Exploring the relationship between user's intention to manage privacy in OSN and the factors of communication under distress

Kijung Lee[1], Il-Yeol Song[2]
[1]University of Cincinnati
[2]Drexel University

Abstract
Understanding and analyzing privacy is a challenging task in that interpretations of privacy involve investigating complex social relationships in many different social occasions. In online social networks (OSNs), user experience of privacy also is deeply related to who sends what message to whom through what kind of interaction mechanism. In this paper, we interpret the idea of privacy management in the context of communication under distress in terms of emotions, cognitions, and beliefs. Communication privacy management theory was examined for establishing and modeling relationship between the context and users' behavior of managing their privacy in OSNs. A user survey was conducted using a comprehensive set of questions measuring salient research constructs. Through a set of analytical techniques of dimension reduction and causal modeling, we built a causal model. Our interpretation of distressful context resulted in a set of research constructs with strong prediction; unwillingness to communicate, willingness to communicate, active self-disclosure, and passive self-disclosure. This paper will make contributions in two folds offering; 1) a quantitative interpretation of context criteria in communication privacy management theory, and 2) better understanding of OSN users' behavior in regards to managing their privacy.
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Contact: kijung.lee@uc.edu

1 Introduction

Online social networks (OSNs) emerge as a primary method of communication on the internet. More people on the internet are making gradual transition from a one-way user experience engineered by hyperlinks to an interactive user experience enabled by social interactions with other users. The exponential growth of OSNs, however, while offering a greater range of opportunities for communication and information sharing, raises issues in privacy, especially, in managing communication privacy.

Users of OSNs encounter diversified threats to their privacy from public revelation of their personal information, published communication, and open boundary of distinct social groups within their social network. Although some threats are unavoidable in order to register and use the service, other threats are caused from user's voluntary disclosure. In this paper, we take on an idea that the reason they would reveal something private when there exists apparent threat to privacy is due to a discrepancy between how users understand and how they experience privacy management in online social networks. First of all, users are not used to the mode of privacy management in online social networks. Although, many times, messages they post in public have intended receivers, they don't go through one more step and set up restriction on the published message because it's not the way they usually communicate in the social context of face-to-face. But even if users are sensible enough to recognize that their posting will be seen by others, and intend to put restriction on the messages, OSNs may not support their needs. For example, on Facebook, information of your work friends interacting with their school friends who are total strangers to you is shown to you in real time. Also, it is not easy to understand all functionalities and combine them to make restrictions as the users exactly want.

Issues of privacy occur when social identity in OSNs emulates that of the real life. Especially when the purpose of using them is communication, majority of users consider OSNs as an extension of the social interaction in the real life. Therefore, it is not common that users fabricate their identity in online social networks. This pattern in managing identity in online social networks can also be interpreted with a theoretical perspective, that person perception is the primary influence of social interaction (Fiske & Taylor, 1991). To maintain their social impression and to manage their self-representation, identity in online social networks should be based on the real life identity. However, unlike real life, the life in online social networks is broadcasted. User's personal communication with their friend can be seen by untargeted audience and may be used against them.

Different from the area of e-commerce where privacy issues mostly concern the vendor's acquisition of personal information of buyers, there exist more diversified threats to privacy in the area of social media, such as communication published to untargeted audience and public disclosure of private information. Moreover, users of online social networks encounter greater possibility of information leak since management of privacy depends on both service vendors and users themselves. In order to better understand the mechanism of privacy in online social networks, this study explores models of privacy in online social networks in relation to user's perception and strategic behavior to manage their privacy.

This paper is organized as follows: In the literature review, we discuss, first, theories and concepts constituting our idea. In the modeling section, we describe a general procedure of methods in studies utilizing SEM technique, and demonstrate our research problem within using structural equation modeling technique. Primarily, we discuss creation of a model, survey implementation and data collection, and analysis of the models for our study. In validation and interpretation section, our discussion presents evaluations and potential revisions of the model while providing interpretations of the analytical results of the study. In the discussion and conclusion section, we briefly discuss implications of the paper in theory development and application and in practical application to system design.

2 Literature Review

In literature review, we, first, review two primary theories used in our research, i.e., Communication Privacy Management theory (CPM) and the Theory of Planned Behavior (TPB) are described. Finally, we discuss privacy from the view of privacy rule management in CPM.

