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# Internet and Online Information Privacy: An Exploratory Study of Pre and Early teens

**Abstract**—Information security and privacy on the Internet are critical issues in our society. In this research, we examine factors that influence internet users' private information sharing behavior. Based on the survey of 285 pre and early teens who are among the most vulnerable groups on the web, this study provides a research framework that explains an internet user's Information Privacy Protection Behavior. According to our study results, Internet users' information privacy behaviors are affected by two significant factors that are the users' perceived importance of information privacy and information privacy self-efficacy. Another finding is that users' belief in the value of online information privacy and information privacy protection behavior varies by gender. Our research findings indicate that educational opportunities regarding Internet privacy and computer security as well as concerns from other reference groups (e.g. peer, teacher, and parents) play an important role in positively affecting Internet users' protective behavior regarding online privacy.

**Index Terms**—online information privacy, online information privacy protection behavior, self-efficacy, gender difference, the perceived value of information privacy, information privacy anxiety, information privacy concern, social cognitive theory, protection motivation theory.

## I. INTRODUCTION

INFORMATION PRIVACY is defined as “the claim of individuals, groups or institutions to determine of themselves when, how, and to what extent information about them is communicated to others” [1].

While information and communication technology deliver various benefits to our daily life, increasing threats on cyberspace, online information privacy breaches are growing as one of the critical problems. Advances in computer technology can jeopardize individuals' information privacy by increasing ability to access personal information[2]. For the organizations, monitoring workers' e-mail contents also discussed as issues regarding legal and ethical concerns in work place[3]. Computer technology and communication bring an obvious advantage to individuals, organizations and schools by conferring on them easy and fast access to the word of information. While the Internet becomes important sources of entertainment, commerce, and education, online users are facing more possibilities of online privacy breaches, computer incidents and cyber crimes which lead to growing public concern about online information privacy. However, the rapid development of information technology can even make the most information security and privacy aware users vulnerable.

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While more than three-fourth of American consumers expressed highly intensive information privacy concerns in 2001[4], companies want to collect and use online consumers' more personal information for marketing and strategic purpose. Moreover, technology facilitates an organization's ability to collect online users' personal information easily and without immediate recognition of online users by using cookies and tracking software[5].

According to the FTC, 85% of the sites that consumers had visited collected personal information from them, whereas only 14% had posted any privacy-related notices[6].

Public concerns about online privacy lead the governments' actions for keeping online users' from possible information privacy breach. Beginning from the data protection directive of the European Union in 1995, the U.S Congress enacted the Children's Online Privacy Protection Act in 1998 to regulate the online collection and use of personal information from children who are the one of the most vulnerable groups in online information privacy. The U.S Congress also passed The Gramm-Leach-Bliley Act to protect personal information privacy in financial industry in 1999.

Even though continuous efforts are expended to prevent the illegal acquisition and use of personal information on the web, information privacy and security threats are increasing rapidly in cyberspace. Especially effective protection for the information privacy vulnerable group is an emerging issue of our society. Children and teenager, one of the most vulnerable groups on the net, are composing the largest portion of Internet user group in the USA. 65% of children between the ages of 10 and 13 use the Internet [7]. Research shows that 163 out of 166 websites collect personal information from children without either the disclosure of any effort to elicit parental involvement even after the Children's Online Privacy Protection Act was enacted [8]. Reported computer crimes which are related to online privacy breaches and incidents of teenagers such as social engineering, phishing, and bullying as well as harassments are exponentially escalating[9].

However, online users are not very aware of how they can protect their personal information on the web. Turow (2003)'s study shows that most online users do not know how to protect their personal information on the web. According to survey results, 64% of 1200 online users respond that they never searched information about how protect information on the

web and 40% of adults users who use the Internet at home say that they know “almost nothing” about stopping sites from collecting information about them[10].

From the above finding, we can conclude that regulation and institutional efforts are not enough to protect online users from online privacy incidents. Of the online user community, children and teenagers are the fastest growing group of online users. In addition, they are very vulnerable to cyber crimes originating from online information privacy breaches, cyber stalking, online sexual harassment and cyber bullying[9]. Children can be easily convinced to share their personal information by promising of a small prize or gift [11]. Since children and teenagers easily tend to be trusting, naive, curious, adventuresome, and eager for attention and affection, potential offenders and strangers have found that children and teenagers are perfect targets for criminal acts in cyberspace [12]. Given the importance and vulnerability of this demographic group, this subset of the community has hardly been researched in the context of cybersecurity yet. In this research, we focus on online users’ behavior regarding online privacy specifically focusing on pre and early teens who are just entering their teen years.

In our research, we empirically explored the factors that influence the internet user’s personal information sharing behavior on Internet. In addition, we will investigate gender difference regarding perception about the importance of Internet privacy and information privacy protection behavior. To find out answers of our research objectives, we carried out an empirical study of middle school students who are familiar with IT and the Internet environment but are one of the vulnerable groups in the context of online privacy. We use social cognitive theory and protection motivation theory to understand internet users’ information privacy protection behavior. We develop a model that incorporates Information Privacy Self-Efficacy, Perceived Information Privacy Importance, and Exposure of Information Privacy as important factors in influencing attitudes toward information privacy.

## II. THEORETICAL DEVELOPMENT

In this sub-section, we discuss two theories, the drivers of our research model: social and cognitive theory that has been proposed by Bandura [13] and protection motivation model primarily ascribed to Rogers [14].

