

Which Message Matters: Implications of Construal Level Theory for Improving Information Security Message Persuasiveness

Early Research Paper

Feng Xu

Mississippi State University
Department of Management & Information Systems,
P.O. Box 9581, Mississippi State, MS 39762-9581,
United States
fx25@msstate.edu

Jianli Xie

Xi'an Jiaotong University
Department of Information Management,
No. 28 xianning West Road, Xi'an, Shaanxi,
710049, China
18392023739@163.com

Wei (Wayne) Huang

Southern University of Science and Technology
College of Business, No. 1088 Xueyuan Avenue,
Shenzhen, Guangdong, 518055, China;
Xi'an Jiaotong University
Department of Information Management,
No. 28 xianning West Road, Xi'an, Shaanxi,
710049, China
waynehw21st@gmail.com

Merrill Warkentin

Mississippi State University
Department of Management & Information Systems,
P.O. Box 9581, Mississippi State, MS 39762-9581,
United States
m.warkentin@msstate.edu

Abstract: A critical component of managing organizational information security is the design of effective information security messages to motivate individuals' engagement in protective security behavior. Previous research has emphasized the role of the general level of threat (*low vs. high*) in eliciting individuals' desired security behavior. Although a few studies have investigated the effects of specific dimensions of security message manipulations, such as gain versus loss-framed messages, the effects of specific message components are inconclusive. Construal level theory (CLT) offers insight into matching the different construal levels between message features and recipients' features that can enhance persuasive communication effectiveness. Based on CLT, this paper investigates the interactive effects of security messages' construal level (*abstract "why" vs. concrete "how"*), message framing (*gain vs. loss*), and individuals' coping styles (*emotion-focused coping vs. problem-focused coping*) on individuals' protection motivation. We posit that the effect of this matching on individual protection motivation is mediated by distinct types of efficacy: security self-efficacy and security response efficacy. Three experiments will be conducted to elucidate which specific security message has the strongest persuasiveness and identify the underlying mechanism. Our work makes a significant contribution to the IS security field by integrating construal level theory into information security message design.

Keywords: Construal level theory (CLT), message framing, coping styles, security response efficacy, security self-efficacy

1. Introduction

Information security breaches become pervasive with the increased prevalence of information technology (IT) (Lee et al., 2019; Liang et al., 2019; Moody et al., 2018). It is necessary to motivate individuals to engage in protective security behaviors (Johnston et al., 2019). Using a persuasive security message is a common way to motivate individuals to secure their information assets (Johnston et al., 2019; Johnston et al., 2015; Puhakainen & Siponen, 2010; Wall & Warkentin, 2019). Increasing the effectiveness of information security message persuasiveness is one of the keys to achieving desirable information security outcomes (Johnston et al., 2019; Johnston et al., 2015; Wall & Warkentin, 2019). Therefore, it is essential to understand how to design effective security messages to motivate individuals' engagement in protective security behaviors (Johnston et al., 2019; Wall & Warkentin, 2019).

Most of the previous research has adopted fear appeal theories (i.e., PMT, FAM) or elaboration likelihood model (ELM) to investigate the effect of security messages on individuals' protective motivation and has focused on the levels of threat when designing an information security message. These earlier studies elucidated threat and coping appraisal as drivers of individuals' adoption of recommended security solution (Anderson & Agarwal, 2010; Barlow et al., 2013; Boss et al., 2015; Johnston & Warkentin, 2010; Johnston et al., 2019; Johnston et al., 2015; Moody et al., 2018; Wall & Warkentin, 2019; Willison et al., 2018). However, these studies ignored the importance of specific security message features on individual responses to secure communication.

As one of the common means to enhance the effectiveness of persuasive communication, message framing is widely used to encourage individuals' positive attitudes towards recommended behavior and promote related behavior (Van't Riet et al., 2010; White et al., 2011). Several studies in the information security area investigated the effects of security messages framing (gain versus loss) on individuals' security-related behavior (Anderson & Agarwal, 2010; Angst & Agarwal, 2009; Barlow et al., 2013) but found inconclusive results. An explanation for the inconclusive results may be that "some message components do not perform uniformly better than others, but that they only do so under certain conditions, i.e., when paired with different message components" (Lee, 2018, p. 323). Furthermore, previous research showed that security message would be more motivational when aligning with individuals' features (Johnston et al., 2019). Construal level theory provides a holistic insight for explaining the matching effect across different message features and individuals' features. Message framing, such as goal frame (i.e., gain vs. loss) and individuals' attitudes and behaviors, such as coping styles (i.e., emotion-focused coping vs. problem-focused coping), can align with different construal levels (high vs. low). We argue that matching the construal level with security message design and individuals' threat coping styles can further enhance secure communication's effectiveness.

