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The Influence of Self-Determined Motivation on Security Education Training and Awareness (SETA) Programs

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The influence of self-determined motivation on security education training and awareness

(SETA) programs

By

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The influence of self-determined motivation on security education training and awareness

(SETA) programs

By

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Despite the best efforts of many organizations, protection of information assets continues to be a major problem for a number of firms. A large portion of data breaches can be attributed to employees of the organization, who have been commonly identified as the weakest link in an organization's overall security profile. Organizations implement security policies to give their employees guidelines for appropriate behavior related to information protection. For policies to be effective, employees must exhibit adequate comprehension of the secure behaviors described in the policy.

Security Education, Training, and Awareness (SETA) programs have been utilized as an organizational mechanism for communicating the details of security policies and the importance of employees' compliance. Although researchers have identified the importance of SETA programs in the implementation of security policies, individual differences among employees may contribute to the effectiveness of a SETA program. One such difference is an employee's orientation toward self-determined (intrinsic) or control-oriented (extrinsic) forms of motivation related to both the workplace context and situational tasks, such as participation in a SETA program. A

theoretical model is developed to assess the influence of an employee's overall work motivation and perceptions of the work environment on his or her situational motivation toward participating in an organization's SETA program. Methods for capturing the hypothesized relationships and analysis of the associated data are described.

The findings indicate that an employee's perceptions of autonomy, competence, and relatedness while participating in the SETA program have a significant impact on the employee's motivation toward the SETA program. SETA program motivation significantly influenced an employee's attitude toward the information security policy (ISP), cognition of ISP concepts, and intention to comply with the ISP while also serving as a significant predictor of an employee's decision to participate in an additional training program. Implications for both research and practice are discussed.

DEDICATION

This dissertation is dedicated to my grandfather, Roy Bergeron, Jr. You recognized the value of higher education at a time when it wasn't common to do so. Because of that, you set the stage for everyone in our family to be successful by following your lead, and I may not have eventually pursued my PhD without your inspiration. You always joke about helping me write my dissertation – what you didn't realize is that you were right there with me the whole time.

So now that this pesky dissertation is complete, you got any fences to put up?

ACKNOWLEDGEMENTS

First, I express all the love and gratitude in the world to my wife Sara. Pursuing a PhD is difficult enough, but it sometimes becomes even more difficult to explain what you do as a researcher to family and friends. To have my best friend right there with me, constantly offering love and support while pursuing a PhD of her own (in a much more difficult field, in my opinion), and also being one of the few people I know who "gets it," means more than I can ever try to say. I always knew that I wanted to pursue a PhD, but Sara was the person who gave me to courage to go for it. She is without a doubt the best thing in my world.

Thanks to my parents for instilling in me the value of a good education, as well as the importance of never giving up. Their words of encouragement throughout my formative years have no doubt stayed with me as I navigated through the doctoral program. More than anything, earning a doctoral degree is about perseverance. They always taught me never to quit, and look where it got me!

Next, I thank my dissertation chair, Merrill Warkentin. His mentorship – from getting me involved in research projects early in the program to encouraging my own research ideas – has been crucial in my development as a researcher. His feedback throughout the writing of my dissertation and other research projects has been invaluable, and his excitement about my work (and research in general) has helped to keep me

motivated throughout the process (funny, considering my topic). His guidance in helping me take the early steps toward building my career have been extremely helpful as well.

To the faculty serving on my committee (Bob Otondo, Kent Marett, Rob Crossler, Jianzhong Xu, and Paul Benjamin Lowry), I truly appreciate the time and effort you have all contributed toward making my dissertation the best it can be. Each of you offered great insight into the information systems research domain, experimental research designs, and analysis techniques. Everyone always had time (or made time) to meet with me, and each of you was a pleasure to work with.

Last but certainly not least, thank you to my fellow graduate students in the program. I really couldn't have asked for a better group of people to go through the difficult, sometimes weird, and ultimately rewarding process of working toward a PhD. More importantly, I can honestly say that I've gained friends for life. Specifically to my past officemates (Rob Gatlin, Martin Ndicu, and Greg Bott), thanks for always being open to chat about research or other things to take our minds off of research. I also feel extremely lucky that I entered the program along with Nirmalee Summers and Shwadhin Sharma. We were always there for each other, and I wish you both the best as we go our separate ways, on to bigger and better things.

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LIST OF ACRONYMS

AC = Affective Commitment

ATT = Attitude toward Information Security Policy

AVE = Average Variance Extracted

CERT = Cyber Emergency Response Team

CFA = Confirmatory Factor Analysis

CFI = Comparative Fit Index

EFA = Exploratory Factor Analysis

IFI = Incremental Fit Index

InfoSec = Information Security

IS = Information Systems

IT = Information Technology

ISP = Information Security Policy

NFI = Normed Fit Index

OBSE = Organizational-Based Self-Esteem

PJ = Procedural Justice

RMSEA = Root Mean Square Error of Approximation

SDT = Self-Determination Theory

SETA = Security, Education, Training, and Awareness

TLI = Tucker-Lewis Index

CHAPTER I

OVERVIEW

Introduction

In the current business environment, organizations regularly experience threats to important information assets. The organization's success in dealing with these threats is dictated by how effectively information technology (IT) managers can align end user behavior with the goals outlined in organizational security policies (M. T. Siponen, 2000; Straub & Welke, 1998). Even though technology professionals attempt to impart a consistent approach to security through policies and procedures, insider abuse is still a common occurrence within organizations (Willison & Warkentin, 2013). Because end users differ vastly in their levels of awareness and education on how to utilize effective countermeasures to threats, security management can be a daunting task (Siponen 2000). Researchers have recognized Security Education, Training, and Awareness (SETA) programs as critical components of an organization's security compliance plan (Karjalainen & Siponen, 2011; Puhakainen & Siponen, 2010). The enhancement of SETA programs may result in increased policy compliance through employees' increased security education.

According to the United States (US) Cyber Emergency Response Team's (CERT) 2013 survey, 23% of the most damaging electronic crimes occurring within organizations were perpetrated by insiders, while 53% of respondents reported experiencing an insider

incident in 2012 (United States Secret Service & United States Cyber Emergency

Response Team, 2013). Internal incidents are primarily caused by employees

intentionally violating information security policies with malicious intent or

unintentionally performing maladaptive behaviors that are detrimental to organizational

security. In its 2014 data breach report, Verizon found that the majority of public sector

data breaches occurred due to unintentional leaks caused by insiders (Verizon Enterprise

Solutions, 2014), while the biggest threat to the network security of corporations is

employees' lack of knowledge or awareness in detecting common threats (Vicinanzo,

2014). In one of the most high profile corporate breaches, security experts have attributed

Target's breach of credit card information for 70 million of its customers to an insider

intending to exploit corporate security weaknesses (Woltman & Webb, 2014). Whether

or not employees are truly cognizant of the consequences, the act of not complying with

organizational security policies results in exposure of classified information which may

damage organizations (D'Arcy, Hovav, & Galletta, 2009).

Initiating Change in Organizational Culture

Purposeful and accidental non-compliance behaviors may be influenced through

change in an organization culture. Organizational culture refers "the pattern of basic

assumptions that a given group has invented, discovered, or developed in learning to cope

with its problem of external adaptation and internal integration, and that have worked

well enough to be considered valid, and, therefore to be taught to new members as the

correct way to perceive, think, and feel in relation to those problems." (Schein, 1999)

Researchers have identified organizational culture as one of the most critical factors in

determining an organization's success or failure (Deal & Kennedy, 1982).

Schein (1999) discusses the role of organizational artifacts, which are described as physical attributes of the organization, as a mechanism of initiating organizational change. Artifacts may influence the beliefs, values, and assumptions espoused by the organization's employees, which in turn in instrumental in transforming culture. One change in culture may be the application of information security awareness, training, or education initiatives. Because they are visible and accessible documents reflecting the overall ideals of the organization, security policies and SETA programs are types of artifacts that an organization can employ to improve its security profile via changing its overall security culture.

Ultimately the desired outcome of changing organizational culture is a change in behavior among those within the organization. Organizational behavior may be categorized as organizational-level, group-level, or individual-level behavior, and the modification or introduction of an organizational artifact can have an impact on any of these varieties of behavior (Vroom & von Solms, 2004). Inadvertent data breaches declined from 53% in 2010 to 31% in 2011 partially due to an increase in employee training focused on information security policies and procedures, demonstrating that organizational artifacts can elicit a desired change in organizational behavior (United States Secret Service, United States Cyber Emergency Response Team, & Deloitte, 2011).

Security Policy Compliance

With information security policies serving as a possible source of change in organizational culture and behavior, the underlying reasons why employees may choose to comply or not comply with organizational ISPs has been examined at length in

behavioral information security research, with compliance or non-compliance intentions often serving as the dependent variable. Depending on the level of concern possessed by managers in an organization, the ISP will contain varying detail regarding possible threats to the security of organizational information and appropriate procedures for protecting information assets. An organization's ISP may be viewed as both a reference for end users to determine proper responses given certain security-related events as well as a managerial vision of the organization's overall security profile.

General Deterrence Theory (GDT) and Protection Motivation Theory (PMT) have been the primary theories adapted for research pertaining to employee compliance or non-compliance, with GDT providing a foundation for the use of extrinsic means for eliciting end user behavior (D'Arcy et al., 2009) and PMT serving as a possible explanation for how end users assess threats and countermeasures (Johnston & Warkentin, 2010). While both theories have given researchers insight to end users' intentions to perform certain secure behaviors, the adaptation of these theories has been shown to be inconsistent and even problematic in some cases (Crossler et al., 2013; D'Arcy & Herath, 2011). Academicians have attempted to fill the perceived gap in the adaptation of these theories to information security contexts by examining the roles of other constructs which may be related but are external to the original theories as conceptualized in their native fields of study.

Security Education Training and Awareness (SETA) Programs

The creation of security policies alone is not adequate for initiating change in employee behavior and ensuring that employee behaviors align with organizational ISPs. The most effective way to ensure the successful implementation of a security policy is to

verify that users comprehend it and accept necessary precautions (Whitman, Townsend, & Alberts, 2001). A SETA program is a critical element of information security implementation because it educates employees on countermeasures employed in the four stages of the Security Action Cycle: deterrence, prevention, detection, and recovery (Straub & Welke, 1998). It is also required by many U.S. regulations such as the Health Insurance Portability and Accountability Act (HIPAA) and the Sarbanes Oxley Act (SOX).

While it is imperative to understand the behavioral mechanisms utilized by employees when electing to act in a particular manner, we must also examine ways in which we can align actual employee behavior with practices outlined in information security policies. The most effective way to ensure the successful implementation of a security policy is to verify that users comprehend it and accept necessary precautions (Whitman et al., 2001). Researchers studying information security have reasoned that SETA programs are essential to limit IS abuse (Dhillon, 1999; Parker, 1998; Whitman, 2004), and IS security training has become the most common approach to improving employees' IS security behavior (Puhakainen & Siponen, 2010).

SETA programs are composed of education, training, and awareness efforts focused on an organization's security policy (Guttman & Roback, 1995). Awareness is the recognition of security concepts, and is the starting point for all knowledge levels. Training begins with security basics and literacy as a foundation for skill development in many functional areas. Education is a deep understanding of security that is coveted by security specialists and professionals for identifying the underlying reasons why potential security threats may occur and initiating organizational endeavors for preventing such

events. SETA programs can be operationalized in a variety of ways and emphasize

delivering broad information about the security environment, along with the skills

required to perform any necessary security protocols (J. Lee & Lee, 2002; Whitman et al.,

2001).

Protection of important information assets is typically achieved through

individual adherence to security policies, practices, and procedures (D'Arcy & Herath,

2011). Organizations build training programs around their particular policies and the

effectiveness of countermeasures available to their employees, resulting in elevated

perceptions of the certainty and severity of organizational sanctions (D'Arcy et al., 2009).

Although sanctions may be effective in improving compliance when properly

administered through persuasive education, Goodhue and Straub (1991) identify the

necessity of a fundamental understanding of technical and managerial controls that

mitigate information security threats. Subsequent research in information security often

espouses the importance of SETA programs in elevating the understanding of potential

threats and countermeasures among employees, and studies specifically designed to

examine the effects of SETA programs have examined this phenomena in a variety of

ways. One approach that has remained unexplored is the role of motivational factors in

employees' desire to participate and become actively engaged in learning security

concepts outlined in SETA programs.

Self-Determination Theory and Motivation

Motivation may play a role in influencing a user's ability to both complete and

adhere to an organization's SETA program. Although motivation had been generally

classified dichotomously as intrinsic, referring to "performing an activity for itself and

the pleasure and satisfaction derived from participation" (Robert J Vallerand, 1997), or extrinsic, meaning "engaging in an activity as a means to an end and not for its own sake" (Robert J Vallerand, 1997), Deci and Ryan (1980) theorized that extrinsic motivation is more nuanced and could not be adequately conceptualized as a single construct. In developing Self-Determination Theory (SDT), Deci and Ryan (1980) posited a spectrum of extrinsic forms of motivation, ranging from those that are highly self-determined to those which are more control-oriented (see Figure 3). Also critical to SDT is the influential power of an individual's perceptions of autonomy, competence, and relatedness in determining the level of self-determination or control-orientation present when participating in a particular activity. If an individual perceives higher levels of autonomy, competence, and relatedness, the individual will be more self-determined in the actions he or she takes (Deci & Ryan, 1980; Ryan, Mims, & Koestner, 1983; Robert J Vallerand, 2000).

Using Deci and Ryan's foundational work on motivation (Deci & Ryan, 1980; Deci, 1972; Ryan, 1982), Vallerand (1997) developed a hierarchical model of motivation, separating one's motivation into global, contextual, and situational levels (see Figure 4). Global level motivation is one's general motivational orientation to interact with the environment. The next lower level, contextual level motivation, is one's usual motivational orientation toward a specific context, such as education, work, leisure, or interpersonal relationships. Finally, situational level motivation is the motivation individuals experience when they are currently engaging in an activity within a specific context. Levels of motivation can affect each other as well. Top-down effects occur when one's tendency toward motivation at one level influences his motivation at the next lower

level. For example, one's intrinsic motivation toward gaining knowledge at the global level could influence one's contextual level motivation in a school environment. Levels of motivation can also have a recursive effect between levels, meaning that repeatedly experiencing motivation at a lower level over time could develop into motivation at the next-higher level. For instance, one's motivation toward a particular task in a class, when experienced repeatedly, could lead to a change in motivation toward school at the contextual level.

At each level of motivation, certain social factors may influence an individual's motivation. Based on SDT, these social factors are mediated by perceptions of autonomy, competence, and relatedness at each level (Robert J Vallerand, 1997). In this context, autonomy refers to one's perception of the degree to which he or she may engage in activities of his or her own desire. Perceptions of competence relate to the degree to which an individual feels he or she can interact effectively with his or her surroundings in order to produce desired outcomes or prevent undesired consequences. Relatedness is one's perception of the degree to which he or she feels connected with others. Using an organization as an example, an employee may perceive high levels of autonomy, competence, and relatedness if he feels he has the freedom to work on projects he is interested in, the confidence in his ability to do his job well, and a friendly rapport with his co-workers.

High levels autonomy, competence, and relatedness have shown to increase intrinsic motivation and decrease amotivation and control-oriented forms of extrinsic motivation, while low levels of autonomy, competence, and relatedness have the opposite effect (Deci & Ryan, 1980; Ryan et al., 1983; Robert J Vallerand, 2000). Despite the

effects of these constructs, many researchers have advocated the implementation of security policies that are centered on deterring deviant behavior through the application of sanctions, which can be classified as extrinsic motivation in the form of external regulations (D'Arcy & Herath, 2011; D'Arcy et al., 2009; Herath & Rao, 2009). Sanctions have also shown inconsistent influence over the performance of secure behaviors, varying depending on the deviant act in question (D'Arcy & Herath, 2011). Embedding varieties of intrinsic motivation or more self-determined forms of extrinsic motivation within SETA programs may influence an employee's understanding and acceptance of organizational security policies communicated through SETA programs.

Although the role motivation has not been examined specifically in employees' participation in SETA programs, it has previously been explored in organizational, (Deci, Connell, & Ryan, 1989; Gagne & Deci, 2005), educational (Deci, Vallerand, Pelletier, & Ryan, 1991; Noels, Pelletier, Clément, & Vallerand, 2000; Patall, Cooper, & Wynn, 2010; R J Vallerand, Fortier, & Guay, 1997), and information systems contexts (Davis, Bagozzi, & Warshaw, 1992; van der Heijden, 2004; Venkatesh, 1999, 2000). Because the introduction of a SETA program into an organizational may have an impact on organizational culture and behavior and incorporates educational principles with information systems security applications, prior research in motivation provides ideal theoretical and empirical foundations for integrating motivation into SETA research.

Contribution

Finding effective ways to mitigate insider threats is critical to organizations with valuable information assets. Examining ways to enhance training programs intended to increase users' awareness of security threats and educate them on effective

countermeasures could reduce the amount of insider abuse within an organization, thus reducing potential for severe security breaches. This study has been developed to determine if motivation, whether self-determined (intrinsic) or control-oriented (extrinsic), may influence a computer user's acceptance of information provided through a SETA program. This study has a particular focus in examining the difference in effects from the various types of extrinsic motivations, as these are the most easily controllable by an organization. Organizations typically use rewards and sanctions to enforce security compliance policies (D'Arcy & Herath, 2011), but there are other types of extrinsic motivations, such as identified regulations, which, according to literature, result in more positive outcomes (Deci & Ryan, 1980). This study could highlight important differences in how to effectively influence employee acceptance of security training programs.

Although motivation has been previously researched in education (Deci et al., 1991; Noels et al., 2000; R J Vallerand et al., 1997) and information systems (Davis et al., 1992; van der Heijden, 2004; Venkatesh, 1999, 2000), the influence of motivation on information security training has received substantially less attention from researchers (Wall, Palvia, & D'Arcy, 2013; Wall & Palvia, 2013). As the process of learning is a key component of a properly developed SETA program, connections can be made between education literature on motivation and the purposes of this study, but these connections have thus far remained unexplored in information security research. The purpose of this research is to examine the effects of employee motivation on SETA program effectiveness and perceptions related to organizational culture. Accordingly, the research questions for this study are as follows:

1. Which type of motivation (self-determined or control-oriented) has the most influence on overall SETA program effectiveness?

2. What influence does situational-level motivation toward SETA programs have on an individual's attitude toward information security policies and intention to comply with such policies?

3. How do employees' perceptions of various elements of organizational culture interact with situational-level motivation?

4. How do enhanced perceptions of autonomy, competence, and relatedness during the administration of a SETA program influence an individual's situational-level motivation toward SETA programs?

