
Security services	0.169	0.013	0.117	0.021	0.105	0.034	-0.031	0.554
Web browsing	0.198	0.006	0.052	0.345	-0.084	0.123	0.024	0.675
Online stores	0.150	0.062	-0.102	0.109	-0.088	0.162	-0.097	0.142
Online payment systems	0.220	0.002	0.064	0.237	-0.005	0.922	0.084	0.130
Streaming music services (fee-charging)	0.173	0.250	0.107	0.301	0.067	0.507	0.055	0.608
Streaming music services (fee-charging)	-0.172	0.270	-0.086	0.445	-0.035	0.748	-0.102	0.380
Other contents (fee-charging)	0.416	0.130	0.321	0.047	0.102	0.513	0.231	0.164
Streaming music services (free)	-0.039	0.662	0.064	0.333	0.042	0.517	0.046	0.499
Streaming video services (free)	-0.042	0.599	-0.080	0.182	-0.047	0.429	-0.107	0.083
Other contents (free)	0.198	0.025	0.123	0.056	-0.099	0.115	0.067	0.306
Online games	-0.018	0.845	0.125	0.074	0.119	0.080	0.016	0.828
Establishing a blog (HTML)	-0.107	0.398	0.170	0.064	-0.045	0.618	0.213	0.025
Establishing a blog (using online service)	0.154	0.256	0.190	0.046	-0.023	0.800	0.138	0.157
SNS	0.195	0.025	0.065	0.305	0.174	0.005	0.166	0.011
Microblog	-0.137	0.241	-0.099	0.243	-0.168	0.042	-0.245	0.005
Personal clouds	-0.074	0.487	-0.066	0.390	-0.125	0.097	0.031	0.699

As for privacy policies, we can see that level of awareness and understanding were high among high household income users, as well as those who use services such as security services and online stores. On the other hand, since use of services does not generally indicate any effect on trust and understanding of Personal Information Protection Law, users might not necessarily trust the service they are using. Further investigation into these points is ongoing.

Appendix: Marginal effect

(awareness of privacy policies)	Coefficient	p-value
Constant	-0.026	0.676
Gender	0.012	0.568
Age	0.001	0.302
Marital status	-0.021	0.343
Household income	0.011	0.094
e-mail	0.058	0.138
0AB-J IP phone	0.040	0.222
050 IP phone	-0.012	0.695
Softphone	0.059	0.089
Security services	0.050	0.012
Web browsing	0.060	0.006
Online stores	0.046	0.068
Online payment systems	0.066	0.002
Streaming music services (fee-charging)	0.049	0.220
Streaming music services (fee-charging)	-0.054	0.293
Other contents (fee-charging)	0.105	0.062
Streaming music services (free)	-0.012	0.664
Streaming video services (free)	-0.013	0.600
Other contents (free)	0.057	0.019
Online games	-0.005	0.846
Establishing a blog (HTML)	-0.033	0.412
Establishing a blog (using online service)	0.044	0.231
SNS	0.056	0.020
Microblog	-0.042	0.256
Personal clouds	-0.023	0.495

(understanding of privacy policies)	Y=00	Y=01	Y=02	Y=03	Y=04
Gender	-0.012	-0.011	-0.001	0.018	0.007
Age	0.000	0.000	0.000	0.000	0.000
Marital status	-0.020	-0.019	-0.002	0.030	0.012
Household income	-0.006	-0.005	-0.001	0.008	0.003
e-mail	-0.018	-0.016	0.000	0.026	0.009
0AB-J IP phone	-0.017	-0.017	-0.003	0.027	0.011
050 IP phone	0.002	0.002	0.000	-0.003	-0.001
Softphone	-0.021	-0.022	-0.004	0.034	0.014
Security services	-0.019	-0.018	-0.002	0.028	0.011
Web browsing	0.015	0.015	0.002	-0.022	-0.009
Online stores	0.016	0.015	0.002	-0.023	-0.009
Online payment systems	0.001	0.001	0.000	-0.001	-0.001
Streaming music services (fee-charging)	-0.012	-0.012	-0.002	0.018	0.007
Streaming music services (fee-charging)	0.007	0.006	0.000	-0.010	-0.004
Other contents (fee-charging)	-0.017	-0.018	-0.003	0.027	0.011
Streaming music services (free)	-0.008	-0.007	-0.001	0.011	0.004
Streaming video services (free)	0.009	0.008	0.001	-0.012	-0.005
Other contents (free)	0.019	0.017	0.001	-0.026	-0.010
Online games	-0.021	-0.021	-0.004	0.032	0.013
Establishing a blog (HTML)	0.008	0.008	0.001	-0.012	-0.005
Establishing a blog (using online service)	0.004	0.004	0.000	-0.006	-0.002
SNS	-0.030	-0.030	-0.005	0.046	0.019
Microblog	0.033	0.028	0.000	-0.045	-0.016
Personal clouds	0.024	0.021	0.000	-0.033	-0.012