Drawing upon CLT, our study aims to examine the matching effects among construal level (abstract "why" vs. concrete "how"), message framing (gain vs. loss), and individuals' coping styles (emotion-focused coping vs. problem-focused coping) on individual protection motivation. According to CLT, messages emphasizing the value of one's behavior (i.e., why) reflect the high construal level, whereas messages emphasizing the ways to reach the final behavior (i.e., how) reflect the low construal level (Trope & Liberman, 2010). Previous research shows that security messages are more persuasive when different message components' construal level is matched. Research in psychology and marketing indicates that message frame and recipient coping style can align with construal level (Han et al., 2016; Lee et al., 2010; Pounders et al., 2015; White et al., 2011). Therefore, match among message frame, construal level, and recipient coping style can enhance individuals' protective motivation. Previous research suggested that gain-framed message may broaden and abstract individuals' mine-set (high construal) because the attainment of desirable results requires a wide-ranging mental process and loss-framed message may activate a narrow-concrete mental process (low construal) because the potential loss or threat needs a detailed and focused mine-set (White et al., 2011). In addition, coping theory shows that individuals adopt two coping styles when facing a threat: emotion-focused coping (EFC) and problem-focused coping (PFC) (Lazarus & Folkman, 1984; Liang et al., 2019). Individuals using problem-focused coping tend to conduct specific detailed measures to solve a problem, but individuals with emotion-focused coping may employ an abstract high construal mine-set and focus on desirable outcomes (Han et al., 2016). Thus, we propose that a match among construal level, message framing, and individuals' coping styles will lead to more persuasive effects and improved outcomes. Specifically, we argue that a match of high (vs. low) construal level with gain (vs. loss) frame and emotion-focused coping (vs. problem-focused coping) leads to more persuasion. Our research will also examine the mechanism underlying the matching effect by identifying two types of efficacy

(security self-efficacy & security response efficacy).

Our research makes several contributions to the information security field. First, anchoring security message framing on construal level, our research provides insight into the security message framing effect on persuasiveness by identifying the role of mental construal level embraced by the individual, and elucidate when loss vs. gain-framed messages are most effective. Second, we estimate the effect of a match between security message framing, construal level, and individuals' coping styles (EFC & PFC). By taking both EFC and PFC into account, our research offers a more complete and encompassing way to design a security message. Third, applying CLT to the context of information security, along with identifying the fit among message construal level, message framing, and individuals' coping styles, are novel perspectives on construal fit. Fourth, self-efficacy and response efficacy are identified as mediators to the matching effect on individuals' protective motivation. This research integrates message construal level, message framing, and individual coping styles to enhance the understanding of information security message effectiveness.

2. Literature review and theoretical foundation

2.1 Previous research about the effect of persuasive security message on protection motivation

Most previous information security research applies protective motivation theory (PMT) and deterrence theory to design information security messages and persuade individuals to adopt the recommended security solution. For example, Johnston and Warkentin (2010) proposed that fear appeals affect individuals' compliance intention with information security policy and found that social influence, self-efficacy, and response efficacy have significant positive effects on compliance intention. Based on the deterrence theory, Johnston et al. (2015) added punitive threats into PMT and proposed an enhanced research model (fear appeal model; FAM) to explain the individuals' compliance intentions. Results show that a fear appeal contains sanctioning diction can enhance individuals' compliance intention. Boss et al. (2015) manipulated the fear appeal and found that the strong fear appeal enhances the individuals' protective intention through activating individuals' perceived threat vulnerability and perceived threat severity. Wall and Warkentin (2019) combined PMT & FAM with ELM and found that perceived security communication quality increases individuals' threat and coping appraisal and protective behavioral intention. Johnston et al. (2019) showed that information security message design aligned with the recipient's organizational identification could enhance fear appeal effectiveness.

Although previous research has made substantial advances in enhancing security message persuasiveness, most previous research on security message design has focused on manipulating the threat level. A few studies focus on how specific message manipulations influence individuals' protective security behavior but have produced equivocal results. For example, Angst and Agarwal (2009) introduced the message recipient's issue involvement in information security message design. They empirically demonstrated that the interactive effect of the gain frame and issue involvement would generate more favorable attitudes towards adopting electronic health records. Anderson and Agarwal (2010) found that security messages which match messages' goal frame and individuals' self-view (independent self-view and gain-frame; interdependent self-view and loss-frame) do not influence attitude toward performing security-related behavior. Barlow et al. (2013) found that neither positive nor negative message frames significantly affect individuals' security behaviors.

Thus, to deeply understand the effectiveness of security message design, there is a need to consider the interactive effect of different message features and individual features based on a theoretical framework. Orazi et al. (2019) proposed a conceptual framework using CLT to design fear appeals and emphasizes the matching effect of construal levels of negative consequences and coping response on threat and coping appraisal. However, it is still unclear how to match the construal level with specific message design, such as gain versus loss, individuals coping styles, and the underlying mechanism of matching effects on individuals' protective behavior.