Organization of the Study

The remainder of this paper is structured as follows. Chapter 1 provides an overview of the study, including a description of the relevant issues being examined, an introduction to the primary literary foundation, and a presentation of the research questions being addressed. Chapter 2 is a thorough review of the salient literature related to organizational culture and behavior, security compliance policies, and SETA programs, while also presenting the research model and corresponding hypotheses and describing the theoretical contribution provided by research related to motivation and self-determination theory. In Chapter 3, the research method and data analysis to be performed are discussed.

CHAPTER II

LITERATURE REVIEW, RESEARCH MODEL, AND HYPOTHESES

Introduction

This chapter provides the theoretical background for answering this study's research questions in greater detail. To better understand the ways in which the application of SETA programs may ultimately influence employee behavior, we will first take a holistic approach to understanding changes in organizational culture and behavior, how organizational interventions may elicit employee behavior, and how individual differences among employees influence the success of such interventions. We will then describe how organizational information security policies, and specifically SETA programs based on these policies, may be utilized as mechanisms for eliciting change in organizational culture and behavior. Motivation, as conceptualized via self-determination theory (SDT), is explored as a possible means to prompting greater SETA program participation and ultimately better adherence to guidelines provided in security policies. Previous studies related to SETA programs and SDT are identified and described to determine existing research gaps and to highlight the potential contribution of the present study. Finally, the research model is presented with theoretical reasoning provided for each of the proposed hypotheses.

Organizational Culture and Behavior

Organizational culture is defined as "the pattern of basic assumptions that a given group has invented, discovered, or developed in learning to cope with its problem of external adaptation and internal integration, and that have worked well enough to be considered valid, and, therefore to be taught to new members as the correct way to perceive, think, and feel in relation to those problems." (Schein, 1999) Organizational culture has been characterized as the most important factor accounting for success or failure in an organization (Deal & Kennedy, 1982) and includes a system of learned behavior developed through sharing among employees (Szilagyi & Wallace, 1990). In a perfectly integrated information security culture, employees would follow organizational policies and procedures voluntarily and possibly even unconsciously via habits or routines (Vance, Siponen, & Pahnila, 2012).

To illustrate the manner in which organizational culture is established and shared, Schein (1999) developed a model of organizational culture consisting of three distinct layers of influence (see Figure 1). The first layer is comprised of artifacts in the organization, which are visible physical attributes or creations implemented by the organization to advance a specific set of beliefs or ideas. Generally these would include architecture or office decorations; in relation to information security, organizational artifacts may include keycard access systems, firewalls, or security cameras. They may also be visible manifestations of underlying cultural climate, such as informal vs. formal employee attire. The second layer consists of espoused values and shared beliefs among groups of employees. These attributes are partially visible, and broad examples may include communication etiquette, teamwork, or the use of humor in the workplace.

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Related specifically to information security, an organization's overall security strategy determined by top-level managers, which informs the information security policy, would be an espoused organizational value. Basic implicit assumptions compose the final layer of organizational culture. These characteristics are derived from individual employees and represent their underlying values and beliefs. This may consist of an individual's personal perceptions and attitudes toward an organizational policy.

Each layer influences the layer above or below it, meaning that a change occurring at one layer would typically result in a change throughout the other layers as well. For example, a change in an organization's information security policy (an artifact) which dictates strict sanctions for non-compliance may influence the espoused values held by the organization (such as the amount of information shared among organizational groups) and ultimately affect the basic assumptions and beliefs of individual employees (such as individual beliefs about organizational information security). This framework has previously been adapted for information systems contexts, including the influence of culture on acceptance of knowledge management systems (Alavi, Kayworth, & Leidner, 2006) and the potential conflict that may occur when information technology is incongruent with an organization's culture (Leidner & Kayworth, 2006).

```
┌─────────────────────┐
│ Artifacts & Creations │     Visible
└─────────────────────┘
          ⇕
┌─────────────────────┐
│  Espoused Values,    │     Partially Visible and Conscious
│  Norms & Knowledge   │
└─────────────────────┘
          ⇕
┌─────────────────────┐
│ Basic Assumptions &  │     Hidden and Mostly Unconscious
│      Beliefs         │
└─────────────────────┘
```
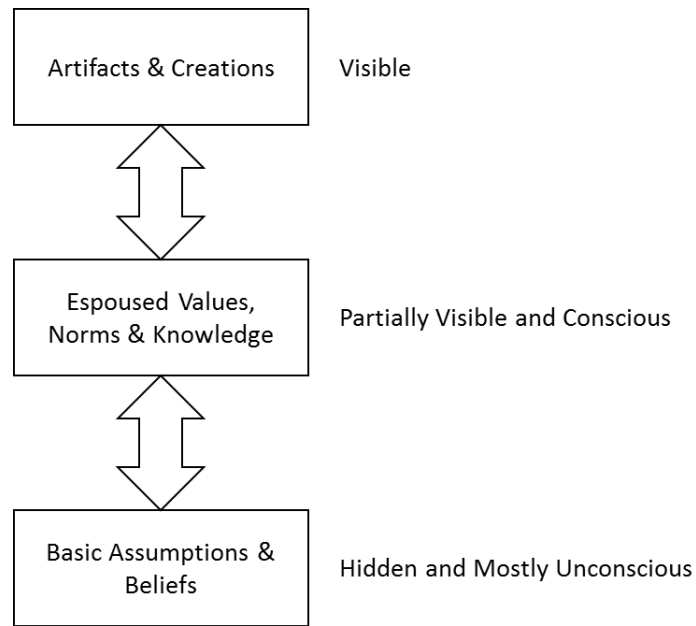
Figure 1   Schein's Model of Organizational Culture (1999)

Initiating a change in organizational culture is critical to improving an

organization's security profile. An additional component of overall organizational change

is behavior. Similarly, organizational behavior also occurs at three distinct levels:

individual, group, and formal organization (Szilagyi & Wallace, 1990). Individual

behavior refers to each employee's unique attributes and perceptions which may impact

the organization. Conversely, organizational forces also have the ability to influence

employee characteristics, such as attitude, commitment, or job satisfaction. Groups,

which are comprised of individuals, establish unique attributes separate from the

individual group members. Group-level behavior may be informed by individual beliefs

or perceptions but may influence individuals as well. The formal organization exhibits

characteristics of the organization as a whole, such as number of employees, physical

size, or organizational structure and influences group-level behavior via these attributes.

The formal organization may also be affected by the internal operations of the organization at the group-level.

Vroom and von Solms (2004) synthesized the preceding organizational literature by providing a framework depicting the interaction between organizational culture and behavior at all three respective levels (see Figure 2), illustrating the impact of organizational change via a shift in artifacts, values, or assumptions related to information security. An operationalization of this paradigm would indicate that the introduction of a new artifact at the organizational level, such as a SETA program, may affect not only values and assumptions, but also behavior at any or all of the three organizational levels.

Examples of artifacts used by organizations to elicit secure behaviors from employees include establishment of security policies, creation of SETA programs based on policies, off-site security training or professional development opportunities related to information security, rewards for compliance, or sanctions for non-compliance (Wood, 1995). While some organizational artifacts are more obvious in their nature and intention, other artifacts introduced by the organization are more covert, such as computer monitoring, distribution of trinkets containing security reminder messages, installation of intrusion detection hardware, or adding layers to the organizational structure to create information obstruction (Wood, 1995).
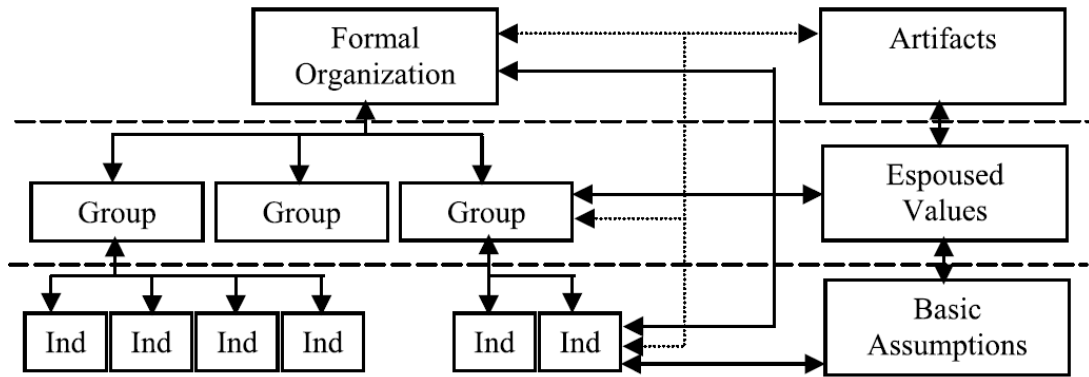
Figure 2   Interaction between Organizational Culture and Behavior

(Vroom & von Solms 2004)

Security Policy Compliance

Although creation and implementation of organizational artifacts is important in eliciting behavioral change, to prompt effective organizational change from an information security perspective, we must also understand the underlying reasons why employees may choose to comply or not comply with organizational information security policies. This topic has been extensively studied in behavioral information security research.

Most commonly, behavior related to information security policy compliance has been researched at the individual level, with compliance or non-compliance intention serving as the dependent variable. Straub (1990) adapted general deterrence theory to an information security context as a tool to encourage employee compliance. Pahnila et al. (2007) tested the influence of attitude and habit on employees' intentions to comply. Workman et al. (2008) examine the influence of locus of control on individuals' failure to perform secure behaviors despite possessing the knowledge to do so. Myyry et al. (2009) investigate the impact of moral reasoning on both hypothetical and actual compliance.

Herath and Rao (2009) demonstrate the effect of organizational commitment on compliance intentions. D'Arcy et al. (2009) extend general deterrence theory by utilizing employees' awareness of security policies, SETA programs, and computer monitoring as antecedents to perceptions of sanction certainty and severity, ultimately measuring employees' intentions to misuse information assets. Boss et al. (2009) assess the effect of employees' perceptions of policy mandatoriness on compliance. Siponen and Vance (2010) investigate employees' use of neutralization techniques as a mechanism leading to non-compliance. Johnston and Warkentin (2010) evaluate the effectiveness of persuasive communication on performance of secure behaviors via the application of fear appeals. Bulgurcu et al. (2010) examine the influence of information security awareness, attitude, self-efficacy and compliance and non-compliance beliefs on employees' intentions to comply with security policies. Willison and Warkentin (2013) discuss the potential impact of employee perceptions of positive workplace environment, organizational justice, and disgruntlement on future insider abuse.

Many studies also capture group- and organizational-level behavior attributes as part of the nomological network associated with individuals' compliance with information security policies. Group-level behavior variables, such as normative beliefs, subjective norm, descriptive norm, social influence, and espoused cultural values, have also been examined in the context of information security policy compliance (Herath & Rao, 2009; Lee & Larsen, 2009; Pahnila et al., 2007; Zhang et al., 2007). Organizational-level behavior variables studied include sanctions, rewards, resource availability, policy specification, facilitating conditions, information quality, IT budget, vendor support, firm size, and organization type (Boss et al., 2009; Bulgurcu et al., 2010; Herath & Rao, 2009;

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Lee & Larsen, 2009; Pahnila et al., 2007; Stanton et al., 2005; Vroom & von Solms, 2004).

While it is imperative to understand the behavioral mechanisms utilized by employees when electing to act in a particular manner, we must also examine ways in which we can align actual employee behavior with practices outlined in information security policies. The most effective way to ensure the successful implementation of a security policy is to verify that users comprehend and adhere to the policy (Whitman et al., 2001). As a result, SETA programs have become a key element in organizations' efforts toward strengthening their overall security profiles.

SETA Programs

Researchers studying information security have reasoned that SETA programs are essential to limit IS abuse (Dhillon, 1999; Parker, 1998; Whitman, 2004), and IS security training has become the most common approach to improving employees' behavior related to information security policies (Puhakainen & Siponen, 2010). Understanding the stream of literature focused on SETA programs will not only highlight what has already been examined by information security researchers, but also reveal some interesting research avenues which have yet to be explored.

Prior to examining the theoretical foundations of SETA programs, it is imperative to understand the practical applications of such programs as they occur in organizations. Guttman and Roback (1995), in accordance with the National Institute of Standards and Technology (NIST), compiled a comprehensive handbook for computer security, of which one of the major topics was SETA program design. The authors recognize the benefits of a SETA program being twofold: improvement of employees' behavior, and

increasing the organization's ability to hold employees accountable for undesirable behaviors. However, these benefits cannot be realized if the SETA program has not been constructed appropriately.

As such, the authors provide a comparative framework for designing SETA programs (see CHAPTER ITable 1). This seminal excerpt differentiates the types of SETA programs which may be implemented at the organizational level. First, an awareness program must be established. This program involves disseminating information about specific threats and countermeasures and is achieved via videos, newsletters, or posters distributed throughout the organization. The goal of this form of SETA is for employees to ably recognize threats as they present themselves in the organizational environment, and remind employees of basic security practices, such as locking workstations or changing passwords. Training employs hands-on practice and demonstration sessions to teach employees how to perform a specific skill, such as encrypting email. Training gives employees an opportunity to apply the concepts learned through awareness initiatives. This level of SETA programs is specialized toward either general audiences or those who may require a more advanced level of skills. Finally, education is designed to provide deeper insight into why security measures are in place and is typically reserved for those whose jobs require security expertise. This level of SETA usually falls outside the scope of organizational SETA programs, as this level of education is obtained via college or graduate classes or specialized training programs.

Table 1   Comparative Framework for Designing SETA Programs

	Awareness	**Training**	**Education**
Attribute	"What"	"How"	"Why"
Level	Information	Knowledge	Insight
Learning Objective	Recognition and Retention	Skill	Understanding
Example Teaching Method	Media - Videos - Newsletters - Posters	Practical Instruction - Lecture and/or demo - Case study - Hands-on practice	Theoretical Instruction - Seminar and discussion - Reading and study - Research
Test Measure	True/False Multiple Choice (identify learning)	Problem solving, i.e. recognition and resolution (apply learning)	Essay (interpret learning)
Impact Timeframe	Short-term	Intermediate	Long-term

This framework is key in recognizing the level of understanding an organization

desires of its employees and the mechanisms necessary for achieving each type of

understanding. Subsequent SETA research often cite this work as a practical foundation

for organizations seeking differentiated methods for training a diverse set of employees.

For example, expanding on the types of media available to organizations constructing a

SETA program, Wood (1995) provides a list of awareness methods which can be

distributed via differentiated media. Hansche gives further guidelines for creating SETA

programs that are designed specifically for either awareness (2001a) or training (2001b).

Acknowledging Guttman and Roback's identification of distinct types of SETA

programs, Peltier (2005) specifically focuses on the development and implementation of

security awareness initiatives. Practical techniques for aligning employee behavior with

organizational security goals via awareness endeavors are described, including

establishment of program goals, program development, presentation format and styles, audience segmentation, communicating effectively, and scheduling awareness initiatives.

The need for proper classification of organizational SETA programs is also highlighted in the literature review of SETA programs conducted by Tsohou et al. (2008). The goal of the review was to reduce the amount of ambiguity that exists in much of the SETA research that had been conducted up to that point, leading to frustration among researchers and practitioners attempting to determine the value of a properly executed awareness initiative. Studies were classified based on six criteria (distinction of security awareness, training, and education; desirable outcome; evaluation approaches; process or product aspects; the role of the IS stakeholders; and conditions intervening to success). The authors stress the importance of distinguishing the type of security initiative being implemented (awareness, training, or education) to reduce confusion among employees about organizational goals and ultimately improve the outcomes of SETA programs. Evaluation of a SETA program should be based on organizational goals as well, such as the use of quizzes or questionnaires pertaining to situational scenarios and corresponding appropriate behaviors. Identification of stakeholders is also critical, as SETA programs will need to be catered to specific user segments. Finally, the authors emphasize the potential outside influences which can affect the success of a SETA program, especially organizational factors. Tsohou et al. (2010) further expand the clarification of SETA program terminology by introducing a standardization framework which researchers and practitioners may use for unification of SETA programs with organizational goals.

While proper classification of SETA programs is critical, every SETA program should be rooted in an organization's information security policy. Nigam and Siponen

(2011) address the issue of ISP development by proposing five essential principles for designing information security policies. First, an ISP should be grounded and informed by an organization's overall business goals. Next, commitment from top management must be established for the ISP to ultimately be beneficial. Third, organizations should be adaptable enough to adhere to the requirements delineated in ISP development methods. Fourth, users must be involved in the ISP development process. Finally, the ISP should be both acceptable and easy to comprehend. The authors report that none of the existing ISP development methods meet all of these essential principles and call for further research in the development of a comprehensive ISP method. Establishing methods for developing organizational ISPs will also ensure SETA programs are educating employees on appropriate security protocols.

Although the development of SETA programs is quite practical in nature, and much of the early SETA literature is practitioner-focused, IS researchers have recognized the need to ground SETA research in behavioral theory to better understand the underlying phenomena driving the success or failure of such programs among employees. Thomson and von Solms (1998) present a variety of behavioral theories derived from social psychology which could provide a basis for designing the content of SETA programs as well as the methods with which they are presented to employees. The authors emphasize the need for organizations to recognize the appropriate method for instigating a change in employees' behaviors and attitudes, such as directly changing behaviors, changing attitudes via behavioral change, and changing attitudes through persuasion, offering relevant theoretical grounding for each organizational change

technique. This study also recommends catering SETA programs to specific user segments as well as keeping training sessions as concise as possible.

In a similar manner to Thomson and von Solms (1998), Straub and Welke (1998) also take a holistic view of organizational security measures for protecting information and present the Security Action Cycle as a mechanism to provide a better understanding of the full range of available actions that can be followed in the face of an information security event. The authors position an organization's SETA program as an organization's second intervention element, directly following the identification of potential weakness within an organization's using a proposed security risk planning model. The training proposed in study would consist of elements of the organizational ISP (if one exists), system authorizations, conditions for use, procedures for changing passwords, sanctions for security breaches, and other security-related topics deemed relevant by the organization. The authors also suggest incorporating a discussion on the efficacy of the countermeasures available in each phase of the Security Action Cycle.

Further developing Thomson and von Solms' (1998) call for grounding SETA research in behavioral theory and Straub and Welke's (1998) exploration of specific organizational mechanisms for changing employee behavior, Siponen (2000) discusses the concept of utilizing behavioral theories and intrinsic motivational tactics to construct SETA programs rather than relying on training which is simply descriptive in nature and not accomplishment-based. In other words, the SETA program should consist of more than mechanisms for elevating awareness about threats and countermeasures and should incorporate other training methods, such as emphasis on appealing to employees' moral responsibility, logic, emotions, ethics, feelings of security, and rationality, to encourage

commitment to compliance. While the recommendations from this study are purely conceptual, Siponen provides a framework for exploring the various theory-based methods of designing and implementing SETA programs that are apparent in future empirical research.

