

ORIGINAL ARTICLE

Online Privacy Concerns and Privacy Management: A Meta-Analytical Review

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This meta-analysis investigates privacy concerns and literacy as predictors of use of online services and social network sites (SNSs), sharing information, and adoption of privacy protective measures. A total of 166 studies from 34 countries (n = 75,269) were included in the analysis. In line with the premise of privacy paradox, privacy concerns did not predict SNS use. However, users concerned about privacy were less likely to use online services and share information and were more likely to utilize privacy protective measures. Except for information sharing, the relationships were comparable for intentions and behavior. Analyses also confirm the role that privacy literacy plays in enhancing use of privacy protective measures. The findings can be generalized across gender, cultural orientation, and national legal systems.

Keywords: Meta-Analysis, Privacy Concerns, Privacy Literacy, Privacy Paradox, Privacy Protection, Communication Privacy Management Theory, Information Sharing, Social Network Sites.

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Since Warren and Brandeis' pioneering article (1890) calling for a "right to be let alone," privacy has received considerable scholarly attention (e.g., Prosser, 1960). Following the revolutionary advances in information technologies and particularly the widespread adoption of Internet and social network sites (SNSs), this scholarly attention has increasingly focused on informational privacy—individuals' right to have control over the flow of information about them (Nissenbaum, 2009).

An important dimension of the extant debates on informational privacy pertains to how users manage privacy boundaries to achieve a balance between accessibility and retreat (Taddicken, 2014; Trepte et al., 2015). Given the regulatory regimes that increasingly delegate the responsibility of privacy protection to users (Baruh & Popescu, 2015), the influence of individuals' concerns about privacy on use of online

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services (e.g., government websites, health websites, online shopping, SNS use), information sharing, and engaging in privacy protective behavior has become a hot-button issue (e.g., Joinson, Reips, Buchanan, & Schofield, 2010; Walrave, Vanwesenbeeck, & Heirman, 2012). To date, however, studies on the relationship between privacy concerns and these behaviors have provided inconclusive results (e.g., Acquisti & Gross, 2006; Debatin, Lovejoy, Horn, & Hughes, 2009; Taddei & Contena, 2013; Tüfekci, 2008). In this light, the aim of this study is to provide a meta-analytical review of research regarding the relationship between online privacy concerns, privacy literacy, and behavioral intentions and behaviors related to: use of online services (other than SNSs), SNS use, sharing information online, and adoption of privacy protective measures. Informed by the communication privacy management (CPM) theory (Petronio, 2002), this study also investigates the respective influences of: cultural orientation of and level of legal protection in the country where data are collected, gender composition of the study sample, and the mode of data collection (online vs. offline) as potential moderators of the relationship between privacy concerns and management.

Privacy concerns and privacy management: A paradox?

The concept of *privacy concerns* refers to individuals' beliefs about the risks and potential negative consequences associated with sharing information (Cho, Lee, & Chung, 2010; Zhou & Li, 2014). It has been frequently utilized as a predictor of privacy management, which may include use of online services, use of SNSs, sharing information online, and engaging in privacy-protective behaviors (e.g., deleting cookies, untagging photos; Dienlin & Trepte, 2015; Zhou & Li, 2014).

A considerable number of studies have observed that individuals' concerns about privacy do not necessarily reflect the privacy management choices they make—a phenomenon named as “privacy paradox” (e.g., Acquisti & Gross, 2006; Taddei & Contena, 2013; Norberg, Horne, & Horne, 2007; Tüfekci, 2008). Yet, there is a growing number of studies which report a significant correlation between privacy concerns and privacy-management behavior (e.g., Wu, Huang, Yen, & Popova, 2012; Utz & Kramer, 2009). Within the domain of e-commerce, for example, concerns about online privacy are associated with engaging in privacy protective behaviors such as removing one's personal information from commercial databases (e.g., Son & Kim, 2008), deleting cookies (e.g., Lutz & Strathoff, 2014), and refraining from self-disclosure (e.g., Spiekermann, Krasnova, Koroleva, & Hildebrand, 2010).

Despite frequent references to the concept of privacy paradox, the mechanisms underlying it have received relatively scant attention. Another commonly utilized framework that focuses on individuals' (and groups') decision-making processes regarding privacy is the CPM theory (Petronio, 2002). However, although these two approaches study overlapping phenomena, they rarely are used in conjunction with each other (Morrison, 2013). In this light, this meta-analysis aims to investigate the mechanisms underlying privacy paradox using the framework provided by CPM theory.

CPM theory argues that privacy should not be considered as establishing a maximum boundary for keeping others out, but rather as a negotiation between accessibility and retreat (see also, Taddicken, 2014; Trepte *et al.*, 2015). Accordingly, privacy management entails a dynamic process within which individuals use strategies—called privacy rules—to control these boundaries. Hence, a key reason for the discrepancy between privacy concerns and behavior may be that users perceive the risk to privacy to be lower than the benefits of sharing.

For example, benefits derived from information disclosure, such as satisfaction of socialization and self-expression needs, may have considerable influence on individuals' decisions about privacy management (Petronio, 2002). Accordingly, the increasingly important role that SNSs play as socialization venues makes it very difficult for users to "give them up" even when concerned about privacy (Blank, Bolsover, & Dubois, 2014). Indeed, studies suggest that social motivations such as developing relationships not only increase use of SNSs but also increase disclosure of sensitive information (Spiekermann *et al.*, 2010; Taddicken, 2014). Although serving various utilitarian (and to a lesser degree hedonic) functions, non-SNS online services (e.g., online shopping sites) may not be as associated with satisfaction of social and self-expressive needs as SNSs are (Bridges & Florsheim, 2008). Hence, the question remains as to whether SNSs and other (non-SNS) online services differ from each other in terms of the extent to which privacy concerns predict service use.

Another important issue to take into consideration while evaluating the premise of privacy paradox concerns the outcome variables. Specifically, in the extant literature, studies utilize both behavioral intentions (e.g., Korzaan & Boswell, 2008) and behaviors (e.g., Acquisti & Gross, 2006; Lutz & Strathoff, 2014). However, a meta-analysis on intention-behavior gap (Sheeran, 2002) indicates that intentions explain only 28% of variance in behavior. Likewise, within the context of privacy, researchers caution against the use of behavioral intentions due to their weak predictive power of actual behavior (e.g., Norberg *et al.*, 2007). In this light, the present study will compare intentions and behaviors as potential outcome variables:

RQ1. What is the association between privacy concerns and, respectively, intentions and behaviors regarding use of online services (non-SNS; e.g., online commerce, government services) and use of SNSs?

RQ2. What is the association between privacy concerns and, respectively, intentions and behaviors regarding information sharing and adoption of privacy protective measures?

As discussed above, according to the CPM theory, information sharing and adoption of privacy protective measures constitute two complementary components of privacy management. In line with this premise of the CPM theory, several recent studies indicate that as individuals share more information they will also be more likely to adopt measures to limit the circulation of that information (e.g., Christofides, Muise, & Desmarais, 2012; Kezer, Sevi, Cemalcilar, & Baruh, 2016). Hence, in this meta-analysis, we will test the relationship between these two privacy-management behaviors.