Theories fundamental to this paper are Communication Privacy Management (CPM) theory (Petronio, 2002) and Theory of Planned Behavior (TPB) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975; Fishbein & Ajzen, 2010). First, the basic idea of communication under distress, in this paper, is examined based on CPM theory. CPM theory identifies that people control their private information based on the use of personal privacy rules. Through developing, learning, and negotiating rules depending on culture, gender, motivation, context, and risk / benefit ratio, people coordinate boundary linkages, boundary permeability, and boundary ownership. The theory delineates such causal relationships in qualitative and interpretive manner. In our paper, we take an aspect of the theory and conceptualize it in quantitative measures to visualize privacy management of OSN users. Second, behavioral mechanism embedded in our model is borrowed from TPB. The theory explicates a mechanism of human decision-making process, i.e., a causal link constituting, "a person's salient beliefs and evaluations, attitude toward a behavior, and behavioral intentions." The theory also states that subjective norms, perceived behavioral control and attitude toward a behavior jointly determine the behavioral intention. In this section, we discuss how the two theories are used in constituting the models of privacy management in OSNs.

The CPM theory emphasizes that it is necessary to consider communicative interactions between people to grasp disclosure of private information. The theory offers concepts and conceptual structures to help identify the way people coordinate the influencing factors on their privacy. According to Petronio (2002), communication privacy management theory deals with how individuals make decisions to disclose private information to others and how this relational process is coordinated. She argues that ''boundaries'' serve as a useful metaphor. Although there may be a flow of private information to others, she further illustrates that borders mark ownership lines such that issues of control are clearly understood by the communicating partners. CPM supposes that both the discloser and the recipient of the disclosure have a degree of agency during the process of revealing private information. Boundaries are coordinated by both parties, and once a successful disclosure is made, the individuals involved coordinate their boundaries so that the private information is co-owned and co-managed appropriately. When disclosures occur, the discloser is willingly giving up a degree of control and ownership over the private information. Consequently, people make choices to reveal or to conceal private information based on criteria and conditions that they perceive as salient.

The primary idea of CPM is that people have a desire for privacy and the dynamic process of revealing and hiding private information constitutes the process of fulfilling the desire. Petronio (2002, 2010) makes distinct assumptions that constitute basis for CPM;

First, people claim ownership of their private information,

Second, they use personal privacy rules to control their privacy,

Third, by sharing private information one becomes a co-owner of that information,

Fourth, co-owners of private information negotiate rules about revealing the information, and

Fifth, boundary turbulence occurs when co-owners of private information fail to negotiate and /or follow rules.

Whenever we share a portion of private information with someone, we are reshaping a privacy boundary. Having a mental image of protective boundaries is central to understanding the five core principles of Petronio's CPM: Instead of talking about self-disclosure as many relational theorists do, Petronio refers to the disclosure of private information.

According to Petronio (2002), individuals manage privacy boundaries using a rule-based system that guide all facets of the disclosure process, including how boundaries are coordinated between individuals. CPM clearly delineates that people have distinct set of attributes when they make decisions about managing their privacy. CPM maintains that five factors play into the way we develop our own privacy rules: culture, gender, motivation, context, and risk/benefit ratios.

Among them, our interest in this paper is context. In CPM, three types of life events are discussed to describe how rules of privacy management emerge and are modified to satisfy the needs for privacy in each circumstance; traumatic events, therapeutic situations, and life circumstances. Life events can temporarily or permanently disrupt the influence of culture, gender, and motivation when people craft their rules for privacy. In this sense, context is the strongest factor influencing rule development for boundary management and, at the same time, a fuzziest concept to define. In our case, we concentrate on the definitions and examples provided in Petronio's (2002) theory, i.e., traumatic and therapeutic events that can potentially change one's life, and what can be responsive variables in such situational needs. Although it is hard to generally define the distressful events, in our interpretation, we focus on communication and disclosure of personal information. In characterizing disclosure-therapy relationship, the interaction model (Watzlawick et al, 1967) emphasizes the process of communication between client and therapist. In the equation, based on this perspective, we included willingness to communicate and willingness to disclose. During traumatic events and therapeutic situations, an individual's disclosure of private information depend on whether they are willing to communicate and also, whether they are willing to reveal their private information while communicating. In this sense, we identified a combination of "unwillingness to communicate" and "self-disclosure" to represent context in CPM.