One branch of SETA research has focused on attempting to apply grounded theory to the SETA program phenomenon as it uniquely occurs within specific contexts. Concentrating on organizations in developing countries, Rezgui and Marks (2008) conducted a case study at a higher education institution in the United Arab Emirates to observe the factors that influence security awareness among staff and information systems decision makers. Their observations indicate that specific environments and the manner in which they are established plays a critical role in affecting information security awareness. Their specific recommendations for awareness programs include creating policies that are catered specifically to the environment where the policy is enacted, establishing best practices for employees and conducting mandatory employee training based on these practices, and continuously evaluating and readjusting the training program. Another interesting suggestion which will inform the present study is the use of rewards and sanctions for proper or improper employee conduct. While the authors do not explore this recommendation in great detail, the present study will specifically address the consequences of such a suggestion.

Specifically examining awareness initiatives in e-government adoption contexts, El-Haddadeh et al. (2012) identify several challenges and potential barriers to achieving implementation success. Echoing the findings of Nigam and Siponen (2011), security vision and top management commitment is described as one of the key organizational

problems inhibiting SETA programs in the public sector. In these situations, organizational goals were not aligned with ISPs and faith from executive-level managers was not be present, which subsequently led to unsuccessful awareness endeavors. This finding underscores the importance of alignment between the organization and both the ISP and the SETA program. In addition to these organizational challenges, the authors also discuss the impact of technological and social barriers to SETA program success, such as technical support inadequacies and stakeholder involvement.

Another branch of SETA research has considered the use of alternative learning methods to increase employees' understanding of security policies. Cone et al. (2007), following Siponen's call (2000) for utilizing motivational tactics within SETA program, examined the alternative method of gaming to increase security awareness among employees. The authors used a video game called CyberCIEGE as a supplement to more traditional training methods. In addition to the software being utilized by a variety of organizations at the time of publication, the results also indicate that the game can be an effective addition to basic information awareness programs designed for general computer users.

Continuing the application of behavioral learning theory to SETA program initiatives, Puhakainen and Siponen (2010) suggest focusing information security training efforts on educational rather than disciplinary approaches that are often utilized by organizations. In their study, they created SETA programs based on Universal Constructive Instructional Theory (UCIT) and the elaboration likelihood model. They provide a thorough summary of the prior SETA literature in order to identify characteristics of training programs used previously.

Karjalainen and Siponen (2011) also supports the use of theory in exploring the psychological and sociological mechanisms that may lead to SETA program success. The authors classify various approaches to SETA program development, categorizing them as psychological training, learning theory, security awareness, process situational, social engineering, and computer-based techniques. In examining psychological training techniques, they discuss several studies that have used foundational theories from psychology to influence one's attitude toward training, resulting in a more desirable program with more positive outcomes. This stream of research highlighted by the authors is critical for the present study, as it indicates that by utilizing such a strategy, organizations may witness a better understanding, and therefore compliance, toward information security policies from their employees.

Some studies have focused specifically on the modification and measurement of the SETA program artifact itself. Applying one of the most commonly adapted theories in information systems, Jenkins et al. (2012) examined the influence of media richness in SETA programs on performance of secure behaviors. The authors conducted a laboratory experiment in which respondents were exposed to a training program with rich media, one using lean media, or no training at all. Their findings indicate that lean media is more effective in security training contexts, whereas rich media was not significantly different from receiving no training whatsoever. This study indicates that organizations may be able to implement relatively inexpensive security training programs while maintaining a sufficient effectiveness in influencing employee behaviors.

Developing a distinct measure for SETA programs has also been explored. One of the challenges in conducting SETA program research is in the conceptualization of the

SETA program as a construct. Merhi and Midha (2012) address this problem by defining SETA as two distinct constructs: threat appraisal training, which emphasizes the severity of a threat and the likelihood of its occurrence, and policy awareness training, which focuses on the specific procedures outlined in an organization's ISP. The authors examine the influence that these SETA sub-constructs have on descriptive norm, which refers to what an individual believes others would do in a specific situation, injunctive norm, which informs what an individual believes others approve or disapprove, and ultimately compliance with an organization's ISP.

SETA research has also been conducted to apply theories focused more broadly on individual differences among employees. While researchers have long espoused the importance of SETA programs in informing employees about security threats and countermeasures and encouraging them to perform behaviors which are compliant with organizational ISPs, the impact of the training could be mitigated by the degree of employees' interest and active participation in such initiatives. Parrish and San Nicolas-Rocca (2012) explore this problem by examining the "mindfulness" and "mindlessness" exhibited by employees during security training sessions. The authors argue that by actively engaging employees in higher thinking processes during training sessions, training will be more effective. The proposed mechanism for engaging trainees is the incorporation of intelligence, design, and choice from Simon's (1960) decision making model. The authors suggest that intelligence will help develop employees' abilities to identify threats to their environment, design may assist in the recognition of a range of appropriate response behaviors, and choice could increase the effectiveness of selecting

the best alternative. The concept of enhancing the SETA program through alternative methods is central to this study as well.

Examining employee behavior in order to prescribe SETA programs catered specifically to individuals, Lebek et al. (2013) propose a process model which evaluates employees' current behaviors related to information security and determines the type of SETA program needed based on the disparity between the current behavior observed and the behavior desired by the organization. The authors utilized a five-cycle technique, which included systematic literature reviews and interview with IT managers and end users, to develop the model and measured actual secure behaviors using organizational data sources, such as system monitoring data, server logs, and security incident reports.

Perhaps most relevant to the present study, Wall and Palvia (2013) examine the effect of employees' perceptions of autonomy on ISP compliance among government workers. The authors specifically study reflective and reactive autonomy. Reflective autonomy is the degree to which an individual believes that his or her actions are a product of personal reflection and choice. Reactive autonomy refers to one's desire to exercise a greater degree of autonomy in the presence of restrictions or control-oriented mechanisms, such as a security policy. Although the sample size in their study was small, the authors found that elevated perceptions of reflective autonomy significantly increased compliance, while reactive autonomy significantly decreased compliance. The authors provide preliminary evidence that self-determined and control-oriented constructs may exhibit some influence in situations concerning employees' performance of secure behaviors, especially in contexts where organizational security policies are implemented.

By recognizing prior research on SETA programs, we hope in the present study to examine areas where prior literature intersects, as well as identify interesting gaps in research that may reveal a new aspect of the SETA program phenomenon. One concept that has been widely studied in other disciplines, and even in other research streams in information systems, but has thus far remained unexplored with regard to SETA program effectiveness, is individuals' motivation toward performing certain behaviors or tasks.

Motivation and Self-Determination Theory

Motivation may play a role in influencing a user's ability to both complete and adhere to an organization's SETA program. Motivation can be generally classified as intrinsic or extrinsic (Deci & Ryan, 1980). An individual can also experience a lack or absence of motivation, referred to as amotivation (Deci & Ryan, 1980). Intrinsic motivation refers to "performing an activity for itself, and the pleasure and satisfaction derived from participation" (Robert J Vallerand, 1997). Extrinsic motivation refers to "engaging in an activity as a means to an end and not for its own sake" (Robert J Vallerand, 1997). Amotivation is defined as "the lack of intentionality and thus the relative absence of motivation" (Robert J Vallerand, 1997). In the context of the delivery of a SETA program, an organizational requirement to complete the program is an example of extrinsic motivation, while participation due to a personal desire to learn more about information security is an example of intrinsic motivation.

Additionally researchers have identified various types of intrinsic and extrinsic motivation (Ryan & Deci, 2000a). Intrinsic motivation consists of intrinsic motivation to know, intrinsic motivation toward accomplishments, and intrinsic motivation to experience stimulation (Robert J Vallerand, 1997). Intrinsic motivation to know refers to

engaging in an activity for the pleasure and satisfaction that one experiences while learning, exploring, or trying to understand something new. Intrinsic motivation toward accomplishments is engaging in an activity for the pleasure and satisfaction experienced while one is attempting to surpass oneself or to accomplish or create something. Intrinsic motivation to experience stimulation is engaging in an activity in order to experience pleasant sensations associated mainly with one's senses.

Drawing on prior research related to types of motivation and their outcomes, Deci and Ryan (1980) developed Self-Determination Theory (SDT). Prior to SDT, intrinsic and extrinsic motivation were conceptualized as dichotomous. The underlying concept of SDT is the identification of different types of extrinsic motivation and their placement on the self-determined continuum, which ranges from highly self-determined forms of extrinsic motivation to those which are more control-oriented. Deci and Ryan conceptualized four types: external regulations, introjected regulations, identified regulations, and integrated regulations. The continuum of self-determined motivation is shown in Figure 3. To further illustrate the meaning of each of these forms of extrinsic motivation, entry-level employees, who often perform undesirable tasks that are not self-determined, will be utilized in the subsequent descriptions of each type as examples.
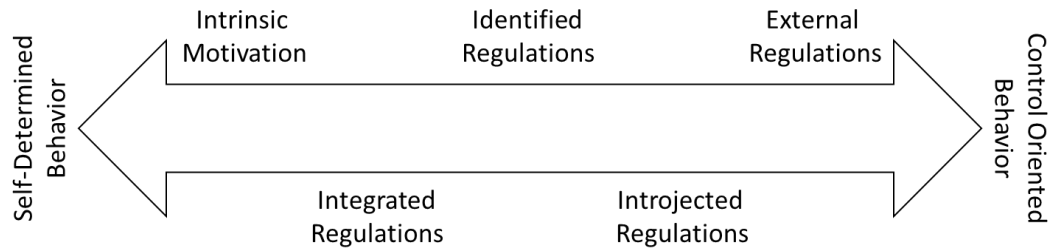
Figure 3   Types of Motivation along the Self-Determined Continuum

(Deci & Ryan 1980)

External regulations, the most control-oriented form of extrinsic motivation,

refers to regulating behavior through external means, such as rewards or constraints. This

form of extrinsic motivation has been extensively examined in information security

research through the adaptation of General Deterrence Theory and the implementation of

formal sanctions in information security policies (D'Arcy et al., 2009; Goodhue &

Straub, 1991; Straub, 1990). Motivated by external regulations, an entry-level employee

at an organization would perform behaviors purely to receive a reward or avoid

punishment from his or her superiors. This employee would also be motivated to receive

promotions strictly for the increased salary that a higher position entails.

Introjected regulations occurs when an individual internalizes the reasons for his

or her actions, meaning the motivation is internal but not self-determined. This often

manifests as the positive or negative judgments one may endure from others in relation to

performing certain behaviors. An individual's behavior under introjected regulations is

largely derived from the praise or shame one may experience when performing a

behavior, meaning that the behavior is largely controlled by the judgments of external

parties. Information security research has also examined this phenomenon via the

exploration of informal sanctions and their influence on employee behavior (Warkentin,

Malimage, & Malimage, 2012). An entry-level employee would be motivated by introjected regulations if he or she performed behaviors in order to receive verbal praise or avoid reprimands from superiors. This employee would be motivated to receive promotions based on the continued praise he or she would receive while moving toward the top of the organizational hierarchy.

Identified regulations occurs when behavior is highly valued and judged as important to the person upon identification. This means that the behavior being performed by the individual may not be self-determined but may be important in achieving some other outcome which is intrinsically desired. In this instance, an entry-level employee may possess the intrinsic motivation to achieve, which would involve attaining higher positions within the organization. This employee would be motivated to perform tasks that may not be self-determined with the hope that doing so may lead to a promotion, where his or her behaviors become more self-determined.

Integrated regulations refers to choices that are made as a function of their coherence with other aspects of the self, meaning that one views a particular behavior as an extension of oneself. An entry-level employee motivated via integrated regulations sees the performance of all behaviors in the organization, even those that are not self-determined, as an extension of who he or she is within the organization. This employee would simply want to do a good job at all tasks because he or she recognizes that how well the task is performed is a reflection of him or her as a person. While this employee would also desire a promotion in order to perform more self-determined behaviors, his or her behaviors would be more integrated than employees motivated via identified regulations.
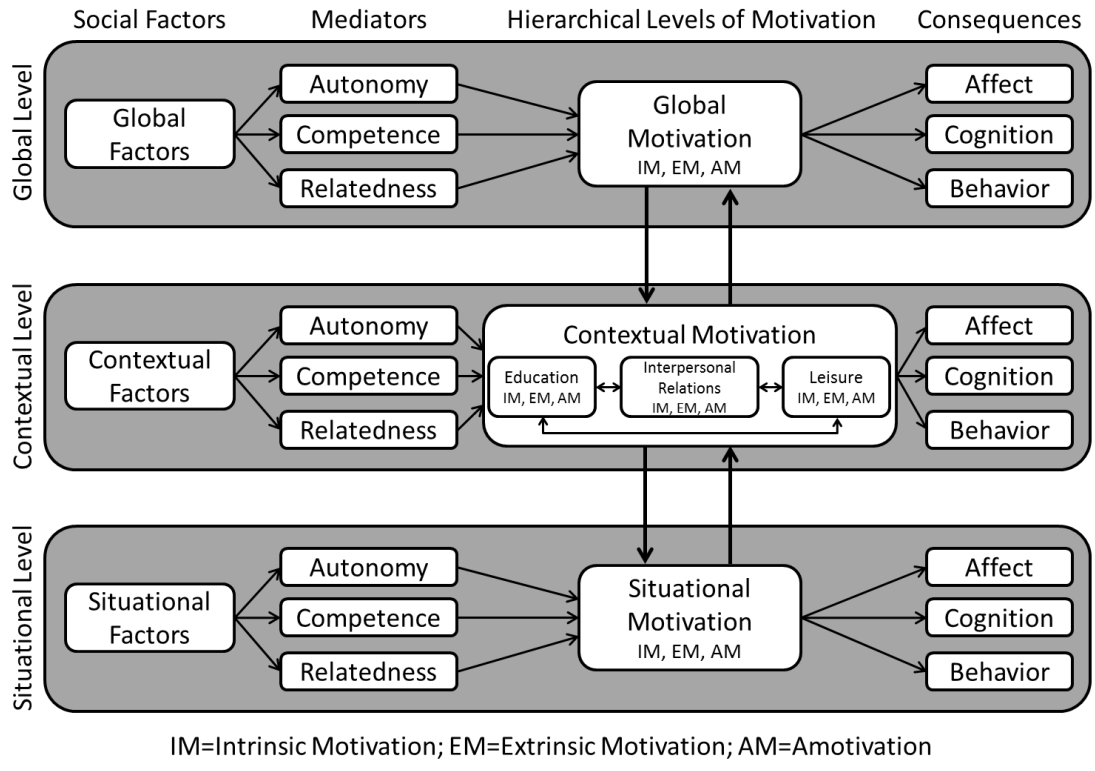
Figure 4   Vallerand's Hierarchical Model of Intrinsic and Extrinsic Motivation
             (1997)

Using Deci and Ryan's foundational work on motivation (Deci & Ryan, 1980;

Deci, 1972; Ryan, 1982), Vallerand (1997) developed a hierarchical model of motivation,

separating one's motivation into global, contextual, and situational levels. This model is

depicted in Figure 4. Global level motivation is one's general motivational orientation to

interact with the environment. The next lower level, contextual level motivation, is one's

usual motivational orientation toward a specific context, such as education, work, leisure,

or interpersonal relationships. Finally, situational level motivation is the motivation

individuals experience when they are currently engaging in an activity within a specific

context. Levels of motivation can affect each other as well. Top-down effects occur when

one's tendency toward motivation at one level influences his motivation at the next lower level. For example, one's global motivation will influence one's motivation in specific contexts of life where the person is engaged, such as leisure, sports, or education. Within the realm of this study, an employee's general motivation orientation may influence his or her degree of intrinsic or extrinsic motivation experienced within a workplace context.

Levels of motivation can also have a recursive effect between levels, meaning that repeatedly experiencing motivation at a lower level over time could develop into motivation at the next-higher level. For instance, one's motivation toward a particular task in a class, when experienced repeatedly, could lead to a change in motivation toward school at the contextual level.

At each level of motivation, perceptions of autonomy, competence, and relatedness positively influence the self-determined nature of one's motivation (Robert J Vallerand, 1997). In this stream of research, autonomy refers to one's perception of the degree to which he or she may engage in activities of his or her own desire. Perceptions of competence relate to the degree to which an individual feels he or she can interact effectively with his or her surroundings in order to produce desired outcomes or prevent undesired consequences. Relatedness is one's perception of the degree to which he or she feels connected with others.

High levels autonomy, competence, and relatedness have been shown to increase intrinsic motivation and decrease amotivation and control-oriented forms of extrinsic motivation, while low levels of autonomy, competence, and relatedness have the opposite effect (Deci & Ryan, 1980; Ryan et al., 1983; Robert J Vallerand, 2000). Despite the effects of these constructs, many organizations choose to implement security policies that

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are centered on deterring deviant behavior through the application of sanctions, which can be classified as extrinsic motivation in the form of external regulations (D'Arcy & Herath, 2011; D'Arcy et al., 2009; Herath & Rao, 2009). Sanctions have also shown inconsistent influence over the performance of secure behaviors, varying depending on the deviant act in question (D'Arcy & Herath, 2011). Embedding varieties of intrinsic motivation or more self-determined forms of extrinsic motivation within SETA programs may influence an employee's understanding and acceptance of organizational security policies communicated through SETA programs. Similarly, when one's contextual-level motivation is affected, as depicted in the example above, it may influence one's motivation to participate in tasks at the situational level, such as a SETA program.

Motivation has previously been explored in organizational contexts. Deci et al. (1989) examine changes that occur in an organizational setting when managers provide supporting environments for their subordinates rather than controlling subordinate behavior, with results showing that self-determination has positive outcomes for employees. Gagne and Deci (2005) provide a synthesized theoretical model incorporating motivation with other commonly used management constructs, such as job satisfaction, psychological well-being, and organizational trust.

Motivation has also been extensively studied in education, typically using motivation as a tool for improving student performance, competence, and well-being. Deci et al. (1991) provide the theoretical foundation for adapting SDT to educational contexts, focusing on students' internalization of learning motivation and improving students' perceptions of confidence in the classroom. Noels et al. (2000) specifically explored the effects of motivation on students' desire to learn second languages, finding

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that although motivation is critical, other factors may also need to be emphasized in this context for students to feel that learning a second language is personally important for them. Vallerand et al. (1997) studied the effects of autonomy-supportive behavior of social agents (i.e. teachers, administrators, etc.) on high school students' perceptions of competence and autonomy, demonstrating that when social agents support students' autonomy, students' perceptions of both competence and autonomy increase. Similarly, Patall et al. (2010) examined the impact of providing choices in homework assignments on students' motivation and subsequent academic performance, finding that students felt more competent and performed better on exams when choices were provided to them.