RQ3. What is the nature of the relationship between information sharing and adoption of privacy protective measures?

Online privacy literacy and privacy management

A frequently investigated factor that may influence privacy management is online privacy literacy. One perspective argues that privacy paradox can be explained by users' lack of firsthand experience in negative consequences of privacy infringements, which may lead to their underestimation of privacy risks (Dienlin & Trepte, 2015). Relatedly, studies indicate that lack of declarative knowledge (i.e., "knowing that") about privacy risks and one's privacy rights as well as lack of procedural knowledge about how to protect one's privacy may reduce the chances that individuals' concerns will translate into privacy-management behavior (Debatin et al., 2009; Park, 2013). On the other hand, a second perspective underlines the possibility that literacy and the accompanying efficacy about privacy protection may reduce "fear of disclosure" and result in higher information sharing (Turow & Hennessy, 2007). This raises the possibility that online literacy will be positively associated with information sharing in online contexts.

RQ4. What is the association between privacy literacy and, respectively, intentions and behaviors regarding use of online services (non-SNS; e.g., online commerce, government services) and use of SNSs?

RQ5. What is the association between privacy literacy and, respectively, intentions and behaviors regarding information sharing and adoption of privacy protective measures?

RQ6. What is the nature of the relationship between privacy concerns and privacy literacy?

Both the contradictory findings regarding privacy paradox and research on attitude-behavior relationship underline the need for identifying factors that may moderate the relationship between individuals' privacy concerns and their privacy related behaviors (e.g., Ajzen & Fishbein, 2005; Kezer et al., 2016). In this meta-analysis, as moderators, we are going to focus on culture and gender, which were identified by CPM theory (Petronio, 2002) as factors that influence privacy rule-making.

Culture

According to the CPM theory, the culture that individuals are situated in, and specifically the meanings that a culture places on privacy, may play a crucial role in the privacy rules they adopt (Petronio, 2002). Namely, tolerance to exposure within a given culture may play a role in privacy decision-making. The CPM theory does not specify cultural orientations that may be related to tolerance to exposure. However, the Hofstede model (Hofstede, Hofstede, & Minkov, 2010), which compares national cultures in terms of six dimensions (i.e., power distance, uncertainty avoidance, individualism/collectivism, masculinity/femininity, long-/short-term orientation, and indulgence/restraint), provides a useful framework regarding cultural orientations

that may be related to differences in tolerance to exposure. Recent revisions to the Hofstede model identify indulgence/restraint as a dimension related to the extent to which a society is oriented toward gratification of basic needs versus regulating gratification of such needs through social norms. To the extent that CPM theory's concept of tolerance to exposure underlines a similar calculus within which privacy norms or expectations are weighed against benefits derived (e.g., self-presentation) from sharing, it is likely that the indulgence/restraint dimension will moderate the relationship between privacy concerns and privacy management.

Second, CPM theory argues that the sociolegal environment and the extent to which privacy is afforded legal protection may factor into the privacy rule-making process. For example, Petronio (2002) underlines that privacy expectations are reportedly lower in the United States than they are in continental Europe and Britain. Relatedly, while privacy is legislated considerably in the European Union, in the United States privacy protection relies on sectorial legislation and self-regulation schemes (Schwartz & Solove, 2011). It has also been argued that in such a legal climate, where personal information is treated as a commodity, individuals may be likely to underestimate risks (Froomkin, 2000). In this light, this meta-analysis will investigate whether differences related to the extent to which legal systems provide protection of privacy moderate the relationship between privacy concerns and privacy management.

Gender

CPM theory points to a number of key differences between men and women's privacy related concerns and behaviors. In line with CPM theory, women are generally reported to be more concerned about privacy than men (e.g., Fogel & Nehmad, 2009; Hoy & Milne, 2010; Sheehan, 1999), less equipped with technical knowledge of privacy protective measures (Park, 2015) but more likely to engage in privacy protective behavior (Hoy & Milne, 2010). The limited number of studies that have investigated the moderating role of gender provide conflicting results, with some reporting privacy concerns to be a stronger predictor of information sharing and adoption of privacy protective behaviors among men (Chai, Das, & Rao, 2011; Sheehan, 1999) while others report the opposite (Janda, 2008; Taddicken, 2014).

In addition to culture and gender (identified by CPM theory), a final factor that has received scant attention concerns the data collection mode.

Mode of data collection

Research on privacy and public opinion already underlines the possibility that surveys may not be the optimum choice for measurement of individuals' attitudes about privacy. The invasiveness of online surveys makes it highly likely that surveys on privacy will exclude individuals with higher privacy concerns (Evans & Mathur, 2005). According to Best, Krueger, Hubbard, and Smith (2001) it is possible that such sampling bias not only results in the underestimation of privacy concerns but may also have implications for the preservation of correlations of interest (e.g., between

attitudes and behavior). Given these considerations, the meta-analysis reported in this study addresses the following research question:

RQ7. Do cultural differences on indulgence/restraint, differences in extent of legal protection of privacy, gender composition of the sample, and the data collection mode of the survey (online vs. offline) moderate the relationship between privacy concerns/literacy and privacy-management behaviors?

Method

Search strategy

A database search of titles and abstracts for the years 1990–(July) 2016 was performed on EBSCOHOST (Academic Search Complete, Business Source Complete, Communications & Mass Media Complete, ERIC, PsycINFO, PsycARTICLES), ScienceDirect, SCOPUS databases. Search terms contained derivatives of *privacy concern*, *privacy knowledge*, and *protective behavior* that were combined using the Boolean “AND”/“OR” operators and asterisk wildcards.¹

Inclusion and exclusion criteria

We included studies published in English in peer-reviewed journals and conference proceedings. We excluded review papers, book chapters, and dissertations. Studies included in the analysis were longitudinal, cross-sectional, or experimental. Case studies and qualitative studies were excluded. Studies containing measures of privacy-management behaviors and/or intentions (i.e., online service use, SNS use, information sharing, privacy protective measures use) and online privacy concerns and/or privacy literacy were included. In the case of studies with overlapping samples or when the same sample was used in multiple articles, we selected only the most relevant and/or recent study.

We assessed the eligibility of the studies following a two-stage procedure: (a) title and abstract screening and (b) whole-text screening. An independent researcher screened 10% of the titles and abstracts, and then 10% of the selected full-texts in order to ensure interrater reliability. Any discrepancies were resolved during consensus meetings.

Data extraction

Table 1 provides a summary of the coding scheme for the target variables. Additionally, we coded each study in terms of first author, publication year, design, and sample size and sample characteristics including ethnicity (i.e., percentage white). We assessed the quality of each study using the STROBE guidelines (Elm et al., 2007), and included only the studies that satisfied 60% or more of the items on the STROBE checklist.

