

# CONFIRMING THE EFFECT OF DEMOGRAPHIC CHARACTERISTICS ON INFORMATION PRIVACY CONCERNS

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## Abstract

*Existing studies on information privacy have largely discussed behavioral determinants of information privacy concerns (IPC). There has been a lack of direct examination on the relationship between demographic characteristics of consumers and IPC. The few studies that did report the linkage produced inconsistent findings. In this study, we aimed to investigate the relationship between consumers' demographic characteristics and IPC with data from a large sample of 9,840 respondents provided by the Korea Information Society Development Institute (KISDI). The results demonstrated that educational attainment and income level exerted effects on IPC in line with existing studies. But the effects of gender and age are different from those identified in existing studies. This study is significant in that by confirming the results of previous studies, it enables generalization of empirical findings. Meanwhile, the results that contrasted previous findings facilitate the discovery of new research topics and discussion.*

*Keywords: Information Privacy Concerns, Age, Gender, Income, Education*

# 1 INTRODUCTION

In academia, there is also increasing interest in information privacy concerns (IPC) research (Dinev and Hart, 2006; Hui et al., 2007). IPC are defined as evaluations and dispositions related to viewing the leakage of sensitive personal information as a threat (Dinev and Hart, 2006). IPC are conceptually subjective and can be present in different ways depending on demographic characteristics (Bergström, 2015). Therefore, when considering IPC, it is crucial to understand its linkage with demographic characteristics of the consumers. Previous studies have empirically analyzed the relationships between varying levels of IPC and different demographic characteristics such as gender, educational attainment, and income level (Blank et al., 2014; Hoofnagle et al., 2010; Jensen et al., 2005; O'Neil, 2001; Omarzu, 2000; Paine et al., 2007; Sheehan, 1999; Sheehan and Hoy, 2000; Taddicken, 2014; Youn, 2009). However, most of these studies have either used small research samples to yield results that may not be generalizable or have produced inconsistent findings due to differences in research objectives and environments.

Therefore, in this study, we aimed to investigate the relationship between consumers' demographic characteristics (gender, age, educational attainment, and income level) and IPC with data from a large sample of 9,840 respondents provided by the Korea Information Society Development Institute (KISDI). We compared and contrasted our results with the findings in the literature to identify similarities and differences. By doing so, we will either confirm existing results in the literature to enable generalization of empirical findings or refute existing results to facilitate the discovery of new research topics and discussion.

## 2 THEORETICAL BACKGROUND

### 2.1 Information Privacy Concerns (IPC)

Because a great deal of personal information is recklessly collected and distributed online, people's right to control their own personal information has gained importance and how personal information can be more aggressively and proactively controlled has come under intense discussion (Buchanan et al., 2007). Information privacy comprises the right to control information not only by deciding the extent of information to provide but also by determining when and how such information is provided (Belanger et al., 2002; Stone et al., 1983). Therefore, as a concept, information privacy seeks to ensure control over personal information management. The right to information privacy can therefore be defined as the right for people to make decisions regarding their own data.

Practitioners have often used the GIPC (Global Information Privacy Concerns) Model, which measured IPC among individuals in a one-dimensional way (Smith et al., 1996). Later, Smith et al. (1996) suggested the CFIP (Concerns for Information Privacy) Model, which categorized such concerns into more detailed dimensions (collection, unauthorized secondary use, improper access, and errors). Stewart and Segars (2002) confirmed the validation of the CFIP and provided a more comprehensive model. Malhotra et al. (2004) developed the IUIPC (Internet Users' Information Privacy Concerns) Model, which had three dimensions (collection, control and awareness). Dinev and Hart (2006) suggested the Internet Privacy Concerns Measurement Index, which measured general levels of privacy concern among Internet users. These studies suggested research models while simultaneously sought predisposing factors that exert effects on information privacy.

### 2.2 Determinants of Information Privacy Concerns

IPC can be parsed as concerns that privacy may be lost due to the voluntary or involuntary exposure of information (Dinev and Hart, 2006). Antecedents of IPC can largely be categorized into four factors: information, collection, environment, and provider factors. Malhotra et al. (2004) argued that people tend to have higher level of privacy concern when the collected information is more sensitive or

detailed. The levels of concern can differ depending on the type or amount of information required (Paine et al., 2007). The data collection factors, the inappropriate management of information, the abuse of collected information, and a lack of privacy policies can also induce an increased level of concern (Wang et al., 1998). From this perspective, Hui et al. (2007) argued that the implementation of measures such as information privacy policies and privacy seals by information collectors can reduce the levels of privacy concern.