Information systems researchers have shown an interest in motivation as well, demonstrating motivation's influence on system acceptance. Davis et al. (1992) examined the role of enjoyment in end users' acceptance of systems by exploring the influence of intrinsic and extrinsic motivation in forming perceptions of enjoyment. While the authors still found that perceived usefulness was the most influential factor in determining system acceptance, the results demonstrated that enjoyment was a significant secondary determinant. Studying end user enjoyment further, van der Heijden (2004) explored the differences in user perceptions regarding productivity-oriented software and pleasure-oriented systems, finding that ease of use and enjoyment, characterized as intrinsically-associated constructs, were stronger determinants of intention to use pleasure-oriented, or hedonic, systems. Venkatesh (1999) utilized game-based training in an effort to improve user perceptions of new systems by intrinsically motivating users during systems training, finding that users who participated in the game-based training perceived the system as being easier to use than those who participated in a traditional training session. Building

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on these results, Venkatesh (2000) incorporated computer playfulness into TAM as a means to measure the level of intrinsic motivation among end users. Venkatesh found that computer playfulness increased perceptions of ease of use in end users and contributed greater explanatory power to TAM. Examining the role of motivation in users' propensity to share information and rumors within online communities, Marett and Joshi (2009) found that those who frequently posted information online were likely to be driven by intrinsic and extrinsic motivational factors, whereas those who simply read the postings of others, or were "lurkers," were significantly influenced only by extrinsic motivation.

Organizational Justice

One of the potential outcomes of enhancing an employee's motivation toward work at the contextual level may be an employee perceiving higher levels of organizational justice. It is important to note that organizational justice is may be measured as four distinct constructs: distributive justice, interpersonal justice, informational justice, and procedural justice (Colquitt, 2001). Distributive justice relates to the perceived fairness of the amounts of compensation employees receive. Interpersonal justice is the degree to which one perceives to be treated in a fair manner by authority figures. Informational justice is related to the perceived fairness in how the information about procedures has been communicated. Procedural justice refers to the perceived fairness of the means used to determine organizational policies regarding rewards or sanctions. Due to its relation to the formulation of policies, procedural justice may be especially salient in the context of the present study.

Previous research in motivation has demonstrated a relationship between intrinsic motivation and procedural justice. Zapata-Phelan et al. (2009) conducted a two-study investigation of the relationship between procedural justice and intrinsic motivation using a laboratory experiment and a field study for data collection. The authors found that procedural justice was highly correlated with intrinsic motivation in forms of data collection.

Organizational-Based Self-Esteem

The relationship between motivation and psychological well-being has been well-established in previous literature related to the motivation of employees, athletes, and students. Deci et al. (1991) discuss the implications of enhancing self-determination in students from an early age with one of the prime outcomes being an increase in students' self-esteem. Deci and Ryan (2000) compare SDT to other psychological theories related to the needs of individuals and determine that motivation should theoretically have some type of influence on psychological well-being. Perhaps most comprehensively, Ryan and Deci (2000b) characterize enhanced psychological well-being as a natural outcome of being self-determined due to having the basic needs of autonomy, competence, and relatedness satisfied via intrinsic motivation or self-determined forms of extrinsic motivation. Specifically related to the context of work environments, Baard et al. (2004) demonstrated that when employees' needs for autonomy, competence, and relatedness are satisfied, intrinsic motivation significantly influenced employees' psychological adjustment.

Psychological well-being has been conceptualized in several ways depending on the context of the study. Researchers examining psychological well-being in work-related

studies often utilize organizational-based self-esteem as a context-specific measure of this construct (Deci & Ryan, 1987; Gardner & Pierce, 1998; Pierce, Gardner, Cummings, & Dunham, 1989). As an employee's motivation at work becomes more self-determined, he or she will experience higher perceptions of organizational-based self-esteem.

Affective Commitment

Based on Allen and Meyer's (1996) conceptualization of affective commitment, which refers to employees' identification with, emotional attachment to, and involvement in the organization, motivational researchers have explored the relationship between motivation and organizational commitment, finding that self-determined forms of motivation positively influence an employee's affective commitment toward his or her organization. Gagne and Koestner (2002) first examined the influence that motivation may have on affective commitment, finding a significant relationship between these two constructs. Further testing this relationship, Gagne et al. (2004) analyzed three samples of employees from different firms, assessing the varying types of extrinsic motivation, as well as intrinsic motivation, in relation to employees' affective commitment. In each dataset, the researchers found evidence that supported the previous findings of Gagne and Koestner (2002). These studies have shown that self-determined motivation influences affective commitment, and this relationship may have an impact on this study as well.

Research Model and Hypotheses
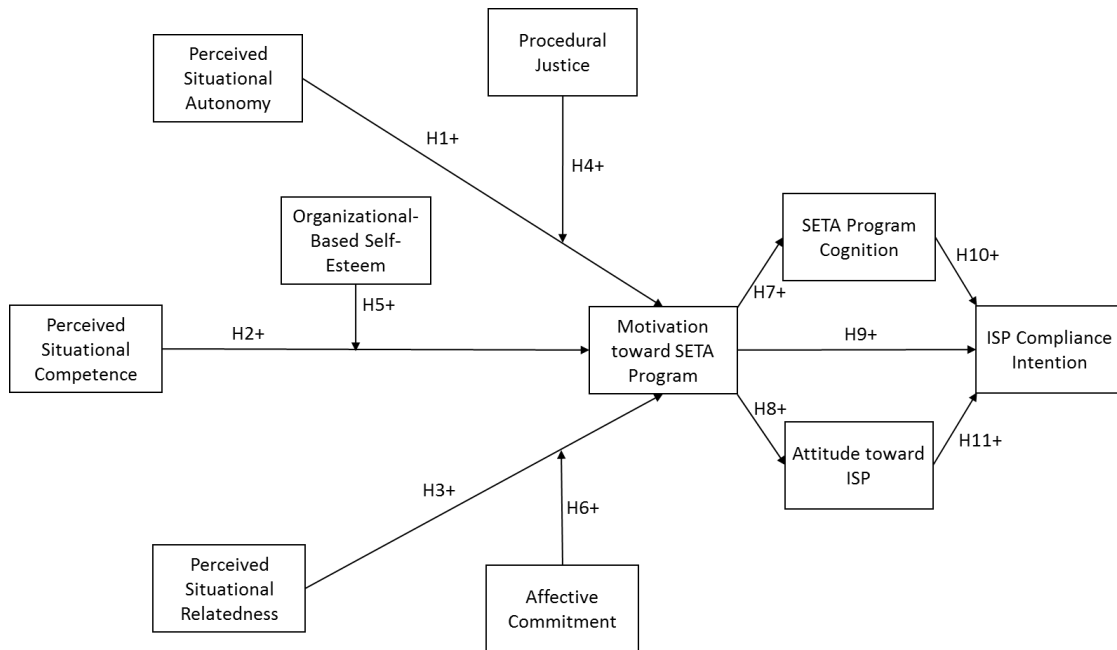
Figure 5   Research Model

Concepts and constructs from the aforementioned literature have been adapted for the current study. The hypothesized relationships are illustrated in the research model (see Figure 5). According to SDT (Deci & Ryan, 1980) and Vallerand's hierarchical model (Robert J Vallerand, 1997), motivation is influenced by competence, autonomy, and relatedness at each level of motivation. Because participation in a SETA program is a situational behavior within the work context, motivation toward an organization's SETA program occurs at the situational level. An employee with an elevated perception of competence related to the concepts being presented in the SETA program will be intrinsically motivated to participate. As an employee perceives a higher degree of autonomy related to the specific ways to participate in a SETA program, motivation will

become more self-determined. If an employee feels that the SETA program offers opportunities to connect with co-workers in an enjoyable manner, his or her motivation will be more intrinsic. Thus, the following hypotheses are offered:

H1:   Perceived situational autonomy will positively influence motivation toward participation in an organization's SETA program.

H2:   Perceived situational competence will positively influence motivation toward participation in an organization's SETA program.

H3:   Perceived situational relatedness will positively influence motivation toward participation in an organization's SETA program.

Due to the separation of hierarchical levels, the only relationship that exists between levels is that of each type of motivation having an influence on its nearest level of motivation, such as global-level motivation affecting contextual-level motivation or situational-level motivation being influenced by contextual-level motivation. This construction of motivational theory does not link other variables at different levels to each other. However, previous literature does demonstrate relationships between organizational constructs, such as procedural justice, affective commitment, or self-esteem, to motivational variables, such as autonomy, relatedness, or competence, measured at the same level of motivation (Gardner & Pierce, 1998; Greguras & Diefendorff, 2009; Zapata-Phelan et al., 2009).

Although a direct relationship between contextual-level organizational variables and situational-level motivation variables does not theoretically exist, the influence between these variables may manifest as a moderating effect. For example, prior work in motivation research has shown that an employee's perception of autonomy at work is

highly correlated with his or her perceptions of fairness related to the amount of control exerted through organizations via policies. Thibaut and Walker (1975) argued that employees' autonomy at work was significantly correlated with their perceptions of procedural justice. Leventhal (1980) suggested that procedures should be influenced by employees' views and opinions. When autonomy is not present in employees' interactions with supervisors, employees' views and opinions tend to not be acknowledged and are therefore underrepresented in subsequent organizational policies.

As an employee perceives higher levels of procedural justice at the contextual level, the degree of influence that the employee's perception of situational-level autonomy has on situational-level motivation should become significantly stronger. Conversely, if an employee feels that organizational policies are generally control-oriented and unfair, the amount of influence that situation-level autonomy has on situational-level motivation will be weakened, signifying the presence of a moderating effect. Thus, the following hypothesis is offered:

H4:   Procedural justice will positively strengthen the relationship between perceived situational autonomy and motivation toward participation in an organization's SETA program.

Using a similar argument as the preceding hypothesis, a moderating effect should exist between contextual-level self-esteem and situational-level competence due to the evidence of a relationship at the contextual level shown in previous research, beginning with educational contexts. Deci et al. (1981) reported significant positive correlations between teachers' use of intrinsic motivation and children's perceived cognitive competence and self-esteem. Comparing self-determined teaching environments with

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control-oriented settings, Deci et al. (1981) found that children who experienced self-determined forms of motivation showed significantly higher perceptions of perceived competence and self-esteem in relation to children in control-oriented classrooms during the first 2 months of a school year. Offering additional support to the prior literature, Ryan and Grolnick (1986) reported significant correlations between children's perceptions of the environment as being self-determined and their own perceived competence and self-esteem. These researchers found that in an educational context that as self-determination increases, children had higher competence and self-esteem than when context was control-oriented.

Similar results have been shown within organizational contexts as well. Gardner and Pierce (1998) found that, when measured at the contextual level, organizational-based self-esteem served as a mediator between general self-efficacy, which is conceptually similar to competence, and job performance. As an employee perceives higher levels of organizational-based self-esteem at the contextual level, the degree of influence that the employee's perception of situational-level competence has on situational-level motivation will become significantly stronger. Similarly, we offer the following hypothesis:

H5: Organizational-based self-esteem will positively strengthen the relationship between perceived situational competence and motivation toward participation in an organization's SETA program.

Again, a moderating relationship should exist between contextual-level affective commitment and situational-level relatedness due to evidence of previous linkages shown when both are measured at the contextual level. As described earlier, affective

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commitment refers to an emotional connection one feels toward an organization, and is due in large part to the relatedness one feels with other employees (Allen & Meyer, 1996; Gagne et al., 2004; Gagne & Koestner, 2002; Kuvaas, 2006; Myer, Becker, & Vandenberghe, 2004). Greguras and Diefendorff (2009), in studying person-environment fit within organizations, found that as employees perceived higher degrees of relatedness between themselves and other employees at the contextual level, affective commitment was significantly positively influenced, providing an empirical basis for our hypothetical argument. Similarly, the affective commitment an employee experiences at the contextual level should strengthen the relationship between the situational-level relatedness one perceives while participating in a SETA program and increase his or her motivation toward the SETA program. As a result, we offer the following hypothesis:

H6:   Affective commitment will positively strengthen the relationship between perceived situational relatedness and motivation toward participation in an organization's SETA program.

As depicted in Vallerand's Hierarchical Model of Motivation (1997) there are three main outcome variables of motivation: cognition, behavior, and affect. In educational motivation research, cognition is typically conceptualized as a student's ability to recall information that was learned. Because the present study is centered on employees' motivation toward learning material related to information security policies, cognition will be similarly conceptualized. An employee who is intrinsically motivated to participate in a SETA program will have an innate desire to learn the material being presented, and should subsequently exhibit better recall of the topics covered during the training. Thus, the following hypothesis is offered:

H7:   Motivation toward participation in an organization's SETA program will

positively influence SETA program cognition.

As conceptualized in information security research, attitude toward an

information security policy refers to one's positive or negative emotion related to an

organizations policies (Herath & Rao, 2009) and has been used extensively in studies

examining employees' compliance with information security policies. Woon and

Kankanhalli (2007) examined the influence of attitude on intention to practice secure

development of applications. Pahnila et al. (2007) explored the impact of positive and

negative reinforcement on attitudes, intention to comply, and actual compliance. Herath

and Rao (2009) tested a model combining aspects of GDT, PMT, organizational

commitment, and security policy attitudes in formulating policy compliance intentions.

Bulgurcu et al. (2010) studied the employees' beliefs about policy outcomes and

consequences in formulating intentions to comply with attitude included as one of the

constructs influencing intention to comply. Ifinedo (2011) examined influence of PMT

with attitude and subjective norms serving as additional constructs affecting compliance

intention.

This is conceptually similar to the construct affect, which has been defined in

motivational research as "interest, positive emotions, satisfaction, or anxiety" and is one

of the main outcomes of motivation (Robert J Vallerand, 1997). Affect has been

previously adapted for IS contexts, including technology acceptance (Moon & Kim,

2001; P. Zhang & Li, 2005, 2007), computer-mediated communication (Brown, Fuller, &

Vician, 2004), computer anxiety (Igbaria & Parasuraman, 1989), IS continuance (Kim,

Chan, & Chan, 2007), and human-computer interaction (P. Zhang, 2013). An employee

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who is intrinsically motivated to participate in a SETA program will have a more positive attitude related to the policies being taught during training seminars. Based on this argument, the following hypothesis is posited:

H8:   Motivation toward participation in an organization's SETA program will positively influence attitude toward an organization's information security policy.

One of the outcome variables of motivation is behavior. However, many studies have examined the relationship between intentions and behavior, finding that the formation of intentions precedes the performance of the actual behavior. The basis of this relationship was first conceptualized by Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA). In their seminal study, Fishbein and Ajzen posit that an individual's behavior is dictated by a cognitive process in which intentions to perform the behavior are first formulated. Measures of intention to perform a behavior have been widely used in information systems research (Davis, Bagozzi, & Warshaw, 1989; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2012), as well as specifically in information security research (Bulgurcu et al., 2010; D'Arcy et al., 2009; Herath & Rao, 2009; Johnston & Warkentin, 2010). An employee who is intrinsically motivated to participate in a SETA program should subsequently form intentions to perform the behaviors described in the SETA program. Thus, we posit the following:

H9:   Motivation toward participation in an organization's SETA program will positively influence intention to comply with an organization's information security policy.

An employee's understanding of the information security policies being implemented by the organization is demonstrated via SETA program cognition, which measures an employee's ability to recall information provided in the SETA program. An employee who exhibits an understanding of the information security policy should form intentions to perform the behaviors described in the SETA program. This relationship has been previously demonstrated in other information security studies (Bulgurcu et al., 2010; D'Arcy et al., 2009) and is thus presented in this research as well:

H10:   SETA program cognition will positively influence intention to comply with an organization's information security policy.

TRA (Fishbein & Ajzen, 1975) hypothesizes that an individual's intention is influenced by his or her attitude. The relationship between attitude and intention has also been well-established in IS studies (Davis et al., 1989), including those specifically focused on information security (C. L. Anderson & Agarwal, 2010; Bulgurcu et al., 2010; Herath & Rao, 2009; Ifinedo, 2011; Pahnila et al., 2007; Woon & Kankanhalli, 2007). Excluding Herath and Rao (2009), each of the studies found attitude significantly influenced compliance intentions. An employee who has a positive attitude toward an organization's information security policy should form intentions to behave in alignment with the procedures outlined in the security policy and communicated in the SETA program. Based on the preceding argument, we offer the following:

H11   Attitude toward an organization's information security policy will positively influence intention to comply with an organization's information security policy.

The SETA framework developed by Guttman and Roback (1995) depicted the progression of understanding that an employee should demonstrate when participating in awareness, training, and education programs. As an employee develops a deeper understanding of the various threats toward an organization's information security and the related countermeasures available, the employee's intention to perform secure behaviors should become more pronounced. An employee's attitude toward the organization's policy should also improve with further SETA participation. Therefore, an employee who successfully completes both an awareness and a training program should possess a more positive attitude toward security policies and a greater intention to perform secure behaviors.

H12a: Compared with attitude after only awareness program participation, attitude toward an organization's information security policy will be significantly higher after participation in an information security training program.

H12b: Compared with intention after only awareness program participation, intention to comply with an organization's information security policy will be significantly higher after participation in an information security training program.

SDT posits that as one perceives a greater degree of autonomy, competence, or relatedness in a situation, one would be more inclined to engage in similar situations. Employees experiencing autonomy, competence, and relatedness while participating in an awareness program should possess a greater desire to continue with a similar training

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program because of a higher perception of self-determination achieved in the awareness program.

> H13a: Individuals perceiving a greater degree of autonomy during an awareness program will elect to participate in a subsequent training program.

> H13b: Individuals perceiving a greater degree of competence during an awareness program will elect to participate in a subsequent training program.

> H13c: Individuals perceiving a greater degree of relatedness during an awareness program will elect to participate in a subsequent training program.

This chapter has explored the background of the study and has provided theoretical grounding for answering the research questions. A review of organizational culture, SETA programs, self-determination theory, and work-related motivational studies was presented, describing critical findings from past works and identifying interesting research opportunities yet to be examined. Building on prior scholarly inquiries, the research model was provided, along with theoretical reasoning for each of the hypotheses in the model.

In Chapter 3, the methods for measuring and testing the research model are described in detail. The study's experimental design, construction of instrumentation, and data analysis techniques are discussed. Results are presented in Chapter 4 and interpreted in Chapter 5.

CHAPTER III

RESEARCH METHOD

Introduction

The third chapter describes the selected method for collecting data, the

experimental manipulations used for motivating respondents, and the analytical tools and

tests used in this study. First the design of the SETA program and motivational

manipulations will be described in detail. The design of the survey instrument and an

illustration of the instrument flow is included. Next, measurement scales for each of the

constructs of interest are listed. Construct definitions and scale development procedures

are described here. Measurement scales are analyzed using pilot data to establish initial

construct validity, including reliability and discriminant and convergent validity. Finally,

the sampling frame of the main study is described, as well as analytical techniques

utilized for examining hypothesized relationships and assessing differences between

treatment groups.

