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Stanislav Mamonov

Zicklin School of Business, Baruch College, CUNY, stanislav.mamonov@baruch.cuny.edu

Marios Koufaris

Zicklin School of Business, Baruch College, CUNY

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Communications of the Association for Information Systems

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Stanislav Mamonov

Zicklin School of Business, Baruch College, CUNY

Stanislav.Mamonov@baruch.cuny.edu

Marios Koufaris

Zicklin School of Business, Baruch College, CUNY

Marios.Koufaris@baruch.cuny.edu

Abstract:

The fast growing adoption of smartphones has accentuated the importance of privacy in the context of mobile computing. While most research has focused on general privacy concerns and their impact on intentions to disclose personal information, little is known about how perceptions of a privacy breach affect ongoing relationships between users and mobile providers. To address this gap, we develop a research framework grounded in psychological contract theory. We test this framework with a survey-based study of smartphone users who are presented with a scenario of a privacy breach. We find that perceptions of privacy breach negatively affect trust and commitment and lead to an increase in cynicism. In turn, trust, commitment, and cynicism are highly predictive of smartphone user intention to terminate the relationship with the mobile carrier. We also evaluate the effects of perceived availability of alternatives and contractual lock-in. The nomological framework developed in the current study provides the foundation for further investigation of perceived privacy breach across practically relevant contexts.

Keywords: privacy breach, mobile computing, psychological contract, trust, commitment, cynicism

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I. INTRODUCTION

The fast growing adoption of smartphones has accentuated the importance of privacy in the context of mobile computing. More than 50 percent of phone users in the United States now have a smartphone and 78 percent of teenagers are using smartphones [Simpson, 2013]. Smartphones provide Internet connectivity and geo-location services, and they also offer a broad range of applications extending their functionality. By the virtue of supporting a broad range of functions, smartphones have become an important channel for communication and information sharing, enabling users not just to talk on the phone, but also to communicate via instant messages and email, stay informed about social network updates, and engage in financial transactions via mobile banking applications, among many other uses.

The growth of smartphone use and information sharing via smartphones exposes their users to increasing privacy risks. Prior privacy-related research in information systems has primarily focused on privacy concerns as the focal construct [Malhotra, Kim, and Agarwal, 2004; Smith, Milberg, and Burke, 1996; Smith, Dinev, and Xu, 2011]. While privacy concerns are an important topic, one question that remains unanswered is what happens when smartphone users *perceive* that their privacy has been breached. We seek to address this knowledge gap by investigating how perceptions of privacy breach affect smartphone user attitudes and behavioral intentions. We specifically focus on the impact of a perceived privacy breach attributed to the mobile carrier.

The business press regularly reports on instances of privacy breaches affecting smartphone users. One such incident involved Carrier IQ technology. The incident began with a publication of a video by a smartphone application developer who detected the presence of Carrier IQ software on his smartphone [Lutz, 2011]. The developer called attention to the fact that the Carrier IQ software gathered detailed information on the users' interactions with their smartphones. The software was installed by mobile carriers on smartphones from different manufacturers, and it appeared to be extremely intrusive. The software captured every keystroke made by the users, and it even went as far as to intercept data exchanges over encrypted Web browser connections. The mobile carriers who installed this software provided no notice to the smartphone users regarding what data was collected and how the information was used. There was also no way for individual users to remove the software from their smartphones. The incident attracted regulatory scrutiny, and the Federal Trade Commission investigation of the incident is ongoing [Schwartz, 2011].

To gain a better understanding of how users, such as those in the Carrier IQ incident, are affected by a perceived privacy breach, we conducted a survey-based study of smartphone user attitudes and behavioral intentions in response to a vignette describing the Carrier IQ software and the hypothetical scenario of it having been installed on their smartphones. Our research model is rooted in psychological contract theory which posits that all exchange relationships involve a set of unwritten expectancies [Rousseau, 1995, 2001, 2004]. Perceived breach of expectancies constitutes a breach of the psychological contract, and it triggers negative consequences reflected in attitudinal and behavioral adjustments, including a possibility of relationship termination. Psychological contract theory has been adopted in information systems research to study virtual teams [Piccolli and Ives, 2004], outsourcing relationships [Koh, Ang, and Straub, 2004], and online marketplaces [Pavlou and Gefen, 2005], highlighting its applicability to different types of exchange relationships. While the expectancies comprising psychological contracts are unique to each context, perceived breach of expectancies has common consequences regardless of context. According to prior research, three of the most important consequences associated with a psychological contract breach are decreases in trust and commitment, as well as an increase in cynicism [Zhao, Wayne, Glibkowski, and Bravo, 2007]. Trust, commitment, and cynicism also are key attitudes that can affect the sustainability of exchange relationships. To gain insight into how perceptions of privacy breach affect smartphone users, we conceptualize privacy-related expectancies as a core domain of expectancies inherent to private information disclosure. We explore the impact of perceived privacy breach on smartphone users' trust, commitment, and cynicism toward the mobile carriers and the effect of these attitudes on the users' intention to terminate their relationship with the carrier. Our research model also accounts for the effects for perceived availability of alternatives and contractual lock-in, which may affect the users' intentions to terminate the relationship.

This study contributes to both theory and practice by examining how perceptions of privacy breach affect technology users. We develop a nomological framework which captures attitudinal adjustments in response to a perceived privacy breach and the consequent effect on user intentions to terminate the relationship. While we evaluate this framework in the context of the relationship between smartphone users and mobile carriers, it also has the potential

to be applied in other contexts. The next sections are structured as follows. First, we review prior research and develop our theoretical framework. Next, we evaluate the framework in a field study of smartphone users by introducing a vignette describing the Carrier IQ software and asking for user reactions if they had discovered that it was installed on their smartphones. We conclude with a discussion of study contributions, limitations, and future research.

II. THEORY BACKGROUND AND HYPOTHESES DEVELOPMENT

Privacy has been a topic of research across many fields, including legal studies, sociology, and information systems [Belanger and Crossler, 2011; DeCew, 1986; Schwartz, 1968; Smith et al., 2011], yet it remains difficult to define [Solove, 2008]. The legal definition of privacy goes back to Warren and Brandeis [1890], who presented an argument that a law was needed to protect individuals from unauthorized portraiture in the media and defined *privacy* as the right “to be left alone.” This legal argument laid the foundation for the development of the privacy-related tort law. The legal basis for privacy protections continues to evolve in both the statutes and the legal precedent, but individuals are generally afforded legal protection against the intrusion onto one’s solitude, unauthorized information collection (surveillance), unauthorized private information disclosure to third parties, and misappropriation of one’s name or likeness [Kalven, 1966]. While privacy encompasses a broad spectrum of rights and associated concerns, we focus on information privacy as a subset of privacy-related concerns that are relevant to information exchanges [Dinev, Bellotto, Hart, Russo, Serra, and Colautti, 2006].