As for environmental factors, laws, regulations, and social regulations can have an effect on the levels of IPC (Chen et al., 2008). For instance, Milberg et al. (2000) empirically shown that four types of group regulation — individualism/collectivism, masculinity/femininity, power distance, and uncertainty avoidance — exert impacts on IPC. In terms of provider factors, IPC can differ among people according to their personal experiences and social status (Campbell, 1997). People who have a higher level of risk recognition and a consequently lower level of familiarity with information technology are more likely to have higher level of privacy concern (Dinev and Hart, 2006; Paine et al., 2007). Age and educational attainment also exert effects on IPC. People of lower social status and educational attainment, as well as older people, have relatively higher levels of IPC (Campbell, 1997). Individual personality factors such as trustfulness or distrustfulness, paranoia, and being inclined toward social criticism have also been suggested as related to IPC (Smith et al., 1996).

### **2.3 Effects of Demographic Factors**

Various studies have yielded different results regarding the effects of various predisposing factors on the levels of IPC. Omarzu (2000) reported that the evaluation of online privacy threats can differ by gender. While Hoofnagle et al. (2010) and Taddicken (2014) indicated that differences by age were very small, other studies have found differences by age regarding IPC and that older people tend to be more defensive. A study conducted by O’Neil (2001) suggested that people with high annual incomes had higher levels of IPC. Blank et al. (2014) and Sheehan (2002) have suggested people with higher levels of educational attainment have higher levels of IPC and engage to a greater extent in privacy protection. Arguing that demographic characteristics exert different influences in different situations, Bergström (2015) found that the effects of demographic characteristics on IPC differed depending on whether a person was engaged in searching for information, writing an e-mail, using an SNS, or processing a payment.

Various hypotheses have been advanced as to why the findings in the literature have not been consistent. It is possible that different results are obtained due to differences in research objectives, situations, and environments. Furthermore, the different findings may also have been caused by rapid technological transformation over time that has affected levels of IPC regarding information technology. Moreover, it may also be suggested that studies have obtained different results because of their inherent limitations: most have not included demographic characteristics and most have analyzed small samples. Consequently, although existing studies have addressed IPC from the perspectives of policy and practice, from the position of strengthening the theoretical basis, the relationships between demographic characteristics and IPC have not been sufficiently discussed and clear understanding has not been established.

## **3 RESEARCH METHODOLOGY**

### **3.1 Data**

In this study, we examined the relationships between demographic characteristics (gender, age, educational attainment, and income level) and IPC using a large sample to establish better understanding of the relationship. We used the data from 2015 Korean Media Panel Survey provided by Korea Information Society Development Institute (KISDI). This dataset was useful for tracking the media environment and changes in usage behaviors among families and individuals as the survey was administered to an identical sample for five years from 2010 to 2014. The dataset was also useful for

both longitudinal and cross-sectional studies requiring large sample size. The survey is administered to approximately 10,000 respondents from 5,000 families every year. Since the 2014 survey contained the IPC measure, we used that sample. There were a total of 10,172 respondents in the dataset. A total of 9,840 respondents were included in the sample and analyzed after excluding children younger than 10 years, seniors older than 100 years, and respondents who could not answer because they did not engage in online activities. The demographic characteristics of the sample are shown in Table 2.

### 3.2 Items and Procedure

Information privacy concerns (IPC) were measured using 6 items (5-point Likert-scale) developed based on Dinev and Hart (2006)'s research. As the construct is a latent variable, internal consistency should be determined using Cronbach's alpha. The cut-off value of Cronbach's alpha is 0.7, and the alpha for IPC is 0.96. Thus, the construct reliability of the sample is satisfied. Table 1 shows the items used to assess IPC.

Information Privacy Concerns	
IPC1	I am concerned about submitting information on the Internet because of what others might do with it.
IPC2	I am concerned that my personal information may be left in my previous digital devices.
IPC3	I am concerned that web sites request too much personal information for registration.
IPC4	I am concerned that someone may use my ID and password illegally.
IPC5	In general, I am concerned about my privacy when I use the Internet.
IPC6	I am suspicious toward those who do not disclose their identity online.