SETA Program Design and Motivation Manipulation

This study has been constructed to assess the influence of self-determined and

control-oriented forms of motivation on employees' willingness to participate in and

successfully complete organizational SETA programs. To rigorously examine this

phenomenon, an experimental design was used to administer motivational treatments.

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Employees received motivational treatment to participate in the SETA program. Half of the treatment groups were motivated with a self-determined appeal to participate in the SETA program, while the remaining groups were motivated to participate via a control-oriented appeal. Self-determined motivational appeals were operationalized as organization-derived security achievement certifications. Although employee certifications are provided by an external entity, this treatment appeals to self-determined behaviors – learning and achievement. Control-oriented motivation was administered via a cash prize awarded upon completion.

Employees were also motivated during their participation in the SETA program. Treatment groups received manipulations intended to enhance perceptions of autonomy, competence, and relatedness while engaged in the SETA program. Each of these variables has been manipulated in previous educational research examining their influence on students' motivation toward learning. Autonomy is commonly operationalized by offering students the freedom to choose what or how they learn (Deci & Ryan, 1987; Gagne & Deci, 2005; Miserandino, 1996; Reis, Sheldon, Gable, Roscoe, & Ryan, 2000). For the autonomy manipulation in this study, employees were asked to select which security topics interested them the most. For the topics selected, employees received additional information; for topics that were not selected, the employee only received the base information regarding that topic. Trainees that did not receive the autonomy manipulation simply received the base information about each security topic and did not have the opportunity to receive additional information about topics that interested them. Employees also had no knowledge that a choice existed for other trainees. Pretest and posttest measures in the awareness and training programs were only

be based on material covered in the base information for each topic to allow for comparisons of pretest and posttest scores across all treatment groups, regardless of supplementary information selected by trainees receiving the autonomy manipulation.

Like autonomy, students' perceptions of competence has been extensively researched in motivational studies related to education. Competence is typically manipulated via the use of positive persuasive language upon successful practice of knowledge; students perceive higher competence when they are praised while engaged in learning activities (Blanck, Reis, & Jackson, 1984; Harackiewicz & Larson, 1986; Robert J Vallerand, Blais, Briere, & Pelletier, 1989; Robert J Vallerand & Reid, 1984, 1988; Robert J Vallerand, 1983). Employees receiving the competence manipulation in this study received a practice quiz question after each security topic and had unlimited opportunities to determine the correct answer. On selecting the correct answer, positive language is presented to the employee, praising the trainee on successful completion of a section of the SETA program.

Educational motivational research has also studied the role of relatedness in influencing students' learning motivation. In these studies, relatedness is manipulated by providing students with opportunities to interact with their peers while engaged in learning activities (Ryan & Grolnick, 1986; Ryan & La Guardia, 2000; Ryan, Stiller, & Lynch, 1994). For this study, those receiving the relatedness manipulation were allowed to "interact" with other trainees during each security topic. At the end of each topic, a statement from another "trainee" regarding the current topic is displayed to the respondent. These statements were actually written by the author and thoroughly examined by an expert panel. A pool of statements was created for each topic, and a

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respondent would randomly be displayed one statement from the pool for each topic. The

respondent also received a text box, allowing the respondent to share a statement about

the topic with fellow trainees. In actuality, the statement was simply stored as survey data

and not shared with other trainees.

Two treatment groups will not receive autonomy, competence, or relatedness

manipulations, while the remaining groups will receive a combination of these

treatments. The full factorial design for participation manipulations and treatments for

autonomy, competence, and relatedness results in sixteen treatment groups. The

manipulation matrix is further illustrated in Table 2.

Table 2　　　Experimental Design – Manipulation Matrix

Treatment Group	Motivation to Participate	Motivation While Engaged		
		Autonomy	Competence	Relatedness
1	OC			
2	OC			✓
3	OC		✓	
4	OC		✓	✓
5	OC	✓		
6	OC	✓		✓
7	OC	✓	✓	
8	OC	✓	✓	✓
9	CR			
10	CR			✓
11	CR		✓	
12	CR		✓	✓
13	CR	✓		
14	CR	✓		✓
15	CR	✓	✓	
16	CR	✓	✓	✓

OC=Organizational Certificate; CR=Cash Reward; ✓=Treatment Given

The SETA program was designed according to levels of awareness (consisting of

text and images explaining security concepts followed by examination) and training

(consisting of demonstrations related to operation of security software). Employees who participate at the training level of the SETA program achieved a higher certification (self-determined motivation) or earned a larger cash reward (control-oriented motivation). Cash rewards were valued at $2 for awareness program completion and $4 total (an additional $2) for training program completion. Cash values were consistent with research showing that respondents receiving relatively small cash rewards are more highly motivated to participate in a study than those receiving a chance to win a large cash prize (Warriner, Goyder, Gjertsen, Hohner, & Spurren, 1996). According to Guttman and Roback (1995), security education is signified by a participant's attainment of a professional certification or university credit and falls outside of the organizational domain for administering SETA programs. Therefore, an education program is not included in the present study.

Sample Population

Because an information security policy and its associated SETA program are organizational artifacts, home computer users or students would not be an appropriate sample population for this study. For this research to achieve adequate levels of realism, the sample population for both the pilot study and the main investigation will need to be composed of actual organizational end users who may potentially be exposed to an information security policy or a SETA program. Selecting one organization for investigation also controls for extraneous variables related to the specifics of an organization's information security policy. The material and topics within the SETA program will remain consistent across any possible treatment groups. Because SETA programs are designed to impart security policies specific to a particular organization,

this also limits the study to examining employees at a single organization. As a result, the organization should be large enough to achieve sufficient statistical power for subsequent data analysis.

A variety of public and private K-12 educational institutions throughout the United States were chosen as an appropriate sample population for motivationally manipulating employees for multiple reasons. Due to the dispersal of employees participating in the program throughout the country, the opportunity for employees in differing treatment groups to discuss the motivational manipulations would be mitigated. By controlling for the type of organization being studied, we were also able to implement identical awareness programs across all organizations and training programs that only differed on the specific antivirus solution used at the location (employees were trained on the same types of tasks to perform in the antivirus program across all organizations). Prior to a school's agreement to participate, we ensured that the school had a policy in place and that the policy covered the same information security topics as all other schools participating in the study. Finally, each of the schools participating in this research did not have any type of security-related training program in place at the time of the study, also making them ideal organizations for participation.

Instrument Design

Employees were invited to participate in the SETA program via an email distributed to the entire organization from the administration. When an employee clicks the link provided in the email to begin the program, he or she was redirected to one of the sixteen treatment groups. Employee perceptions were captured throughout participation in the SETA program. Work motivation, organizational-based self-esteem, procedural

justice, and affective commitment were measured prior to entering the SETA program in order to capture perceptions of work motivation and its associated contextual variables prior to the employee being manipulated via situational intrinsic or extrinsic motivation. After these initial assessments, the employee was presented with motivational treatment language that describes whether the employee would be awarded with organizational certification or a cash prize upon completion of the SETA program.

At this point, the employee was directed to the awareness program. This portion of the SETA program was designed to address organization-specific security issues related to policy, as well as general security topics, such as common dangers associated with using the Internet. Employees were given a pretest to provide insight into the amount of organization-specific security awareness the employee already possessed prior to participation in the SETA program. The employee was then exposed to the first half of the awareness program. While the employee was still engaged in the awareness program, he or she was assessed on situational variables, including autonomy, competence, relatedness, and motivation toward the SETA program. In studies examining motivation at the situational level, participants must be assessed while in the midst of performing the activity in order to accurately assess the individual's situational perceptions (Robert J Vallerand, 1997). Once the situational assessment is finished, the employee continued the awareness program. Upon completion, the employee received a brief quiz testing his or her understanding of the topics presented in the awareness program; these questions mirrored those presented in the pretest. Following the quiz, employees were assessed on attitude toward the organizational ISP and intention to perform the secure behaviors outlined in the awareness program.

The employee was then given the option to receive further training. The employee was presented with motivational language according to his or her treatment group and asked whether he or she would like to begin the training portion of the SETA program. If the employee elected to not continue, he or she was redirected to the end of the instrument. Otherwise, the employee began the training program, which consisted of a training demonstration designed to teach the employee how to perform specific tasks within security software provided by the organization, such as anti-virus software. As with the awareness program, the employee was assessed on perceptions of situational autonomy, competence, relatedness, and motivation toward the SETA program while still engaged in the program. Afterward, the employee continued and eventually finished the training program, at which time he or she was tested on the training. Employees were again assessed on attitude toward the ISP and intention to comply with the ISP, which concludes the instrument. The instrument flow is further illustrated in Figure 6.
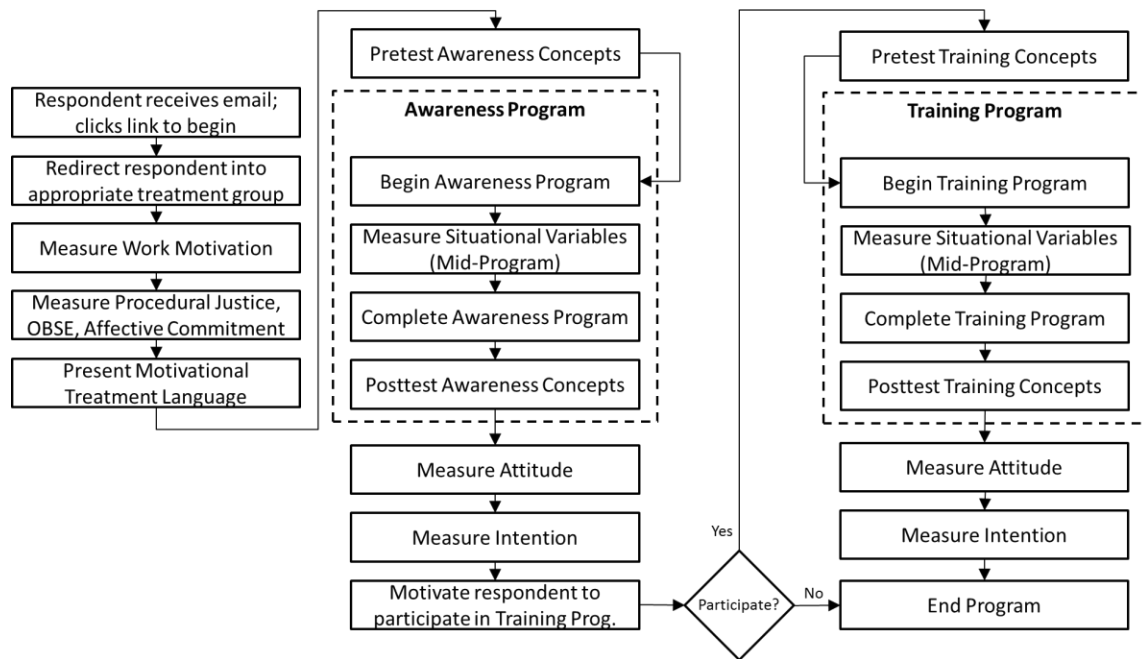
Figure 6   Instrument Flow

Because the research design for this study includes pretests, the act of respondents

seeing measurement scales in a pretest could introduce a potential bias when the same

scales are measured again in a posttest. To control for a possible pretest bias, the

Solomon four-group design is recommended for such situations. In this design, the

sample is split into two groups receiving the experimental treatment and two control

groups where the treatment is absent. One treatment group and one control group receive

the pretest, while the remaining groups do not. Using this design allows for comparisons

across groups to test for significant differences based on the presence of a pretest.

A summary of the implementation of the Solomon four-group for this study is

shown in Table 3. Because the research design for this study natively includes pretests for

respondents' knowledge of awareness and training concepts, as well as their perceptions

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of attitude and intention (see Figure 6), comparison groups A and C respectively encompass the treatment groups receiving the autonomy, competence, and relatedness treatments and those not receiving any treatments. As illustrated in the manipulation matrix (see Table 2), treatment groups 8 and 16 receive all three treatments. This would result in respondents from treatment groups 8 and 16 being included in comparison group A, while comparison group B would be comprised of a subset of respondents from those treatment groups who do not receive the pretests. Only respondents from treatment groups 8 and 16 would need to be included as treatment comparisons in the Solomon four-group design because all of the motivational treatments within the program (autonomy, competence, and relatedness) are given in these groups; if the pretest does not bias the results of the posttest when all treatments are present, it should not bias the results for any group where an individual treatment or combination of treatments is given.

Similarly, respondents from treatment groups 1 and 9 would be included in comparison group C, and a subset of respondents from those treatment groups would not be administered the pretests, resulting in comparison group D. For statistical comparisons to have adequate power, each comparison group should have at least 30 respondents. About 15 additional respondents each from treatment groups 1, 8, 9, and 16 did not receive pretests.

Table 3   Solomon Four-Group Design

Comparison Group Subset	Treatment Groups Included	Pretest	ACR Treatments	Posttest
A	8, 16	✓	✓	✓
B	8, 16		✓	✓
C	1, 9	✓		✓
D	1, 9			✓

ACR=Autonomy, Competence, and Relatedness

Measurement

In behavioral positivist research, phenomena of interest are typically not directly measurable, yet researchers are often interested in conducting quantitative analyses on these types of concepts. A construct is "an abstract concept that is specifically chosen (or 'created') to explain a given phenomenon" (Bhattacherjee, 2012). A latent construct is one which is not directly measurable. Allowing the measurement of concepts that are naturally unmeasurable, researchers develop measurement scales, and the proper procedures for constructing such scales have been debated, rigorously tested, and modified over time (Churchill, 1979; Mackenzie, Podsakoff, & Podsakoff, 2011; Peter, 1981).
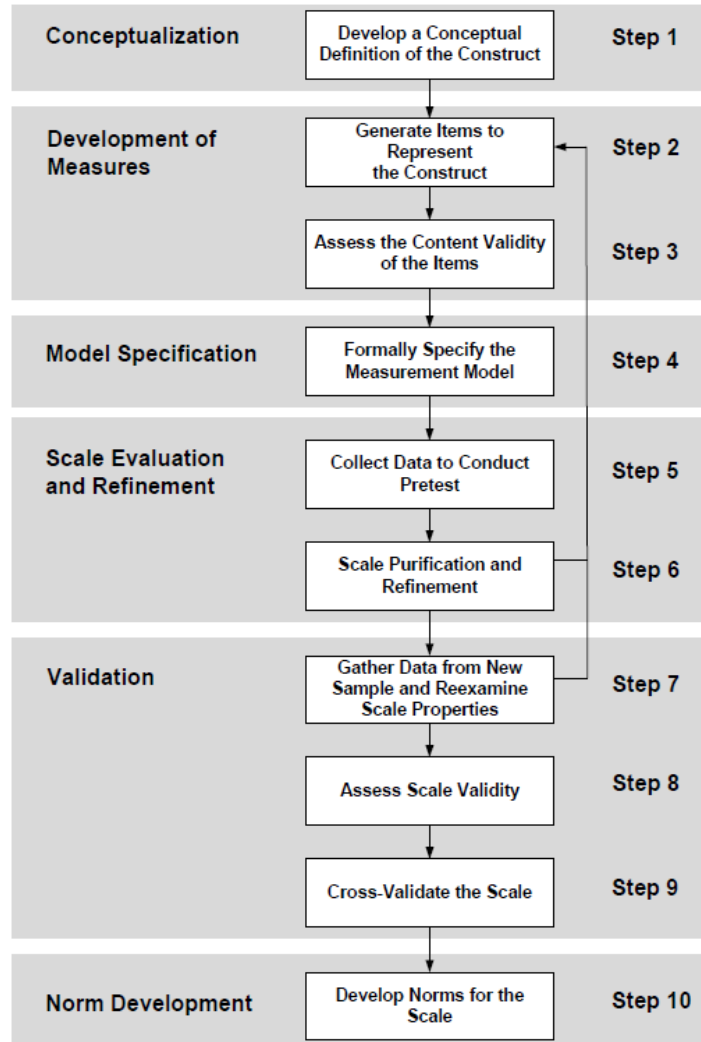
Figure 7   Overview of Scale Development Procedures

(MacKenzie et al. 2011)

Although scale development had been previously practiced in behavioral sciences,

Churchill's (1979) seminal scale development study provided a framework upon which

behavioral researchers have heavily relied. This framework was later refined by

MacKenzie et al. (2011), and the updated scale development procedure are illustrated in

Figure 7. The first step of scale development is the conceptualization of the latent

construct that the scale is designed to measure. Each construct included in the study

should be explicitly defined. Adaptation of the construct may vary depending to the

research context. For this study, each construct's definition was adapted from previous

research to fit the context of motivating employees to participate in a SETA program.

Construct definitions for the present study are listed in Table 4.

Table 4   Construct Definitions

Construct	Adapted Definition	Definition Sources
Work Motivation	A set of forces that influences an individual's desire to initiate work-related behavior and its form, direction, intensity, and duration	Tremblay et al. 2009
Procedural Justice	The justice of the processes that lead to decision outcomes	Colquitt 2001
Organizational-Based Self-Esteem	The extent to which individuals perceive themselves as competent, need-satisfying individuals within work-related contexts	Pierce et al. 1989
Affective Commitment	An employee's identification with, emotional attachment to, and involvement in an organization	Allen & Meyer 1996
Perceived Situational Autonomy	An individual's perception of engaging in activities of one's own choosing; to be the origin of one's own behavior when engaged in a specific activity	Vallerand 1997
Perceived Situational Competence	An individual's perception of interacting effectively with the environment in order to produce desired outcomes when engaged in a specific activity	
Perceived Situational Relatedness	An individual's perception of feeling connected or a sense of belonging when engaged in a specific activity	
Motivation toward SETA Program	Motivation individuals experience when they are currently engaging in a SETA program	
Attitude toward ISP	An individual's degree of like or dislike toward his or her organization's information security policies	Anderson & Agarwal 2010
Intention to Comply with ISP	The degree to which an individual believes he or she will adhere to organizational information security policies	Herath & Rao 2009

Once constructs have been defined, multiple measurement items are generated for each construct and assessed on content validity, which relates to how well a set of scale items matches with the relevant content domain of their respective construct (Bhattacherjee, 2012). Each item should adequately and uniquely capture the essence of the latent construct as defined while also maintaining an appropriate level of consistency across all items representing the construct. In accordance with standard scale development procedures, each construct's definition served as a reference for its respective items' development and validation. All scales in this study were previously validated in prior research, and were either adapted to fit the present study's context, or left unaltered from their original applications. To reduce respondents' cognitive load, scales were standardized via the use of fully-anchored 5-point Likert scales. Content validity for each of the scales was assessed by expert panels consisting of faculty members and PhD students with prior experience in scale development and research methods. Items were purified based on panel feedback. The following subsections will provide further details regarding measurement items for each of the latent constructs included in this study.