Data synthesis and statistical analyses

All analyses were carried out using metafor package for R v.3.2 (R Core Team, 2013). Correlation coefficients (r) were chosen as the main outcome metric. When

Table 1 Included Measures and Coding for Variables Used in the Meta-Analysis

Variable	Included Measures
Privacy concerns	Privacy concern, privacy risk, privacy risk perception, information privacy valuation, ^a privacy orientation, perceived digital risk, privacy, and security risk, privacy risk beliefs, perceived web risks, susceptibility to perceived risk
Privacy literacy	Privacy knowledge, web skills, privacy awareness, digital awareness, knowledge of online security tools, knowledge about online behavioral advertising, knowledge about cookies, Internet literacy, technical familiarity, awareness of institutional practices online, online policy understanding, Internet, and e-commerce experience, Internet related experience, awareness of security measures, online social media experience, experience online, online countermeasures awareness, knowledge of privacy settings, social privacy literacy, web-use knowledge, online security awareness
Online service use/intention to use online services	Online banking use, intentions to adopt Internet banking, online shopping, volume of online spending, online transaction, online auction use, likelihood of electronic exchange, online repurchase, use of e-government, use of e-vendors, location based services use, cloud computing adoption, cloud computing use, intent to register online, online personalized system use
Information sharing/intention to share information	Online information disclosure, knowledge/information-sharing behavior, opt-in behavior to disclose health information
SNS use/intention to use SNS	Facebook membership, SNS Use, Twitter use, intensity of Twitter use, SNS Use continuance, Social media subscription
Protective measures use/intention to use protective measures	Privacy protective behavior, control SNS privacy settings, use of antispyware, social privacy behavior, use of anonymity software, limiting profile visibility in SNS, privacy control, encryption practice, software countermeasure practice, access control practice, risk mitigation practice, misrepresentation of online identity, reading privacy agreements, Facebook vigilance, privacy coping behaviors

Note: SNS = social network site.

^aIndicates reversed measures.

correlations were not reported in the study, we estimated correlation coefficients from available descriptive statistics using standard computational techniques for continuous data (Borenstein, Hedges, Higgins, & Rothstein, 2009; Fleiss & Berlin, 2009). We converted raw correlations to Fisher's *z* scale (Hedges & Olkin, 1985) to stabilize the variance and performed the analyses using the transformed values. For studies that reported multiple effect sizes from the same sample, we used only the most relevant effect size.

We carried out meta-analyses using a random-effects model with restricted maximum likelihood estimator (Viechtbauer, 2005) separately for each outcome variable. In accordance with Hunter and Schmidt (2004), we analyze and report raw correlations (r) and correlations corrected (ρ) for measurement reliability.² When reliability coefficients were not reported in the study, we estimated the reliability for the measure using recognized methods.³ We imputed, where available, the median reliability coefficients based on those reported in the sample. For single-item measures, we imputed .60 (see Hunter & Schmidt, 2004; Sharma & Yetton, 2007).

We tested the heterogeneity of effect sizes using Cochrane Q , τ^2 , and I^2 statistics to examine and quantify the amount of observed variance accounted for by true heterogeneity rather than sampling error (Higgins, Thompson, Deeks, & Altman, 2003). Summary statistics of z -values and their 95% confidence intervals (CIs) were converted back to the r metric (Schulze, 2004) using an integral z -to- r transformation to allow ease of interpretation. To determine if publication bias was present, we used Begg's funnel plot (Begg & Mazlumdar, 1994), Egger's test of asymmetry (Egger, Smith, Schneider, & Minder, 1997; Sterne & Egger, 2005), and Duval and Tweedie's (2000) trim-and-fill adjustment methods.

We performed metaregression analyses to assess the presence of moderating effects of gender (measured by percentage of female respondents), cultural differences regarding indulgence/restraint orientation, differences in level of legal protection of privacy, and data collection mode (online or offline). For indulgence/restraint orientation, we categorized countries as high or low in indulgence based on country scores provided by the Hofstede (n.d.) Compare Countries tool available online. For level of legal protection, we used the Data Privacy Heat Map tool provided by Forrester® Research (2013) to classify each country either as having "effectively no protection" or "minimal protection" (low protection) versus having more than minimal protection (high protection). We did not conduct moderation analyses when less than three effect sizes were reported for a given relationship.

Results

Study characteristics

The database search identified 7,830 publications. Of these 1,403 duplications were excluded. At Phase 1, 6,427 articles were extracted for title and abstract screening, and 402 were selected for full text screening. There was 97.2% interrater agreement, with a moderate Cohen's (1992) *kappa* ($\kappa = .664$, 95% CI [0.59, 0.74], $p < .001$). At Phase 2, 41 additional articles were identified from reference lists of articles retrieved from database search, resulting in 443 full texts for screening. There was 93.3% interrater agreement, with a substantial Cohen's *kappa* agreement ($\kappa = .867$, 95% CI [0.79, 0.94], $p < .001$; Figure 1).