3 Modeling

In the methods section, we illustrate the process of causal modeling, questionnaire and survey implementation, analytical techniques, and research questions and research hypotheses. The method of this study follows generic steps suggested by most studies that facilitate SEM techniques as their analytical approach. First, using a qualitative approach, a conceptual model is created. In the background section, model development is explicated in terms of theories and models, whereas it is recapitulated in relation to modeling components of SEM in this section. Then, measurement items for research variables and constructs are created and/or adopted and modified depending on availability. Using the identified model and measurement items, a user survey is designed and implemented to collect user responses. Lastly, the conceptual model is redrawn using AMOS software with the connection to the collected user responses. Then, it is now ready for the analysis, evaluation of research questions and research hypotheses, and interpretation of the analytical result.

3.1 Causal Modeling

Combining the CPM theory and TPB, a model of our interest can be represented as below in Figure 1. The diagram shows the overall model including all factors from CPM and TPB. The rectangle on the left shows foundations for privacy rule management (derived from CPM), while the rectangle on the right contains factors that are related to behavioral decision (originated from TPB). Behavioral component of endogenous measure is analyzed as a set; for example, "intention to control boundary permeability" is analyzed along with "attitudes towards controlling boundary permeability", "subjective norm about controlling boundary permeability", and "behavioral control of controlling boundary permeability". Controlling permeability is operationally defined in the later section as "Controlling how much private information to reveal".

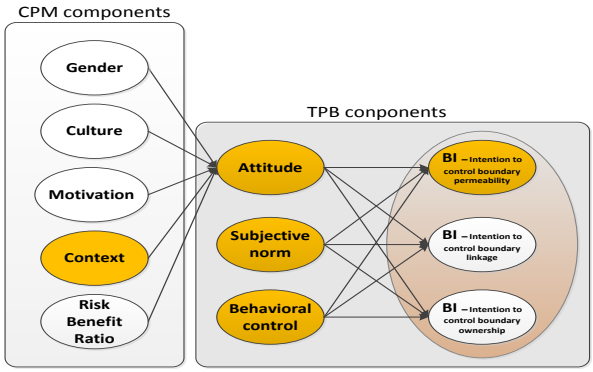

Figure 1. A Combined Model of CPM Theory and TPB Represented in a Model

3.2 Survey and Analytical Method

The survey was implemented using a paid service from Surveygizmo.com. The sample (N=400) was collected mostly from United States (93.2%). Caucasian was the most participated race (65.2%, African American 11.3%, and Asian 8.5%), and gender proportion was male, 54.7%, and female, 45.3%. Also, more than 80% of participants had higher than college education. Ages between 30 and 39 were the most frequent age group (27.5%) and twenties and forties followed in the proportion of 24.3% and 19.8%, respectively.

Contextual factor is interpreted as function of two primary research constructs; “unwillingness to communicate” (Burgoon, 1976) and “self-disclosure” (Wheeless, 1978). In CPM, contextual factors are discussed in terms of communication patterns under life events like distressful events leading to therapeutic situations. We interpreted that, in such communication situations, management of privacy depends upon the communicator’s willingness or unwillingness to communicate while making concurrent decisions of disclosing self.

$$COC = (UC)\omega 1 + (SD)\omega 2 \qquad (1)$$

where UC is unwillingness to communicate and SD denotes self-disclosure.

Unwillingness to communicate is defined as a “chronic tendency to avoid and/or devalue oral communication” (Burgoon, 1976, p. p60). Original measurements of unwillingness to communicate consist of two primary dimensions; approach-avoidance and reward. Burgoon and Hale (1983, p. 240) explicates that approach-avoidance is “the degree to which individuals feel anxiety and fear about interpersonal encounters and are inclined to actively participate in them or not”, whereas reward is defined as “the degree to which people perceive that friends and family don’t seek them out for conversation and opinions, and that interactions with others are manipulative and untruthful”. The scale is composed of 20 items, 10 for each dimension. In our questionnaire, questions are tuned for social interaction in OSNs. For example, a statement, “Talking to other people on social networking website is just a waste of time” is rated in 7 point Likert scale from Strongly disagree (1) to Strongly agree (7).