Work Motivation

According to Tremblay et al. (2009), work motivation is a set of forces that influences an individual's desire to initiate work-related behavior and its form, direction, intensity, and duration. Work motivation can be classified broadly as a form of motivation that occurs at the contextual level. Because proximal effects exist between levels of motivation, contextual-level motivation may influence situational-level motivation (Robert J Vallerand, 1997). For example, a student who is intrinsically

motivated while at school is more likely to be intrinsically motivated when engaged in specific school-related tasks. While situational factors will also contribute to the student's situational motivation, his or her contextual-level motivation toward school could be influential on any specific tasks that occur within the school context. Similarly, an employee who is intrinsically motivated at work may be more likely to be intrinsically motivated toward work-related tasks at the situational level, such as participation in a SETA program. Although this study is primarily concerned with an employee's motivation toward a specific activity, each employee's motivation toward work could have an impact on our model. To control for individual differences in employees, work motivation was measured and utilized as a covariate.

The scale for work motivation has been adapted from Tremblay et al. (2009) and is designed as a series of multi-item reflective scales assessing each type of motivation along the self-determined spectrum. Intrinsic motivation, integrated regulations, identified regulations, introjected regulations, external regulations, and amotivation are included in the work motivation scale. Based on mean scores for each type of motivation, a composite score is calculated representing the respondent's level of self-determined work motivation with a value ranging between 0 and 5. Each item in the scale is measured using a fully-anchored 5-point Likert scale. Items for the work motivation scale are shown in Table 5.

Table 5   Work Motivation Scale

Item ID	Item	Original Item	Reference
IM1	Because I derive much pleasure from learning new things.	Original items were used in this study.	Tremblay et al. 2009
IM2	For the satisfaction I experience from taking on interesting challenges.		
IM3	For the satisfaction I experience when I am successful at performing difficult tasks.		
INTEG1	Because it has become a fundamental part of who I am.		
INTEG2	Because it is part of the way in which I have chosen to live my life.		
INTEG3	Because this job is a part of my life.		
IDR1	Because this is the type of work I chose to do to attain a certain lifestyle.		
IDR2	Because I chose this type of work to attain my career goals.		
IDR3	Because it is the type of work I have chosen to attain certain important objectives.		
INTR1	Because I want to succeed at this job. If not, I would be ashamed of myself.		
INTR2	Because I want to be very good at this work. Otherwise, I would be very disappointed.		
INTR3	Because I want to be a "winner" in life.		
ER1	For the income it provides me.		
ER2	Because it allows me to earn money.		
ER3	Because this type of work provides me with financial security.		
AM1	I ask myself this question. I don't seem to be able to manage the important tasks related to this work.		
AM2	I don't know why. We are provided with unrealistic working conditions.		
AM3	I don't know. Too much is expected of us.		

Items correspond to the reasons why respondents are currently involved in their work.

Procedural Justice

 Procedural justice is a specific dimension of organizational justice and is defined

as the justice of the processes that lead to decision outcomes (Colquitt, 2001). While

procedural justice may be classified as a contextual construct according to Vallerand's

Hierarchical Model of Motivation (1997), it may still have an influence on an employee's

motivation toward a SETA program, which is situational. The scale used in this study has

been adapted from Colquitt and Rodell's (2011) multi-item reflective scale. The items are

listed in Table 6 and were measured using a fully-anchored 5-point Likert scale.

Table 6   Procedural Justice Scale

Item ID	Item	Original Item	Reference
PJ1	I am able to express my views during the creation of organizational procedures.	Are you able to express your views during those procedures?	
PJ2	I am able to influence the decisions arrived at by organizational procedures.	Can you influence the decisions arrived at by those procedures?	
PJ3	Organizational procedures are applied consistently.	Are those procedures applied consistently?	
PJ4	Organizational procedures are free of bias.	Are those procedures free of bias?	Colquitt & Rodell 2011
PJ5	Organizational procedures are based on accurate information.	Are those procedures based on accurate information?	
PJ6	I am able to appeal the decisions arrived at by organizational procedures.	Are you able to appeal the decisions arrived at by those procedures?	
PJ7	Organizational procedures uphold ethical and moral standards.	Do those procedures uphold ethical and moral standards?	

Organizational-Based Self-Esteem

A context-specific measure of an employee's psychological well-being within an organization is organizational-based self-esteem, which is defined as the extent to which individuals perceive themselves as competent need-satisfying individuals within work-related contexts. Although this construct is contextual in nature, it may still have an influence on situational activities in an organization, such as a SETA program. This multi-item reflective scale has been adapted from Pierce et al. (1989) and was measured using a fully-anchored 5-point Likert scale. The items for this scale are shown in Table 7.

Table 7   Organizational-Based Self-Esteem

Item ID	Item	Original Item	Reference
OBSE1	I count around here.		
OBSE2	I am taken seriously.		
OBSE3	I am important.		
OBSE4	I am trusted.		
OBSE5	There is faith in me.	Original items were used in this study.	Pierce et al. 1989
OBSE6	I can make a difference.		
OBSE7	I am valuable.		
OBSE8	I am helpful.		
OBSE9	I am efficient.		
OBSE10	I am cooperative.		

Affective Commitment

One of the dimensions of organizational commitment is affective commitment (Allen & Meyer, 1990). Affective commitment is an employee's identification with, emotional attachment to, and involvement in an organization and has been adapted from Allen and Meyer's (1996) multi-item reflective scale. The items are listed in Table 8 and were measured using a fully-anchored 5-point Likert scale.

Table 8   Affective Commitment Scale

Item ID	Item	Original Item	Reference
AC1	I would be very happy to spend the rest of my career with this organization.	I would be very happy to spend the rest of my career with this organization.	Allen & Meyer 1996
AC2	I enjoy discussing my organization with people outside it.	I enjoy discussing my organization with people outside it.	
AC3	I really feel as if this organization's problems are my own.	I really feel as if this organization's problems are my own.	
AC4	I would be hard for me to become as attached to another organization as I am to this one.	I think that I could easily become as attached to another organization as I am to this one.*	
AC5	I feel like 'part of the family' at my organization.	I do not feel like 'part of the family' at my organization.*	
AC6	I feel 'emotionally attached' to this organization.	I do not feel 'emotionally attached' to this organization.*	
AC7	This organization has a great deal of personal meaning for me.	This organization has a great deal of personal meaning for me.	
AC8	I feel a strong sense of belonging to my organization.	I do not feel a strong sense of belonging to my organization.*	

* = reverse-coded in original scale

Perceived Situational Autonomy

Perceived situational autonomy refers to an individual's perception of engaging in activities of one's own choosing and to be the origin of one's own behavior when engaged in a specific activity. If an employee feels that he or she has the freedom to choose how or what is learned within a training session, the employee will perceive a higher degree of autonomy in that particular situation. The multi-item scale for this

reflective construct has been adapted from Vallerand (1997). Its items are shown in Table 9 and were measured using a fully-anchored 5-point Likert scale.

Table 9   Perceived Situational Autonomy Scale

Item ID	Item	Original Item	Reference
PSA1	The concepts I learn in this training program are compatible with my choices and interests	The exercise program I follow is highly compatible with my choices and interests	Vlachopoulos & Michailidou 2006
PSA2	I feel that what I'm told to learn in this training program fits perfectly with what I prefer to learn	I feel very strongly that the way I exercise fits perfectly with the way I prefer to exercise	
PSA3	I feel that the concepts I've chosen to learn in this training program is an expression of myself	I feel that the way I exercise is definitely an expression of myself	
PSA4	I feel that I have the opportunity to make choices with respect to what I learn in this training program	I feel very strongly that I have the opportunity to make choices with respect to the way I exercise	

Perceived Situational Competence

Perceived situational competence is an individual's perception of interacting effectively with the environment in order to produce desired outcomes when engaged in a specific activity. When an employee is participating in a SETA program, he or she will perceive a higher level of competence if he or she is confident that actions taken while engaged in the SETA program will produce desired results, which in this case would be a successful completion of the program. This scale has been adapted from Vallerand (1997) and was measured using a fully-anchored 5-point Likert scale. The items are listed in Table 10.

Table 10   Perceived Situational Competence Scale

Item ID	Item	Original Item	Reference
PSC1	I feel I have been making progress with respect to the end result I pursue in this training program	I feel I have been making a huge progress with respect to the end result I pursue	Vlachopoulos & Michailidou 2006
PSC2	I feel that I learn effectively in this training program	I feel that I execute very effectively the exercises of my training program	
PSC3	I feel that I am doing a good job learning the material in this training program	I feel that exercise is an activity in which I do very well	
PSC4	I feel that I can manage the requirements of this training program	I feel that I can manage with the requirements of the training program I am involved	

Perceived Situational Relatedness

Perceived situational relatedness is an individual's perception of feeling connected or a sense of belonging when engaged in a specific activity. In the context of learning environments, like SETA programs, this refers to the connection an employee develops with other trainees during learning sessions. This construct has been measured reflectively using a multi-item fully-anchored 5-point Likert scale adapted from adapted from Vallerand (1997). Items for this scale are displayed in Table 11.

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Table 11   Perceived Situational Relatedness Scale

Item ID	Item	Original Item	Reference
PSR1	I feel comfortable with other employees while participating in this training program	I feel extremely comfortable when with the other exercise participants	Vlachopoulos & Michailidou 2006
PSR2	I feel that I associate with other employees in a friendly way while participating in this training program	I feel that I associate with the other exercise participants in a very friendly way	
PSR3	I feel there are open channels of communication with other employees during this training program	I feel there are open channels of communication with the other exercise participants	
PSR4	I feel at ease with other employees while participating in this training program	I feel very much at ease with the other exercise participants	

Situational Motivation toward SETA Program

Motivation toward the SETA program is defined as the level of self-determined motivation individuals experience when they are currently engaging in a SETA program. This scale has been adapted from Vallerand (1997). In a similar fashion as work motivation, this scale is composed of several multi-item scales to measure specific types of motivation reflectively. Because this scale is administered while the respondent is participating in the SETA program, only four types of motivation are assessed for the sake of brevity (intrinsic motivation, identified regulations, external regulations, and amotivation). Like work motivation, a composite score is calculated to represent the respondent's level of self-determined motivation based on mean score for each individual type of motivation. Items for this scale are listed in Table 12.

Table 12   Situational Motivation Scale

Item ID	Item	Original Item	Reference
SMIM1	I am currently participating in this training program…because I think that this activity is interesting.	Original items were used in this study.	Vallerand 1997
SMIM2	…because I think that this activity is pleasant.		
SMIM3	…because I think that this activity is fun.		
SMIM4	…because I feel good when participating in this activity.		
SMIR1	…because I am doing it for my own good.		
SMIR2	…because I think that this activity is good for me.		
SMIR3	…because I decided that this activity is beneificial.		
SMIR4	…because I believe that this activity is important to me.		
SMER1	…because I am supposed to do it.		
SMER2	…because it is something that I have to do.		
SMER3	…because I don't have any choice.		
SMER4	…because I feel that I have to do it.		
SMAM1	…but I am not sure if it is worth it.		
SMAM2	…but I don't see what the activity brings me.		
SMAM3	…but I am not sure it is a good thing to pursue it.		
SMAM4	…but personally I don't see any good reasons to do this activity.		

SMIM=Situational Motivation-Intrinsic Motivation; SMIR=Situational Motivation-Identified Regulations; SMER=Situational Motivation-External Regulations; SMAM=Situational Motivation-Amotivation

Attitude toward ISP

  Attitude toward the organizational ISP is defined as an individual's degree of like or dislike toward his or her organization's information security policies. An employee's attitude toward and organizational ISP may be affected by the motivation he or she experiences while learning about such policies in a SETA program. Attitude has traditionally been conceptualized as a reflective construct, and its scale has been adapted from Anderson and Agarwal (2010). The multi-item scale was measured using a fully-anchored 5-point Likert scale. Items are shown in Table 13.

Table 13 Attitude toward ISP Scale

Item ID	Item	Original Item	Reference
ATT1	Security measures such as implementing antivirus software, firewalls, or system updates on my work computer are a good idea.	Security measures such as implementing anti-virus software, firewalls, or system updates on your home computer are a good idea.	Anderson & Agarwal 2010
ATT2	It is important to use the security measures as described in my organization's policy to protect my work computer.	Taking security measures to protect your home computer is important.	
ATT3	I like the idea of taking the security measures described in our policy to secure my work computer.	I like the idea of taking security measures to secure my home computer.	

Intention to Comply with ISP

  Intention to comply with an organization's ISP is the degree to which an individual believes he or she will adhere to organizational information security policies. As an employee's motivation toward participating in a SETA program becomes more self-determined, his or her intention to perform secure behaviors should manifest as an

intrinsic desire to protect the organization's information assets. The scale for this construct has been adapted from Herath and Rao's (2009) multi-item reflective scale and was measured using a fully-anchored 5-point Likert scale. Items are listed in Table 14.

Table 14   Intention to Comply with ISP Scale

Item ID	Item	Original Item	Reference
INT1	I am likely to follow organizational security policies.	I am likely to follow organizational security policies.	Herath & Rao 2009
INT2	It is probable that I will comply with the security policies to protect my organization's information.	It is possible that I will comply with organizational IS security policies to protect the organization's IS.	
INT3	I am certain that I will follow organizational security policies.	I am certain that I will follow organizational security policies.	

Construct Validity

Construct validity refers to the extent to which a measure adequately represents the underlying construct it is purported to measure. In addition, to face validity and content validity, mentioned previously in the discussion on scale development, the measurement scale for a construct should also be assessed on convergent and discriminant validity and reliability. Each of these is critical for achieving adequate construct validity for all measurement scales included in a study. Convergent validity refers to the degree to which a measurement item relates to the construct it is supposed to measure. Discriminant validity is the degree to which items that measure differing constructs correlate with each other. Reliability is the level of consistency achieved across a set of measurement items in a scale.

Exploratory and Confirmatory Factor Analysis

Exploratory factor analysis (EFA) is a method that examines correlations and communalities among a set of measurement items (Floyd & Widaman, 1995). One of the primary purposes of EFA is to determine the number of latent constructs that underlie a set of indicators within a domain (DeVellis, 2012a). Although exploratory factor analysis is useful for discovering relationships between items and as a preliminary study of how well measurement items correlate according to expectations from theory, it is not as rigorous as confirmatory factor analysis. In EFA, items are allowed to freely correlate with all other items with no constraints in place (DeVellis, 2012a). While the researcher may have theoretical foundation for observing how items correlate, there are no mathematical restrictions built into EFA to account for a priori theory. EFA may be used to identify major measurement issues prior to moving forward with assessment of the measurement model, as problems that exist in EFA will only be magnified in confirmatory factor analysis. For the measurement items in this study, EFA was conducted using a Promax rotation in SPSS 21.

Confirmatory factor analysis (CFA) is a technique used to confirm a priori hypotheses through the examination of items measuring latent constructs (Floyd & Widaman, 1995). CFA is most useful when assessing whether a hypothesized factor structure, based on prior literature, sufficiently fits the data (Garver & Mentzer, 1999). Unlike EFA, CFA is based on the measurement model and does not allow free correlation among items (Garver & Mentzer, 1999). In the measurement model, restrictions are placed on how measurement items relate to latent constructs (Bollen & Lennox, 1991), and these constraints are included in CFA. The measurement model adds rigor to the

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analysis and provides stronger evidence for internal and external validity, thus confirming what may have initially been observed through EFA methods. If a priori hypotheses are being examined, EFA can provide valuable preliminary information, but CFA should always be conducted in order to confirm observations made in EFA (Floyd & Widaman, 1995). For this study, CFA was conducted using AMOS 22. The measurement model was assessed for goodness of fit, standardized item loadings, latent construct correlations, and average variance extracted. Common method bias was also assessed, and a description of the statistical analysis is included in the following section.

Common Method Bias

Common method bias refers to spurious correlations occurring in a dataset due to systematic error (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). This can manifest when a common method is used to measure all items in a survey instrument. Because the present study includes the collection of measurement items using a common data collection mechanism, common method bias is a potential area of concern. The presence of common method bias indicates that common method used is contributing to some of the correlations present in latent variables. Researchers who detect common method bias cannot state that observed correlations are fully attributable to the underlying relationships present in the studied phenomenon, and this can severely impair interpretation of the data.

To ensure that correlations were not falsely inflated or deflated due to common method bias, researchers can employ a variety of techniques in the instrument development phase to potentially reduce the likelihood of common method bias manifesting. Some procedural remedies include conducting expert panels for purifying

measurement items, randomization of items within the instrument, and temporally

spacing measurement items as they are presented to the respondent (Podsakoff et al.,

2003). Each of these techniques is utilized in the present study.

Post hoc techniques, or statistical remedies, are also critical for detecting whether

common method bias is indeed present in the data once it has been collected (Podsakoff

et al., 2003). Harmon's single factor test uses principal components analysis to determine

if all of the instrument's items load on a single factor. Although this analysis was

commonly used, it has been criticized for being a weak indicator of common method

bias. The latent common method factor is more commonly used currently and is a more

robust examination of common method bias (Podsakoff et al., 2003). This techniques

involves the inclusion of a latent common method factor in the measurement model.

When performing confirmatory factor analysis, the χ2 value of the original measurement

model and the model including the latent common factor are compared. If there is a

significant difference in model fit according to the χ2 score, common method bias is

present. The latent common factor technique was used to detect common method bias for

this study.

Non-Response Bias

Because survey research typically experiences low response rates, there is

potential for non-response bias to be present in the data. Non-response bias indicates that

there is a systematic reason for a majority of the sample to not participate in the data

collection activity (Bhattacherjee, 2012). Although the present study may be classified as

a field experiment due to the use of a single organization and inclusion of manipulated

variables in multiple treatments, non-response bias may still pose problems. Employees

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were notified about the SETA program, which is not mandatory for employees to complete, via email, introducing the potential for initial low responses.

Procedural remedies that can help prevent the occurrence of non-response bias include providing follow-up requests, endorsement from senior-level management, and the assurance of respondents' confidentiality or privacy. Each of these techniques were used, as employees were invited to participate by the technology coordinator, and confidentiality was ensured at the beginning of the program. Follow-up emails were also sent approximately two weeks and four weeks after the initial invitation.

To statistically analyze whether non-response bias is present in a dataset, early responders can be compared to late responders. In behavioral survey research, late responders are considered demographically similar to non-responders, and therefore can be used as a statistical proxy for comparison (DeVellis, 2012b). If no significant differences are demonstrated between early responders and late responders, non-response bias should not have a significant impact on the interpretation of the data.

