

Exploring the Role of Mindfulness on Easing the Negative Impacts of Information Security Stress

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Abstract

Information security stress has been considered as one major source of unwanted security-related behaviors. For example, based on moral disengagement theory, past studies argued and confirmed that information security stresses increase the chance for moral disengagement, which in turn, cause the violation of information security policy. Therefore, easing information security related stress is important since doing so may effectively prevent security policy violating behaviors. In this study, based on the stressor-strain-outcome three-layered model, we proposed a positive relationship between stressor and strain and between strain and avoiding behavior, and an inverted U shape relationship between strain and approaching behavior. In addition, mindfulness can mitigate the proposed positive relationships and inverted U shape relationships.

Keywords: Information Security, Stressors, Strain, Mindfulness

Introduction

Over the last years, information security incidents are growing rapidly. For example, data lost has increased by 12 percent, from 35% in 2015 to 43% in 2017 (Kevin Richards, 2017). Organizations adopt more complex and specialized mechanisms to respond to heterogeneous threats (Guo, 2013). To secure information, various approaches have been suggested by behavioral information security studies, including information security policies (Bulgurcu, Cavusoglu, & Benbasat, 2010), training (Puhakainen & Siponen, 2010), and awareness programs (Tsohou, Karyda, Kokolakis, & Kiountouzis, 2015). In fact, many employees are overwhelmed by these policies and related trainings since they are tedious and time-consuming (D'Arcy, Herath, & Shoss, 2014). Complying with security policy may increase the difficulty of performing regular tasks. Employees have to deal with increased workload and unclear guidelines imposed by the security protocol. Some employees may even consider information security policies as an invasion of personal privacy, complex and difficult to follow (Lee, Lee, & Kim, 2016). Those stressful conditions increase the burden to employees. While employees make actively cope with the stress, they may passively escape from the stress when the demand is extremely high. Therefore, our first research question is “*how the negative effects of information security related stress can be mitigated?*”

Past studies intensively investigated the factors of information security policy compliance behaviors (Moody, Siponen, & Pahlila, 2018; Vance, Siponen, & Pahlila, 2012). Being aware of information security threats and solutions can effectively increase information security policy compliance (Bulgurcu et al., 2010). In addition to awareness, the importance of being mindfulness has been highlighted

recently. Broader than awareness, mindfulness is an open-minded state where the individual is aware of thinking, commonly attentive to what is going on in the present situation (Brown, Ryan, & Creswell, 2007). Researchers showed that the mindfulness positively related to the quality of thinking (Weick & Sutcliffe, 2006), and quality of mutual relationships (Brown et al., 2007). In information security area, mindfulness has been proposed to increase protection motivation through enhancing threat and coping appraisal (Wirth, Maier, Laumer, & Weitzel, 2017). In addition, mindfulness training can better mitigate the threat of phishing than the traditional clue-based training approach (Jensen, Dinger, Wright, & Thatcher, 2017). Based on these studies, the present study focusses on the benefits of being mindfulness and attempt to examine whether *mindfulness on countering measures can ease the negative impacts of stress, on diminishing coping behaviors?*

By answering those questions, this study contributes to the information security research stream by reaffirming the importance of being mindful. When employees are relative mindful, more information security policy compliance behaviors can be observed, and information can better be secured. In the following sections, we first introduce each concept, and then proposed hypotheses. Research method will then be introduced.

Literature review

The Stressors-Strain-Outcome Model

This study adopts a three-layered model, stressor-strain-outcome, proposed by Koeske, Kirk, & Koeske, (1993) as shown in Figure 1. This model illustrates how stress generates impacts on individuals' life. It is an extension of the traditional stressor-strain model by including the final outcomes. According to the three-layered model, stressors are considered irritating, troublesome, or disruptive stimuli of an individual's environment. Stressors are circumstances and situations that elicit strain (Stich, Tarafdar, Stacey, & Cooper, 2018). Stressors manifest as the stressful stimuli encountered by individuals, and stress is the individual's psychological response to the stressors. Strain can be considered as the psychological and physiological responses of individuals to environmental stimuli (Perrewe & Ganster, 1989) and an employee's psychological reactions to the stressors. Finally, job satisfaction (or dissatisfaction) are commonly used variable in the last stage of the model.