### A. Social Cognitive Theory

Social cognitive theory [13] is widely used to explain individual behavior. It premises that personal factors in the form of cognitive, affective and biological events, behavior and environmental events all operate as interacting determinants that influence each other [13]. According to this theory, an individual chooses the environment in which they exist in addition to being influenced by that environment. Furthermore, both behavior in a given situation and the environment affect each other. Finally, behavior is influenced by cognitive and

personal factors [15]. In this reciprocal relationship among environment, behavior and individual, Bandura introduces self-efficacy as a major cognitive force guiding individual behavior. He defines self-efficacy as people’s judgment of their capabilities to perform a task. Self-efficacy is concerned with judgments of what one can do and not with skills [13].

In the context of IT, the research suggests that individuals who possess high self-efficacy toward IT use IT more frequently [16]. People who have higher level of self-efficacy toward a specific subject are more like to give greater value to that subject. In our research we use social cognitive theory as a key theoretical background.

### B. Protection Motivation Theory (PMT)

Protection motivation theory [14] provides a conceptual framework of understanding fear, appeal and behavioral change. According to Rogers, individual’s intention to protect oneself depends on four factors; the perceived severity of a threatened event, the perceived probability of the occurrence, the efficacy of the recommended preventive behavior which is the individual’s expectation of carrying out, and the perceived self-efficacy that is the level of confidence in one’s ability to undertake the recommended preventive behavior[14]. Protection motivation theory explains individual’s protection motivation as a result of threat assessment and coping appraisal. In this relationship, fear appeal plays a critical role to motivate one’s protection behavior [17, 18].

Based on social cognitive theory and protection motivation theory, this research presents a conceptual model which is presented in Fig. 1.

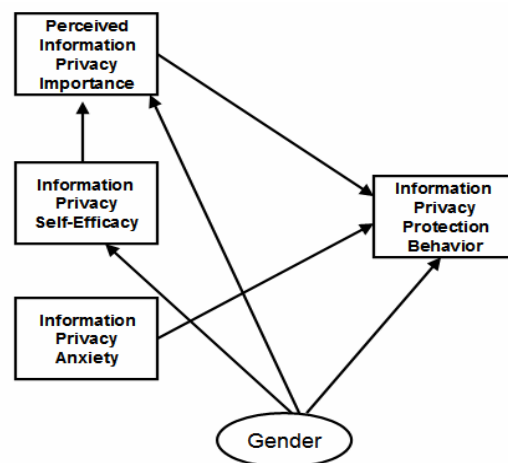


Fig.1 Conceptual Model

## III. THE RESEARCH MODEL AND HYPOTHESES

### A. Perceived Importance of Information Privacy and information Privacy Protection Behavior

As one of the factors driving individual motivation to perform a behavior such as an academic task, perceived importance has been discussed in numerous studies. “Perceived Importance” on the other hand is defined as the individual’s perceived degree of importance of a certain event or behavior [19-21]. For example, Robin et al. (1996) measured the impact of perceived

importance of ethics of marketing personnel on ethical decision making behavior in the context of marketing strategy. They measured perceived importance (how important business ethic for you etc) by using a 9 point Likert scale from strongly disagree to strongly agree[19]. The study of Pajares and Graham investigated the role of perceived importance of mathematics with regard to math outcome (math test results)[22].

In evaluating training programs, employee's perceived importance of the training program plays an important role in increasing motivation to join and do well in the training program[23]. The value, or importance of the object or activity, has positive relationship with individual motivation[24]. The research of Robin et al. explored the impact of perceived importance of an ethical issues on the ethical decision making and behavioral intention of business managers[19]. In the IT domain, ethical behavior in IT was also influenced by the user's perceived importance of IT ethics [25].

In this research, we propose a relationship between the Internet users' perceived importance of information privacy and their behavior to protect their privacy on the web. According to previous research results which indicate a positive relationship between perceived importance in a certain domain and behavioral motivation to perform the activities related to in that area, we assume that internet users who place a higher on the importance of information privacy will demonstrate more of a tendency to show online privacy protection behavior than the users who place a lower value on the importance of information privacy on the Internet. Based on the discussion we propose hypothesis 1:

**H1.** *Perceived importance of information privacy will positively affect information privacy protection behavior.*

### **B. Information Privacy Self-efficacy (IPSE)**

In social cognitive theory [26, 27], as discussed earlier, self-efficacy is considered to be an important factor driving individuals' behavior [28, 29]. Individuals' self-efficacy beliefs operate on personal behavior through motivational, cognitive, and affective intervening processes [26]. Bandura et al. investigated the role of academic self-efficacy on academic performance and found a positive relationship between students' academic self-efficacy and their performance[29].

In the context of IT, the research suggests that individuals who possess high self-efficacy toward IT, use IT more frequently [15, 16]. The research of Brown and Venkatesh also confirms that individual's self-efficacy is a critical factor on technology adoption[30]. People who have higher level of self-efficacy toward a specific subject are more like to confer a greater value to that subject. The research of Wisenbaker, Scott & Nasser show that students' strong cognitive competency toward statistics is related to more value for statistics[31]. Student's task-specific beliefs regarding their own ability influence their values regarding a subject [32]. For example, a student, who

believes he or she can do well at math, tends to value mathematics more than a child who does not believe in his or her math competency. Previous research also shows students are much more likely to value math, language, art, and sports when they feel competent in the domain [33].

In the current study, we define information privacy self-efficacy as an Individual's judgment of their capabilities to perform information privacy behavior. In other words, information privacy self-efficacy is about how confident children are in their skills and performing behavior to keep their online privacy.