Data Analysis Techniques

For the data collected for this study, SPSS 21 was used to compare results between treatment groups via MANOVAs analyzing differences in situational-level motivation, autonomy, relatedness, and competence. The data will also be analyzed for differences in ISP compliance intention, attitude toward ISP, and SETA program cognition. Pretest and posttest scores were compared in the awareness and training programs to determine if motivation within the programs significantly increases SETA program cognition. Perceptions of attitude and intention measured after the awareness program were compared with respondents' attitude and intention after the training

program to determine if participating in additional training improves employees' intention to comply with organizational ISPs. Logistic regression was used for testing the influence of motivation on whether respondents choose to participate in the training portion of the program.

Principal components analysis was used for exploratory factor analysis. We will also examine differences between employees who choose to participate in and successfully the training portion of the program and those who only complete the awareness program. AMOS 22 was used for assessment of the measurement model (confirmatory factor analysis) and analysis of the structural model. The structural model was tested for model fit and for significance of hypothesized relationships. Chi-square difference tests were used to determine significance of moderating relationships hypothesized in the research model.

To appropriately interpret the significance of the findings, there must be sufficient statistical power. Obtaining appropriate statistical power is typically achieved by acquiring a large enough sample size to accommodate the number of treatment groups included in the study. A power analysis was conducted with G*Power using a priori values of an effect size equal to .25, which is considered moderate, power equal to .95, which is considered excellent, and significance equal to .05. Using these values for 16 treatment groups, a minimum sample of 464, or about 29 respondents per treatment group, is required to analyze the data with sufficient statistical power.

Summary

This chapter described data collection techniques and the instrument development process related to this study. Experimental manipulations embedded in the awareness and

training programs were provided, as well as a description of the organization utilized for data collection.

CHAPTER IV

DATA ANALYSIS AND RESULTS

Introduction

This chapter will report the results of two pilot studies, as well as the results of the main study. Pilot studies were conducted to assess reliability and convergent and discriminant validity of the measured reflective constructs before proceeding to the main data collection. Statistical analysis was performed using IBM SPSS Statistics software version 21 and IBM AMOS version 22. SPSS was used for exploratory factor analysis, as well as for calculating frequencies, descriptive statistics, paired samples t-tests, and MANOVA. AMOS was used to determine model fit for both the measurement model and the structural model. Common method variance was tested using the inclusion of an unmeasured latent method construct in AMOS. Analysis of individual structural path estimates were also assessed with AMOS. Each form of analysis is described, and results are discussed further in this chapter.

Pilot Study I

Using data collected from Amazon Mechanical Turk, a pilot test was conducted to assess construct validity of the measurement items. The pilot data collection resulted in a total of 60 responses. Motivational treatments and measurement items within the awareness and training programs administered to the pilot sample matched those that

were administered to the main sample. Analysis of the pilot data, including exploratory

factor analysis, confirmatory factor analysis, and reliability, is described in the following

subsections.

Exploratory Factor Analysis

For researchers measuring latent constructs, a two-step approach is recommended

in assessing measurement items: first, exploratory factor analysis (EFA) using principal

components analysis with a Promax rotation, followed by assessment of the measurement

model in confirmatory factor analysis (Anderson & Gerbing, 1988). In EFA, items are

allowed to freely correlate with each because there is no underlying measurement model

for establishing construct measurement. Items associated with a particular construct

should exhibit factor loadings of .6 or greater and should not exceed loadings of .4 or

greater for any other factor, referred to as cross-loadings (Hair, Black, Babin, &

Anderson, 2009). Problematic items may be identified at this stage and removed from

further analysis before proceeding with confirmatory factor analysis (CFA). Only

variables modeled as reflective latent constructs are included in EFA and CFA (SETA

program motivation is calculated as a single observable index score for each respondent,

and SETA program cognition is calculated as each respondent's post-awareness program

quiz score).

In assessing the pilot data, seventeen of measurement items exhibited cross-

loadings in excess of .4 and were removed (PJ1, 2, 6, 7; OBSE01, 02, 03, 06, 07; AC2, 5;

AUTO1, 3; COMP 3, 4; REL 1, 2). Although removing these items did improve the

overall loadings of most of the measurement items, there were still loading issues with

some items. Items for Attitude and Behavioral Intention appeared to be too highly

correlated to diverge into distinct factors. Items measuring perceived situational autonomy also exhibited cross-loading with both perceived situational competence and relatedness while failing to load adequately on their own factor. EFA results are further illustrated in Table 15.

Table 15   Principal component analysis – pilot study I

| Item | Component | | | | | | |
	1	2	3	4	5	6	7
ATT1		.803					
ATT2		.875					
ATT3		.870					
BI1		.906					
BI2		.763					
BI3		.767					
PJ3						.748	
PJ4						.733	
PJ5						.805	
OBSE04					.839		
OBSE05					.708		
OBSE08					.767		
OBSE09					.732		
OBSE10					.721		
AC1	.927						
AC3	.851						
AC4	.889						
AC6	.915						
AC7	.849						
AC8	.820						
AUTO2				.550			.523
AUTO4			.509	.401			.690
COMP1			.633				
COMP2			.787				
REL3				.824			
REL4				.759			

Values suppressed below 0.4; ATT=Attitude toward ISP; BI=Behavioral Intention; PJ=Procedural Justice; OBSE=Organizational-Based Self-Esteem; AC=Affective Commitment; AUTO=Perceived Situational Autonomy; COMP=Perceived Situational Competence; REL=Perceived Situational Relatedness; n=60

Confirmatory Factor Analysis

In CFA, the measurement model for our latent constructs is established, constraining measurement items to their respective constructs and allowing no free correlation among items. Problematic items are removed based on large modification indices, which demonstrate significant shared variance between error terms. To improve overall model fit, measurement items were removed (OBSE04, 09; AC3, 7, 8; ATT3; BI2). The analysis indicates that the model fit the data adequately (χ^2=169.601; df=85; IFI=.938; CFI=.933; TLI=.908; RMSEA=.079).

Table 16   Measurement model fit statistics – pilot study I

Goodness of Fit Statistic	Recommended Value	Calculated Value
χ^2	--	169.601
Degrees of Freedom (df)	--	85
χ^2 statistical significance (p-value)	--	.004
χ^2 index (Chi-square/df)	$\leq 3; \leq 5$	1.368
Normed Fit Index (NFI)	$\geq .90$	.802
Incremental Fit Index (IFI)	$\geq .90$	.938
Tucker-Lewis Index (TLI)	$\geq .90$	.908
Comparative Fit Index (CFI)	$\geq .90$	.933
Root Mean Square Error of Approximation (RMSEA)	$\leq .06; \leq .08$	.079

In research measuring latent constructs reflectively, it is critical to show evidence of both convergent and discriminant validity (Churchill, 1979; Peter, 1981). Convergent validity refers to a set of items presumed to measure the same construct indeed converging on that construct, while discriminant validity occurs when items presumed to measure different constructs are adequately differentiated from each other (Peter 1981). Fornell and Larcker's (1981) guidelines for assessing convergent and discriminant

validity were followed. Using these recommendations, constructs must exhibit average variance extracted (AVE) measures above 0.5 to demonstrate convergent validity, and variance shared between constructs must not exceed the corresponding constructs' AVEs to show evidence of discriminant validity. All AVEs were above 0.5, demonstrating convergent validity (see Table 17). However, the shared variance between Attitude and Behavioral Intention (.909) exceeded each construct's AVE. Discriminant validity also could not be established among Perceived Situational Autonomy, Competence, and Relatedness. Analysis for convergent and discriminant validity is further illustrated in Table 18.

Table 17   Standardized loadings, composite reliability, and AVE for latent
              constructs – pilot study I

Construct	Item	Standardized Loading	Composite Reliability	AVE
AC	AC1	0.911	.960	.807
	AC4	0.901		
	AC6	0.882		
ATT	A_ATT1	0.809	.923	.766
	A_ATT2	0.937		
AUTO	A_AUTO2	0.686	.794	.529
	A_AUTO4	0.767		
BI	A_BI1	0.906	.908	.730
	A_BI3	0.8		
COMP	A_COMP1	0.759	.794	.528
	A_COMP2	0.693		
OBSE	OBSE05	0.655	.872	.572
	OBSE08	0.729		
	OBSE10	0.87		
PJ	PJ3	0.812	.885	.597
	PJ4	0.814		
	PJ5	0.684		
REL	A_REL3	0.733	.865	.644
	A_REL4	0.867		

ATT=Attitude toward ISP; BI=Behavioral Intention; PJ=Procedural Justice;
OBSE=Organizational-Based Self-Esteem; AC=Affective Commitment;
AUTO=Perceived Situational Autonomy; COMP=Perceived Situational Competence;
REL=Perceived Situational Relatedness; n=60

Table 18   Intercorrelations of constructs – pilot study I

	Mean	SD	AC	ATT	AUTO	BI	COMP	OBSE	PJ	REL
AC	3.14	1.08	(.898)							
ATT	4.40	0.64	-.129	(.875)						
AUTO	3.72	0.71	.066	.607	(.728)					
BI	4.36	0.68	.045	.909	.678	(.855)				
COMP	4.15	0.58	.143	.544	.850	.589	(.727)			
OBSE	4.08	0.62	.270	.591	.521	.518	.632	(.757)		
PJ	3.54	0.82	.707	.195	.172	.370	.316	.503	(.772)	
REL	3.88	0.58	.117	.528	.816	.498	.756	.413	.238	(.803)

Square root AVE shown in ( ); ATT=Attitude toward ISP; BI=Behavioral Intention; PJ=Procedural Justice; OBSE=Organizational-Based Self-Esteem; AC=Affective Commitment; AUTO=Perceived Situational Autonomy; COMP=Perceived Situational Competence; REL=Perceived Situational Relatedness; n=60

Pilot Study II

Despite good model fit and removal of problematic measurement items, further scale development and pilot testing was needed to refine measurement items and establish discriminant validity among some of the latent constructs. Based on analysis of the first pilot data collection, some measurement items were excluded from further measurement endeavors due to a lack of convergent and discriminant validity. (PJ1, 2, 7; OBSE01, 02, 03, 04, 06, 07; AC2, 5, 8). These items were also deemed unnecessary, as they did not add sufficient incremental explanatory power for their respective latent constructs. Measurement items related to perceived situational autonomy, competence, and relatedness were also given further examination because of their exceedingly high

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interconstruct correlations. Only one slight change to the perceived situational autonomy scale was made. Item 3 was changed to "I feel that the concepts I've chosen to learn in this training program are an expression of my interests," to reflect a respondent's ability to elect to learn more about topics of interest. A second round of pilot data was collected via Amazon Mechanical Turk, resulting in 232 responses.

Exploratory Factor Analysis

Using the data collected in Pilot Study II, principal components analysis revealed improved initial loadings for almost all of the measurement items. Only two items exhibited cross-loading problems (AUTO4 and COMP2). These items were subsequently excluded from further analysis. Running principal components analysis without the problematic items yielded clean loadings for all items. No items exhibited significant cross-loading, and all items demonstrated loadings of at least 0.6 on their respective constructs. Only four items (PJ6, OBSE05, COMP3, COMP4) failed to load at 0.7 or above. These items were kept in subsequent analyses because they demonstrated sufficient discriminant validity in our initial findings. EFA results are further illustrated in Table 19.

Table 19   Principal component analysis – pilot study II

Item	Component							
	1	2	3	4	5	6	7	8
PJ3			.750					
PJ4			.822					
PJ5			.795					
PJ6			.643					
OBSE05				.658				
OBSE08				.833				
OBSE09				.756				
OBSE10				.717				
AC1	.728							
AC3	.794							
AC4	.836							
AC6	.875							
AC7	.840							
AUTO1							.750	
AUTO2							.765	
AUTO3							.828	
COMP1								.723
COMP3								.675
COMP4								.621
REL1		.882						
REL2		.846						
REL3		.836						
REL4		.880						
ATT1						.756		
ATT2						.842		
ATT3						.752		
BI1					.805			
BI2					.799			
BI3					.853			

Values suppressed below 0.4; ATT=Attitude toward ISP; BI=Behavioral Intention; PJ=Procedural Justice; OBSE=Organizational-Based Self-Esteem; AC=Affective Commitment; AUTO=Perceived Situational Autonomy; COMP=Perceived Situational Competence; REL=Perceived Situational Relatedness; n=232

Confirmatory Factor Analysis

CFA indicated that the data collected in Pilot Study II fit the measurement model well. Although the calculated χ^2 and df for Pilot Study II are higher than the χ^2 and df for Pilot Study I, these values increased due to a larger number of responses and measurement items included in the analysis for Pilot Study II (χ^2=614.705; df=349). The resulting χ^2 index for Pilot Study II was still below the recommended threshold. The remainder of the analysis indicated that the model fit the data well (IFI=.938; CFI=.937; TLI=.921; RMSEA=.057) and demonstrated a marked improvement over the measurement model fit from Pilot Study I.

Table 20   Measurement model fit statistics – pilot study II

Goodness of Fit Statistic	Recommended Value	Calculated Value
χ^2	--	614.705
Degrees of Freedom (df)	--	349
χ^2 statistical significance (p-value)	--	.000
χ^2 index (Chi-square/df)	$\leq 3; \leq 5$	1.761
Normed Fit Index (NFI)	$\geq .90$	.867
Incremental Fit Index (IFI)	$\geq .90$	.938
Tucker-Lewis Index (TLI)	$\geq .90$	.921
Comparative Fit Index (CFI)	$\geq .90$	.937
Root Mean Square Error of Approximation (RMSEA)	$\leq .06; \leq .08$	.057

In addition to improved model fit, the data from Pilot Study II also demonstrated a substantial improvement in convergent and discriminant validity when compared to the data from Pilot Study I. With the exception of only two items (OBSE05 and PJ6), all standardized item loadings were above the recommended 0.7 threshold, and all items loaded above 0.6 on their respective constructs, which has been alternatively

recommended by some researchers (DeVellis, 2012a). The composite reliability for each of the latent constructs was well above the recommended 0.7 threshold, and all AVEs were above 0.5. These values provided sufficient evidence of convergent validity for our measurement items and are further illustrated in Table 21.

In examining the intercorrelations of our latent constructs, we also found evidence of discriminant validity for our data collected in Pilot Study II. Although some correlations between constructs are high, none of the correlations surpass their respective square root AVE scores. This demonstrated that the variance explained in our constructs can be attributed to our constructs' respective measurement items and not those associated with other constructs. Calculations used for analysis of discriminant validity are shown in Table 22.

The scale development endeavors conducted between Pilot Study I and Pilot Study II appeared to have sufficiently improved our measurement items. With adequate evidence of construct validity, we were then able to proceed to our main data collection.

Table 21   Standardized loadings, composite reliability, and AVE for latent
            constructs – pilot study II

Construct	Item	Standardized Loading	Composite Reliability	AVE
AC	AC1	.762	.901	.647
	AC3	.722		
	AC4	.805		
	AC6	.850		
	AC7	.874		
ATT	A_ATT1	.896	.890	.731
	A_ATT2	.892		
	A_ATT3	.771		
AUTO	A_AUTO1	.816	.848	.650
	A_AUTO2	.781		
	A_AUTO3	.821		
BI	A_BI1	.922	.908	.768
	A_BI2	.872		
	A_BI3	.832		
COMP	A_COMP1	.817	.817	.598
	A_COMP3	.779		
	A_COMP4	.721		
OBSE	OBSE05	.612	.823	.540
	OBSE08	.812		
	OBSE09	.757		
	OBSE10	.744		
PJ	PJ3	.772	.827	.547
	PJ4	.747		
	PJ5	.803		
	PJ6	.625		
REL	A_REL1	.909	.914	.728
	A_REL2	.845		
	A_REL3	.759		
	A_REL4	.891		

ATT=Attitude toward ISP; BI=Behavioral Intention; PJ=Procedural Justice;
OBSE=Organizational-Based Self-Esteem; AC=Affective Commitment;
AUTO=Perceived Situational Autonomy; COMP=Perceived Situational Competence;
REL=Perceived Situational Relatedness; n=232

Table 22   Intercorrelations of constructs – pilot study II

	Mean	SD	AC	ATT	AUTO	BI	COMP	OBSE	PJ	REL
AC	3.05	1.02	(.805)							
ATT	4.58	0.60	.054	(.855)						
AUTO	4.05	0.69	.236	.471	(.806)					
BI	4.38	0.70	.017	.700	.529	(.876)				
COMP	4.29	0.60	.125	.693	.761	.660	(.773)			
OBSE	4.25	0.56	.232	.482	.541	.475	.570	(.735)		
PJ	3.47	0.82	.557	.197	.297	.253	.278	.360	(.740)	
REL	3.69	0.79	.183	.299	.403	.268	.441	.347	.306	(.853)

Square root AVE shown in ( ); ATT=Attitude toward ISP; BI=Behavioral Intention; PJ=Procedural Justice; OBSE=Organizational-Based Self-Esteem; AC=Affective Commitment; AUTO=Perceived Situational Autonomy; COMP=Perceived Situational Competence; REL=Perceived Situational Relatedness; n=232

Main Study

After measurement scales were further refined in Pilot Study II, data was collected for use in the main study. Respondents in the main study were solicited from a variety of K-12 educational institutions and school districts throughout the United States. To ensure responses from each school would be eligible for inclusion in the study, schools or districts had to possess similar policies related to username and password protection, password strength and change frequency, malware detection, and social engineering, allowing for identical awareness programs across all organizations while maintaining relevance to their organizational policies. While responses within the same school may have differed slightly based on the inclusion or exclusion of one or more of

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the motivational manipulations within the SETA program, all respondents at a particular school were solicited in the same way, either via the cash reward or the organizational certificate (please see APPENDIX A for recruitment language).

Response Rates and Respondent Characteristics

A total of 1,545 employees were solicited to participate in the main study (747 were solicited via the organizational certificate; 798 were solicited via the cash reward). Those who were solicited via the organizational certificate demonstrated a response rate of 38.9%, resulting in 291 responses. Those who were solicited via the cash reward responded at a rate of 35.1%, resulting in 280 responses. Of these responses, 107 were deemed unusable due to systematic responses to measurement items, unreasonably short completion times, or failed attention filter items displayed periodically among measurement scales. This resulted in 464 total usable responses (234 certificate respondents; 230 cash respondents). Respondent demographic characteristics are represented in Table 23 and Table 24.

Table 23   Summary of Demographic Frequencies

Gender		Ethnicity	
Male	227	White/Caucasian	376
Female	237	African American	27
		Hispanic	23
Participation Incentive		Asian	29
Cash Reward	230	Native American	2
Org. Certificate	234	Other	7

Table 24   Demographic Descriptive Statistics

Variable	Mean	Median	Standard Deviation
Age	37.47	34	12.36
Computer Experience	18.49	18	7.62
Current Organization Experience	6.95	5	6.83
Overall Work Experience	10.36	7	9.51

Overall Work Experience represents the total number of years employed in his/her current profession

Exploratory Factor Analysis

Using the data collected for the main study, exploratory factor analysis revealed further improved initial loadings for all of the measurement items. No items exhibited cross-loading problems, and all items demonstrated loadings of at least 0.6 on their respective constructs. No items failed to load at 0.7 or above. All items were kept in subsequent analyses because they demonstrated sufficient discriminant validity in our initial findings. EFA results are further illustrated in Table 25.