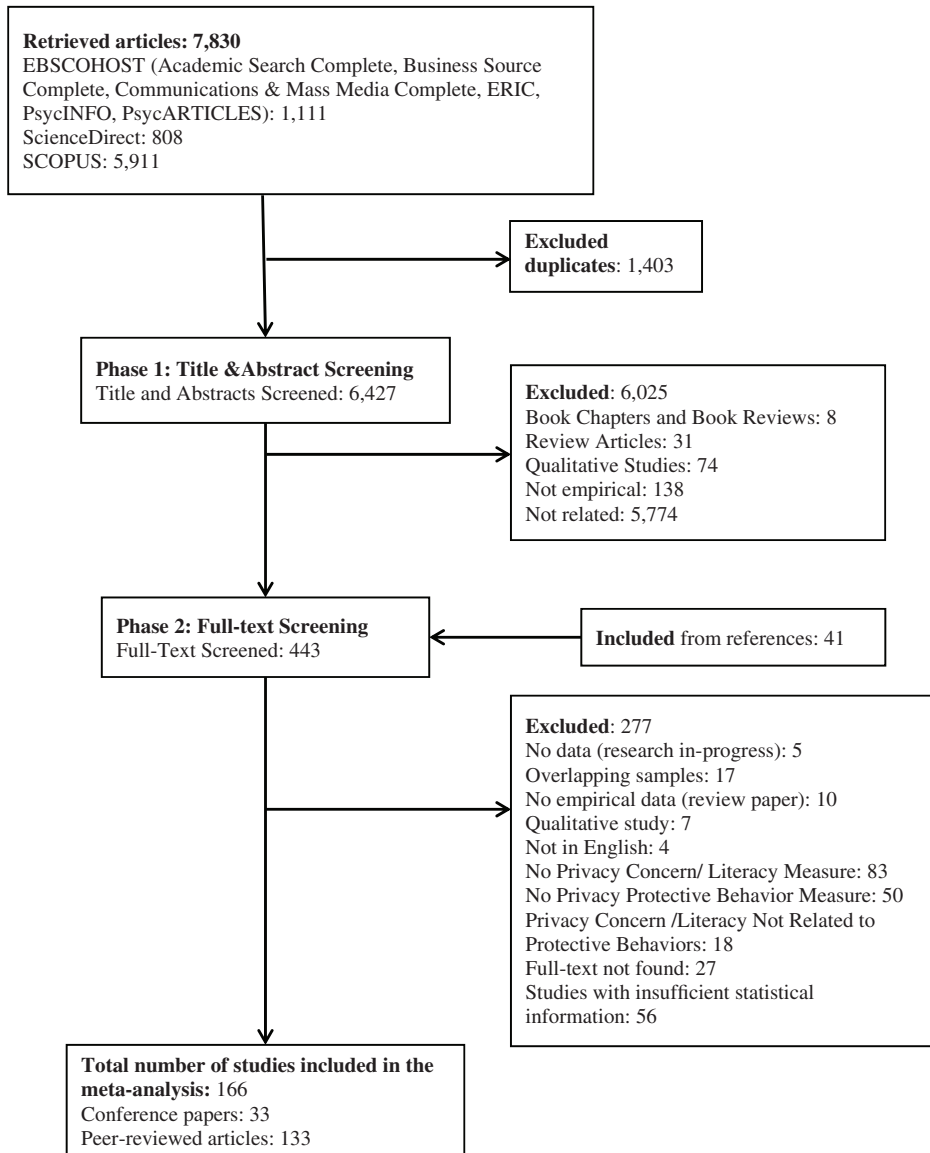


Figure 1 Study selection procedure for the systematic review and meta-analysis.

A total of 166 studies, conducted with 75,269 participants from 34 countries met the criteria to be included in the meta-analysis (for descriptive summaries of the studies, see Table 2). Figure 1 summarizes the exclusion reasons for the articles excluded from analysis. Table 3 shows the summary of the pairwise relationships identified in the analysis. In several articles, multiple effect sizes were reported individually for each study or sample. Based on this information, 178 subsamples were identified.

Table 2 Overview of Studies Included in the Meta-Analysis ($k = 166$)

Characteristic	Number of Studies (k)	Number of Participants (N)
Study characteristics		
Publication year		
1990–1999	1	881
2000–2009	53	23,540
2010–2016	112	50,848
Publication type		
Article	133	63,002
Conference paper	33	12,267
Indulgence/restraint orientation of the country ^a		
Low indulgence orientation ^b	56	26,034
High indulgence orientation ^c	102	44,651
Privacy protection laws of the country ^d		
High protection ^e	47	28,282
Low protection ^f	109	41,425
Data collection		
Online	100	48,574
Offline	63	25,577
Both	3	1,118
Sample size		
Median = 300		
Range = 30–2,739		
Participant characteristics		
Population		
General	86	47,936
Student	80	27,333
Proportion female	144	
Median = 50.74		
Age	58	
Median = 24.12		
Range = 13.60–52.00		
Median age group		
0–17	10	5,267
18–24	64	21,358
25–34	38	16,344

Table 2 Continued

Characteristic	Number of Studies (<i>k</i>)	Number of Participants (<i>N</i>)
35–44	21	12,095
45+	10	7,671
Total	166	75,269

^aOnly countries for which indulgence/restraint orientation scores were provided by Hofstede (n.d.) were included in the analysis.

^bLow indulgence orientation countries: China, Egypt, France, Greece, Hong Kong, India, Indonesia, Iran, Italy, Japan, Jordan, Korea, Pakistan, Russia, Singapore, Slovenia, Spain, Taiwan, Turkey, Vietnam.

^cHigh indulgence orientation countries: Australia, Belgium, Canada, Germany, Malaysia, Netherlands, New Zealand, Norway, Switzerland, United Kingdom, United States.

^dOnly countries for which legal privacy protection rating was provided by Forrester^{*} were included in the analysis

^eHigh-protection countries: Australia, Belgium, Canada, France, Germany, Greece, Israel, Italy, Korea, Netherlands, New Zealand, Norway, Slovenia, Spain, Switzerland, United Kingdom.

^fLow-protection countries: China, Hong Kong, India, Japan, Malaysia, Russia, Singapore, Taiwan, Turkey, United States.

Meta-analysis

Table 4 summarizes the pairwise relations between both privacy concerns and privacy literacy and privacy-management behavioral intentions and behaviors.

Privacy concerns and use of online services (RQ1)

Higher privacy concerns were associated with weaker intentions to utilize online services ($r = -0.17$, 95% CI $[-0.27, -0.07]$); however, privacy concerns were not significantly associated with intention to use SNSs ($r = -0.05$, 95% CI $[-0.20, 0.13]$).

Similarly, for behavioral outcomes: People with higher privacy concerns used online services less ($r = -0.16$, 95% CI $[-0.26, -0.05]$), while there was no significant relationship between privacy concerns and SNS use ($r = -0.02$, 95% CI $[-0.09, 0.05]$).

Privacy concerns, information sharing, and protective behaviors (RQ2, RQ3)

Users with higher privacy concerns had weaker intentions to share personal information ($r = -0.22$, 95% CI $[-0.28, -0.15]$) and had stronger intentions to adopt privacy protective measures ($r = 0.31$, 95% CI $[0.16, 0.43]$).

Likewise, with respect to behavioral outcomes, users with higher privacy concerns shared less personal information ($r = -0.13$, 95% CI $[-0.18, -0.07]$), and utilized privacy protective measures more ($r = 0.17$, 95% CI $[0.11, 0.23]$).

In addition, a meta-analysis of the six studies that reported participants' information-sharing behavior and use of protective measures indicated that there

Table 3 Descriptive Statistics of Pairwise Relationships

Pairwise Relationship	Number of Studies	Number of ES	Correlations			Total <i>N</i>
			Min	Max	Ave	
Privacy concerns—online service use intentions	33	36	−0.63	0.55	−0.16	12,020
Privacy concerns—information sharing intentions	37	38	−0.58	0.36	−0.21	13,934
Privacy concerns—SNS use intentions	11	11	−0.52	0.47	−0.05	4,115
Privacy concerns—protective measures use intentions	9	9	0.02	0.61	0.28	2,898
Privacy concerns—online service use	13	14	−0.42	0.18	−0.15	6,382
Privacy concerns—information sharing	37	38	−0.60	0.26	−0.12	18,249
Privacy concerns—SNS use	17	17	−0.29	0.21	−0.02	9,197
Privacy concerns—protective measures use	35	40	−0.41	0.52	0.17	19,157
Privacy literacy—online service use intentions	6	6	−0.05	0.45	0.31	2,528
Privacy literacy—information sharing intentions	2	2	0.00	0.64	0.32	280
Privacy literacy—SNS use intentions	2	2	0.41	0.42	0.42	713
Privacy literacy—protective measures use intentions	3	3	0.08	0.27	0.16	1,444
Privacy literacy—online service use	1	1	0.46	0.46	0.46	1,194
Privacy literacy—information sharing	4	4	−0.09	0.17	0.04	1,954
Privacy literacy—SNS use	2	3	0.07	0.29	0.19	1,424
Privacy literacy—protective measures use	10	10	−0.07	0.56	0.27	5,507
Information sharing intention—protective measures use intentions	1	1	−0.34	−0.34	−0.34	370
Information sharing—protective measures use intentions	1	1	−0.30	−0.30	−0.30	370
Information sharing—protective measures use	6	6	−0.17	0.33	0.10	3,429
Privacy concerns—privacy literacy	18	18	−0.17	0.51	0.12	8,781

Note: ES = effect size; SNS = social network site.