In order to measure self-disclosure, we adopted a topic-free multi-dimensional measure of self-disclosure. Self-disclosure is defined as “any message about the self that a person communicates to another” (Wheeless, 1978). In the study, the research construct of self-disclosure is conceived in five dimensions, i.e., intended disclosure, amount, positive-negative valence, control of depth, and honesty-accuracy. In our questionnaire, a statement “The things I reveal about myself to those I meet on the social networking website are always accurate reflections of who I really am” is rated in 7 point Likert scale from Strongly disagree (1) to Strongly agree (7).

Interpretation of contextual factor is the most explorative in our research. We first investigated measures of emotional distress to represent it on the quantitative model. However, context of disclosure can be much more various than only the stressful situations. For example, in many cases, postings on social networking websites are happy moments rather than grave secrets of incest victimization as often exemplified in Petronio (2002).

The collected data was analyzed using Structural Equation Modeling (SEM) technique. SEM is a multivariate statistical method aimed at examining the underlying relationships or structure among variables in a model. Using SEM, a researcher can ask substantial questions like “Why do people engage in privacy managing behavior?” And “How do they adopt privacy managing behavior?” These theoretical models can inform us the development and improvement of privacy-related constructs. Moreover, SEM is a useful tool in estimating the effects of those constructs.

Buhi and colleagues (Buhi, Goodson, & Neilands, 2007) identify 4 factors of why researchers use SEM; First, SEM best honors the realities to which investigators are attempting to generalize. Most behavioral outcomes have multiple causes, in general, and most causes have multiple outcomes, all interacting dynamically. Second, multivariate methods such as SEM control for inflation of experiment-wise error. Employing SEM can correct this analytic limitation by avoiding the use of multiple univariate / bivariate tests and, instead, testing hypotheses / research questions across several variables at once. Third, SEM gives researchers flexibility in specifying theory-driven models that can be tested with empirical data. SEM allows researchers to test theories and assumptions directly by specifying which variables are related to other variables. Moreover, SEM allows researchers to examine relationships among latent variables with multiple observed measures. Lastly, SEM is useful because it enables the advanced treatment of incomplete data.

Studies suggest distinct steps in performing SEM for model testing. Two-step modeling is suggested by Kline (2005) and a few other researchers (Anderson & Gerbing, 1988; Buhi et al., 2007). They urge that SEM researchers should;

1. Test the pure measurement model underlying a full structural equation model first, and if the fit of the measurement model is found acceptable, then
2. Proceed to the second step of testing the structural model by comparing its fit with that of different structural models

Mulaik & Millsap (2000) have suggested a more stringent four-step approach to modeling:

1. Common factor analysis to establish the number of latent variables
2. Confirmatory factor analysis to confirm the measurement model. As a further refinement, factor loadings can be constrained to 0 for any measured variable's crossloadings on other latent variables, so every measured variable loads only on its latent.
3. Test the structural model.
4. Test nested models to get the most parsimonious one. Alternatively, test other research studies' findings or theory by constraining parameters as they suggest should be the case. Consider raising the alpha significant level from .05 to .01 to test for a more significant model.

In our analyses, we use the two-step approach in addition to exploratory factor analysis before confirmatory factor analysis for filtering out unfit variables.

3.3 Research Questions and Hypotheses

Research questions are formulated in order to examine models of user experience regarding their privacy management in OSNs. Questions are organized to identify salient research constructs, develop models based on the research constructs and test them for fitness to user data, and define and test statistical significance of interrelationship among the research constructs. Three primary questions are formulated as below;

RQ1: Can we identify quantitative models of user's privacy management in OSNs in relation to context?
RQ2: What are salient research constructs in the contextual criteria of privacy rule development in the context of privacy management in OSNs?
RQ3: What are the significant relationships among research constructs within the model?