Based on previous studies regarding self-efficacy, we propose that if students have high self-efficacy toward information privacy behavior, like keeping personal information private during Internet use, they will have a strong motivation to implement behavior that shows sensitivity to information privacy. Furthermore, students are more likely to value information privacy when they have a high level of self-efficacy in the information security domain. Here we propose the following hypothesis:

**H2a.** *Information privacy self-efficacy will positively affect perceived information privacy importance.*

**H2b.** *Information privacy self-efficacy will positively affect information privacy protection behavior.*

The effect of education or informative programs is discussed as one of the importance factors that influence on individual's self-efficacy and behavior. The research of Strecher et al. finds that the role of self-efficacy on behaviors to achieve an improvement of health condition. According to their research, individuals' behavior such as cigarette smoking, weight control and contraception are positively related with their level of self-efficacy which can be enhanced by educational programs[34]. Rubin et al. also found out that basic knowledge as well as knowing how to manage diabetes positively affects an individual's self-efficacy to cope with diabetes[35]. Based on an experiment with 321 university students, Cody et al. find out that student's enhanced knowledge regarding skin cancer strongly affects their skin protection intention. According to their research results, the group who watched the video about skin cancer has a higher intention to protect their skin as compared to the group who watched an emotional address video[36]. In the context of information privacy, the research of Weisband and Reining discusses education or training experiences as one of influencers on users' privacy awareness regarding an e-mail usage [37].

Based on previous research findings, we assume that students who have more opportunities to learn about information privacy from school, parents and friends would have stronger self-efficacy in information privacy. Furthermore, if students are exposed to information privacy, they tend to have strong perceived importance of information privacy. In other words, if students hear about information security issues such as how to protect privacy on the Internet or avoid risks from computer viruses and spy ware, they will develop better perception of

information privacy on the Internet. Based on these assumptions, the hypotheses are:

**H3a.** *Information privacy exposure will positively affect perceived information privacy importance.*

**H3b.** *Information privacy exposure will positively affect information privacy self-efficacy.*

### C. Information Privacy Anxiety (IPA)

According to protection motivation theory (PMT), the likelihood of engaging in protective behavior like risk avoidance is positively related to factors such as the high magnitude of danger, the great probability of occurrence, the existing effective actions to control consequences and the capability to manage consequences. Among the above discussed factors, fear appeals to individual attitude and behavioral intention is discussed as an important factor which determines an individual's protective behavior [14, 17, 18, 38]. Researches using PMT as their theoretical background suggest that fear is an affective mediator of leading people's intention on doing protective behavior to avoid risks [39, 40].

In our study, we investigate the role of information privacy anxiety which comes from an individual's cognitive assessment regarding their vulnerability and the possibility of an occurrence of an online information privacy breach. This study defines the information privacy anxiety as an individual's concern and anxiety regarding possible online privacy breach occurrences.

The previous literature of PMT, leads us to argue that individuals' level of anxiety toward an online privacy breach will cause greater protective behavior among students.

**H4.** *Information privacy anxiety will positively affect information privacy protection behavior.*

An individual's past experience regarding certain domain also affects one's cognitive process of decision making on certain behavior[41]. The research of Cody et al. also empirically proves the impact of previous experience on health protection behavior. Their research findings support that an individual who has a skin cancer experience has a stronger intention to protect skin and more of a tendency to exhibit a protective behavior [36].

In this research, we discuss the impact of past experience on online information privacy breach. In our research, past bad experience on online information privacy is represented by Internet users' past experiences on computer virus hitting, a computer/information security problems, privacy breach, and bullying on the net. To investigate the role of bad experience in the users' past, we hypothesize the following relationships between students' bad experience in the past and their self-efficacy, anxiety and protective behavior toward online privacy incidents.

**H5a.** *Past bad experience will have an impact on information*

*privacy protection behavior.*

**H5b.** *Past bad experience will positively affect information privacy anxiety.*

**H5c.** *Past bad experience will negatively affect information privacy self-efficacy.*

The influence of peers, teacher, and parents to adolescent behavior are researched extensively in prior research [42-45]. The research of Carr et al. empirically tested the relationship between students' physical education and the involvement of parents, teacher and peers. They found that goal orientation toward physical education of students was positively influenced by a supportive climate of physical education[43]. Davis et al. found out the parental influence on the adolescent's aspirations regarding education plan which is stronger than peer influence. They also find out this influence does not decline over the adolescent years[42].

Our research suggests a relationship between anxiety of parent, peer and teacher and online information privacy protection behavior. We term external information privacy anxiety as online privacy concerns of parents, peers, and teachers. Based on PMT theory and prior research regarding the influence of peers, teacher, and parents, we assume the positive relationship between external information privacy and information privacy protection behavior.

**H6.** *External information privacy anxiety influence will positively affect information privacy protection behavior.*

### D. Gender

There are various pieces of literature which examine gender differences in technology adoption, usage behavior and perception. Several studies suggest that gender difference is a strong predictor of users' usage behavior and perception of technology. According to research of Kekelis, Ancheta et al., in the U.S, girls are less given computer related support by their parents compared to boys[46]. Boys are more encouraged to participate in hands on experiment comparing with girls which gives them an advantage of self-confidence and a willingness toward technology[47]. Gefen and Straub find out that women and men differ in their perceptions and use of e-mail[48]. Their study confirms that women have differences on perception of social presence of e-mail and women also perceive a higher value for usefulness than men do. Their research supports the notion that men feel more at ease with computers compared with women. Other studies point out that that gender difference plays significant role on user's online purchase intention[49-51]. Male employees have a tendency to use internet more frequently than female workers in the organization [52]. In the context of information privacy, women have perceptions of grater risk in online transactions than do men[53] and more concern about information privacy[54]. The research of Eccles et al. empirically tests gender difference on level of competency belief (self-efficacy) on various class activities including math, reading and sports

[55]. Their study results confirm that students' self-efficacy belief about various task is vary by gender. In the PTM literatures, females had greater knowledge and stronger intentions to prevent skin cancer than males did but reported fewer high-risk behaviors[36].