Table 1. Measurement Items

Age, gender, education, and income were considered as independent variables affecting IPC. In order to test group difference, an analysis of variance (ANOVA) was performed. Multiple regression analysis was conducted to compare the effect of each independent variable. During the analysis procedure, a nonlinear relationship between age and IPC was observed and hence a nonlinear regression model was also tested. SPSS 18.0 was used as the analytical tool.

## 4 RESULTS

### 4.1 Descriptive statistics

The mean value of all items was slightly over 3.0. IPC6 had the highest mean value (3.20) and IPC1, the lowest (3.11). The standard deviation of all items ranged from 1.23 to 1.30. For the normality analysis, Kolmogorov–Smirnov test was conducted, and the absence of normality was confirmed. In general, a large sample guarantees normality. Thus, it is interesting that non-normality from the sample was observed. To identify the reason, we checked the distribution of IPC. We found that extreme values (6 or 30) had a higher share (10.7% and 7.6%, respectively). However, as the data was provided by a Korean public research organization, the data can be deemed reliable enough. Thus, it can be inferred that a noteworthy number of people have either strong privacy concerns or none at all. Since our research sample is big enough and artificially manipulating the extreme values may lead to bias, we made no omissions.

### 4.2 Group comparison

As shown in Table 2, every group has significant mean differences as compared to other groups. The results for gender and age are different from the findings in the literature. Most of previous studies have argued that females tend to feel more concerned than males, even though some assert no significant differences. However, our results show that males have higher IPC than females ( $F = 11.717, p = .001$ ). Significant age difference is also found, but the mean value of IPC has a tendency to

decrease, which is at odds with previous research. In terms of education and income, our results are similar to those in the literature. One noteworthy point is that some degree of IPC exist even in the group with no income. In sum, our analysis shows that demographical variables have varying effects on IPC, rather than a simple direct relationship.

Category		N (%)	Mean (SD)	F	p
Gender	Male	4484 (45.6%)	19.15 (6.81)	11.717	.001
	Female	5356 (54.4%)	18.66 (7.23)		
Age	10-19	1326 (13.48%)	19.83 (6.28)	333.72	.000
	20-29	887 (9.01%)	21.60 (5.56)		
	30-39	1316 (13.37%)	21.33 (5.81)		
	40-49	2086 (21.20%)	21.07 (5.88)		
	50-59	1620 (16.46%)	19.09 (6.54)		
	60-69	1100 (11.18%)	15.76 (7.65)		
	70-79	1505 (15.30%)	13.33 (7.11)		
Education	Elementary School	2054 (20.9%)	13.87 (7.27)	512.68	.000
	Middle School	1225 (12.4%)	17.08 (7.33)		
	High School	3417 (34.7%)	19.95 (6.30)		
	Undergraduate	3004 (30.5%)	21.69 (5.46)		
	Graduate	140 (1.4%)	21.91 (6.19)		
Monthly Income (\$) (approximately)	None	4328 (44%)	18.73 (6.95)	102.93	.000
	~500	601 (6.1%)	13.85 (7.59)		
	500~999	811 (8.2%)	16.03 (7.66)		
	1000~1999	1588 (16.1%)	19.44 (6.89)		
	2000~2999	1298 (13.2%)	20.74 (6.16)		
	3000~3999	721 (7.3%)	20.60 (5.85)		
	4000~4999	301 (3.1%)	21.89 (5.52)		
	5000~	192 (2.0%)	21.74 (5.55)		

Table 2. ANOVA results

### 4.3 Multiple linear and single nonlinear regression

To examine the relative effect of independent variables, multiple regression analysis was conducted. Model 1 shows the significance of all independent variables (see table 3). Among the variables, education ( $\beta = .292, p = .000$ ) and age ( $\beta = -.217, p = .000$ ) are strong determinants of IPC. On the other hand, the effects of income and gender are relatively small. Since the possibility of a nonlinear relationship between age and IPC was observed in the group difference analysis, single nonlinear regression analysis was conducted. Model 3 (quadratic nonlinear model) better explains the variation in IPC as compared to model 2 (linear model). The following shows the equation of the nonlinear model:

$$Y = -.004X^2 + .221X + 17.885$$

	Model 1	Model 2	Model 3
Constant	13.38	24.29	17.89
Age	-.217***	-.117***	.221, -.004
Education	.292***	-	-
Income	.090***	-	-
Gender	.067***	-	-
F	629.36	1227.81	953.04
R <sup>2</sup>	.204	.111	.162