Table 4 Effect Size of Meta-Analyses

Association Between	<i>k</i>	<i>r</i>	95% CI for <i>r</i>		ρ	80 % Credibility Interval for ρ		τ^2	<i>Q</i>	<i>I</i> ²
			<i>LL</i>	<i>UL</i>		<i>LL</i>	<i>UL</i>			
Privacy concerns — online service use intentions	33	-0.17**	-0.27	-0.07	-0.20**	-0.74	0.50	0.096	1075.19***	96.9%
Privacy concerns — information sharing intentions	37	-0.22***	-0.28	-0.15	-0.25***	-0.66	0.27	0.042	455.73***	93.8%
Privacy concerns — SNS use intentions	11	-0.05	-0.20	0.13	-0.06	-0.57	0.49	0.063	201.90***	95.8%
Privacy concerns — protective measures use intentions	9	0.31***	0.16	0.43	0.36***	-0.19	0.73	0.045	98.75***	92.8%
Privacy concerns — online service use	13	-0.16**	-0.26	-0.05	-0.20***	-0.62	0.30	0.036	144.86***	93.9%
Privacy concerns — information sharing	37	-0.13***	-0.18	-0.07	-0.14***	-0.49	0.25	0.029	424.11***	93.0%
Privacy concerns — SNS use	17	-0.02	-0.09	0.05	-0.02	-0.29	0.26	0.019	179.19***	90.6%
Privacy concerns — protective measures use	35	0.17***	0.12	0.23	0.21***	-0.25	0.59	0.032	472.55***	93.7%
Privacy literacy — online service use intentions	6	0.31**	0.16	0.45	0.38**	-0.11	0.70	0.037	99.25***	93.1%
Privacy literacy — protective measures use intentions	3	0.13***	0.08	0.18	0.15***	0.10	0.20	0.000	3.01	0.1%
Privacy literacy — information sharing	4	0.04	-0.07	0.15	0.05	-0.09	0.18	0.010	18.02***	82.1%
Privacy literacy — protective measures use	10	0.29***	0.15	0.41	0.36***	-0.22	0.76	0.051	396.23***	96.2%
Information sharing — protective measures use	6	0.10	-0.05	0.25	0.12	-0.34	0.54	0.04	73.90***	94.9%
Privacy concerns — privacy literacy	18	0.12**	0.03	0.20	0.14**	-0.27	0.50	0.029	237.44***	92.8%

Note: CI = confidence interval; *I*² = proportion of total variance due to variance in population effect sizes; *k* = number of studies included in the analysis; *LL* = lower limit; *r* = estimated correlation; SNS = social network site; ρ = reliability corrected correlation; *Q* = Cochran's (1954) measure of homogeneity; τ^2 = estimated variance of the population effect sizes; *UL* = upper limit (Higgins & Thompson, 2002).

* $p < .05$. ** $p < .01$. *** $p < .001$.

was no significant association between disclosing information and use of protective measures ($r = 0.10$, 95% CI $[-0.05, 0.25]$).

Privacy literacy and use of online services (RQ4)

Owing to the limited number (<3) of studies that reported the correlations between privacy literacy and intention to use SNSs, use of online services (behavior), and use of SNSs (behavior), we could not investigate these associations. People with higher privacy literacy had stronger intentions to use online services ($r = 0.31$, 95% CI $[0.16, 0.45]$).

Privacy literacy, information sharing, and protective behaviors (RQ5)

Owing to the limited number (<3) of studies that reported the correlations between privacy literacy and intentions to share information, we could not investigate this association. Users with higher privacy literacy reported stronger intentions to utilize privacy protective measures ($r = 0.13$, 95% CI $[0.08, 0.18]$).

In terms of privacy-management behaviors, privacy literacy was not significantly associated with information-sharing behavior ($r = 0.04$, 95% CI $[-0.07, 0.15]$). However, people with higher privacy literacy used protective measures more than people with lower privacy literacy ($r = 0.29$, 95% CI $[0.15, 0.41]$).

Relationship between privacy concerns and privacy literacy (RQ6)

Privacy concern was significantly associated with privacy literacy: Users with higher privacy literacy reported higher concern for privacy ($r = 0.12$, 95% CI $[0.03, 0.14]$).

Comparison of effect sizes of intentions versus behaviors

To explore the differences between intentions and behaviors in terms of their respective relationships to privacy concerns and literacy (RQ1, RQ2, RQ4, RQ5), we contrasted the effect size estimates of meta-analyses reported above.

In terms of privacy concerns; there were no significant differences between studies investigating behavioral intentions versus behavior regarding use of online services ($b = -0.01$, $SE = 0.094$, $z = -0.01$, $p = 0.989$) and use of SNSs ($b = 0.04$, $SE = 0.095$, $z = 0.42$, $p = 0.674$).

Studies measuring users' intentions to share information online obtained significantly larger (more negative) effects than studies measuring information-sharing behavior ($b = 0.11$, $SE = 0.056$, $z = 2.01$, $p = 0.044$). On the other hand, there were no significant differences between behavioral intentions and behaviors in terms of utilization of privacy protective measures ($b = -0.16$, $SE = 0.102$, $z = -1.56$, $p = 0.120$).

In terms of privacy literacy, we could not compare behavioral intentions and behaviors for use of online services, use of SNSs, and information sharing due to insufficient number of studies. For utilization of privacy protective measures, effect size comparisons suggested that the relationship between literacy and intentions was significantly smaller (less positive) than the relationship between literacy and behaviors ($b = 0.23$, $SE = 0.099$, $z = 2.350$, $p = 0.019$).

Moderation analyses (RQ7)

As moderators (Table 5), we investigated indulgence/restraint orientation of the country within which data was collected (low vs. high indulgence), privacy protection laws of the country within which data was collected (high vs. low protection), percentage of female respondents, and the mode of data collection (online vs. offline).

Indulgence/restraint orientation and privacy protection laws of the country within which a study was conducted had no significant moderating effects.

With respect to gender, we found contrasting results for online service use intentions and SNS use behavior. The relationship between privacy concerns and intention to use non-SNS services was stronger for samples with more female participants ($b = -0.02, p < 0.05$),⁴ whereas no moderating effect of gender was found on actual behavior. Similarly, for SNS use, the relationship between privacy concerns and use of SNS was stronger for samples with more female participants ($b = -0.01, p < 0.05$).