Based on the above discussion, we argue that gender difference will have an impact on an individual's information privacy protection behavior, belief about their level of self-efficacy.

**H7.** Information privacy protection behaviors will vary by gender.

**H8.** Information privacy self-efficacy will vary by gender.

**H9.** Perceived information privacy importance will vary by gender.

Figure 2 presents research model and table 1 indicates hypotheses.

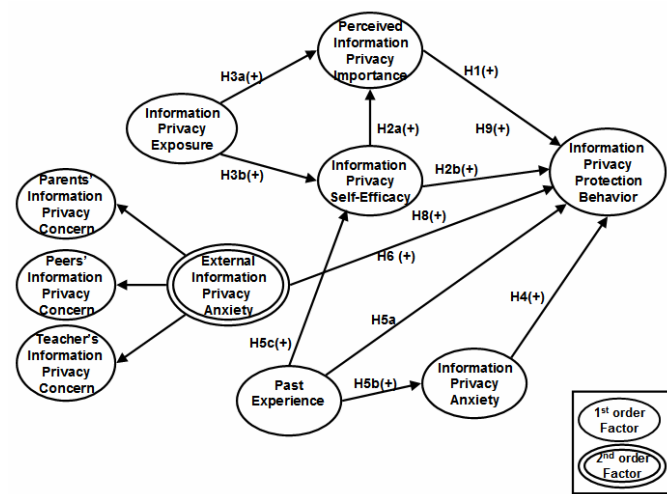


Fig. 2 Research Model and Hypothesis

TABLE I  
RESEARCH HYPOTHESIS

Hypotheses:
H1. Perceived importance of information privacy will positively affect information privacy protection behavior.
H2a. Information privacy self-efficacy will positively affect perceived information privacy importance.
H2b. Information privacy self-efficacy will positively affect information privacy protection behavior.
H3a. Information privacy exposure will positively affect perceived information privacy importance.
H3b. Information privacy exposure will positively affect information privacy self-efficacy.
H4. Information privacy anxiety will positively affect information privacy protection behavior.
H5a. Past bad experience will have an impact on information privacy protection behavior.
H5b. Past bad experience will positively affect information privacy anxiety.
H5c. Past bad experience will negatively affect information privacy self-efficacy.
H6. External information privacy anxiety influence will positively affect

information privacy protection behavior.

H7. Information privacy protection behaviors will vary by gender.

H8. Information privacy self-efficacy will vary by gender.

H9. Perceived information privacy importance will vary by gender.

#### IV. RESEARCH DESIGN AND METHODOLOGY

This research adopted a structured questionnaire survey. We conducted a structured survey of school age internet users who are middle school students. The survey was conducted at technology camps held in Maryland in June 2006 and in New York in February of 2007.

285 students out of 400 responded to our survey, resulting in a 71.3% response rate. The average age of the respondents is 13.6 years, and 45% were male and 55% were female respondents.

We used Partial Least Square (PLS) to investigate the effect of structural model, PLS enables the specification of both the relationships among the constructs and the measures underlying each construct [56]. PLS, as a variance-based approach, was first introduced by Wold (1975), focusing on maximizing the variance of the dependent variables explained by the independent ones instead of reproducing the empirical covariance matrix [57]. Covariance-based approach such as LISREL or AMOS is based on the assumption of a standard distribution of the data and this also requires a large sample size. However, if the distribution is skewed, or sample size is not sufficient, the covariance-based approach can yield non-unique or otherwise improper solutions in some cases [58, 59]. In contrast, PLS has an advantage that it involves no assumption about the population or scale of measurement, and consequently works without distributional assumptions and with nominal, ordinal, and interval scaled variables[60].

PLS must be an appropriate method compared with LISREL or AMOS because of following reasons. First, our data is highly skewed in information privacy protection behavior and information privacy exposure because it is collected from summer technology camp of middle school students. Second, our study is exploratory study in investigating new area, information privacy.

We adopted many measurement indicators from prior literature and modified them to fit in online information privacy context. Measurement indicators of information privacy self-efficacy are adopted from [61, 62]. We use measures that have been validated in previous research to ensure the control of measurement errors. However, we did construct some measures to reflect the context of information privacy. Since our study is the first study which explores teen's behavior regarding information privacy protection behavior, measurements for information privacy protection behavior (dependent variable: IPPB1, IPPB2, IPPB3, IPPB4) were newly constructed based on previous literature that focused on human behavior about information technology [63-65]. Self-efficacy measures are adopted from self-efficacy literature in educational psychology

[29, 66]. Perceived importance measures are borrowed from Pajares and Graham (1999). Graham (1999), Robin et al. (1996), Eccles (1983), Meece et al. (1990) and adapted them to reflect the online privacy context;

Measurement indicators for the information privacy anxiety, past experience, and external influence are adopted from literatures which use protection motivation theory. These adopted measures are modified to reflect the context of information privacy. Other measures in the analysis are newly constructed for this study. Since our research samples are middle school students, we adjusted the level of difficulty and complexity of survey questionnaire by pilot test which was carried out in summer, 2005. The construct definition is shown in table II.

For reliability assessment of measurement indicators, this study employed Cronbach's alpha. Discriminant validity was analyzed by comparing the average variance extracted (AVE) to the R<sup>2</sup> among the latent variables [67]. Factorial validity test of measurement indicators are carried out by exploratory factor analysis by SPSS12. For the investigation of gender difference on information privacy protection behavior and individual's belief regarding self-efficacy and importance of online information privacy, we adopt independent sample t-test method to compare males and females. The effect structural model was evaluated using bootstrap resampling procedure within PLS using 200 resembles.