Based on CPM theory and TPB, hypotheses are formulated based on the initial model. The initial model contains research constructs that may be specialized more in the later process as a result of factor analyses. Therefore, the actual hypotheses in operational level that are examined through statistical analysis are identified in the analysis and result section, except for behavioral components, cultural criteria, and gender criteria which are already decomposed in the studies we borrowed them from. Following are the hypotheses (Propositions are in need of further analysis and are decomposed to hypotheses in the later section);

H1: In OSNs, user's attitude towards controlling boundary permeability has a positive effect on the behavioral intention to control boundary permeability.

H2: In OSNs, user's perceived social pressure of controlling boundary permeability has a positive effect on the behavioral intention to control boundary permeability.
H3: In OSNs, user's perceived behavioral control over controlling boundary permeability has a positive effect on the behavioral intention to control boundary permeability.
H4: In OSNs, user's unwillingness to communicate and self-disclosure are critical criteria that determine their attitude towards controlling boundary permeability.

4 Analysis and Results

In this section, we discuss results of statistical analyses manifesting research questions and hypotheses. A two-step process is described in terms of analyzing measurement models and structural models.

In order to analyze measurement models, a series of factor analyses are conducted. In our approach, we use both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). The two statistical techniques serve different purposes. First, EFA is used for finding hidden construct out of a set of variables. Using this analysis, we identify factor structures (a grouping of variables based on strong correlations), compare them with foundational theories and models, and interpret emerged structures. During this process, we also detect "misfit" variables. In general, an EFA prepares the variables to be used for cleaner structural equation modeling. In contrast, the purpose of CFA is validating the identified structure of theoretical components. Therefore, models are defined first and then tested whether the data support them. However, we use it for both exploratory and confirmatory purposes since our research is somewhat exploratory in the sense that we develop a quantitative model based on an interpretive theory by examining quantitative measures to best describe behavioral models. Based on the structures identified as a result of EFA, in the second step, we conduct CFA to see how observed variables are related to latent variables and how appropriate the measurement models are.

In the second step of analysis, structural models are identified and estimated. In this step, a set of causal relationships are hypothesized in the models and tested against the collected data while the models are evaluated for their fitness to the data.

4.1 Analyses of Behavioral Constructs from TPB

Components from TPB, i.e., attitude towards controlling boundary permeability, behavioral control of controlling boundary permeability, subjective norm of controlling boundary permeability, and behavioral intention of controlling boundary permeability, are primary research constructs that are repeated throughout establishing models of each criterion of privacy rule development. Therefore, the analysis of behavioral constructs from TPB is the most fundamental and important analysis that has to be conducted first.

4.1.1 A Measurement Model of TPB

This part of measurement model explores the relationship among constructs from TPB. TPB components were measured using Fishbein & Azjen (Fishbein & Ajzen, 2010).The original sample (N=400) was treated for univariate and multivariate outliers. For the analysis of TPB, sample size was N=346 after screening.

The model indicated in TPB is studied by many scholars in various domains. However, since we modified our questionnaire to include communication context in online social networks, we conducted an EFA first to see if the items show similar pattern of dimension reduction as indicated in the original theory. Although the 4-factor solution emerged from the EFA showed clear factor structure, except for attitude items, factors were not interpretable in regards to TPB. Some variables were loaded on factors they should not be loaded. After removing the problem variables, we conducted CFA.

In order to see if the model can be identified using a confirmatory approach, a CFA was conducted using predefined dimension structure based on TPB. Each item was restricted so as to load only on its predefined factor while the factors themselves were allowed to covary freely. In the initial examination, two items under attitude factor, one item under behavioral intention factor and another item under behavioral control factor were trimmed out due to low loading scores. After the items were removed, CFA was conducted again. Various overall fit indices indicated a good fit of the model to the data because most of the indices were close to the recommended thresholds. Fit indices of the measurement model ($\chi 2$ (36) = 57.389, $p<.05$) were as follows: CMIN/DF = 1.59, RMSEA = .04, NFI = .97, CFI = .99, GFI = .97, AGFI = .95, TLI = .98.

In addition to the model fit, we examined reliability, convergent validity, and discriminant validity of the scale. As shown in Table 3, reliability requirements are met since the CRs range from 0.683 to 0.886 which are above recommended cut-off values, except for behavioral condition which indicates border line

value, i.e., 0.683. Convergent validity is also established since all AVE values are above .5 and CR values for each latent variable is larger than AVE values. Finally, discriminant validity was also satisfactory since MSVs and ASVs in each latent construct were larger than AVEs.
As shown in Table 1, the evidence of good model fit, reliability, convergent validity, and discriminant validity indicates that the measurement model was appropriate for testing the structural model at a subsequent stage.