2.2 Construal level theory and application in security message design

2.2.1 Construal level theory

Construal level theory describes the relationship between individuals' psychological distance and construal level of objects. Psychological distance is used to describe the perception of objects that are distant or close to self, here, and now. Construal level refers to the mental representation about objects, which divides mental construal into two levels: high-level and low-level. The high construal level reflects the abstract representation of an object and is related to desirability in decision making, while the low construal level represents the

concreteness of an object and is related to feasibility in decision making. The desirability aspects of an object or event focus on the result, while feasibility puts more importance on getting the result. (Trope et al., 2007). For example, an action which focuses on why or the value of this action emphasizes the desirability (more abstract). Thus it can be constructed at high construal level. An action that emphasizes how to puts more attention to concrete ways, thus it can be constructed at low construal level. Individuals' mental construal of the objects influence individuals' prediction, preference, and action to objects (Trope & Liberman, 2010). The general idea is that individuals will be more likely to think abstractly when the object is distant from the individuals. In contrast, if the object is close, individuals will be more likely to think concretely.

CLT is widely used in marketing, healthcare area to design persuasive messages. For example, Han et al. (2016) match the coping styles and construal level to design the health message, and they found that paired the PFC (vs. EFC) with a low (vs. high) construal level increased persuasion. Pounders et al. (2015) found three-way interaction across goal frame (gain/loss), self-view (independent/interdependent), temporal frames (distant/proximal) when they design health messages. White et al. (2011) design the message to encourage individual recycling intention and behavior through match message framing and construal level. Furthermore, they demonstrated that the match effect on persuasion was moderated by the message framing (gain/loss).

2.2.2 Message framing and construal level

Prospect theory (Kahneman & Tversky, 1979) proposed that individuals' behavior or evaluation was influenced by the message framing effect. Message framing has been widely used in message design to persuade individuals to adopt the recommended behavior, especially in healthcare communication (Pounders et al., 2015; Van't Riet et al., 2010; Van't Riet et al., 2008; White et al., 2011). The message could be designed to emphasize the positive aspects of acting (gain frame) or the negative aspects of the action are not undertaken (loss frame) (White et al., 2011). Based on prospect theory, most studies examine the gain- and loss- framed messages on individuals' decision and yield variations in findings in different fields.

Previous IS security research also framed security message as a gain or loss. For example, Anderson and Agarwal (2010) framed security messages which focus on the benefits of taking security precautions as promotion-focused and framed security messages which stress the negative effect of not performing security precautions as prevention-focused. Barlow et al. (2013) designed negative and positive security communication related to neutralization. However, previous research on goal framing effect found that either a negative-framed message is persuasive or both are not effective (Anderson & Agarwal, 2010; Angst & Agarwal, 2009; Barlow et al., 2013). Research in the marketing and health communication area has shown that message frames (gain vs. loss) aligned with construal levels (high vs. low) perform better. For example, White et al. (2011) demonstrated that the paired message frame (gain/loss) with the construal level (high/low) increased individuals' recycling behavior. CLT might provide a theoretical framework for explaining the matching effect between security message frame and message construal level on the persuasiveness of security message.

CLT can also predict the interaction between the framing of messages and individuals' features. Lee et al. (2010) demonstrated that the match of the regulatory focus (promotion/prevention) with construal level could enhance the processing fluency and engagement, which in turn influence an individual's brand attitude. Anderson and Agarwal (2010) found that subjects primed with an independent self-view indicate higher perception of the descriptive norm when they received a promotion-focused goal frame. Previous research suggested that it is important to take the role of individual features into account when designing an effective security message.

2.2.3 Individuals' coping styles and construal level

The aim of performing security behaviors is to reduce IT security risks. Thus, understanding how individuals cope with IT security threats is important for security message design. There are two important individuals' coping styles, emotion-focused coping (EFC) and problem-focused coping (PFC) (Lazarus & Folkman, 1984; Liang et al., 2019). Individuals primed with EFC tend to adopt styles to manage their emotional response, such as letting the negative emotion out, seeking emotional support, or fantasizing that the IT threat would go away by itself. PFC deals with the stress caused by the IT threat directly. Individuals primed with PFC are trying to find a way to eliminate the IT threat (Liang et al., 2019).

As shown in Table A1 (Appendix A), most of the previous security message design research is based on protection motivation theory or deterrence theory, concentrating on problem-focused coping style when facing a threat (Liang et al., 2019). These studies primarily manipulate security messages in feasibility, such as tips and

actions on how to avoid negative consequences (low construal). However, individuals may also adopt EFC when facing IT security threats, but EFC has been largely ignored when designing a security message (Liang et al., 2019). Individuals who employ EFC focus more on the desirability and why one should perform certain actions (high construal). Considering individuals' coping styles into security message design can enhance understanding of how to improve security message persuasiveness. Previous research found that individuals adopt EFC tend to be persuaded by messages which emphasize the desirability (high construal), while those adopt PFC tend to be persuaded by messages which focus on feasibility (low construal) (Han et al. 2016).

Therefore, CLT offers us a holistic perspective to design a security message. As illustrated in Figure 1, the way to design an effective security message has two components: match the message frame with the message construal level to improve the effectiveness of security message, and align the individuals' coping styles with security message to motivate individuals to take actions to protect organizational information assets. In the next chapter, we will adopt CLT to identify the interactive effect of the construal level of security message, security message frame, and individuals' coping styles on their protective security behaviors and identify the underline mechanism of the persuasive process.