TABLE II  
CONSTRUCT DEFINITION

Construct	Definition
<b>Information Privacy Protection Behavior (IPPB)</b>	User's behavior to protect their privacy on the Internet. (e. g. not giving out personal information (like home/email address, telephone number, school name, etc.) to unknown website, never opening e-mail from unknown senders and never having an online chat with a person who first met on the Internet etc.)
<b>Information Privacy Self-Efficacy (IPS)</b>	Individuals' judgment of their capabilities to perform information privacy behavior
<b>Perceived Information Privacy Importance (PIPI)</b>	Individuals' perceived value of information privacy protection behavior
<b>Information Privacy Exposure (IPE)</b>	Experience of learning and hearing about information privacy in using internet and computer
<b>Information Privacy Anxiety (IPA)</b>	Individual's concern and anxiety regarding expected occurrence of online privacy breach
<b>Past Bad Experience (PE)</b>	Individual's personal experience of personal information breaches or threatening safety on the Internet
<b>External Information Privacy Anxiety (EIPA)</b>	Individual's beliefs coming from reference groups' (e.g. parents, peers and teachers) approval or disapproval on information privacy protection behavior.

As mentioned earlier, we investigated Cronbach's alpha to verify the internal consistency of each construct. Table III shows that the reliability test tuned out to be feasible and there

is no significant defect in internal consistency.

TABLE III. RELIABILITY VALUES FOR MEASUREMENT CONSTRUCT

Construct	Number of Item	Cronbach's Alpha
(1) Information Privacy Protection Behavior (IPPB)	4	0.710
(2) Information Privacy Self-Efficacy (IPS)	3	0.766
(3) Perceived Information Privacy Importance (PIPI)	3	0.944
(4) Information Privacy Anxiety (IPA)	2	0.860
(5) Parents' Information Privacy Concern (PIPC)	2	0.840
(6) Peers' Information Privacy Concern (PEIPC)	2	0.820
(7) Teachers' Information Privacy Concern (TIPC)	2	0.799

To examine the validity of the measurement model, we carried out the composite reliability test as well as investigated PLS factor loading and Average Variance Extracted (AVE).

As shown in table IV, most of the standardized loadings of individual items were above the ideal cutoff level of 0.7[68, 69]. However, the study of Hair et al.[70]suggests a measurement item loads highly if its loading coefficient is above .60 and does not load highly if the coefficient is below .40. Only two out of the 18 reflective indicators(0.689) had loadings lower than 0.7, but they were higher or the same as the acceptable level of 0.6 [70]. It is important to point out that this value (0.689) is acceptable since it is exploratory study [70]. (The measurement items are shown Appendix.)

TABLE IV  
INDIVIDUAL ITEM LOADING ( PLS FACTOR LOADING)

ITEM	Loadings
Information Privacy Protection Behavior (IPPB) 1 (Do not open e-mail from unknown sender)	0.776
Information Privacy Protection Behavior (IPPB) 2 (Do not download unknown files from known people and website on Internet)	0.789
Information Privacy Protection Behavior (IPPB) 3 (Do not give personal information (like home/email address, telephone number, school name, etc.) to unknown websites.)	0.718
Information Privacy Protection Behavior (IPPB) 4: (Do not give my personal information to people I first met on the Internet.)	0.710
Information Privacy Self-Efficacy (IPS) 1: (Self-efficacy regarding Internet Privacy)	0.775
Information Privacy Self-Efficacy (IPS) 2: (Self-efficacy regarding distinguishing between trusted website and unsafe website)	0.767
Information Privacy Self-Efficacy (IPS) 3: (Self-efficacy regarding awareness of information security problems (e.g. virus, privacy breach, bullying	0.689

on the net etc.)	
Perceived Information Privacy Importance (PIPI) 1 ( Perceived importance regarding personal information )	0.786
Perceived Information Privacy Importance (PIPI) 2 (Perceived importance regarding protecting computer from computer viruses)	0.689
Perceived Information Privacy Importance (PIPI) 3 ( Perceived importance regarding Internet privacy)	0.863
Information Privacy Anxiety (IPA) 1 ( Anxiety toward becoming a target of bullying on Internet)	0.902
Information Privacy Anxiety (IPA) 2 ( Anxiety toward computer and privacy incidents)	0.838
Parents' Information Privacy Concern (PIPC)1 ( Parents' concerns regarding Internet safety)	0.929
Parents' Information Privacy Concern (PIPC)2 ( Parents' concern regarding Internet safety)	0.925
Peers' Information Privacy Concern (PEIPC)1 ( Peers' awareness regarding Internet privacy and safety)	0.927
Peers' Information Privacy Concern (PEIPC)2 ( Peers' awareness regarding Internet privacy and safety)	0.892
Teachers' Information Privacy Concern (TIPC)1 (Teachers' concerns regarding Internet safety)	0.919
Teachers' Information Privacy Concern (TIPC)2 (Teachers' concerns regarding Internet safety)	0.917

We also investigated cross-loadings of each item to compare it to all latent variables. Table V shows Principal Component Analysis (PCA) results by SPSS12. We used Varimax with Kaiser Normalization rotation method.