	R	VE	SV	SV	C	T	N	I
C	.683	.521	.475	.209	.722			
T	.886	.615	.300	.211	.339	.784		
N	.780	.644	.475	.317	.689	.548	.802	
I	.742	.590	.218	.143	.193	.467	.418	.768

Table 1 Reliability, Convergent Validity, and Discriminant Validity for Measurement Model of TPB Constructs

4.1.2 A Structural Model of TPB

We tested the causal model using the SEM technique. Figure 2 reports the results of SEM analysis. Fit indices indicate that the model ($\chi 2(36) = 57.389$, $p<.05$) is a good fit to the data; CMIN/DF = 1.59, RMSEA = .04, NFI = .97, CFI = .99, GFI = .97, AGFI = .95, TLI = .98. In our case, however, behavioral control did not blend into the model as we expected.

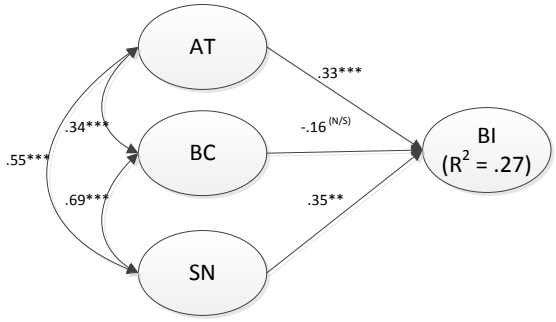

Figure 2 A Structural Model of Behavioral Constructs from TPB

Based on this mode, we examined the hypotheses related to TPB, i.e., hypothesis 1, hypothesis 2, and hypothesis 3 as below;

H1: In OSNs, user's attitude towards controlling the amount of private information being shared has a positive effect on the behavioral intention to control the amount of private information being revealed.
H2: In OSNs, user's perceived social pressure of controlling the amount of private information being shared has a positive effect on the behavioral intention to control the amount of private information being revealed.
H3: In OSNs, user's perceived behavioral control over controlling the amount of private information being shared has a positive effect on the behavioral intention to control the amount of private information being revealed.

We found that some of the hypotheses proposed in the causal model were supported. Specifically, as hypothesized, attitude towards controlling the amount of private information being shared had a positive effect on behavioral intention to control the amount of private information being shared (β= .33, $p < .001$, Hypothesis 1 supported). Also, perceived social pressure of controlling the amount of private information being shared had a positive effect on behavioral intention to control the amount of

private information being shared as hypothesized in Hypothesis 2 (β = .35, $p < .05$, Hypothesis 2 supported). However, Hypothesis 3 was not supported since the effect of behavioral control to control the amount of private information being shared on behavioral intention to control the amount of private information being shared was not statistically significant (β=-.16, N/S, Hypothesis 3 not supported). Therefore, in the population, when people have more attitude towards controlling boundary permeability, they will more likely to have behavioral intention to control how much of private information they share in online social networks. Also, when people have higher perceived social pressure of controlling boundary permeability, they will more likely to have behavioral intention to control how much of private information they share in online social networks.

4.2 Analyses of Context from CPM

In this section, we investigate measurements in regards to contextual criteria for privacy rule development in CPM, and its causal relationship with behavioral constructs from TPB.

4.2.1 A Measurement Model of Context

Contextual criteria consist of two primary research constructs, i.e., “unwillingness to communicate” and “self-disclosure” on the outset. Rationale of this functional composition is explained in the previous section. In this section, we demonstrate that the proposed equation is acceptable and sound in explaining user’s behavior of privacy management in online social networks. Privacy rule development in contextual criteria was measured using unwillingness to communicate and self-disclosure scales. The original sample (N=400) was treated for univariate and multivariate outliers. For the analysis of risk / benefit criteria, sample size was N=362 after screening.