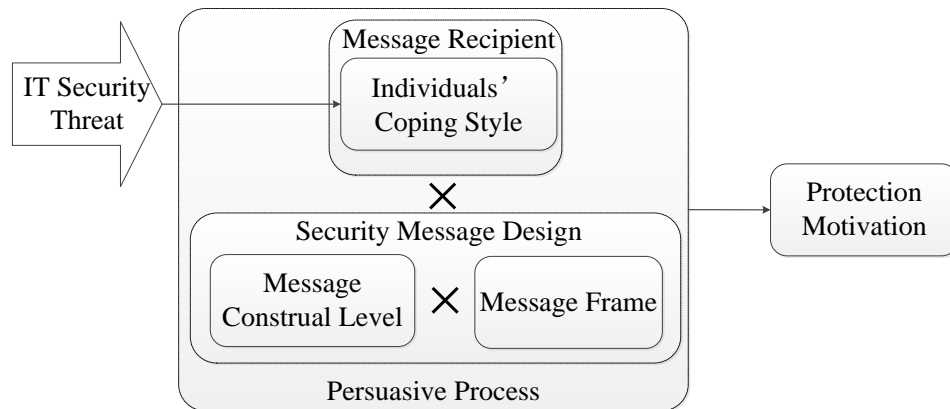


Figure 1. The Framework of Security Message Design

3. Research model and hypotheses development

3.1 Security message frame & construal level

Grounded on CLT, we posit that the effect of message framing on individual protection motivation will be more effective when the recommended protective behavior is considered at different construal levels. In this study, message framing focuses on the gain frame (i.e., the benefits of taking the recommended protective behavior) and the loss frame (the negative consequences of not taking recommended protective behavior). A low construal level refers to concrete features, such as specific protective actions and tips about how to do it. A high construal level is related to general and decontextualized features, such as for purposes about why they do it. Specially, we propose that the security message framed as the loss will be more persuasive when aligned with the low-level concrete actions, whereas the security message framed as gain will be more persuasive when aligned with the high-level purposes.

Loss-framed messages emphasize the negative consequences of not taking recommended protective behavior. Negative consequences convey signals that there is a threat or problem that needs to be deal with (Baumeister et al., 2001; Van'T Riet et al., 2008). The loss-framed message will trigger individuals' narrow and focused mine-set and lead to mobilization towards action (White et al., 2011). The low-level construal emphasizes the specific actions individuals can take to mitigate threats. As such, a loss-framed message which activates a detailed concrete mine-set will be more persuasive when aligning with low construal level on concrete "how." The gain-framed message highlights the positive outcome of preforming a recommend protective behavior. Individuals pay attention to desirable outcomes that lead to individuals' abstract and higher-level thinking. The high-level construal highlights the purposes of why the recommended protective behavior should be performed and activate a similar mode of thinking. Thus, matching gain-framed messages, which trigger a broad and abstract mine-set, with a high construal level on abstract "why" should lead to more individual protective motivation.

Previous research also showed that the match effect between message framing and construal level influences the outcomes—for example, Lee et al. (2010) examined that the experience construal fit from individuals' regulatory orientation (i.e., promotion & prevention) and construal level (i.e., high construal & low construal) induced engagement and more favorable attitude towards brand than non-fit. White et al. (2011) put forward their mindset would moderate the effects of message framing on individuals' recycling behavior. That is, the loss-frame would be more persuasive when matching a mindset prime with a low construal level, whereas the gain-frame would be more persuasive when matching a mindset prime with a high construal level. As such, we propose that a paired security message frame with the construal level would increase individuals' security protection motivation.

H1: A loss (vs. gain) framed security message will lead to higher protection motivation when combined with a concrete “how” (vs. abstract “why”) construal.

3.2 Matching the security message with individuals' coping styles

We proposed that the message frame paired with the construal level would be more persuasive based on CLT. However, both message frame (gain versus loss) and construal level (concrete how versus abstract why) focus on the security message design and aim to increase the matching effects of different message components. Our study explores the effectiveness of security messages in increasing individual protection motivation. Thus, individuals' coping styles, such as EFC and PFC, determines which matched framed security message would be more effective.

Construal level and individuals' coping styles

Individuals who employ PFC tend to take specific and detailed actions to address threats (Lazarus & Folkman, 1984). For example, individuals who adopt PFC are likely to take specific safeguarding to counter the IT threat (Liang et al., 2019). Focusing on detailed and concrete actions is consistent with the low construal level (Han et al., 2016). Individuals who engage in EFC tend to avoid negative emotions regarding the negative consequences of the information security threat (Liang et al., 2019). For example, individuals may let themselves stop thinking about the unpleasant consequence of threat/stress or denying the reality of the unpleasant consequence. Individuals who adopt EFC distance them from IT threats and focus on the desirable outcome, consistent with the high construal level. The coping styles cast at different construal levels has been demonstrated in previous research. Han et al. (2016) theoretically and empirically demonstrated that individuals primed to employ EFC would construe actions at a high (abstract) level, while individuals primed to employ PFC would construe actions at a low (concrete) level.