TABLE V. CROSS LOADINGS FOR THE MEASUREMENT MODEL

	IPPB	PIPI	IPS	PIPC	PEIPC	TIPC	IPA
IPPB1	0.77	0.29	0.26	0.17	0.20	0.06	0.00

IPPB2	0.79	0.33	0.28	0.26	0.29	0.06	0.06
IPPB3	0.72	0.27	0.31	0.25	0.12	0.00	-0.03
IPPB4	0.71	0.28	0.28	0.15	0.11	-0.01	-0.02
PIPI1	0.34	0.79	0.34	0.27	0.17	-0.03	-0.07
PIPI2	0.20	0.69	0.40	0.20	0.11	0.00	0.00
PIPI3	0.39	0.86	0.35	0.30	0.21	0.05	0.03
IPS1	0.35	0.43	0.78	0.20	0.05	-0.05	-0.10
IPS2	0.24	0.29	0.77	0.13	0.12	0.10	-0.02
IPS3	0.21	0.29	0.69	0.10	0.16	0.12	-0.03
PIPC1	0.24	0.27	0.20	0.93	0.25	0.19	0.12
PIPC2	0.26	0.32	0.21	0.93	0.26	0.13	0.05
PEIPC1	0.25	0.18	0.15	0.26	0.92	0.12	0.14
PEIPC2	0.18	0.14	0.11	0.25	0.92	0.07	0.12
TIPC1	0.09	0.04	0.08	0.27	0.23	0.93	0.21
TIPC2	-0.06	-0.07	-0.07	0.20	0.10	0.90	0.25
IPA1	-0.03	-0.09	-0.11	0.10	0.20	0.19	0.90
IPA2	-0.06	-0.07	-0.06	0.05	0.03	0.06	0.84

We also carried out composite reliability (CR) test. Values greater than 0.70 indicate acceptable values[71].

We tested discriminant validity by comparing Average Variance Extracted (AVE) and the R<sup>2</sup> among the latent variables[67]. The AVE is calculated as:

$$\frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum (1 - \lambda_i^2)} \quad (\lambda_i \text{ is the loading of each measurement item on its corresponding construct})$$

This comparison indicates that more variability is within a latent variable and its indicators than between the latent variables themselves. The results of the correlation matrix are shown in Table VI. All AVEs for the latent variables measured by reflective indicators were greater than the required minimum level of 0.5 and every construct had a larger square root of AVE than its correlations with other constructs. This result shows that our measurement model ensures discriminant validity [72] . The values of AVE, composite reliability and correlation are presented in Table VI.

TABLEVI  
CROSS LOADINGS FOR THE MEASUREMENT MODEL

Latent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	CR
(1) Information Privacy Protection Behavior	(.749)*							0.836
(2) Information Privacy Self-Efficacy	.373	(.745)						0.788
(3) Perceived Information Privacy Importance	.396	.462	(.782)					0.825
(4) Information Privacy Anxiety	-.049	-.103	-.088	(.757)				0.862
(5) Parents' Information Privacy Concern	.263	.166	.244	.216	(.926)			0.924
(6) Peers' Information Privacy Concern	.024	.012	-.013	.086	.264	(.909)		0.906
(7) Teacher's Information Privacy Concern	.234	.146	.173	.145	.190	.185	(.918)	0.915

Note: The number in the parenthesis is the square root of AVE

In our research model, there is a second order factor (i.e. external influence). As shown in Fig. 2, the three dimensions of external influence are arranged in a second-order factor model, which depicts the multiple external influence dimensions as multidimensional entities of the higher second order factor. All of its indicators had factor loadings above 0.7 and were significant at the 0.01 level. All indicators load higher on the first order factors than on the second order factor and AVE of External influence was greater than the square of the correlations between it and its three first order factors. It confirms that parents' information privacy concern, Peer's information privacy concern, and teacher's privacy information

concern reflect the second order factor well [73]. Regarding the relative importance of the three dimensions, the parents' information privacy concern is relatively more important than peer's information privacy concern and teacher's information privacy concern since their path coefficients from the external influence to parents' information privacy concern, peers' information privacy concern and teacher's information privacy concern were 0.771, 0.639, and 0.695 respectively. The correlations between second-order factors and other latent variables are shown on table VII. The summary of hypotheses results is presented on table VIII.

TABLE VII  
CORRELATIONS BETWEEN SECOND-ORDER FACTORS AND OTHER LATENT VARIABLES

Latent Variables	(1)	(2)	(3)	(4)	(5)
(1) Information Privacy Protection Behavior	(.749)*				
(2) Information Privacy Self-Efficacy	.373	(.745)			
(3) Perceived Information Privacy Importance	.396	.462	(.782)		
(4) Information Privacy Anxiety	-.049	-.103	-.088	(.757)	
(5) External Information Privacy Anxiety	.263	.166	.244	.216	(.708)

Note: The number in the parenthesis is the square root of AVE

V. RESULTS

Overall, the tests showed significant support for our model and the amount of variance in the dependent latent variables explained by the model was moderate. Our research result is presented in Fig. 3 and table VII. As shown in Fig. 3, most hypotheses are supported by data test results except for the hypothesis regarding the effect of an information privacy anxiety to the information privacy protection behavior and information privacy exposure to perceived information privacy importance. Around 24% of variance of the students' information privacy protection behavior is explained by an information privacy self-efficacy, a perceived information privacy importance, a past experience, and an external information privacy anxiety.