With respect to the contrast between studies conducted online versus offline, we found for studies conducted offline a weaker positive association between privacy concerns and adoption of privacy protective measures ($b = -0.22, p < 0.01$). The relationship between privacy concerns, privacy literacy, and other measures of privacy management were not affected by mode of data collection.

Publication bias

To test the possibility that our analysis overestimates the effects due to the fact that studies that find nonsignificant effects tend not to get published (Rothstein, Sutton, & Borenstein, 2005), we used funnel plot asymmetry techniques (Becker, 2005) to all pairwise associations. We found that potential publication bias was unlikely as the plots showed symmetrical distributions. Similarly, Begg's rank correlation tests and Egger's regression tests were nonsignificant for all associations, indicating that there is no appreciable funnel plot asymmetry. Further, results of Duval and Tweedie's (2000) trim and fill analyses showed that there were no studies "missing," or "trimmed," from one side of the funnel plot, implying that there was not sufficient asymmetry to raise concerns about potential bias.

Discussion

"We attempt to conceal ourselves ... but the truth is we do not entirely want to be concealed. We want to be found ... within perfect walls, there is nothing worth protecting. ... And so we exchange privacy for intimacy ..." Coming from a work of fiction entitled *Lexicon* (Barry, 2014) about a dystopian world in which a class of people can access and manipulate individuals' minds, these remarks resonate with a common conundrum for the contemporary individual: balancing connectivity and accessibility with privacy. This meta-analysis focused on studies that investigate how individuals balance need for privacy with openness. Specifically, informed by the theoretical framework provided by the CPM theory, we focused on the concept of privacy paradox—the argument that individuals' concerns about privacy do not translate into their privacy-management behavior.

Table 5 Moderators

Moderator ^a	Association Between	k	Estimate	SE	z	95% CI		Q _E
						LL	UL	
Culture: indulgence/restraint orientation ^b (low/high indulgence)	Privacy concerns—online service use intentions	33	-0.120	0.126	-0.950	-0.342	0.127	1411.86*** (df = 32)
	Privacy concerns—information sharing intentions	37	-0.183	0.094	-1.953	-0.367	0.001	669.82*** (df = 35)
	Privacy concerns—SNS use intentions	10	0.129	0.198	0.649	-0.260	0.517	249.12*** (df = 8)
	Privacy concerns—protective measures use intentions	8	-0.071	0.249	-0.284	-0.558	0.417	151.60*** (df = 6)
	Privacy concerns—online service use	12	-0.244	0.139	-1.749	-0.517	0.029	205.04*** (df = 11)
	Privacy concerns—information sharing	37	0.019	0.069	0.269	-0.116	0.154	566.74*** (df = 36)
	Privacy concerns—SNS use	15	-0.024	0.086	-0.276	-0.192	0.145	121.67*** (df = 13)
	Privacy concerns—protective measures use	30	0.005	0.112	0.044	-0.214	0.224	676.07*** (df = 33)
	Privacy literacy—online service use intentions	6	0.243	0.190	1.279	-0.129	0.616	48.78*** (df = 4)
	Privacy literacy—protective measures use intentions	3	0.044	0.162	0.269	-0.274	0.361	3.19 (df = 1)
Information sharing—protective measures use	Privacy literacy—protective measures use	4	0.013	0.191	0.066	-0.361	0.387	28.37*** (df = 2)
	Information sharing—protective measures use	10	0.047	0.334	0.140	-0.608	0.702	673.02*** (df = 8)
	Privacy concerns—privacy literacy	6	0.116	0.220	0.529	-0.314	0.546	107.23*** (df = 4)

Table 5 Continued

Moderator ^a	Association Between	<i>k</i>	Estimate	SE	<i>z</i>	95% CI		<i>Q_E</i>
						LL	UL	
Culture: level of legal protection of privacy ^c (high/low protection)	Privacy concerns—online service use intentions	33	−0.070	0.153	−0.456	−0.369	0.230	1242.43*** (<i>df</i> = 32)
	Privacy concerns—information sharing intentions	37	0.029	0.112	0.257	−0.190	0.248	607.88*** (<i>df</i> = 35)
	Privacy concerns—SNS use intentions	10	−0.215	0.193	−1.114	−0.594	0.163	232.32*** (<i>df</i> = 8)
	Privacy concerns—protective measures use intentions	8	−0.021	0.229	−0.093	−0.470	0.427	150.39*** (<i>df</i> = 6)
	Privacy concerns—online service use	13	−0.044	0.159	−0.279	−0.356	0.267	234.25*** (<i>df</i> = 12)
	Privacy concerns—information sharing	37	−0.114	0.073	−1.551	−0.257	0.030	575.00*** (<i>df</i> = 36)
	Privacy concerns—SNS use	15	−0.032	0.097	−0.328	−0.223	0.159	145.10*** (<i>df</i> = 13)
	Privacy concerns—protective measures use	31	−0.114	0.087	−1.311	−0.284	0.056	681.56*** (<i>df</i> = 34)
	Privacy literacy—online service use intentions	6	−0.017	0.289	−0.059	−0.583	0.549	139.91*** (<i>df</i> = 4)
	Privacy literacy—protective measures use intentions	3	−0.044	0.162	−0.269	−0.361	0.274	3.19 (<i>df</i> = 1)
	Privacy literacy—information sharing	4	−0.013	0.191	−0.066	−0.387	0.361	28.37*** (<i>df</i> = 1)
	Privacy literacy—protective measures use	10	−0.050	0.204	−0.243	−0.450	0.351	624.60*** (<i>df</i> = 8)
	Information sharing—protective measures use	6	−0.264	0.250	−1.060	−0.754	0.225	71.81*** (<i>df</i> = 4)
	Privacy concerns—privacy literacy	18	−0.092	0.112	−0.819	−0.312	0.128	33.45*** (<i>df</i> = 16)