The matching effect

As mentioned before, the message frame and coping orientation can cast at different construal levels. Previous research had demonstrated that the match of message elements in the same construal level could enhance message persuasiveness. Message frame is effective when matching or aligning with the individual's features (Giorgi, 2017; Keller et al., 2003; Lockwood et al., 2018; Van't Riet et al., 2010). Several studies have shown the relationship between the message frame and coping styles. For instance, Duhachek et al. (2012) demonstrated the framing effect of health messages facilitates different coping styles. Updegraff et al. (2007) proposed that aligning the message frame with individuals' motivation orientation can enhance the effectiveness of health messages.

Lee et al. (2010) investigated the match effect between construal levels and individuals' regulatory focus and found that such a construal fit can induce more positive attitudes about the brand. Pounders et al. (2015) explored a three-way interaction across the message frame (gain vs. loss), construal level (distal temporal vs. proximal temporal), and self-view (independent vs. interdependent). Their results showed that messages to individuals with an independent (vs. interdependent) self-view are more persuasive when aligned with high (vs. low) construal level (i.e., distal temporal vs. proximal temporal), and message frame (gain vs. loss) moderates the interplay between construal level and self-view (Pounders et al., 2015). Thus, we argue that the matching among construal level, security message frame, and individuals' coping styles can increase security message persuasion and lead to more individual protection motivation. Therefore, we posit that:

H2: Individuals who employ emotion-focused coping (vs. problem-focused coping) will have a higher protection motivation when receiving a security message presented at “abstract” (vs. “concrete”) construal level combined with gain (vs. loss) message frame.

3.3 Underlying mechanism of the matching effects

Protection motivation theory has shown that individuals would conduct a coping appraisal after the perceived threat (Boss et al., 2015; Maddux & Rogers, 1983). Previous information security researchers demonstrated that self-efficacy and response efficacy are essential factors of individual protection motivation during the coping appraisal process (Johnston & Warkentin, 2010; Johnston et al., 2015). Self-efficacy, defined as “an individual’s belief regarding his/her ability to perform the proposed actions” (Maddux & Rogers, 1983; Witte, 1994), and response efficacy, defined as “the degree to which an individual expects their response to the recommended actions to be effective” (Maddux & Rogers, 1983; Witte, 1995). We propose that different types of efficacy mediate the matching effect.

Han et al. (2016) suggested that self-efficacy reflects a low level of efficacy, while response efficacy reflects a high level of efficacy. Self-efficacy emphasizes an individual’s belief to conduct a specific behavior, which focuses on the feasibility of behavior. For example, when an individual perceives that he/she can perform the recommended protective behavior (i.e., more feasibility), he/she will likely perform it. A low construal level message delineates concrete actions to protect the organizational information security, making the recommended protective behavior easier for individuals to follow and consequently increase self-efficacy. We have argued that PFC, concrete how, and loss frame can cast on low construal level. Thus, we propose that the match effect (PFC, concrete how, and loss frame) on individual protection motivation is mediated by self-efficacy.

Response efficacy focuses on the effectiveness of security-related behaviors, which emphasizes the desirability of behaviors. For example, if an individual perceives that performing a specific action can secure organizational information asset (i.e., positive consequences), he/she will be more likely to adopt this behavior. A high construal level message centers on abstract and desirable outcomes of recommended protective behavior. Individuals would consider the recommend protective behavior to be effective at bringing about a described outcome and consequently perceive a high response efficacy. We also suggest that EFC, abstract why, and gain frame can cast on high construal level. Thus, we propose that the match effect (EFC, abstract why, and gain frame) on individual protection motivation is mediated by response efficacy. Therefore, we propose that:

H3: Self-efficacy will mediate the match effect among PFC, concrete how, and loss-framed security messages on individual protection motivation.

H4: Response efficacy will mediate the match effect among EFC, abstract why, and gain-framed security messages on individual protection motivation.

The hypotheses and our theoretical model are described in Figure 2.

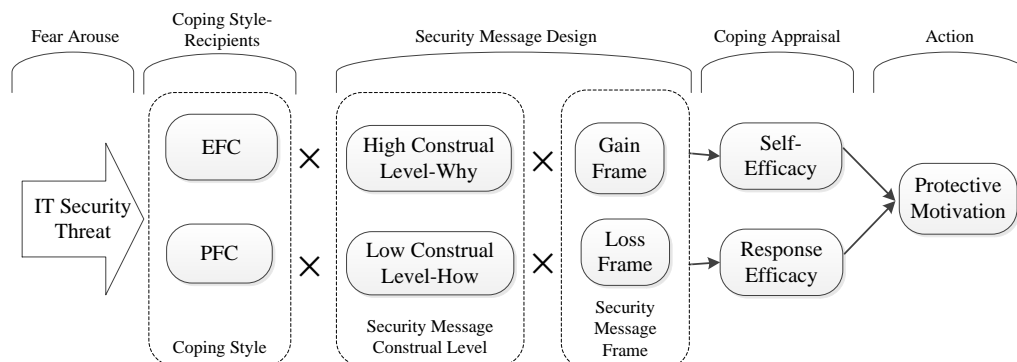


Figure 2. Research Model

4. Research methodology

Three experimental studies will be conducted to examine our hypotheses. Study 1 will examine the matching effect between the security message frame and the construal level on individual protection motivation.