Information privacy is defined as an individual’s desire to control the collection and use of their personal data [Belanger and Crossler, 2011]. Concerns about information privacy have been identified as a significant impediment to e-commerce transactions, leading to a wave of publications related to factors that influence the intent to disclose personal information [Lee, Ahn, and Bang, 2011; Sheng, Nah, and Siau, 2008]. Seemingly in violation of stated concerns about privacy, consumer information disclosure online appears to proliferate rapidly [Berendt, Günther, and Spiekemann, 2005]. This observation has been referred to as a *privacy paradox* [Awad and Krishnan, 2006]. Privacy calculus theory evolved to address the seemingly counterintuitive observations of the privacy paradox [Dinev and Hart, 2006a]. The privacy calculus model of individual decision making in relation to the disclosure of personal information is built on the calculus of behavior model originally proposed by Laufer and Wolfe [1977]. The calculus of behavior emphasizes individual and environmental dimensions as the drivers of behavioral outcomes, and it involves the evaluation of risks and benefits. Privacy calculus theory adopts the risk/benefit perspective and offers an explanation of the privacy paradox phenomenon: although the consumers perceive privacy-related risks associated with e-commerce to be high, the perceived benefits of information disclosure in online transactions outweigh privacy-related risks, and the volume of e-commerce continues to grow even in the presence of high perceived risks [Awad and Krishnan, 2006].

The privacy calculus model of information disclosure presumes that the disclosing party forms a set of expectancies associated with the disclosure of information. Psychological contract theory posits that implicit expectancies which accompany virtually all exchange relationships constitute psychological contracts [Rousseau, 2001]. A perception that expectancies have been breached (*psychological contract breach*) triggers attitudinal adjustments as the participants in the exchange reevaluate their expectancies from the relationships. Prior research evaluating psychological contract theory across a diverse set of contexts supports the general applicability of the theory to understanding outcomes across different exchange relationships. Psychological contract fulfillment in outsourcing relationships predicts outsourcing relationship success [Koh et al., 2004]. Examination of psychological contracts in the context of online marketplaces has revealed that apparent breach of expectancies in relation to market transactions leads to diminished trust and increased perceived risk toward the marketplace as a whole [Pavlou and Gefen, 2005]. We conceptualize the relationships between smartphone users and mobile carriers as economic exchanges which, in addition to the legal contracts, are also a subject to unwritten expectancies comprising psychological contracts. Expectation of privacy is inherent to willingness to disclose private information. A perceived breach of privacy expectancies constitutes a breach of psychological contract. Our research model, which we will outline in the paragraphs that follow, predicts that cognitive perceptions of a privacy breach attributed to the mobile carrier will have an impact on trust, commitment, and cynicism felt toward the carrier. Trust and commitment attitudes have been firmly established as key predictors of continued participation in exchange relationships across different contexts. Cynicism is a distinct and less-explored attitude which captures negative evaluations related to trust. We included cynicism in our model to evaluate the impact of privacy breach on both positive and negative attitudes which influence exchange outcomes.

Smartphone users rely on the technology for personal and business needs and often disclose personal and confidential information to others using smartphones. The disclosure of private and confidential information implies trust in the intermediary, i.e., the mobile carrier that provides the communication infrastructure. Trust is a concept that has been researched extensively in information systems [Belanger and Crossler, 2011]. For our study, we adhere to the conceptualization of trust as “willingness to be vulnerable” in an exchange relationship [Mayer and

Davis, 1995]. Such willingness to be vulnerable can be affected by both cognitive and affective factors [McKnight, Choudhury, and Kacmar, 2002]. We expect that cognitive perceptions that the mobile carrier has infringed on one's privacy will lead to a negative cognitive adjustment in trust beliefs toward the carrier. This type of cognitive trust adjustment in response to unmet expectancies has been demonstrated in personal [Sorrentino, Holmes, Hanna, and Sharp, 1995] and business partnerships [Jeffries and Reed, 2000], as well as relationships between manufacturers and consumers [Colwell and Hogarth-Scott, 2004]. In other words, perceived breach of expectancies which comprise psychological contracts undermines trust in the counterparty in the exchange. Therefore, in the context of smartphone users and mobile carriers, we hypothesize that:

H1. Perceived privacy breach is negatively related to trust in the mobile carrier.

While the loss of trust poses a serious threat to exchange relationships, research across different exchange contexts has highlighted that attitudinal commitment also plays an important role. Commitment is a multifaceted construct which encompasses affective attachment and long-term active orientation toward maintenance of the relationship [Meyer and Allen, 1991]. Research in the organizational context has shown that psychological contract breach is associated with a decline in organizational commitment in employment relationships [Suazo, 2009]. Recent research in information systems has affirmed the critical role of commitment attitudes in the sustainability of exchange relationships in a virtual community context [Bateman, Gray, and Butler, 2010]. In ongoing exchange relationships, commitment reflects perceptions that the relationship provides important benefits while imposing reasonable costs. A perceived breach of privacy by the mobile carrier can undermine the expectancies of positive benefits, such as the ability to have private conversations over the smartphone, while also increasing perceived costs. For example, leaked personal information may expose smartphone users to certain risks. Given that a perceived breach of privacy undermines the benefits expected from smartphone technology and increases potential risks (costs) associated with technology use, we hypothesize that in the context of smartphone users and mobile carriers:

H2. Perceived privacy breach is negatively related to commitment.

Research in individual psychology has emphasized that negative and positive attitudes, although they may be correlated, have independent effects on motivating behaviors [Diener and Emmons, 1984]. Cynicism is a negative attitude that stems from the negative evaluation of competence, integrity, and benevolence—dimensions that, when evaluated positively, are associated with trust. Cynicism is characterized by frustration, hopelessness, and disillusionment, as well as contempt and distrust toward a counterparty [Dean, Brandes, and Dharwadkar, 1998]. Prior research on cynicism has established that it is distinct from trust. While trust requires vulnerability, cynicism does not. Further, while trust may exist in the absence of prior experience with the exchange partner, cynicism generally requires experience [Dean et al., 1998]. In fact, empirical evaluation of trust and cynicism shows that they are only weakly related [Wrightsman, 1991]. Neuroimaging studies have affirmed that positive and negative trust signals activate different areas of the human brain [Dimoka, 2010], providing further evidence that humans process positive and negative trust signals differently.