Table 5 Continued

Moderator ^a	Association Between	k	Estimate	SE	z	95% CI		Q _E
						LL	UL	
Gender: percentage female	Privacy concerns—online service use intentions	33	-0.016	0.007	-2.232*	-0.030	-0.002	1429.50*** (df = 34)
	Privacy concerns—information sharing intentions	32	0.002	0.004	0.391	-0.007	0.010	642.39*** (df = 31)
	privacy concerns—SNS use intentions	10	-0.001	0.011	-0.126	-0.023	0.021	250.42*** (df = 8)
	Privacy concerns—protective measures use intentions	7	-0.001	0.006	-0.093	-0.011	0.010	39.67*** (df = 5)
	Privacy concerns—online service use	11	0.005	0.009	0.560	-0.013	0.022	195.28*** (df = 10)
Data collection mode ^d (online/offline)	Privacy concerns—information sharing	34	0.003	0.003	0.938	-0.003	0.009	511.88*** (df = 33)
	Privacy concerns—SNS use	17	-0.008	0.004	-2.168*	-0.016	-0.001	162.79*** (df = 15)
	Privacy concerns—protective measures use	33	-0.002	0.003	-0.567	-0.007	0.004	722.57*** (df = 36)
	Privacy literacy—online service use intentions	5	-0.021	0.030	-0.704	-0.079	0.037	72.41*** (df = 3)
	Privacy literacy—information sharing	4	-0.003	0.007	-0.413	-0.018	0.012	24.39*** (df = 2)
	Privacy literacy—protective measures use	9	-0.005	0.013	-0.398	-0.030	0.020	661.23*** (df = 7)
	Privacy concerns—online service use intentions	33	-0.109	0.137	0.800	-0.377	0.159	1457.44*** (df = 33)
	Privacy concerns—information sharing intentions	37	0.021	0.098	0.212	-0.171	0.213	703.19*** (df = 35)
	Privacy concerns—SNS use intentions	11	0.040	0.207	0.194	-0.366	0.447	258.81*** (df = 9)
	Privacy concerns—protective measures use intentions	9	-0.014	0.203	-0.069	-0.411	0.383	154.05*** (df = 7)
Data collection mode ^d (online/offline)	Privacy concerns—online service use	13	-0.141	0.146	-0.966	-0.427	0.145	236.81*** (df = 12)

Table 5 Continued

Moderator ^a	Association Between	k	Estimate	SE	z	95% CI		Q _E
						LL	UL	
Privacy concerns — information sharing		37	-0.018	0.079	-0.231	-0.172	0.136	572.86*** (df = 36)
Privacy concerns — SNS use		17	-0.003	0.075	-0.033	-0.150	0.145	180.71*** (df = 15)
Privacy concerns — protective measures use		35	-0.215	0.070	-3.075**	-0.353	-0.078	507.94*** (df = 38)
Privacy literacy — online service use intentions		6	-0.222	0.182	-1.224	-0.578	0.134	56.86*** (df = 4)
Privacy literacy — protective measures use intentions		3	-0.104	0.133	-0.782	-0.365	0.157	2.57 (df = 1)
Privacy literacy — information sharing		4	-0.001	0.195	-0.006	-0.383	0.381	28.51*** (df = 1)
Privacy literacy — protective measures use		10	0.035	0.201	0.172	-0.359	0.428	625.97*** (df = 8)

^aFor some analyses, studies did not vary for the moderator, thus we could not conduct moderation analyses for those associations.

^bIndulgence/restraint orientation variable is dummy coded as 0 = low indulgence, 1 = high indulgence. Moderation analyses were also conducted with cultural differences related to individualism/collectivism, long/short term orientation, power distance, masculinity/femininity, uncertainty avoidance (Hofstede et al., 2010). The analyses are available on the Journal of Communication website as Appendix S1, Supporting Information.

^cPrivacy protection laws variable is dummy coded as 1 = low protection, 2 = high protection.

^dData collection variable is dummy coded as 1 = online, 2 = offline.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Note: CI = confidence interval; Estimate = estimate for ρ when transformed to Fisher's z is used as the dependent variable; k = number of studies included; LL = lower limit; Q_E = test for heterogeneity; SE = standard error; SNS = social network site; UL = upper limit; z = z -value.

To the best of our knowledge, this is the first study to systematically evaluate the associations between online privacy concerns, privacy literacy, online service use, and adoption of privacy protective measures. One notable exception is a recent meta-analysis on how trust and risk perceptions influence online behavior (Wang, Min, & Han, 2016). Wang et al. (2016) combined privacy risks with other types of online uncertainties/risks in predicting behavior. Additionally, the search strategy of our analysis was considerably broader, including various measures and synthesizing data from more than 70,000 participants from multiple countries across the world.

Generally, our findings suggest that contrary to the premise of the concept of “privacy paradox,” privacy concerns predict the extent to which individuals use online services and engage in privacy management (i.e., information sharing and use of privacy protective measures), albeit with typically small or moderate effect sizes. One behavior for which privacy paradox was observed was SNS use: For both the intentions outcome and the behavioral outcome, privacy concerns were not significantly correlated with SNS use. A potential reason why SNS use exhibits this discrepancy between concerns and behavior may relate to CPM theory’s predictions (Petronio, 2002) regarding user motivations and the associated risk–benefit analysis. To the extent that SNSs serve more expressive needs of users than other forms of online services such as online shopping sites, many users may continue using SNSs despite their privacy concerns. In addition to the CPM theory, this finding also lends support to functional models social media (e.g., Bazarova & Choi, 2014; Chen & Kim, 2013), which underline the need to consider user motivations, gratifications, and media affordances to understand how individuals navigate between accessibility and retreat.

While these nuances regarding SNS use motivations and privacy management are difficult to discern via quantitative studies that this meta-analysis covers, extant qualitative research on youth, privacy, and social media provides several explanations that may be relevant. First, Lee, Park, and Kim (2013) observe that SNS users “endure” the privacy risks because of key benefits, such as self-clarification and relationship development, derived from self-disclosure. Second, studies (e.g., Hargittai & Marwick, 2016; Marwick & Boyd, 2014) indicate that rather than a signifying lack of concern about privacy risks, youths’ privacy-management behavior reflect their dissatisfaction with the sufficiency of existing technical or social privacy protection affordances. Accordingly, for young users, many of the “choices” available for protecting privacy are unrealistic, resulting in use of alternative privacy protective techniques (e.g., linguistically encoding messages to make sure that only a limited circle within a large network would understand it; Marwick & Boyd, 2014).

The issues discussed above have several implications for both future research considerations and policy-making. First, future research needs to consider a wider diversity of types of privacy protective behaviors. In this respect, online ethnographies that investigate privacy-related decision-making both at an individual and at a networked level would provide important insights for the CPM theory. Second, further research is needed to understand users’ perceptions about the adequacy

and applicability of existing privacy-protection options afforded by SNS platforms. In line with theories like the theory of planned behavior (Ajzen & Fishbein, 2005), this question may also be considered from the lens of perceived control regarding privacy protection. Uncovering the actual and perceived barriers to adopting privacy-protective measures through this line of research would help the development of policy options that can more effectively respond to users' needs. For example, while the dominant regulatory regime emphasizes individual responsibility and literacy as key facilitators of privacy-protective behavior (for a summary see Baruh & Popescu, 2015), policy options that increase the availability of meaningful choices may be more likely to help users act in line with their privacy concerns (e.g., reducing lock-ins that prevent users from switching services).

One common interpretation of privacy paradox is that there is a discrepancy between stated intentions and actual behavior. Unfortunately, this meta-analysis cannot provide a sufficient answer as to the existence of such a discrepancy because only a very limited number of studies included in the meta-analysis investigated both intentions and behaviors for the same participants. This echoes a problem within the current literature with respect to the testing of the attitude-behavior relationship in accordance with established behavioral models (e.g., Ajzen & Fishbein, 2005). Nevertheless, our finding that both intentions and behaviors are similarly correlated (both in direction and magnitude) with privacy concerns may signal that such discrepancy might not be as pronounced as earlier interpretations of privacy paradox claims. Future studies focusing on privacy paradox should assess both intentions and behaviors and in doing so should make sure that domain specificity of intentions and behaviors are aligned.