Study 2 will examine the matching effect between the security message (message frame and construal level) and message recipients' coping styles (EFC and PFC). Study 3 will investigate the underlying mechanisms that influence the effect of matching on individual protection motivation. Before conducting the main studies, we will run two pilot studies to examine the critical theorizing between message frame and construal level, and between coping styles and construal level.

Study 1

Study 1 will examine the matching effect between the security message frame and the construal level on individual protection motivation. We predict that individuals presented with low (vs. high) construal (i.e., how vs. why) match a loss (vs. gain) framed security message will improve their protective motivation.

Procedure

A 2 (message construal level: abstract why vs. concrete how) * 2 (message frame: gain vs. loss) between-subjects factorial design will be employed. The data will be collected from Amazon Mechanical Turk. The security message frame and construal level will be manipulated by asking the participants to review material that differentially highlights the gain and loss, and concrete how and abstract why themes.

First, participants will be provided with the background information describing the IT threat in daily life, and then randomly assign them to one of four security campaign messages. The top of those materials shows the appeals advocating security protection, followed by the manipulation of construal level either focus on the value of one recommended security program (i.e., *participating in this security program can mitigate your concerns to IT security threats*) or the concrete actions (i.e., *this security program installs up-to-date anti-malware software to your computer*) (Fujita et al., 2006; Trope & Liberman, 2003; Trope et al., 2007). We manipulate security message frame by either emphasis on the gains of participating in the security program (e.g., *if you participate in this security program, there is only authorized access to your personal information*) or emphasis on the losses of not participating in the security program (e.g., *if you don't participate in this security program, there will be unauthorized access to your personal information*). Moreover, we controlled the volume of message content, the length, and design to eliminate any possible biases.

Then, subjects will be asked to evaluate the security program material on three 7-point likelihood scales

Next, subjects will complete manipulation checks for construal level and message frame. For the frame effect check, subjects will be asked to evaluate the degree to which they think about the gains or losses of this security program material (Duhachek et al., 2012; White et al., 2011). For the construal level check, subjects will be asked to evaluate the degree to which they think about the abstract or concrete of the security program material (White et al., 2011).

Study 2

There are two objectives of Study 2: 1) examine the robustness of matching effect in Study 1 from different samples; 2) examine the interaction effects between security message frame, construal level, and message recipients' coping styles.

Procedure

A 2 (individuals' coping styles: EFC versus PFC) * 2 (construal level: abstract why versus concrete how) * 2 (message frame: gain versus loss) between-subjects factorial design will be employed. Before we conduct the main experiment in Study 2, we will run a pilot study to examine whether the message design in Study 1 could active individuals' different construal levels.

After the pilot study, we will conduct the main experiment. First, participants will be provided a cover story that includes the background information describing the IT threat in daily life and the manipulation of coping styles that individuals often use. Then, participants will be assigned to write down either EFC or PFC and elaborate one specific strategy and try to write about the benefits of this coping strategy in a way that would motivate others to use it. After that, participants will be informed about participating in a security program. All participants will be randomly assigned to review one of the four security program messages. The manipulation of the construal level and message frame of security programs are the same as Study 1.

Then, participants will be asked to rate the security program on four 7-point semantic differential scales (*bad/good, negative/good, against/in favor, and unfavorable/favorable*) (Han et al., 2016). Next, participants

will complete manipulation checks for construal level, message frame, and coping styles.

Study 3

The objectives of study 3 are: 1) examine the robustness of matching effect in Study 2 in different IT contexts; 2) examine the mediation effects of efficacy on the relationship between the matching and individual protection motivation.

Procedure

A 2 (individuals' coping styles: EFC versus PFC) * 2 (construal level: why versus how) * 2 (message frame: gain versus loss) between-subjects factorial design will be employed. The whole procedure of Study 3 is the same as Study 2. In addition, we measure individuals' perceptions of self-efficacy and response efficacy.

5. Expected results

We anticipate the following results.

- (1) Individuals presented with a concrete how (vs. abstract why) message in combination with a loss (vs. gain) framed security message will report higher protection motivation.
- (2) Individuals primed with emotion-focused coping (vs. problem-focused coping) will be more persuaded when receiving an abstract why (vs. concrete how) message in combination with gain (vs. loss) message frame.
- (3) Self-efficacy will mediate the match effect among PFC, concrete how construal level, and loss frame message on individual protection motivation.
- (4) Response efficacy will mediate the match effect among EFC, abstract why construal level, and gain frame message on individual protection motivation.