The EFA for the construct of “unwillingness to communicate” combined extraction method of Principal axis factoring with Promax rotation. A factor loading value of .3 was used as the factor interpretation. Initially, 4-factor solution with 16 items emerged and one item was removed since it was cross-loaded on multiple factors with very small difference. The deleted item was identified as the question, “I think my friends on the social networking website are truthful with me”. However, without the item, EFA was terminated because the communality value exceeded 1. We then predefined 3 and 2 factor solutions, compared them with each other, and concluded that 2-factor solution was the better model with substantial meaning of factor structure. However, the factor structure identified in Burgoon (1976) did not hold in our study. Factors were identified as “positive interaction valence (PIV)” and “negative interaction valence (NIV)”. The two factor model accounted for 45.95% of total variance and the communalities ranged from .21 to .58. Reliabilities were checked for each factor emerged from the analysis of unwillingness to communicate. “Positive interaction valence”, which included 8 items was reliable at Cronbach’s Alpha =.79, while “negative interaction valence” which contained 11 items was reliable at Cronbach’s Alpha =.88.

The same procedure was followed for “self-disclosure”, conducting EFA using Principal axis factoring with Promax rotation. A factor loading value of .3 was used as the factor interpretation. Initially, 4 factors emerged that had eigenvalues greater than 1. But, 4-factor solution did not offer a theoretically meaningful interpretation. Five items that are cross-loaded across multiple factors were removed. The deleted items were; “I am not always honest in my self-disclosures with those I meet on the social networking website”, “When I reveal my feelings about myself to those I meet on the social networking website, I consciously intend to do so”, “I do not always feel completely sincere when I reveal my own feelings, emotions, behaviors, or experiences to those I meet on the social network website”, “When I express my personal feelings with those I meet on the social networking website, I am always aware of what I am doing and saying”, and “I usually disclose only positive things about myself with those I meet on the social networking website”. We compared 4, 3, and 2 factor solutions and concluded that 2-factor solution was the better model with substantial meaning of factor structure. Factors were identified as “active” and “passive”. The two factor model accounted for 53.19% of total variance and the communalities ranged from .31 to .54. Reliabilities were checked for each factor emerged from the analysis of self-disclosure. “Active”, which included 5 items was reliable at Cronbach’s Alpha =.83, while “passive” which contained 6 items was reliable at Cronbach’s Alpha =.41.

Based on the result of EFAs, a 4-factor measurement model was set up to assess the measurement quality of contextual criteria constructs. Each item was restricted so as to load only on its predefined factor while the factors themselves were allowed to correlate freely. Initial examination indicated that the two items that are negatively loaded on “passive” factor should be removed. After the two items are trimmed CFA was conducted again. Various overall fit indices indicated a tolerable fit of the model to the data because most of the indices satisfied the recommended thresholds. Fit indices of the

measurement model (χ2 (833) = 1858.418) were as follows: CMIN/DF = 2.23, RMSEA = .06, NFI =.76, CFI = .87, GFI = .81, AGFI = .79, TLI = .83.

Research hypothesis 4 is formulated as hypotheses in operational level. Although the identified constructs are not based on theories, we can intuitively assume directions since the sub-factors of each factor have clearly interpretable binary structure;

H4a: Positive interaction valence has a negative effect on users' attitude towards controlling the amount of private information being revealed in OSNs.
H4b: Negative interaction valence has a positive effect on users' attitude towards controlling the amount of private information being revealed in OSNs.
H4c: Active self-disclosure has a positive effect on users' attitude towards controlling the amount of private information being revealed in OSNs.
H4d: Passive self-disclosure has a negative effect on users' attitude towards controlling the amount of private information being revealed in OSNs.

4.2.2 A Structural model of Context

A structural model was set up by specifying attitude towards a behavior and behavioral intention as exogenous constructs; and the unwillingness to communicate, self-disclosure, perceived behavioral control, and subjective norm as endogenous constructs (see Figure 3). "Unwillingness to communicate" is represented in the model with sub-factors of "PIV" and "NIV". Also, "Self-disclosure" was identified with two sub-factors, i.e., "active" and "passive". All exogenous constructs are allowed to covary freely, and paths are added based on hypotheses that proposed causal relationships between constructs. As in the estimation of the measurement model, various overall fit indices indicated a relatively good fit of the model to the data because most indices were within the range of recommended thresholds. Fit indices of the structural model (χ2 (835) = 1949.397) were as follows: CMIN/DF = 2.34, RMSEA = .06, NFI = .74, CFI = .83, GFI = .81, AGFI = .78, TLI = .82. We found that H4a (β = -.41, p<.001, hypothesis 4a supported) and H4b (β = .51, p<.001, hypothesis 4b supported) were statistically significant. Also, both H4c (β = .41, p<.001) and H4d (β = -.32, p<.05) were supported.