Cynicism is an attitude that may affect information processing [Andersson and Bateman, 1997] or may be part of a coping strategy that allows one to reduce cognitive dissonance [Bateman, Sakano, and Fujita, 1992]. For example, when a participant in an exchange has a negative trust evaluation of the counter party, but receives a positive trust signal from the same counterparty, a cynical attitude can reduce the valence of the incongruent signal by reducing its believability. Cynicism develops from experiences indicating that the counter party cannot be trusted. Psychological contract breaches have been shown to increase employee cynicism in the organizational context [Anderson, 1996; Johnson and O'Leary-Kelly, 2003]. These effects also have been demonstrated in a study of IT adoption that revealed that employees in a call center resisted adoption of a new software that they perceived as serving management goals while neglecting the needs of employees [Selander and Henfridsson, 2012]. Employee cynicism developed from a history of management failure to fulfill employees' expectations. We conceptualize perceived privacy breach as an instance of psychological contract breach, and, therefore, in the context of smartphone users and mobile carriers, we hypothesize that:

H3. Perceived privacy breach is positively related to cynicism.

While much of the early research on psychological contracts focused on the direct effects of perceived breaches of expectancies on attitudes and behaviors, Morrison and Robinson [1997] revised the psychological contract theory to distinguish between cognitive perceptions of *psychological contract breach* and the affective experience of *psychological contract violation* which is often triggered by psychological contract breach. Psychological contract violation comprises feelings of anger, betrayal, and frustration. The affective experience of psychological contract violation partially mediates the effects of psychological contract breach on the attitudinal and behavioral outcomes [Morrison and Robinson, 1997]. Robinson and Morrison provided the empirical support for the revised model in a longitudinal study of employment relationships [Robinson and Wolfe Morrison, 2000]. A meta-analysis of

psychological contract literature has affirmed that the affective experience of psychological contract violation generally mediates the effects of cognitive perceptions of psychological contract breach [Zhao et al., 2007]. Since privacy is important for the individual sense of dignity [Bloustein, 1964], we expect that cognitive perceptions of a privacy breach will trigger feelings of anger, betrayal, and indignation, which constitute the affective experience of psychological contract violation.

H4. Perceived privacy breach is positively related to psychological contract violation.

The model of psychological contract breach proposed by Morrison and Robinson [1997] posits that the affective experience of psychological contract violation will partially mediate the effects of perceived privacy breach [Morrison and Robinson, 1997]. In our model, trust, commitment, and cynicism are attitudes, which, by definition, can be affected by both cognitions and affective experiences [Ajzen, 2001]. Therefore, while cognitive perceptions of a privacy breach can have a direct impact on trust, commitment, and cynicism, if perceptions of privacy breach also trigger feelings of anger and betrayal, these emotions will also impact the affective dimensions of trust, commitment, and cynicism.

The negative impact of the affective experience of psychological contract violation on trust and commitment is well established in the organizational context [Zhao et al., 2007]. The negative impact of betrayal on relationship commitment has also been demonstrated in personal [Wieselquist, Rusbult, Foster, and Agnew, 1999], as well as marketing, relationships [Ndubisi and Wah, 2005]. In addition, the association of anger and cynicism is well documented in studies of individual psychology [Martin et al., 2000], and it has been demonstrated in the organizational context [Pugh, Skarlicki, and Passell, 2003] where layoffs trigger angry responses which lead to the development of cynical attitudes among the employees. We expect that in the context of the relationships between smartphone users and mobile carriers the affective experience of psychological contract violation also will mediate the impact of perceived privacy breach on smartphone users' trust, commitment, and cynicism. Therefore, we hypothesize that:

H5a. Psychological contract violation partially mediates the effect of perceived privacy breach on trust.

H5b. Psychological contract violation partially mediates the effect of perceived privacy breach on commitment.

H5c. Psychological contract violation partially mediates the effect of perceived privacy breach on cynicism.

The sustainability of customer relationships is a key concern for mobile carriers because customer acquisition costs represent a key business expense [Pham, 2013]. In this section we discuss the effects of trust, commitment, and cynicism on the smartphone users' intentions to terminate the relationship with the carrier, which pose a significant threat to the profitability of mobile carrier businesses.

Mobile carriers providing smartphone devices and connectivity act as intermediaries facilitating communication and information sharing among their users. Intermediaries have been generally viewed as having a positive impact on helping to overcome lack of trust among potential exchange participants. Prior research on the institutional trust mechanisms in online marketplaces highlighted the positive role of market structures in facilitating economic exchanges among buyers and sellers who have no prior experience with each other [Pavlou and Gefen, 2004]. Online marketplaces help overcome perceived risks and uncertainty by providing reputation feedback mechanisms and conflict resolution options. While prior research has focused on the positive role of intermediary trust in facilitating exchange relationships, the Carrier IQ incident reveals the opposite side of the coin.

Smartphones have become an indispensable technology for information sharing, and their users have an expectancy of privacy inherent in the willingness to disclose private information via their smartphones. However, the disclosure of private information makes smartphone users vulnerable to privacy breaches. Trust in the mobile carrier is critical for the users' reliance on smartphone technology as a trusted channel for private information exchanges. Loss of trust in the carrier will make continued use of the smartphones too risky because it would expose the user to further potential infringement on privacy. A meta-analysis of trust research in the organizational context has shown that trust toward the employer is strongly and negatively related to turnover intentions [Dirks and Ferrin, 2002]. Trust is among the most researched constructs in information systems [Benbasat, Gefen, and Pavlou, 2010], and recent research on trust emphasizes that loss of trust has a profound impact on continued participation in e-commerce exchanges [Liu and Goodhue, 2012]. We expect that loss of trust in the mobile carrier will be associated strongly with smartphone users' intention to terminate the relationship with the carrier. Therefore, in the context of smartphone users and mobile carriers, we hypothesize that:

H6. Trust is negatively related to intention to terminate relationship.

Commitment is a key attitude which has been extensively researched across different exchange contexts. Commitment reflects a positive evaluation of individual needs fulfillment vis-à-vis associated costs [Meyer and Allen, 1991]. Meta-analyses of commitment research have indicated that commitment is strongly predictive of turnover intentions and actual turnover behavior [Cohen, 1993; Williams and Hazer, 1986]. Research in information systems echoes findings from the organizational context. Commitment is the central attitudinal predictor of intention to terminate relationships in the context of outsourcing relationships [Goo and Huang, 2008], participation in knowledge repositories [Bateman et al., 2010], and virtual communities [Gupta and Kim, 2007; Moon, Hossain, Sanders, Garrity, and Jo, 2013]. We expect commitment attitude to play a similar role in the context of relationships between smartphone users and their carriers.

H7. Commitment is negatively related to intention to terminate relationship.