For hypothesis 1, there was a significant and positive relationship between perceived importance of information privacy and information privacy protection behavior (path = 0.247; p < 0.005). For Hypothesis 2a, information privacy self-efficacy had a positive relationship with the information privacy protection behavior (path = 0.207; p < 0.005). Hypothesis 2b is also supported by data test results. Students' information privacy self-efficacy had a strong positive effect on their perceived importance of information privacy (path= 0.452; p<0.005). Our data results supported hypothesis 3a, which postulated that an individual's information privacy exposure has a positive impact on information privacy self-efficacy (path = 0.181; p < 0.01). In the hypotheses 4 and 6 which represent individual's cognitive procedure regarding fear appealing, we found out only external information privacy anxiety has an impact on information privacy protection behavior (path = 0.168; p < 0.001). The hypotheses 5a, 5b and

5c all supported by the results (5a; path= -0.119; p<0.5, 5b; path= 0.398; p<0.001, 5c; path= -0.188; p<0.001). From these research findings, we realized that past experience of online privacy breach can negatively affect on user's information privacy protection behavior and their self-efficacy of coping behavior, which indicates that students who has experiences of Internet privacy breach or computer security problem show less protection behavior on Internet so that they can be victims again in the future.

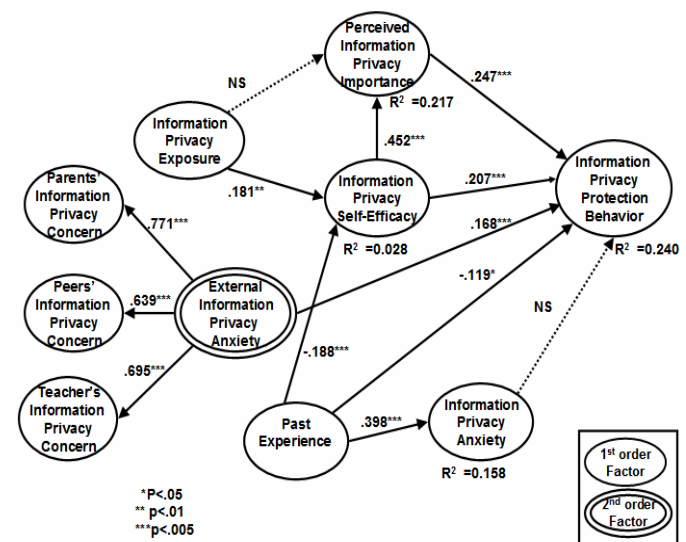


Figure 3 Data Analysis Results

Hypotheses 7, 8 and 9 are related to gender differences in individual's belief and behavior of online information privacy areas. Before we examined T-test results, we carried out Levene's test to investigate equality of variance between boy's

group and girl's group. Levene's test is a F test of the hypothesis that all variances are equal against the alternative hypothesis that the standard deviations are not all equal[74]. When the F resulting from Levene's test was significant at 0.05 level, we used Welch modification to carry out t test. Each group shows unequal variance regarding one construct, information privacy protection behavior (p<0.01) so we used modified procedure (Welch modification) to compare mean difference of two groups. As shown in table VII, boys and girls

show differences in their information protection behavior and perceived importance of information privacy. Thus, hypothesis 7 is supported by data test results (p<0.01) and H8 was also supported by data (p<0.5). From the data analysis results, we observe that female students are more likely to apply information privacy protection behavior than male students as they value the perceived information privacy higher. Interestingly, their belief about self-efficacy level of online information privacy was not different from other groups.

TABLE VIII  
GENDER DIFFERENCES IN INFORMATION PRIVACY PROTECTION BEHAVIOR AND BELIEF ON INFORMATION PRIVACY

	Girls			Boys			Levene's Test		Mean Difference		
	N	M	SD	N	M	SD	F	Sig.	t	df	Sig.
Information Privacy Protection Behavior	153	5.717	1.284	130	5.259	1.567	7.317	.007**	-2.608	281	.007**
Information Privacy Self-efficacy	153	5.762	1.009	129	5.734	1.091	0.198	.657	-0.228	263.744	.820
Perceived Information Privacy Importance	154	6.470	0.743	130	6.308	0.867	4.791	.031	-1.695	282	.091*

\*P<0.5, \*\*P<0.01

TABLE IX  
SUMMARY OF HYPOTHESES RESULTS

Hypotheses	Results
H1. Perceived importance of information privacy will positively affect information privacy protection behavior.	Supported
H2a. Information privacy self-efficacy will positively affect perceived information privacy importance.	Supported
H2b. Information privacy self-efficacy will positively affect information privacy protection behavior.	Supported
H3a. Information privacy exposure will positively affect perceived information privacy importance.	Not Supported
H3b. Information privacy exposure will positively affect information privacy self-efficacy.	Supported
H4. Information privacy anxiety will positively affect information privacy protection behavior.	Not Supported
H5a. Past bad experience will have influence on information privacy protection behavior.	Supported
H5b. Past bad experience will positively affect information privacy anxiety.	Supported
H5c. Past bad experience will negatively affect information privacy self-efficacy.	Supported
H6. External influence will positively affect information privacy protection behavior.	Supported
H7. Information privacy protection behaviors will vary by gender.	Supported
H8. Information privacy self-efficacy will vary by gender.	Not Supported
H9. Perceived information privacy importance will vary by gender.	Supported

## VI. DISCUSSION & CONCLUSION

This study focuses on social cognitive theory and protection motivation theory to investigate the online information protection behavior of Internet users. In this study, we explored private information sharing behavior of children and teenager Internet users on the web based on the fact that they are one of the most active groups on Internet but the most vulnerable group on online information privacy.

According to survey of U.S Department of Justice, one in five youths who regularly use the Internet received sexual solicitations or approaches during a 1-year period and 25% of youths surveyed received a sexual approach or solicitation over the Internet in the past year [75]. More importantly, potential offenders and strangers have found that children and teenagers are perfect targets for criminal acts because of these reasons: pre and early teens are trusting, naive, curious, and eager for attention and affection. Since the Internet provides anonymity to predators, the danger for children and teenagers will increase, making them the most vulnerable group for information privacy [12].