Table 3. Regression results

To gain an intuitive understanding of the results, we checked the changes in IPC according to age. Figure 1 provides two interesting findings. As in earlier analyses, IPC have a tendency to increase and then gradually decrease. This implies that people of a specific age group has higher IPC. In our results, those from the early 30s group has the highest IPC. Another interesting finding is that females are more concerned with privacy concern until the age of 30s while males are more concerned about their privacy only after the age of 40s. This shows that no single demographic variable affects IPC in a direct and simple way.

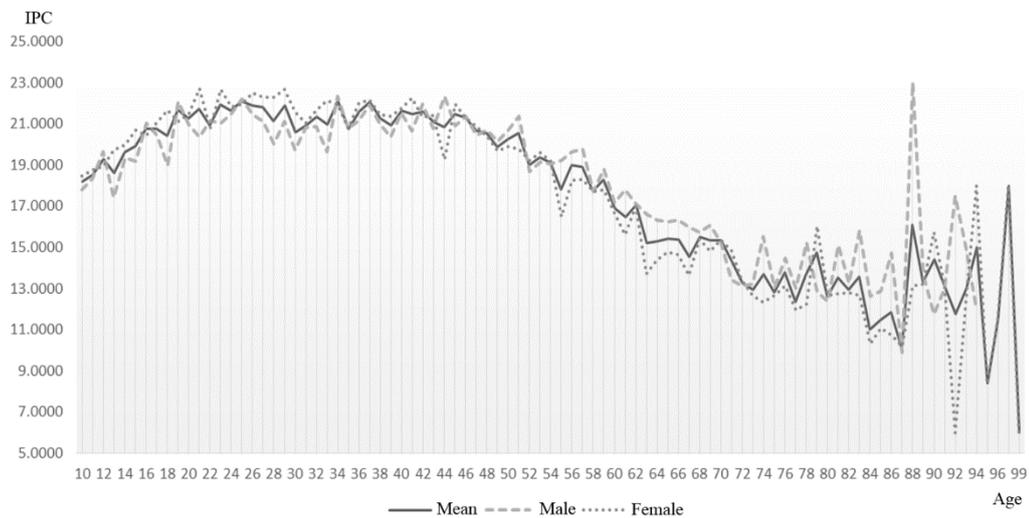


Figure 2. Age and IPC

## 5 DISCUSSION

This study examined the relationships of different demographic characteristics and levels of IPC. Our results indicated that men with high levels of educational attainment and high incomes have higher levels of IPC. However, in the literature, it was reported that women, because of their dispositional characteristics, tend to have higher levels of IPC (Sheehan, 1999). This suggests that we must be careful in discussing the relationship between the levels of IPC and gender.

The results obtained in regard to educational attainment and income levels are identical to those found in the literature where higher levels of educational attainment imply higher levels of privacy concern (Blank et al., 2014; O'Neil, 2001; Sheehan, 2002). This is because IPC tend to be proportional to the quantity and quality of information and goods a person has. Income can be understood in the same context where it is highly correlated with the information and knowledge a person is able to obtain.

For age effect, previous studies have argued that levels of IPC rise with increasing age (Paine et al., 2007; Youn, 2009). However, our findings reveal a tendency for the levels of IPC to decrease after increasing with increasing age. Teenagers have a lower level of privacy concerns compare to older people. Those in their 20s and 30s have the highest level of concerns and the level gradually decreases from 40s. Therefore, the relationship is non-linear and may have an inverted u shape. Additional analysis and discussion is needed to determine whether the cause of such nonlinearity is due to age or other factors such as Internet experiences or familiarity. It has not been long since the Internet was common and since the infringement of personal privacy has been discussed. Therefore, studies that further reexamine the effect of age while controlling for other factors should be conducted since people's experience with the Internet may differ by age.

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