References

- Anderson, C. L., & Agarwal, R. (2010). Practicing Safe Computing: A Multimedia Empirical Examination of Home Computer User Security Behavioral Intentions. *MIS Quarterly*, 34(3), 613-643.
- Angst, C. M., & Agarwal, R. (2009). Adoption of Electronic Health Records in the Presence of Privacy Concerns: The Elaboration Likelihood Model and Individual Persuasion. *MIS Quarterly*, 33(2), 339-370.
- Barlow, J. B., Warkentin, M., Ormond, D., & Dennis, A. R. (2013). Don't Make Excuses! Discouraging Neutralization to Reduce IT Policy Violation. *Computers & Security*, 39, 145-159.
- Barlow, J. B., Warkentin, M., Ormond, D., & Dennis, A. R. (2018). Don't Even Think About It! The Effects of Antineutralization, Informational, and Normative Communication on Information Security Compliance. *Journal of the Association for Information Systems*, 19(8), 689-715.
- Baumeister, R., Bratslavsky, E., Finkenauer, C., & Vohs, K. (2001). Bad Is Stronger than Good. *Review of General Psychology*, 5(4), 323-370.
- Boss, S. R., Galletta, D. F., Lowry, P. B., Moody, G. D., & Polak, P. (2015). What Do Systems Users Have to Fear? Using Fear Appeals to Engender Threats and Fear That Motivate Protective Security Behaviors. *Mis Quarterly*, 39(4), 837-864.
- Duhachek, A., Agrawal, N., & Han, D. (2012). Guilt Versus Shame: Coping, Fluency, and Framing in the Effectiveness of Responsible Drinking Messages. *Journal of Marketing Research*, 49(6), 928-941.
- Fujita, K., Trope, Y., Liberman, N., & Levin-Sagi, M. (2006). Construal levels and self-control. *Journal of Personality and Social Psychology*, 90(3), 351-367.
- Giorgi, S. (2017). The Mind and Heart of Resonance: The Role of Cognition and Emotions in Frame Effectiveness. *Journal of Management Studies*, 54(5), 711-738.
- Han, D., Duhachek, A., & Agrawal, N. (2016). Coping and Construal Level Matching Drives Health Message Effectiveness via Response Efficacy or Self-Efficacy Enhancement. *Journal of Consumer Research*, 43(3), 429-447.
- Johnston, A. C., & Warkentin, M. (2010). Fear Appeals and Information Security Behaviors: An Empirical Study. *MIS Quarterly*, 34, 549-566.
- Johnston, A. C., Warkentin, M., Dennis, A. R., & Siponen, M. (2019). Speak their Language: Designing Effective Messages to Improve Employees' Information Security Decision Making. *Decision Sciences*, 50(2), 245-284.
- Johnston, A. C., Warkentin, M., & Siponen, M. (2015). An Enhanced Fear Appeal Rhetorical Framework: Leveraging Threats to the Human Asset through Sanctioning Rhetoric. *MIS Quarterly*, 39(1), 113-134.
- Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, 47(2), 263-292.
- Keller, P. A., Lipkus, I. M., & Rimer, B. K. (2003). Affect, Framing, and Persuasion. *Journal of Marketing Research*, 40(1), 54-64.
- Lazarus, R., & Folkman, S. (1984). *Stress, Appraisal, and Coping*. New York: Springer.
- Lee, A. Y., Keller, P. A., & Sternthal, B. (2010). Value from Regulatory Construal Fit: The Persuasive Impact of Fit between Consumer Goals and Message Concreteness. *Journal of Consumer Research*, 36(5), 735-747.
- Lee, J. S., Keil, M., & Shalev, E. (2019). Seeing the Trees or the Forest? The Effect of IT Project Managers' Mental Construal on IT Project Risk Management Activities. *Information Systems Research*, 30(3), 1051-1072.
- Lee, S. J. (2018). The Role of Construal Level in Message Effects Research: A Review and Future Directions. *Communication Theory*, 29(3), 319-338.
- Liang, H., Xue, Y., Pinsonneault, A., & Wu, Y. A. (2019). What Users do Besides Problem-focused Coping When Facing IT Security Threats: An Emotion-focused Coping Perspective. *MIS Quarterly*, 43(2), 373-394.
- Lockwood, C., Giorgi, S., & Glynn, M. A. (2018). "How to Do Things With Words": Mechanisms Bridging Language and Action in Management Research. *Journal of Management*, 45(1), 7-34.
- Maddux, J., & Rogers, R. (1983). Protection Motivation and Self-Efficacy: A Revised Theory of Fear Appeals and Attitude Change. *Journal of Experimental Social Psychology*, 19, 469-479.
- Moody, G. D., Siponen, M., & Pahlila, S. (2018). Toward a Unified Model of Information Security Policy Compliance. *MIS Quarterly*, 42(1), 285-312.
- Orazi, D., Warkentin, M., & Johnston, A. (2019). Integrating Construal Level Theory in the design of fear appeals in IS security research. *Communications of the Association for Information Systems*, forthcoming.
- Pounders, K. R., Lee, S., & Mackert, M. (2015). Matching Temporal Frame, Self-View, and Message Frame Valence: Improving Persuasiveness in Health Communications. *Journal of Advertising*, 44(4), 388-402.
- Puhakainen, P., & Siponen, M. (2010). Improving Employees' Compliance through Information Systems Security Training: An Action Research Study. *MIS Quarterly*, 34(4), 757-778.