First, negative interaction valence (NIV) was a good predictor of the attitude. In OSNs, users with higher degree of NIV are likely to have more favorable attitude towards controlling the amount of private information being shared. Second, positive interaction valence (PIV) was a good predictor of the attitude. In OSNs, users with higher degree of PIV are likely to have less favorable attitude towards controlling the amount of private information being shared. Third, active self-disclosure was a good predictor of the attitude. In OSNs, users with higher degree of active self-disclosure are likely to have more favorable attitude towards controlling the amount of private information being shared. Lastly, passive self-disclosure was a good predictor of the attitude. In OSNs, users with higher degree of passive self-disclosure are likely to have less favorable attitude towards controlling the amount of private information being shared.

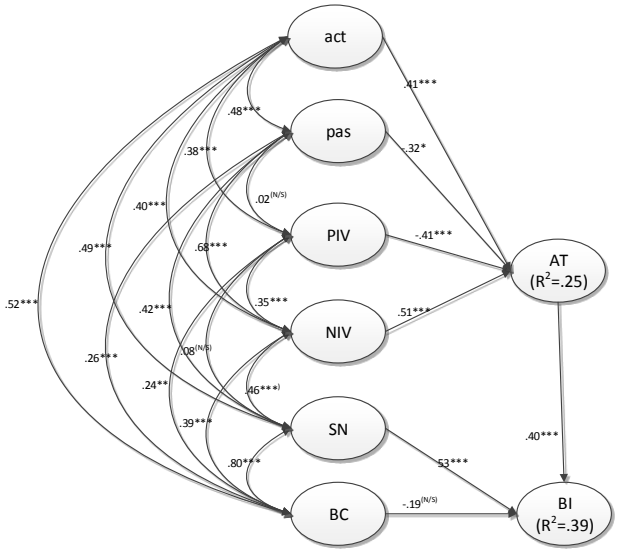

Figure 3 A Structural Model of Context criteria

5 Discussion and Conclusion

This research identified a model of users' management of privacy in online social networks in relation to contextual criteria in CPM. Based on CPM theory, we interpreted research concepts and their relationships using quantitative measures. The model specifically identifies causal relationship between foundations of privacy rule development in contextual criteria and a boundary coordinating operation, i.e., coordination of boundary permeability. The primary contribution of this study is interpreting privacy in context in terms of communication variables and analyzing influence of context on the behavior of controlling how much private information users share in OSNs. Secondly, we identified salient research constructs and tested them for validity in the real world context of user's privacy management in OSN. In the course of construct identification, we provided interpretation of context criteria; in combination of constructs, i.e., unwillingness to communicate (PIV and NIV) and self-disclosure (active self-disclosure and passive self-disclosure). The third contribution is development of causal models of user's privacy management in OSN and tested their fitness based on user data. Then, finally, we tested interrelationship among the research constructs.

Our model shows that influence to privacy are multi-dimensional and thus, the user's privacy management behaviors vary depending on the privacy in context. In addition, many users are unaware of how privacy works in online social networks and how they can protect themselves from becoming victims of privacy invasion. Our models can be used to show them what appropriate modes of behavior are when it comes to managing their privacy in online social networks. In the theoretical sense, this research is significant in that it validates the quantitative model of communication privacy management with user data. The model's goodness of fit and hypotheses based on communication privacy management theory are tested for representative sample data as a way of estimating the model's accountability in the population. In the practical sense, the primary significance is that we identified patterns of user's privacy management in OSN. The result of this paper will, first, provide users with a basis for educational material of privacy management in OSN. Second, they will provide designers of user experience with reference for designing privacy management in their services. And finally, they will provide researchers with foundational findings for further research in privacy management in OSN is in relation to the potential use of our model in the real world practice.

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