In IS area, such a stressor-strain-outcome model has been partially adopted to understand the impacts of technologies. For example, Ayyagari et al (2011) explored the impact of technology characteristics on forming stressor and strain. They first identified major stressors (including conflict, invasion of privacy, work overload, role ambiguity, and job insecurity) and their impacts on the strain. Previous IS stress studies have focused almost predominantly on stressors from a different perspective, like behavioral, psychology, management, and information security systems. Recently, a first attempt has been made to understand this issue from the behavioral information security perspective. The overall transaction process of stress constitutes the experience of stress (Ayyagari, Grover, & Purvis, 2011).

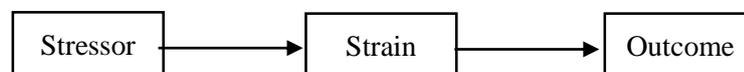


Figure 1. Stressor-Strain-Outcome Model

Based on Um & Harrison (1998), stressors in general, are considered as environmental stimuli from external. In addition, to be called stressors, an employee must consider those stimuli as troublesome. Some common stressors include task-related (e.g. task complexity), role-related (e.g. role ambiguity), and personal related (e.g. work-family imbalance) (Koeske et al., 1993). In the following, we introduce several stressors.

Information security stressors. In addition, to enhance software and hardware to defend external invasion, it is important to note that regular information system security has a “behavioral root”. Stress related to information security therefore gradually become an important issue. P-E fit theory points out the importance to maintain harmony among individual and condition. Stress is increased when that balance is disrupting (Cooper et al., 2001). In the information system (IS) area, stress has long been

described as a crucial determinant of IS efficiency and turnover, resulting in significant additional costs to the organization. Most prominently, humans increasing stress during technology adoption, maintain various job roles, diverse tasks, disparate personal issues. These constructs have a significant influence on stress at the work and causes strain (Gaudioso et al., 2017). Previous studies have identified three major type of stressors, including role, task, and personal (Ament & Haag, 2016). Each type of stress will be discussed individually.

Role stressors. Stressors are related to role issue in general cover conflicts, ambiguity and job insecurity (Fogarty, Singh, Rhoads, & Moore, 2000). Role conflict is defined as the perception of incompatibility of the role demands. It exists when the individuals are overwhelmed by tasks they were assigned to accomplish (Galluch, Grover, & Thatcher, 2015). Role ambiguity is defined as the erratic ramifications of one's role performance and inadequate information required to implement the role (Ayyagari et al., 2011). The Information security policy (ISP) may cause role conflict and ambiguity when employees need to deal with the security requirements specified by the organization. Role conflicts take place when the purpose of compliance with security policy cannot be aligned with individuals' objectives. For instance, the development of new technologies makes current security policy outdated or changed. A lack of timely updated information leads to ambiguity. Job insecurity refers to the subjective perception of the risk of losing a job. Job insecurity leads to perceived uncertainties about the future and doubt about staying employed. Studies have shown that employees experience an immense state of anxiety and stress when their positions are unstable (Fogarty et al., 2000). Consequently, job insecurity is a plausible creator of stress (Young, 2010).

Task stressor. Task-related stressors include high work overload, high complexity of the task, and many interruptions. Techno stress related studies identify overload as one major source of stress. Rapid technology developments cause uncertainties at work. Technology evolution also introduces many new security policies and requirements (D'Arcy et al., 2014). Employees must update their security knowledge to follow ISPs. Uncertainties, therefore, cause stress in the employees. The constant change of new technologies and information security policies also increase the complexity of getting tasks done. Moreover, these requirements may be beyond the employee's psychological capabilities.

Job stressor. There are two major stressors are associated with job stress: privacy invasion and degree of freedom (Ayyagari et al., 2011). Invasion of Privacy may become a concern when information security policies are enforced. Moore (2000) and Ayyagari et al. (2011) identified invasion of privacy as one major source of stress. ISPs, in general, are enforced with tight monitoring of organizations log in history, emails and all internet browsing history of all employees. As an outcome, employees have to change their working style when they comply with the security policies. This not only forces employees to change the way they perform tasks but also reduces the flexibility of performing a specific task. Individuals may be stressful under this condition.