(trust in privacy policies)	Y=00	Y=01	Y=02	Y=03	Y=04
Gender	-0.003	-0.012	-0.003	0.013	0.006
Age	-0.001	-0.002	-0.001	0.002	0.001
Marital status	0.005	0.021	0.006	-0.022	-0.010
Household income	-0.004	-0.014	-0.004	0.015	0.007
e-mail	0.000	0.000	0.000	0.001	0.000
0AB-J IP phone	-0.008	-0.032	-0.010	0.033	0.017
050 IP phone	-0.004	-0.015	-0.004	0.015	0.008
Softphone	-0.014	-0.063	-0.022	0.061	0.037
Security services	-0.008	-0.030	-0.009	0.032	0.015
Web browsing	-0.004	-0.014	-0.004	0.014	0.007
Online stores	0.007	0.026	0.008	-0.027	-0.013
Online payment systems	-0.004	-0.017	-0.005	0.017	0.008
Streaming music services (fee-charging)	-0.007	-0.027	-0.008	0.028	0.015
Streaming music services (fee-charging)	0.006	0.023	0.006	-0.024	-0.010
Other contents (fee-charging)	-0.016	-0.078	-0.030	0.074	0.051
Streaming music services (free)	-0.004	-0.017	-0.005	0.017	0.008
Streaming video services (free)	0.006	0.021	0.006	-0.022	-0.010
Other contents (free)	-0.008	-0.032	-0.009	0.032	0.016
Online games	-0.008	-0.032	-0.010	0.033	0.017
Establishing a blog (HTML)	-0.010	-0.043	-0.014	0.043	0.024
Establishing a blog (using online service)	-0.011	-0.048	-0.016	0.048	0.027
SNS	-0.004	-0.017	-0.005	0.017	0.008
Microblog	0.007	0.026	0.006	-0.028	-0.012
Personal clouds	0.005	0.017	0.004	-0.018	-0.008

(understanding of Personal Information Protection Law)	Y=00	Y=01	Y=02	Y=03
Gender	0.005	0.042	-0.006	-0.041
Age	0.000	-0.002	0.000	0.002
Marital status	0.000	-0.001	0.000	0.001
Household income	-0.004	-0.036	0.005	0.034
e-mail	0.000	0.004	-0.001	-0.004
0AB-J IP phone	-0.004	-0.038	0.002	0.040
050 IP phone	-0.001	-0.006	0.001	0.006
Softphone	-0.001	-0.012	0.001	0.012
Security services	0.001	0.009	-0.001	-0.009
Web browsing	-0.001	-0.007	0.001	0.007
Online stores	0.003	0.028	-0.003	-0.027
Online payment systems	-0.003	-0.024	0.004	0.023
Streaming music services (fee-charging)	-0.002	-0.016	0.002	0.016
Streaming music services (fee-charging)	0.004	0.030	-0.006	-0.027
Other contents (fee-charging)	-0.006	-0.062	-0.002	0.070
Streaming music services (free)	-0.001	-0.013	0.002	0.013
Streaming video services (free)	0.003	0.031	-0.005	-0.030
Other contents (free)	-0.002	-0.019	0.002	0.019
Online games	-0.001	-0.005	0.001	0.004
Establishing a blog (HTML)	-0.006	-0.058	0.001	0.063
Establishing a blog (using online service)	-0.004	-0.038	0.002	0.040
SNS	-0.005	-0.047	0.004	0.047
Microblog	0.009	0.073	-0.020	-0.063
Personal clouds	-0.001	-0.009	0.001	0.009

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