Another important point to note is that a large majority of the studies included in this meta-analysis utilized self-reported measures of behavior. This may have implications for overreporting of protective behavior due to memory and/or social desirability issues. The low number of studies that utilized observations of actual behavior prevent us from engaging in a meaningful comparison of how data based on self-reports versus observation of actual behavior differ from each other in terms of their relationship with privacy concerns.

Regarding privacy literacy, we were only able to investigate the relationship between privacy literacy and online service use intentions, privacy protective measure utilization intentions, information-sharing behavior, and privacy-protective measure utilization (reported behaviors). Accordingly, privacy literacy was positively correlated with both online service use (intentions) and use of privacy-protective measures (intentions and behavior). This finding is in line with the premise of the CPM theory that online engagement (in this case, online service use) and adoption of protective measures are two complementary components of privacy rule-making. In other words, these results suggest that individuals who use online services more have higher literacy, and take more privacy-protective measures. Likewise, it is possible that those with higher literacy may choose to share more information while at the same time adopting more privacy protective measures. We tested this possibility by

checking the association between information sharing and use of privacy protective measures. While positive, this association was marginally significant with the 95% confidence interval for the correlation coefficient ranging between -0.05 and 0.25 . It should be noted that this finding is based on a very limited number of studies ($k = 6$). Hence, further studies are needed to test this potential relationship between these two potentially complementary components of privacy management.

Our analyses also indicate that privacy literacy is positively associated with privacy concerns. This finding contrasts with the argument that users who are more literate, and hence more able to engage in privacy protective measures, will be less concerned about privacy (Turow & Hennessy, 2007). However, a word of caution is warranted. In understanding how literacy may be related to privacy concerns, we need to be able to distinguish between declarative knowledge, which typically entails knowledge of risks and rights, and procedural knowledge, which entails skills necessary for protection (Treppe et al., 2015). The latter can foreseeably be more germane to whether literacy translates into being less concerned about risks. Unfortunately, due to the low number of studies that distinguish between these two dimensions of privacy literacy, we were not able to test their respective relationships to privacy concerns. For future studies, we recommend the inclusion of measures that can differentiate between these two types of literacies.

While in this specific meta-analysis, we tested the influence of privacy literacy on the outcome measures (e.g., online service use, information sharing, use of protective measures), an alternative is to investigate whether literacy moderates the relationship between privacy concerns and privacy-management behavior. For example, it is possible that among users who have lower procedural knowledge, privacy concerns will be less likely to translate to protective behavior (Debatin et al., 2009).

In this meta-analysis, we also focused on cultural differences (i.e., indulgence/restraint), legal system differences (level of legal protection of privacy), gender, and mode of data collection (online vs. offline) as potential moderators. Regarding gender, in samples that contained more women, privacy concerns had a stronger (negative) impact on intention to use online services and actual reported use of SNSs. These results suggest that even if disadvantaged in terms of privacy literacy, when compared to men, women are more likely to take action to protect their privacy.

Our focus on the indulgence/restraint dimension of Hofstede's model (Hofstede et al., 2010) was due to its conceptual relevance to CPM theory's argument that privacy management entails a cost–benefit calculus within which individuals tolerate exposure in return for benefits derived from sharing. Specifically, the indulgence/restraint dimension focuses on cultural differences related to the balance between satisfaction of needs (in this context, e.g., self-presentation) and social norms (such as those related to privacy).

Our moderation analyses indicate that the results discussed above can be generalized across cultures that differ from each other in terms of indulgence/restraint orientation and level of legal protection for privacy. This finding needs to be interpreted in light of research suggesting that despite cultural differences in usage

patterns associated with Internet use (e.g. Li & Kirkup, 2007), there are also significant overlaps across cultural contexts, particularly in terms of values and motivations of Internet use (e.g., Kim, Sohn, & Choi, 2011; Bagchi, Udo, Kirs, & Choden, 2015). Future research should also recognize the possibility that different dimensions of cultural differences may have conflicting impact on users' privacy attitudes and privacy-management behavior. For example, the US scores high on individualism (a cultural dimension associated with higher preference for privacy) but low on restraint (a cultural dimension more likely to be associated with hedonistic motivations). Yet, there is not a sufficiently developed theoretical framework that maps these different cultural dimensions into different aspects of users' privacy attitudes and behavior. Furthermore, in media, such as SNSs, within which intercultural interaction is so prevalent, it is necessary to investigate how "networked norms" (Boyd, 2013) and/or individual differences may supplant macrolevel cultural determinants. It should be noted that moderation analyses were limited as not all the studies provided sufficient information. Owing to this limitation there may not have been enough statistical power to reveal significant effects for these analyses.

We should note that the meta-analysis only included studies that were published in English, potentially limiting the generalizability of the findings. Also, we were unable to include 56 studies as they did not report sufficient details for analysis and we were unable to get this information upon contact with the authors. However, Duval and Tweedie's (2000) trim-fill analyses indicated that there was no evidence of publication bias in this review.

Despite the limitations outlined above, this study makes several contributions to communication and privacy literature. Foremost, to our knowledge, this is the first study to meta-analytically examine the growing literature on the relationship between privacy concerns and privacy management. In doing so, the study also helps ground empirical research on privacy paradox and privacy literacy on the framework provided by the CPM theory. Specifically, our findings underline the need to more directly investigate the role that users' motivations and risk–benefit perceptions play in privacy-management behavior.

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Notes

- 1 Our meta-analysis produced a series of outputs that cannot be included in this manuscript due to space constraints. These include a list of articles used in the meta-analysis, further information about the search syntax utilized for retrieving the articles, details about the sample structures of studies used in the meta-analysis, forest plots, and the funnel plots. This additional information is available in Supporting Information in the online version of this article (Appendix S1) or from the corresponding author's blog <https://lemibaruh.me/privacy-meta-analysis/>.

- 2 The estimate of the true correlation, ρ , ($\rho(r_{xy})$), obtained by the formula $\rho(r_{xy}) = r_{xy} / \sqrt{r_{xx} * r_{yy}}$, where r_{xx} is the reliability of x and r_{yy} is the reliability of y , with x representing reliability coefficient of the first measure and the y representing the reliability coefficient of the second measure for any given effect size.
- 3 Reliabilities were not reported for one or more measures in 60 studies.
- 4 The b values reported represent the unstandardized regression weights from the moderation analysis, where the outcome variable is the effect size of the study. Thus, a b value of -0.02 for percentage of female participants means that for each additional percent of females in the study, the effect size changes by -0.02 . In the case of privacy concerns and intent to use services, this means a reduction in effect-size magnitude, as the mean effect size is negative ($r = -0.16$).

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Supporting Information

Additional supporting information may be found in the online version of this article:
Appendix S1. Additional information and list of articles used in the meta-analysis.