The second component of the three-layered model is the strain. Strain can be considered as the psychological, physiological responses of individuals to environmental demands and stressors (Gaudioso, Turel, & Galimberti, 2017). Stress is stimuli experienced by the individual. Stress generates effects on employee. According to the stressor-strain relationship, stressors are circumstances and situations that elicit strain (Stich et al., 2018). Strain is developed, and negative outcomes may observe when the level of stress is high. In an organization, strain is an employee's psychological reactions to the stressors (Cooper et al., 2001). Several variables were used to represent strain, including anxiety, fatigue, frustration, or emotion exhaustion (Koeske et al., 1993). In IS research, fatigue was used to represent strain (Lee, Son, & Kim, 2016). In this study, we follow this research stream and adopt policy fatigue to represent strain.

The last component of the three-layered model is the outcome. Theoretically, stressors lead to strain and impaired job performance (Johnson et al., 2005). Individuals govern stress with different strategies, including approaching and avoiding two coping types. The adoption of coping strategies is based on individual preference and external situations. Typically, coping is defined as the ability to handle stressful emotions and start dealing with the extremely unpleasant events from where those emotions arise (Lazarus, 1966). Each individual deals the stress either with approaching or avoiding strategies

(Krohne, 1993). Approaching-based coping focuses on taking actions that can reduce or manage stressful events (Anshel, Kang, & Miesner, 2010). Approaching-based coping mechanisms include searching, learning, strategic planning, monitoring, expressing emotions and visualization. Individuals who adopt approaching strategies may consciously attempt to confront the threats, either directly or indirectly (Anshel, 2000). On the other hand, avoidance-based coping refers to the decisions that a person withdraws from a perceived threat. This can be done by filtering or ignoring information (i.e. discounting or eliminating the stressor 's importance), or by cognitively isolating oneself from the stressor.

Mindfulness on countermeasures

Mindfulness is defined as “one’s conscious experience of the contents [of the mind]” (p. 1) (Mikulas, 2011). Social psychologist Ellen Langer (1989) introduced research related to the concept of mindfulness and illustrated possible social psychological factors affect the health of mindfulness mind and body. Langer further then outline the major components of mindfulness, including being open to novelty, being sensitive to content and perspective, creating new categories, challenging assumptions and taking responsibility (Langer, 1989). For being sensitive to content and perspective, mindful individuals tend to be pay attention to incoming new information and be aware of local context. For challenging assumptions, mindful individuals have higher flexibility and are willing to take different perspectives to assess multiple implications.

Several recent studies attempted to associate mindfulness with performance, well-being, productivity, awareness in training. In information system research, mindfulness has been adopted to understand IS security (Jensen et al., 2017), technology adoption (Sun & Fang, 2016), and information system adoption (Aanestad & Jensen, 2016). People who are mindful, they tend to collect more information and being aware of different ways of interpreting information. Therefore, mindfulness people are more attentive to various coping strategies and countermeasures of information security threats. For instance, people with mindfulness are more (less) likely to take active (passive) actions (e.g. escape or withdraw) because they know how to deal with security related threats.

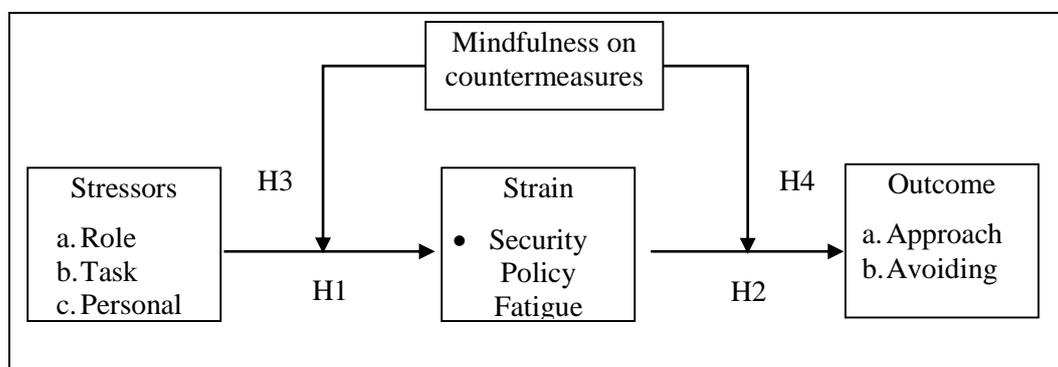


Figure 2. Research Model

Hypotheses development

In this study, we adopted the three-layered model to examine the relationship between stressor, strain, and outcome. As shown in Figure 2, in addition to the direct relationship from stressors to outcomes, we also hypothesize the moderating effect of mindfulness.