- Trope, Y., & Liberman, N. (2003). Temporal Construal. *Psychological Review*, 110(3), 403-421.
- Trope, Y., & Liberman, N. (2010). Construal-Level Theory of Psychological Distance. *Psychological Review*, 117(2), 440-463.
- Trope, Y., Liberman, N., & Wakslak, C. (2007). Construal Levels and Psychological Distance: Effects on Representation, Prediction, Evaluation, and Behavior. *Journal of Consumer Psychology*, 17(2), 83-95.
- Updegraff, J. A., Sherman, D. K., Luyster, F. S., & Mann, T. L. (2007). The Effects of Message Quality and Congruency on Perceptions of Tailored Health Communications. *Journal of Experimental Social Psychology*, 43(2), 249-257.
- Vallacher, R. R., & Wegner, D. M. (1989). Levels of Personal Agency: Individual Variation in Action Identification. *Journal of Personality and Social Psychology*, 57(4), 660-671.
- Van't Riet, J., Ruiter, R. A. C., Werrij, M. Q., Candel, M. J. J. M., & De Vries, H. (2010). Distinct Pathways to Persuasion: The Role of Affect in Message-framing Effects. *European Journal of Social Psychology*, 40(7), 1261-1276.
- Van't Riet, J., Ruiter, R. A. C., Werrij, M. Q., & De Vries, H. (2008). The Influence of Self-efficacy on the Effects of Framed Health Messages. *European Journal of Social Psychology*, 38(5), 800-809.
- Wall, J. D., & Warkentin, M. (2019). Perceived Argument Quality's Effect on Threat and Coping Appraisals in Fear Appeals: An Experiment and Exploration of Realism Check Heuristics. *Information & Management*, 56(8), 103-157.
- White, K., Macdonnell, R., & Dahl, D. W. (2011). It's the Mind-Set that Matters: The Role of Construal Level and Message Framing in Influencing Consumer Efficacy and Conservation Behaviors. *Journal of Marketing Research*, 48(3), 472-485.
- Willison, R., Warkentin, M., & Johnston, A. C. (2018). Examining Employee Computer Abuse Intentions: Insights from Justice, Deterrence and Neutralization Perspectives. *Information Systems Journal*, 28(2), 266-293.
- Witte, K. (1994). Fear Control and Danger Control: A Test of the Extended Parallel Process Model (EPPM). *Communication Monographs*, 61(2), 113-134.
- Witte, K. (1995). Generating Effective Risk Messages: How Scary Should Your Risk Communication Be? *Annals of the International Communication Association*, 18(1), 229-254.

Appendix A

Table A1 Overview of the effect of persuasive security message on individual's protection motivation

Citation, journal	Context	Method	Theory	Message components manipulate in their study				Recipients features	Related results about the effect of persuasive security message on individual protection motivation
				Fear appeal	Message features				
					Message frame	Construal level	Others		
Angst and Agarwal (2009)@MISQ	Healthcare adoption	Experiment; survey	PMT; FAM; ELM	N/A	√	N/A	N/A	Issue involvement	Positive message frame and high issue involvement evokes more favorable attitudes
Anderson and Agarwal (2010)@MISQ	ISS protection	Survey; experiment	PMT	N/A	√	N/A	N/A	Self-view	The interact effect between self-view and goal frame influence individuals’ descriptive norms, in turn, influence security behavior.
Johnston and Warkentin (2010)@MISQ	ISS protection	Experiment	PMT	√	N/A	N/A	N/A	N/A	The manipulation of the fear appeal effectively elicits a change in user perception of response efficacy, self- efficacy, threat severity, and threat susceptibility.
Barlow et al. (2013)@ C&S	ISP violation	Experiment	NoT; Framing theory	N/A	√	N/A	Deterrent sanctions, anti- neutralization	N/A	Message framing has no effective to reduce individuals’ violate intention.
Johnston et al. (2015)@MISQ	ISP compliance	Experiment; survey	PMT; DT;	√	N/A	N/A	N/A	N/A	A fear appeal contains sanctioning rhetoric can enhance individuals’ compliance intention.
Boss et al. (2015)@MISQ	ISS protection	Experiment	PMT	√	N/A	N/A	N/A	N/A	High fear-appeal manipulations produce more fear and supporting threat that inspires protection motivation than do low fear- appeal manipulations.
Barlow et al. (2018)@JAIS	SETA communication	Experiment; survey	NoT	N/A	N/A	N/A	1.Informational communication; 2. Normative influence statement; 3. Anti- neutralization	N/A	Both informational and anti-neutralization communication decreased violation intentions.

Wall and Warkentin (2019)@ I&M	ISP compliance	Experiment; survey	PMT; FAM; ELM	N/A	N/A	N/A	Argument quality	N/A	Argument quality affect individual's coping appraisal and compliance intention.
Johnston et al. (2019)@DS	ISP compliance	Experiment	FAM; ELM; OIT	N/A	N/A	N/A	N/A	Individuals' organizational identification	Messages using language fit with individuals' organizational identification is more effective than not fit.
Orazi, Warkentin, & Johnston (2019)@CAIS	IS protection motivation	Conceptual	PMT; CLT	√	N/A	√	N/A	N/A	1. Manipulating as high construal (i.e., why) the framing of the coping response will increase protection motivation ; 2. Match the different construal level of threat and coping appraisal will enhance the effectiveness