Cynicism encompasses feelings of contempt, frustration, and distrust. In the organizational context, cynicism is characterized by (a) attribution of self-interested behavior to company management and (b) belief that these conditions are unlikely to change [Andersson, 1996]. Research on IT adoption has shown that cynicism can be a major impediment to successful system implementations [Selander and Henfridsson, 2012]. At the individual level, cynical attitudes also have a significant negative impact on emotional health, such as a strong association with emotional exhaustion [Johnson and O'Leary-Kelly, 2003]. Studies in the organizational context have demonstrated that cynicism is positively related to turnover intentions [Leiter and Maslach, 2009]. Therefore, in the context of smartphone users and mobile carriers, we hypothesize that:

H8. Cynicism is positively related to intention to terminate relationship.

Smartphones afford a broad range of functionality, and they have become an indispensable technology for many people. The decision to terminate the relationship with a carrier requires the evaluation of potential alternatives, as well as costs associated with the termination of the relationship. Availability of alternatives is a critical constraint that has been found to affect intentions to terminate relationships. Lydon, Menzies-Toman, Burton, and Bell [2008] have found that perceived availability of alternative partners affected the responses to a betrayal in romantic relationships. Partners in romantic relationships were less likely to terminate the relationships after a betrayal when they perceived having few alternatives [Lydon et al., 2008]. Robinson [1996] has shown that outcomes associated with psychological contract violations in the organizational context were affected by the availability of alternative employment options [Robinson, 1996]. In times of sparse employment opportunities, employees are less likely to consider leaving the company even when they felt that their psychological contracts had been violated. Research in information systems has demonstrated the importance of alternatives on the decision to switch online brokers [Chen and Hitt, 2002], email service providers [Kim, Shin, and Lee, 2006], and Web analytics services [Park, Kim, and Koh, 2010]. Availability of alternative mobile carriers varies greatly with geography [Singer, 2013]. We expect that similarly to other contexts, perceived availability of alternatives will be positively related to the intention to terminate the relationship with a carrier.

H9. Perceived availability of alternatives is positively related to intention to terminate relationship.

Even when the alternatives are available, changing the mobile carrier may involve significant switching costs. While some mobile carriers offer month-to-month service contracts which can be terminated without financial penalty, the majority of consumers choose long-term contracts with mobile carriers in exchange for subsidies toward the purchase of the phone at the initiation of the contract [Chen, 2012]. Typical contracts offered by mobile carriers require customers to sign up for two years of service, and the contracts carry significant early termination penalties. Financial switching costs represent an important factor which affects consumer switching behavior [Burnham, Frels, and Mahajan, 2003]. We expect that financial penalties associated with early termination of long-term mobile service contracts will reduce intention to terminate relationship among mobile service users. In other words, consumers who have signed long-term contracts will be much less likely to consider switching carriers than consumers who have prepaid monthly contracts.

H10. Contractual lock-ins will be negatively related to intention to terminate relationship.

The diagram below summarizes the research model in our study. Our focus is on understanding how perceived privacy breach affects key attitudes which predict intention to terminate relationship. In addition to evaluating the relationships among constructs in the model, we also include age, gender, education, and length of smartphone use as covariates of intention to terminate relationship.

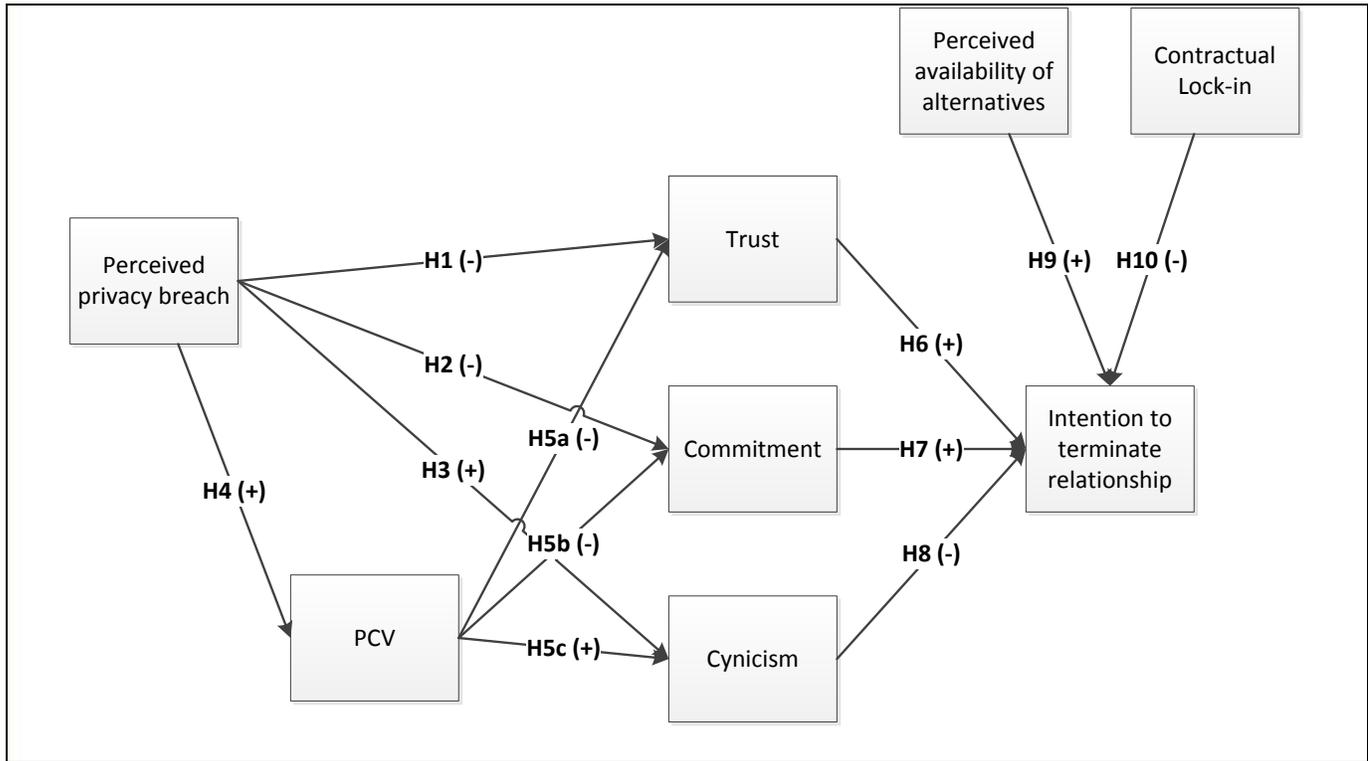


Figure 1. Research Model

III. METHODOLOGY

We evaluated the theoretical framework in a field survey of current smartphone users after exposure to a vignette describing the Carrier IQ software. The vignette summarizes key facts which were revealed in the press, and the full text of the vignette is provided in the Appendix. First, we collected basic demographic and smartphone usage data; then we exposed study participants to the vignette and asked them to fill out a survey and report how their attitudes and behavioral intentions would be impacted in relation to their carrier if they had discovered that their carrier had pre-installed the Carrier IQ software on their smartphones. This approach is designed to mimic closely a scenario in which consumers may learn about privacy-infringing technology through news media.