First, the relationship between stressors and strain has been examined broadly. Researchers in information security research area had proved that stress generated circumstances in organization causes increased strain (Ayyagari et al., 2011). We, therefore, followed the previous studies and construct the relationship between information security stressors and strain. Past studies have identified many information securities related stressors (Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008). Role, job, and personal three components are included in this study. Past studies have theoretically argued and

empirically confirmed those relationships (Cooper et al., 2001). Given the widely recognized positive impact of stressors on strain, therefore, hypothesize that the stressors increase strain.

H1: Stressors are positively associated with strain

Strain, in general, is believed to cause unwanted outcomes. When people feel an unpleasant strain, they tend to consciously or unconsciously take actions to cope with such strain. Coping theory points out that each individual determines whether a condition is as stressful as expected through two disparate and parallel directions (Lazarus & Folkman, 1984). Individuals may cope with stressful situations with approaching or avoidance attitude. The former refers to withdrawing from the stressful condition and the latter refers to facing stressful condition with assertiveness (Anshel, 2000). While coping with stress, the individual first evaluates threatening level of the stress. They then evaluate their capacity on coping the stress adequately. Both kinds of coping strategy are often applied instantaneously. The attention placed on each of these strategies (i.e. the coping strategies they have preferred to apply) is often delineated by potential risk factors and the duration of the different aspects of strain they endure (Gaudioso et al., 2017). When the level of strain is getting higher, the likelihood for individual to withdraw from the stressful condition is also getting higher. Individuals may temporarily avoid thinking of the stressful condition and shift their attention to unrelated issues. Therefore, a positive correlation between strain and avoidance behavior can be expected.

H2a: Strain is positively associated with avoidance behavior

On the other hand, for approaching behavior, a different type of relationship may be observed. When the level of strain is low, the likelihood for individuals to take action to cope with stress is not high as well. Individuals tend to take actions when the level of strain is getting higher and when they have capabilities to counter it. In the information security area, approaching behaviors include understanding the threats and learn the way to effectively deal the threats. Given that the level of stress is low to middle, appropriate actions may help employees to reduce the stress originated from the stressors. As a result, employees are able to escape from strain. However, when the strain is too high or beyond ones' capabilities to handle it, they most likely reduce approaching behavior. When the strain is extremely high, taking actions may not effectively ease the stress originated from the stressors. As a result, employees tend to adopt avoiding strategy instead of approaching strategy. Similar to the situation pointed out by demand-control theory, individuals tend to adopt positive behaviors (such as learning) when demand is slightly higher than control (Tarafdar, 2018). However, individuals may feel stressful and eventually decide to withdraw or quit when the demand from external is extremely higher than ones' ability to counter (Karasek, 1998). Therefore, we hypothesize an inverted U shape between strain and approaching behavior.

H2b: Strain is associated with approaching behavior in an inverted U shape

As indicated above, a positive relationship between stressors and strain is hypothesized. That is, when the level of stressors is high, the likelihood for individuals to feel exhausted, drawn, or tired are higher. In this section, we further argue that such a positive relationship is strong when individuals have limited knowledge of countering measures and is weaker when individuals are mindful on the countering measures. Mindfulness is the awareness of available countering measures and openness to new countering measures. Mindful individuals compare the pros and cons of different measures for countering information security threats. They also know what approach should be adopted under a specific condition (Langer, 1989). Tasks stressors generate less effect on strain when individuals are aware of the most effective and efficient ways to fulfill requirements enforced by ISP. Role stressors cause less strain when employees are familiar with the pros and cons of different countering measures. They can effectively evaluate the facing situation and figure out the best way to react to conflict demands. Personal stressors have less effect when the level of mindfulness is high because knowing the countering measures increase self-efficacy, which is an important antecedent of strain (Bandura, 2002). Employees may sometimes also oversee security decision making. Such responsibility leads to work stress. In contrast, employees may feel more stressful when their self-efficacy is low (Matsui & Onglatco, 1992). Therefore, we hypothesize a negative moderating effect of mindfulness.