Based on middle school students, a highly vulnerable group in terms of online privacy as compared with adult internet users, we investigated the factors affecting users' online information protection behavior.

Our research findings suggest that students, who have strong self-efficacy toward information privacy on the Internet and have an exposure of online information privacy from school, parents and media, are more likely to practice online information privacy behaviors such as not opening e-mails from unknown senders, protecting personal information on the Internet, not downloading files from unknown people or websites.

Another factor which affects information privacy behavior was online privacy concern from reference groups who are composed of teachers, peers and parents. Among these groups, the most influential group was parents, indicating that the parents who indicated their concerns about their children's online safety positively contribute to their children's behavior to protect their privacy on the web. The role of perceived importance of information privacy was very critical to determine students' behavior to keep their online privacy. As a mediator between users' self-efficacy and their protective behavior, the perceived importance of online information privacy has a significant impact on students' decision making to employ information protection behavior.

While user's self-efficacy, perceived importance of information privacy and external information privacy anxiety increase the individual's behaviors to keep online privacy, past experience of online privacy breaches negatively correlated with individual's self-efficacy and information privacy protection behavior. From this finding, we expect that an internet user who has bad experience regarding online privacy would have more chance to suffer

online privacy breach again because of low self-efficacy about online privacy incidents coping behaviors and less likelihood of executing behavior in order to protect himself or herself on the internet.

In terms of the role of fear appeal, only online privacy anxiety from outer environment has an impact on user's online privacy protection behavior while the internal anxiety of students themselves does not play a significant role.

In addition to factors affecting teenagers' protection behavior on the web, we explore the impact of gender difference on their perception of information privacy. Furthermore, we investigate the behavioral difference of online privacy protection behavior between male and female students on the web. Our data analysis suggests strong support that girls have more of a tendency to practice protective behavior on the web. Our results also suggest that online user's level of perception about online information privacy importance can cause different online privacy protection behavior. In addition, as shown in table VIII, the mean of perceived information privacy importance for girls is higher than that for boys so that we can say that girls consider online privacy more important than boys do. According to our research results, we need to provide more information regarding how pre and early teens can protect themselves from online privacy incidents. More importantly, online privacy information and education opportunities are necessary for internet users to promote them to be aware of online privacy and to do information privacy protection behavior.

The limitation of this study is the sample characteristic. First, we have investigated middle school students in two states, New York and Maryland. However a more random sample may need to be used. Second, as our study is the first research which explores internet users' online privacy protection behavior and our sample is limited to pre and early teenagers, some of measurement indicators did not have higher loading value. To obtain solid measurement items for online privacy protection behavior, more empirical researches need to be carried out based on larger and various samples. For subsequent study, a higher value will be expected. Third, even though our current study focuses on teenager internet users, our research model can be expanded to adult internet users. We need to carry out further research to focus on adult users as well.

Although our empirical research results are based on the data set of pre and early teens' behavior regarding online information privacy, our research findings as well as the model can be applied to understanding general Internet users' behavior on online private information sharing. Internet users who have more knowledge and self-efficacy regarding online privacy issues show more tendencies to protect their personal information on Internet. However, our interesting research results suggest that Internet users who suffered negative experience (e.g. privacy breach, information security/ privacy incidents, computer virus) show less protective behavior on sharing their personal

information in Internet, which we can interpret that Internet users with negative experience can have more probability of becoming a victim of privacy incidents in the future. In addition, external factors, education opportunities regarding Internet privacy and computer security as well as concerns from other reference groups (e.g. peer, teacher, and parents) also play a significant role on affecting Internet users' protective behavior to keep their online privacy as their perceived value on importance of online privacy and self-efficacy level directly affect Internet user's private information protective behavior on Internet. Another interesting finding is that female Internet users think that their private information is more important than male Internet users do so that they show more protective behavior to keep their private information.

We believe that our research framework and empirical results contribute to understanding the users' behaviors toward online information privacy and protection of internet users from information privacy incidents.

APPENDIX

MEASUREMENT ITEM
IPPB1. I never open emails from unknown senders
IPPB2. I never download files (like music, picture, game, movies, etc.) from the Internet if the files are from unknown people.
IPPB3. I never give my personal information (like home/email address, telephone number, school name, etc.) to unknown websites.
IPPB4. I never give my personal information to people I first met on the Internet.
IPS.1 How good are you at keeping personal information (like name, photo, email, address, telephone number, etc.) secret from other Internet users you don't trust?
IPS.2 How good are you at noticing which web sites are not safe for children?
IPS3. How well are you aware of various computer/information security problems (like virus, privacy breach, bullying on the net, etc.)?
PIPI1. How important is it to keep your personal information (like address, telephone number, etc.) safe while using a computer?
PIPI2. How important is it to protect computers you use from viruses?
PIPI3. How important is it to protect your privacy (like giving your name, email, address, telephone number, etc.) on the Internet?
EIPA1. My parents are very worried about bad people on the Internet.
EIPA2. My parents are very worried about my safety on the Internet.
EIPA3. My teachers are very worried about bad people on the Internet.

EIPA4. My teachers are very worried about students' safety on the Internet.
EIPA5. My friends often talk about bad people on the Internet.
EIPA6. My friends often talk about bad things happening on the Internet.
IPE1. Have you ever heard how to protect your personal information and yourself from school, parents, friend, community course, media, or other?
IPA1. I may become a target of bullying on the Internet one day.
IPA2. I may have a bad experience on the Internet one day.
PE1. I have suffered from a computer/information security problem (like virus, privacy breach, bullying on the net, etc.) in the past.

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