Measurement

We developed our survey instrument based on previously published scales, except for measures of contractual lock-in and perceived privacy breach. Contractual lock-in was measured by asking the study participants to indicate whether they had a prepaid month-to-month or a long-term contract with their mobile carrier. The responses were coded as 0 for a prepaid month-to-month contract and 1 for a long-term contract. In line with the recommendations of Cenfetelli and Basseller [2009] *perceived breach of privacy* was measured using formative indicators. A properly measured formative construct has to include all factors that formatively contribute to the construct. The measure of perceived privacy breach is based on the guidelines established by Privacy Safe Harbor Policy (PSHP) adopted in the United States, which addresses the strict legal requirements regarding private information handling [Export.gov—Safe harbor homepage, 2012]. The PSHP includes seven requirements regarding what companies must do in relation to gathering and using information. The companies are required (1) to inform individuals about what information is being collected and how it will be used, (2) to provide an opportunity for individuals to opt out of the collection of information, (3) to limit their ability to transfer information to third parties, (4) to invest in reasonable efforts to prevent loss of collected information, (5) to ensure that data is relevant and reliable for the purpose for which it was collected, (6) to provide individuals with access to information that is collected, and (7) to be subject to enforcement of the rules stated in PSHP. The PSHP requirements for investment to prevent information loss and companies being subject to rule enforcement do not directly address consumer perceptions of a privacy breach, and they were not included in the measurement instrument. To confirm the nomological validity of the formatively measured *perceived privacy breach* construct, we conducted a pilot study. Following the recommendation of Cenfetelli and Basseller [2009], we evaluated the correlation between formatively measured *perceived privacy breach* with the responses to a question measuring perceived CIQ infringement on privacy. This is consistent with prior research on psychological contracts [Turnley and Feldman, 1999]. The formatively measured *perceived privacy breach* was highly correlated with responses to the question concerning overall perceptions of privacy breach ($r =$

0.73, $p < 0.001$). These findings support the nomological validity of the formatively measured construct. The full survey instrument is provided in the Appendix.

Participants and Data Collection

Study participants were recruited through Amazon's Mechanical Turk. Mechanical Turk (MT) is an online labor market that is organized around micro-tasks called human intelligence tasks (HITs) [Buhrmester, Kwang, and Gosling, 2011]. Participant recruitment through Mechanical Turk offers the benefits of higher internal and external validity compared to student samples commonly used in research. The internal validity of an MT sample stems from a lower risk of the researcher interference—HITs are completed anonymously online, and Amazon serves as a financial broker for compensation [Paolacci and Chandler, 2010]. The greater external validity stems from a more diverse subject pool available through MT, compared to student population pools. The MT subject pool demographics are continually evolving and include subjects from many countries. However, we recruited only subjects based in the United States for this study in order to avoid possible country-specific effects that may impact the results. The demographics of MT workers located in the United States have been shown to be similar to the U.S. Census data, although the participants' distribution of incomes has a lower mean compared to the overall U.S. population [Buhrmester et al., 2011].

Participants recruited through Mechanical Turk were provided with a link to the survey. Following the recommendation of Downs, Holbrook, and Sheng [2010], at the end of the survey a unique code was provided to each participant who successfully completed the survey. The code was used to track survey submissions and assign credit for participation through the Mechanical Turk tracking system. A total of 300 participants were recruited to take part in the study. Of those, 278 participants actually completed the survey. The average age of the participants was thirty-three, and they were 52 percent male. Descriptive statistics of the sample are provided in Table 1.

Age	Mean: 33, SD = 11, Min = 18, Max = 60
Gender	Male: 52%, Female: 48%
Education	High school diploma: 16.3% Some college: 26.5% Associate degree: 13.3% Bachelor degree: 32.7% Advanced degree: 11.2%
Smartphone use	Less than 1 year: 14.3% 1–2 years: 27.6% 2–4 years: 30.6% More than 4 years: 37.5%

III. DATA ANALYSIS AND RESULTS

We employed the Partial Least Squares method through SmartPLS [Ringle et al., 2005] to evaluate our model because of its suitability to evaluate models that include formatively and reflectively indicated constructs. In addition, PLS offers advantages in the evaluation of complex models [Gefen, Rigdon, and Straub, 2011]. Our research model includes eight latent constructs and mediation effects, as well as four covariates.

Measurement Model

We evaluated the convergent validity, discriminant validity, and construct reliability of the constructs in our measurement instrument. Item weights for formatively measured constructs are presented in Table 2. Items with low weights were retained due to the importance of including all factors that formatively measure a latent construct [Cenfetelli and Basseller, 2009].

Construct	Items	Weight	t value	p value
Perceived privacy Breach	Pri_Breach1	0.49	3.80	<0.001
	Pri_Breach2	0.59	3.18	<0.002
	Pri_Breach3	0.19	0.05	n.s.
	Pri_Breach4	0.09	0.03	n.s.
	Pri_Breach5	0.72	6.50	<0.001

Convergent validity was assessed by item cross-loadings for reflectively measured constructs [Fornell and Larcker, 1981]. The results are shown in Table 3. Individual survey items have loading factors above 0.7 on the respective constructs, and the loadings on the respective constructs exceed loadings on other constructs in the model, indicating good convergent validity. Discriminant validity was assessed by comparing inter-construct correlations with the square root of the average variance extracted (AVE) for each construct. The results are presented in Table 4. The average variance extracted is above 0.7 in all cases, and the square root of AVE is greater than the correlation coefficients among the constructs, thus indicating appropriate discriminant validity. Construct reliability was evaluated with composite reliability and Cronbach's alpha calculations. The results are provided in Table 3. All values of composite reliability and Cronbach's alpha were above the generally accepted threshold of 0.70 [Fornell and Larcker, 1981] indicating sufficient internal consistency.