H3: Mindfulness on countermeasures ease the positive impact of stressors on strain

A positive relationship between strain and avoidance behaviors was hypothesized in the previous section. Higher strain refers to the exhaustion of emotion or cognition caused by information security related stressors. In this condition, the likelihood for employees to take avoidance actions is also higher. In this section, we argue that such a positive relationship is weaker when individuals are mindful on the countering measures. Knowing available countering measures on various threats and being open to new countering measures increases the ability for individuals to comply with information security compliance (Hanus & Wu, 2016). Therefore, even though the level of strain is high, avoiding behaviors is less observed when individuals are mindful. On the other hand, the strain-outcome relationship is stronger when individuals are not familiar with countering measures. A lack of related knowledge blocks individuals to take appropriate actions. As a result, individuals are more likely a temporary escape from the stressful condition by withdrawing emotionally and Cognitively. Therefore, a negative moderating effect of mindfulness on the strain-outcome relationship is hypothesized.

H4a: Mindfulness on countermeasures eases the positive impact of strain on avoiding behaviors

In the previous section, we have hypothesized the inverted U shape between strain and approaching behavior. In this section, we further argue that such an inverted U shape relationship is weaker when individuals are mindful. Since an inverted U shape reflects on the negative coefficient of the quadratic part; we therefore argue that the negative coefficient of the quadratic part is smaller for mindful individuals. Mindful individuals pay attention to threats and according to countering methods. Mindful individuals are also more open to new countering measures and carefully evaluate the effectiveness and the most suitable condition for each new countering measure (Wirth et al., 2017). Therefore, based on the demand-control concept, when strain is low to moderate, mindful individuals tend to take more countering measures (approaching behaviors), compared with individuals less mindful on information security (Karasek Jr, 1979). On the other hand, high strain causes psychological and physical illness and inhibits individuals to take approaching action. Therefore, when strain is moderate to high, less mindful individuals tend to withdraw from stressful situation and take less approaching behavior because they know fewer countering measures or have less confidence on picking the right countering measure. Meanwhile, we also predict that mindful individuals still tend to possess an approaching attitude since they have high self-efficacy toward their capability. Social cognitive theory has demonstrated that self-efficacy can effectively reduce stress (Bandura, 1994). Therefore, they are more likely to take countering measures when strain is moderate to high. It is reasonable to expect that the magnitude of the negative effect from high strain is less for mindful individuals. Thus, we hypothesize that the inverted U shape is weaker for mindful individuals, which reflects on a smaller negative coefficient of the quadratic part.

H4b: Mindfulness on countermeasure eases the inverted U shape relationship between strain and approaching behaviors

Research Methods

The target samples for this research are employees of organizations who use computer technologies to support their daily work. We will adopt the survey approach to collect the data from the employees within organizations to test our hypotheses. Based on the level of complexity of our research mode, the expected sample size is 300. We will adopt measurement items from past studies. For the stress, the items will be adopted from Ayyagari et al. (2011) and Lee et al. (2016). Items to measure strain will be adopted from Moore (2000). For the Approach and avoidance items from Seiffge-Krenke & Shulman (1990). Lastly, items used by Wirth et al. (2017) will be used to measure mindfulness. We are planning to analyze the data by using hierarchical multiple regression to show the inverted U shaped relationship.

Conclusion

This study illustrates the viable attitude of employees to alleviate the stress caused by strain. By showing the impact of mindfulness on easing the impacts of stress and strain on the consequential variables, this study shows how employees can minimize their stress and guide to prefer either approach and avoidance.

Past studies have proposed the impacts of mindfulness on coping and threat appraisal. This study attempts to contribute to this research stream by illustrating the moderating effect of mindfulness.

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