Table 3: PLS Loadings and Cross-loadings

	CR	CA		PCV	Trust	Commitment	Cynicism	Alternatives	Contract	Exit
Psychological contract violation	0.98	0.97	PCV1	0.979	-0.420	-0.209	0.298	-0.137	-0.121	0.390
			PCV2	0.974	-0.393	-0.184	0.259	-0.102	-0.136	0.394
			PCV3	0.969	-0.397	-0.211	0.268	-0.086	-0.168	0.345
Trust	0.95	0.92	Trust1	-0.386	0.931	0.455	-0.463	0.124	-0.063	-0.406
			Trust2	-0.372	0.942	0.534	-0.425	0.186	-0.029	-0.517
			Trust3	-0.398	0.910	0.569	-0.403	0.186	0.054	-0.416
Commitment	0.84	0.71	Commit1	-0.139	0.512	0.851	-0.247	0.172	0.070	-0.164
			Commit2	-0.208	0.472	0.844	-0.198	0.146	-0.036	-0.219
			Commit3	-0.143	0.342	0.788	-0.123	-0.180	0.171	-0.267
Cynicism	0.79	0.74	Cynic1	0.116	-0.394	-0.171	0.857	-0.247	0.037	0.399
			Cynic2	0.355	-0.428	-0.251	0.920	-0.158	-0.148	0.396
Alternatives			Alt	-0.111	0.179	0.080	-0.220	1.000	0.157	-0.274
Contractual lock-in			Contract	-0.156	-0.008	0.069	-0.085	0.157	1.000	-0.134
Intention to terminate relationship	0.93	0.89	Exit1	0.295	-0.472	-0.195	0.421	-0.262	-0.067	0.938
			Exit2	0.366	-0.443	-0.161	0.428	-0.264	-0.149	0.927
			Exit3	0.399	-0.400	-0.382	0.358	-0.216	-0.130	0.853

Table 4: Descriptive Statistics, Correlations, and Square Root of AVEs

	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. Age	33	11	1									
2. Alternatives	5.95	0.96	0.05	1								
3. Commitment	3.58	1.37	-0.02	0.08	0.80							
4. Cynicism	5.23	3.66	0.00	-0.22	-0.24	0.76						
5. Education	3.96	1.31	0.12	-0.09	-0.16	0.10	1					
6. Intention to terminate relationship	3.75	1.32	-0.02	-0.27	-0.26	0.45	0.05	0.91				
7. PCV	6.28	1.10	0.05	-0.11	-0.21	0.28	0.07	0.39	0.97			
8. Perceived privacy breach	3.74	1.32	0.01	-0.08	-0.37	0.24	0.13	0.22	0.51	n.a.		
9. Tenure	2.71	1.03	0.13	-0.14	0.04	0.07	0.08	0.07	0.04	0.06	1	
10. Trust	4.05	1.40	0.07	0.18	0.56	-0.46	-0.09	-0.48	-0.41	-0.48	-0.04	0.90

Common Method Variance Analysis

Common method variance (CMV) is a common concern in survey-based research. We used two methods to assess the degree of CMV present in our study. First, we followed the guidelines provided by Podsakoff, MacKenzie, Lee,

and Podsakoff [2003] and performed the Harman single-factor test. This was done using exploratory factor analysis (principal components analysis) using SPSS 20. The highest variance explained by one factor was 22 percent, and all eight components were present. Since more than one factor emerged from the analysis and no one factor explained the majority of variance, we can conclude that common method variance is not a serious concern in our study. Second, we examined the potential impact of common method bias using the procedure suggested by Podsakoff and Organ [1986]. We added a control predictor variable to the PLS model, which was indicated by the items that loaded on the first factor in our principal component analysis. This control factor is assumed to approximate common method variance [Podsakoff and Organ, 1986]. The control factor did not produce a significant change in variance explained in any of the dependent variables, providing further evidence that common method bias does not present a significant problem in the current study.

Structural Model

The hypotheses were assessed using PLS structural modeling. R^2 values of the dependent variables reflect the predictive value of the model, and standardized path coefficients indicate the strength of the relationship between the independent and the dependent variables [Chin, 1998]. We used a bootstrapping resampling procedure to estimate the significance of paths in the structural model. The results are summarized in Figure 2.

Perceived privacy breach has a significant impact on trust ($\beta = -0.36, p < 0.001$), commitment ($\beta = -0.22, p < 0.01$), and cynicism ($\beta = 0.15, p < 0.05$). *Perceived privacy breach* has a positive impact on *psychological contract violation* ($\beta = 0.51, p < 0.001, R^2 = 0.26$). *Psychological contract violation* partially mediates the impact of *perceived privacy breach* on trust ($\beta = -0.23, p < 0.001$), commitment ($\beta = -0.14, p < 0.05$), and cynicism ($\beta = 0.22, p < 0.001$). The perception of a privacy breach in combination with the experience of a psychological contract violation explains 21 percent of variance in trust, 10 percent of variance in commitment, and 10 percent of variance in cynicism. Trust ($\beta = -0.36, p < 0.001$), commitment ($\beta = -0.30, p < 0.001$), and cynicism ($\beta = 0.28, p < 0.001$) are also significant predictors of intention to terminate relationship. Contrary to our hypothesis, perceived availability of alternatives is negatively related to intention to terminate relationship ($\beta = -0.29, p < 0.05$). Long-term service contracts reduce intention to terminate relationship among mobile service customers ($\beta = -0.09, p < 0.05$). The combination of the attitudinal and contextual factors predicts 47 percent of variance in intention to terminate relationship. Among the covariates of intention to terminate relationship, only education showed a statistically significant relationship ($\beta = -0.13, p < 0.01$). In sum, all of our hypotheses except H9 were supported by our data. The findings are summarized in Figure 2.

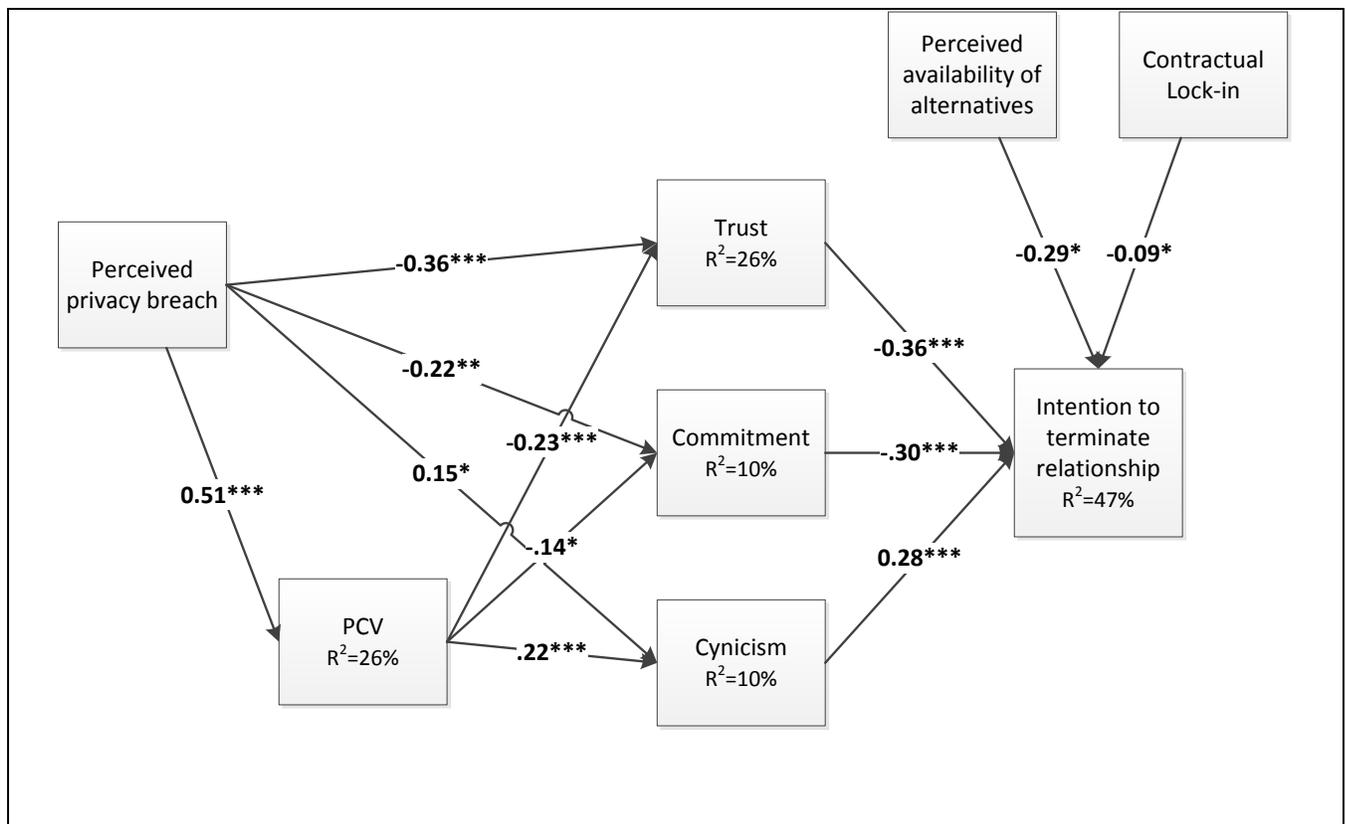


Figure 2. Structural Model Analysis

IV. DISCUSSION

The focus of the current study is to gain insight on how a perceived privacy breach affects technology users' attitudes and behavioral intentions. Our research framework is grounded in psychological contract theory which posits that all exchange relationships are accompanied by expectancies which form a psychological contract [Rousseau, 2004]. We conceptualize privacy expectancies as a core domain of psychological contracts associated with disclosure of private information. A psychological contract breach triggers the affective experience of psychological contract violation, characterized by feelings of anger, betrayal, and indignation. The psychological contract violation partially mediates the attitudinal and behavioral adjustments that follow perceptions of breach [Robinson and Wolfe Morrison, 2000]. In examining the behavioral outcomes associated with perceived privacy breach we focus on intention to terminate relationship because it represents the most serious threat to ongoing relationships.

We evaluated the research framework by exposing smartphone users to a vignette that describes the Carrier IQ software, which was recently discovered to have been used by mobile carriers to collect information about smartphone users without their knowledge. We evaluated the impact of information suggesting that a breach of privacy may have occurred by examining smartphone user attitudes and behavioral intentions in a cross-sectional survey. We also examined the effects of perceived availability of alternatives and contractual lock-ins on intention to terminate relationship. The results largely support the proposed research model. We found that perceived privacy breach has a negative impact on trust and commitment, while it is positively related to cynicism felt toward the mobile carrier. Trust, commitment, and cynicism in combination with contextual factors explain 47 percent of variance in intention to terminate relationship indicating that these attitudes are critical predictors of users' intentions to terminate their relationships with mobile carriers. Contrary to our hypothesis that perceived availability of alternatives is positively related to intention to terminate relationship, our data analysis indicated a significant negative relationship between the two variables. This finding may reflect the "paradox of choice" phenomenon which suggests that presenting too many options to consumers makes making the decision difficult and, therefore, may reduce the chances of a successful transaction [Schwartz, 2005]. In other words, when consumers feel overwhelmed by too many options, they will likely choose to stay with their current mobile service provider to avoid the difficulty associated with choosing an alternative provider, irrespective of the type of contract which they have. It is worth noting that while the number of mobile service providers is relatively small, the choice between available devices and plans can be daunting [Domanico, 2012].

Our study makes a number of contributions to theory and practice. Much of prior research in information systems on privacy focused on general privacy concerns as the focal construct [Dinev and Hart, 2006b; Malhotra and Kim, 2004; Smith et al., 1996]. For example, privacy concerns play an important role in influencing online shopping [Van Slyke, Shim, Johnson, and Jiang, 2006], adoption of personalization technologies [Sheng et al., 2008], and disclosure of personal information through instant messaging [Lowry, Cao, and Everard, 2011]. Prior research also had examined how privacy-related industry self-regulation and company privacy policy influence perceptions of privacy risks [Xu, Dinev, Smith, and Hart, 2011]. In contrast, we draw attention to user *perceptions* of a privacy breach. While privacy-related concerns are critical at the initiation of information disclosure, perceptions of privacy breaches are critically relevant to the sustainability of exchange relationships that involve disclosure of private information. Our results have shown that as we try to understand what happens in an ongoing relationship between a technology user and the technology provider, it is important to consider the impact of perceived psychological contract breaches. We have shown how one such type of perceived breach, that of a privacy breach, can significantly increase a user's intention to sever that relationship. We see this as only the beginning in a stream of research that can examine the impact of other types of perceived contract breaches in different IT-related contexts.

Further contributing to this proposed stream of research, we have developed and tested a nomological framework that relates the impact of perceived privacy breach to attitudinal and behavioral adjustments by the users. The framework provides the theoretical foundation for examining perceived privacy breaches across different contexts that feature technology-mediated private information disclosure. For example, social networking sites are critically dependent on private information sharing by the social networking site users [Joinson, Reips, Buchanan, and Schofield, 2010]. Also, electronic medical record management systems represent another important context where disclosure of private information carries significant risks, and perceived privacy breach would likely have significant detrimental impact on sustained technology use [Angst and Agarwal, 2009].

Our third contribution to theory is the evaluation of parallel and independent effects of positive and negative affect on users' behavioral intentions. While psychologists have long recognized that positive and negative affect have independent effects on user behavior [Diener and Emmons, 1984], few studies in information systems have examined the parallel effects of positive and negative attitudes [Komiak and Benbasat, 2008]. Trust and cynicism represent two related but independent attitudes. We examine the effects of psychological contract violations on both and find that both are affected by the perceptions of psychological contract breach and the affective experience of

psychological contract violation. Further, both trust and cynicism have parallel countervailing effects on intention to terminate relationship. Trust has been an important topic in information systems research, though cynicism has received little attention. Our findings support prior observations that trust and distrust attitudes have independent effects [Komiak and Benbasat, 2008].

Our study also contributes to practice by highlighting the critical role of privacy expectancies for users employing technology for information sharing. Pervasive computing exemplified by mobile technologies is becoming more deeply integrated into everyday life. Industry statistics show that there were 324 million active mobile devices in the United States (102 percent of total population) and more than 35 percent of U.S. households do not have landlines, but rely exclusively on wireless phones [CTIA, 2012]. Our study draws attention to the critical role of privacy expectancies in assuring sustained consumer patronage for technology providers. Consumers increasingly rely on technology to exchange private information that spans personal communications, online banking transactions, and electronic medical records. Consumers' expectancy of privacy in these contexts is inherent to continued reliance on technology to share private information. Perceived breaches of privacy undermine trust and commitment, which are core attitudes predictive of sustained technology use. In other words, providers' failure to assure privacy can quickly erode trust in the technology and force consumers to find alternatives that preserve privacy. More importantly, our findings suggest that financial lock-ins may have a very limited effect on preventing switching intentions.

One limitation of the present study stems from the use of the survey methodology. Cross-sectional surveys rely on self-report measures that are subject to common-method bias. We examined common method bias in our study and we did not find significant indicators of common method variance. A further limitation of the present study is that it examines the proposed model in a single context among Americans, thus limiting our ability to generalize our findings. A third limitation concerns prior knowledge of the Carrier IQ incident by some of our subjects. We did not ask the subjects about their prior knowledge because we wanted to replicate a scenario in which a person may learn of information suggesting that a privacy infringement may have taken place from the general media. Therefore, we did not want to alert the participants to the topic of the study prior to the exposure. These limitations point to opportunities for further research. Experimental studies that explore the impact of perceived privacy breach or other perceived contract breaches across different contexts and among a more diverse group of participants can help evaluate the generalizability of the proposed model and uncover boundary conditions.

V. CONCLUSION

As technological advancements make the collection and possible misuse of private information more common, understanding the role of perceptions of privacy breaches becomes essential. Perceived breaches of privacy can erode the users' trust in the technology provider and can jeopardize sustained technology use. Our study offers a novel theoretical perspective for privacy research and a nomological network which will help gain insight on how perceptions of privacy breach may affect ongoing exchange relationships, such as those between mobile phone users and their carriers.

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Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the article on the Web, can gain direct access to these linked references. Readers are warned, however, that:

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APPENDIX A: CARRIER IQ VIGNETTE

CIQ is a hidden app that can be installed by mobile carriers. It always runs in the background on your smartphone.

What the app does:

- It logs every keystroke on your phone (numbers dialed, messages, search queries, etc.).
- It tracks your location.
- It intercepts your text messages.
- It intercepts secure communications through the Web browser on your phone.
- It sends all information to the company servers.
- It is unclear how the information is used.
- There is no notification that the application is installed.
- There is no way to quit the application.
- There is no way to remove the application.

How would you feel if you found out that the app is installed on your phone?

APPENDIX B: SURVEY INSTRUMENT

Perceived Privacy Breach

If the CIQ app was installed on your phone, please indicate to what extent you feel your mobile carrier would fulfill its obligations in relation to each of the following.

PrivBr1	Your mobile carrier should provide notice of what information the company collects about you.
PrivBr2	Your mobile carrier should not use any personal information for any unintended purpose.
PrivBr3	Information that you share on your phone should not be shared with any unauthorized third party.
PrivBr4	Information that you share on your phone should not be sold to any third party without your permission.
PrivBr5	Your mobile carrier should provide a mechanism to address any privacy-related questions and/or concerns.

The scale is modeled after the measure of psychological contract breach in Turnley and Feldman [1999]. Responses are measured using 5-point semantic differential scale anchored in -2 – carrier does much less than expected and 2 – carrier does much more than expected. The responses are reverse coded to measure psychological contract breach [Turnley and Feldman, 1999b].

Psychological Contract Violation [Robinson and Wolfe Morrison, 2000]

PCV1	I would feel a great deal of anger towards my mobile carrier.
PCV2	I would feel betrayed by my mobile carrier.
PCV3	I would feel extremely frustrated by how I am treated by my mobile carrier.

7-point Likert scale anchored in 1—strongly disagree, 7—strongly agree.

Trust [Robinson and Rousseau, 1994]

Trust1	My mobile phone service provider is open and upfront with me.
Trust2	I believe my mobile phone service provider has high integrity.
Trust3	In general I believe my mobile phone service provider's motives and intentions are good.

7-point Likert scale anchored in 1—strongly disagree, 7—strongly agree.

Exchange Commitment [Allen and Meyer, 1990]

ExchCom1	I would be hard for me to leave my mobile phone service provider.
ExchCom2	Too much of my life would be disrupted if I decided to leave my mobile phone service provider.
ExchCom3	I would be costly for me to leave my mobile service provider.

7-point Likert scale anchored in 1—strongly disagree, 7—strongly agree.

Cynicism [Stanley et al., 2005]

Cynic1	How likely are you to use cynical humor in relation to your mobile phone service provider?
Cynic2	How likely are you to talk to your friends about provider's incompetence?

7-point Likert scale anchored in 1—strongly disagree, 7—strongly agree.

Exit [Turnley and Feldman, 1999]

Exit1	I have frequent thoughts of leaving my phone service provider.
Exit2	I frequently think of cancelling my service contract.
Exit3	I would switch to an alternative mobile service provider if there was one.

7-point Likert scale anchored in 1—strongly disagree, 7—strongly agree.

ABOUT THE AUTHORS

Stanislav Mamonov is a doctoral candidate at the Zicklin School of Business, Baruch College, City University of New York. His research focuses on factors which affect the sustainability of information exchanges across different contexts which include social networking sites, mobile applications, and health management systems. He is also a serial entrepreneur and the founder and CEO of MintFinder, a B2B Big Data analytics platform which performs real-time clickstream analysis and translates behavioral insights into personalized product recommendations. His research has been published in the proceedings of the *Americas Conference on Information Systems* and the *Hawaii International Conference on System Sciences*.

Marios Koufaris is an Associate Professor in Computer Information Systems at the Zicklin School of Business of Baruch College, City University of New York. He received a Ph.D. in Information Systems from the Stern School of Business of New York University, as well as a B.Sc. in Decision Sciences from the Wharton School of Business and a B.A. in Psychology from the College of Arts and Sciences, both at the University of Pennsylvania. His research interests include consumer behavior in Web-based commerce, end-user behavior, and the social impact of IT. His work has been published in *Information Systems Research*, *MIS Quarterly*, *Journal of Management Information Systems*, *International Journal of Electronic Commerce*, *Information & Management*, *DATA BASE for Information Systems*, and *Communications of the ACM*.

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