Table 25   Principal component analysis – main study

				Component				
	1	2	3	4	5	6	7	8
PJ3					.875			
PJ4					.889			
PJ5					.826			
PJ6					.756			
OBSE05						.714		
OBSE08						.812		
OBSE09						.785		
OBSE10						.865		
AC1	.730							
AC3	.746							
AC4	.859							
AC6	.874							
AC7	.857							
AUTO1				.794				
AUTO2				.765				
AUTO3				.814				
AUTO4				.844				
COMP1			.861					
COMP2			.782					
COMP3			.792					
COMP4			.843					
REL1		.869						
REL2		.899						
REL3		.886						
REL4		.873						
ATT1								.890
ATT2								.848
ATT3								.868
BI1							.937	
BI2							.823	
BI3							.800	

Values suppressed below 0.4; ATT=Attitude toward ISP; BI=Behavioral Intention;
PJ=Procedural Justice; OBSE=Organizational-Based Self-Esteem; AC=Affective
Commitment; AUTO=Perceived Situational Autonomy; COMP=Perceived Situational
Competence; REL=Perceived Situational Relatedness

Confirmatory Factor Analysis

CFA indicated that the data collected in the main study fit the measurement model well. The calculated χ^2 increased from Pilot Study II to the main study, but these values again increased due to a larger number of responses included in the analysis for the main study (χ^2=761.027; df=296). The resulting χ^2 index for the main study was still below the recommended threshold. The remainder of the analysis indicated that the model fit the data well (IFI=.943; CFI=.942; TLI=.926; RMSEA=.058) and demonstrated a similar model fit in comparison with the measurement model analyzed in Pilot Study II. A graphical depiction of the measurement model is illustrated in Figure 8, and model fit statistics for the main study are shown in Table 26.
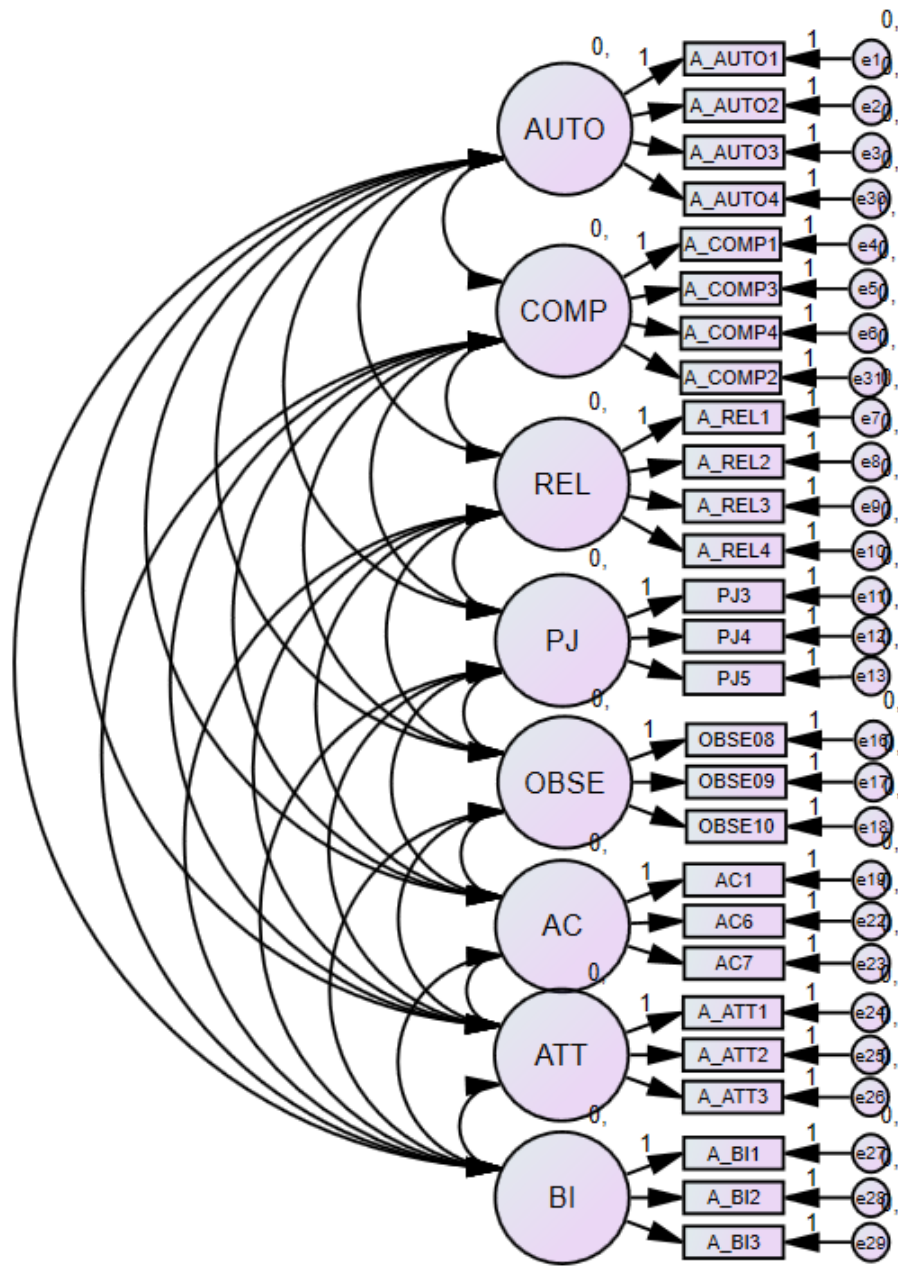
Figure 8   Measurement model

Table 26   Measurement model fit statistics – main study

Goodness of Fit Statistic	Recommended Value	Calculated Value
χ^2	--	761.027
Degrees of Freedom (df)	--	296
χ^2 statistical significance (p-value)	--	.000
χ^2 index (Chi-square/df)	$\leq 3; \leq 5$	2.571
Normed Fit Index (NFI)	$\geq .90$	.909
Incremental Fit Index (IFI)	$\geq .90$	.943
Tucker-Lewis Index (TLI)	$\geq .90$	.926
Comparative Fit Index (CFI)	$\geq .90$	.942
Root Mean Square Error of Approximation (RMSEA)	$\leq .06; \leq .08$	.058

The data collected for the main study also demonstrated convergent and discriminant validity. Most measurement items met or exceeded the recommended 0.7 threshold for standardized item loadings. Items with loadings less than 0.7 (AC3, AC4, PJ6, OBSE05) were removed from further analysis (with the exception of AC1 and OBSE09, which were included to maintain a minimum of three items per latent construct for reliability purposes). The composite reliability for each of the latent constructs was well above the recommended 0.7 threshold, and all AVEs were above 0.5. These values provided sufficient evidence of convergent validity for our measurement items and are further illustrated in Table 27.

Table 27   Standardized loadings, composite reliability, and AVE for latent constructs
            – main study

Construct	Item	Standardized Loading	Composite Reliability	AVE
AC	AC1	.690	.851	.658
	AC6	.853		
	AC7	.878		
ATT	ATT1	.898	.884	.717
	ATT2	.835		
	ATT3	.805		
AUTO	AUTO1	.839	.873	.632
	AUTO2	.768		
	AUTO3	.841		
	AUTO4	.726		
BI	BI1	.863	.874	.699
	BI2	.850		
	BI3	.793		
COMP	COMP1	.834	.890	.670
	COMP2	.849		
	COMP3	.844		
	COMP4	.742		
REL	REL1	.896	.911	.720
	REL2	.838		
	REL3	.732		
	REL4	.915		
PJ	PJ3	.828	.849	.652
	PJ4	.790		
	PJ5	.803		
OBSE	OBSE08	.874	.833	.627
	OBSE09	.692		
	OBSE10	.799		

ATT=Attitude toward ISP; BI=Behavioral Intention; PJ=Procedural Justice;
OBSE=Organizational-Based Self-Esteem; AC=Affective Commitment;
AUTO=Perceived Situational Autonomy; COMP=Perceived Situational Competence;
REL=Perceived Situational Relatedness

In examining the intercorrelations of our latent constructs, we also found evidence

of discriminant validity in our data collected for the main study. None of the correlations

between latent constructs surpass their respective square root AVE scores. This

demonstrated that the variance explained in our constructs can be mostly attributed to our constructs' respective measurement items and not those associated with other constructs. The data collected for the main study demonstrate further improvement in discriminant validity when compared with the data collected for Pilot Study II. Calculations used for analysis of discriminant validity are shown in Table 28.

Table 28   Intercorrelations of constructs – main study

	Mean	SD	AC	ATT	AUTO	BI	COMP	OBSE	PJ	REL
AC	3.829	.882	(.811)							
ATT	4.492	.632	.096	(.847)						
AUTO	3.955	.680	.144	.201	(.795)					
BI	4.199	.702	.124	.257	.242	(.836)				
COMP	4.071	.629	.101	.195	.309	.245	(.818)			
OBSE	4.346	.607	.180	.230	.160	.199	.167	(.792)		
PJ	3.415	.921	.260	.043	.141	.131	.095	.154	(.807)	
REL	3.525	.825	.114	.096	.246	.170	.271	.118	.176	(.848)

Square root AVE shown in ( ); ATT=Attitude toward ISP; BI=Behavioral Intention; PJ=Procedural Justice; OBSE=Organizational-Based Self-Esteem; AC=Affective Commitment; AUTO=Perceived Situational Autonomy; COMP=Perceived Situational Competence; REL=Perceived Situational Relatedness

Common Method Variance (CMV)

Although preventative measures were taken to mitigate the potential effects of common method variance (see Chapter 3), researchers should conduct a post hoc examination of the potential influence of CMV on the data (Podsakoff et al., 2003). Post hoc analysis was also conducted to detect whether common method variance had a significant impact on the data. Including an unmeasured latent method construct (ULMC) in the measurement model allows researchers to determine if there is a significant change in model fit due to the inclusion of the ULMC and is appropriate for measurement

models calculated using maximum likelihood (Marsh & Hocevar, 1988; Straub et al., 2004; Woszczynski & Whitman, 2004). The χ^2 difference test assesses the degree of difference in model fit between competing models. These models differ by one degree of freedom, which means that a significant difference between models at an alpha level of .05 can be demonstrated by a difference in χ^2 values greater than or equal to 3.84. The difference in χ^2 values between the standard measurement model and the ULMC model indicated that common-method variance did not have a significant impact on the main study's dataset ($\chi^2 = 757.485$ with common-method factor included; $\chi^2 = 761.027$ without common-method factor; χ^2 difference =3.542). Results of the ULMC test are further illustrated in Table 29.

Table 29   Summary of common method variance analysis using unmeasured latent method construct (ULMC)

	Without ULMC		With ULMC	
Model	χ^2	df	χ^2	df
Unconstrained	761.027	296	757.485	295

Solomon Four-Group Analysis

For research utilizing pretest and posttest measures, respondents' posttest scores may be falsely inflated because of respondents' exposure to identical pretest measures, thus confounding any interpretation of the effect of the treatment. To test for the possible influence a pretest measure may have on a posttest measure, researchers must implement a Solomon four-group design, which includes control groups who are not exposed to pretest measures (Bhattacherjee, 2012). For the main study, additional responses that excluded pretest measures were collected (see Chapter 3 for a detailed description of the

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treatment groups affected). These responses were collected only for use in the Solomon four-group analysis and were not included in other analyses performed in this chapter.

A 2x2 ANOVA is used to assess the influence of the pretest and the experimental treatment on respondents' posttest scores. If the data demonstrate a significant difference based on the treatment, as well as no significant differences based on the pretest or an interaction between the treatment and the pretest, the treatment is concluded to have the intended effect on the dependent variable without interference from the presence of a pretest measure (Braver & Braver, 1988). The data for the main study show that respondents who received the motivational treatment possessed significantly higher posttest scores than those who did not receive the treatment. The data also show that there was no significant difference in posttest scores based on whether a respondent received a pretest. Additionally, there was no significant interaction effect between the treatment and the pretest, indicating that the presence of a pretest did not significantly influence respondents' posttest scores. Results of the Solomon four-group ANOVA are further illustrated in Table 30.

Table 30   Comparison of Solomon four-group using ANOVA

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Corrected Model	29.382	3	9.794	1.867	.137
Intercept	6376.950	1	6376.95	1215.500	.000
Pretest-No Pretest Comparison	2.271	1	2.271	.433	.511
Treatment-No Treatment Comparison	21.304	1	21.304	4.061	.045
Pretest-Treatment Interaction	5.307	1	5.307	1.012	.316
Error	876.139	167	5.246		
Total	7828.000	171			
Corrected Total	905.520	170			

Effect sizes: Pretest-No Pretest = .003; Treatment-No Treatment = .024; Pretest-Treatment Interaction = .006

Structural Model Analysis

The structural model and its associated hypotheses were tested using AMOS version 22, a covariance-based statistical tool for assessing structural equation models. Before analyzing individual relationships within the model, the overall model must be assessed for model fit. The χ^2 index (χ^2=613.916; df=161; χ^2 index=3.813) for the structural model was below the recommended threshold. The remainder of the analysis indicated that the model adequately fit the data (NFI=.902; IFI=.926; CFI=.925; TLI=.902; RMSEA=.078), and the model fit statistics indicate that analysis may proceed toward examining individual relationships within the model.

Table 31   Structural model fit statistics

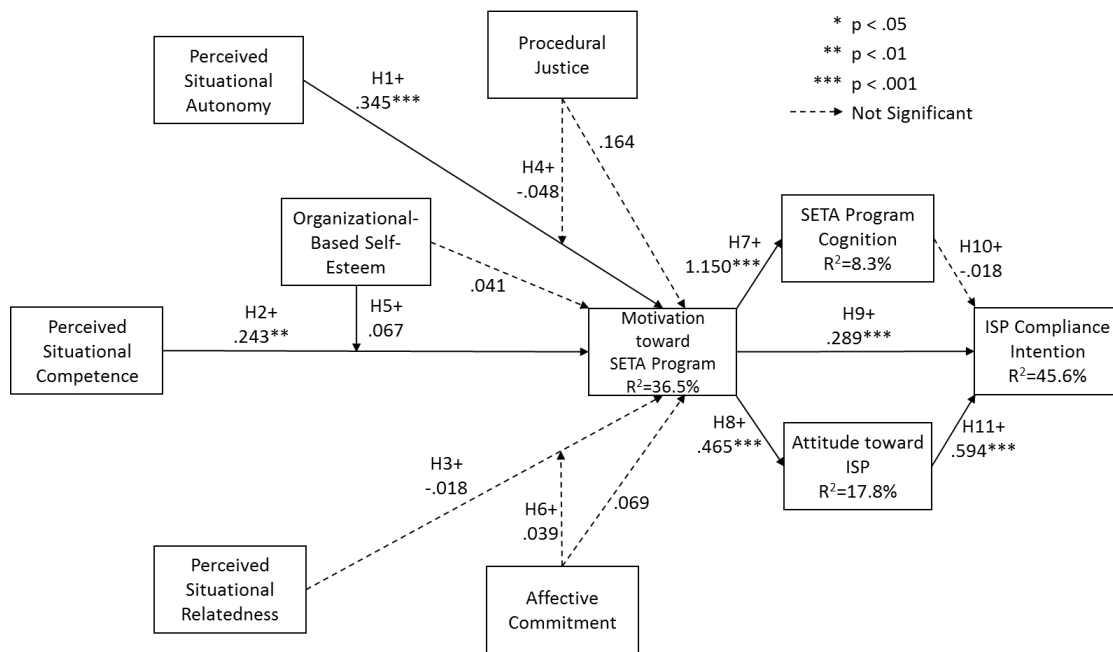| Goodness of Fit Statistic	Recommended Value	Calculated Value
χ^2	--	613.916
Degrees of Freedom (df)	--	161
χ^2 statistical significance (p-value)	--	.000
χ^2 index (Chi-square/df)	$\leq 3; \leq 5$	3.813
Normed Fit Index (NFI)	$\geq .90$	.902
Incremental Fit Index (IFI)	$\geq .90$	.926
Tucker-Lewis Index (TLI)	$\geq .90$	.902
Comparative Fit Index (CFI)	$\geq .90$	.925
Root Mean Square Error of Approximation (RMSEA)	$\leq .06; \leq .08$	.078

Figure 9   Path model with hypothesis support

Next, relationships in the structural model were analyzed by examining individual path estimates. With the exception of H3 and H10, all other hypotheses modeled as direct effects were supported. The remaining significant hypotheses were supported with a p-

value of 0.001 or lower. Perceived situational autonomy ($\beta = .345, p < .001$) and perceived situational competence ($\beta = .243, p < .001$) each had a significant positive effect on SETA program motivation, while the relationship between perceived situational relatedness and SETA program motivation was not significant ($\beta = -.018, p = .295$). SETA program motivation had a significant positive influence on SETA program cognition ($\beta = 1.150, p < .001$), attitude toward the ISP ($\beta = .465, p < .001$), and behavioral intention to comply with the ISP ($\beta = .289, p < .001$). Attitude toward the ISP demonstrated a significant positive effect on behavioral intention to comply ($\beta = .594, p < .001$), but SETA program cognition did not show a significant influence ($\beta = -.018, p = .075$). The overall findings for hypothesis support are shown in Table 32. As illustrated in Figure 9, the model explains 36.5% of the variance in SETA program motivation, 8.3% of the variance in SETA program cognition, 17.8% of the variance in attitude toward the ISP, and 45.6% of the variance in behavioral intention to comply with the ISP.

Table 32   Path estimates and hypothesis support

Hypothesis (with Direction)	Path Coefficient (β)	T-stat	P-Value	Supported?
H1: AUTO → SM (+)	.345	4.989	< .001	Yes
H2: COMP → SM (+)	.243	3.180	< .001	Yes
H3: REL → SM (+)	-.018	-.538	.295	No
H7: SM → COG (+)	1.150	6.423	< .001	Yes
H8: SM → ATT (+)	.465	9.191	< .001	Yes
H9: SM → BI (+)	.289	5.217	< .001	Yes
H10: COG → BI (+)	-.018	-1.442	.075	No
H11: ATT → BI (+)	.594	10.840	< .001	Yes

AUTO=Perceived Situational Autonomy; COMP=Perceived Situational Competence; REL=Perceived Situational Relatedness; SM=Motivation toward SETA Program; COG=SETA Program Cognition; ATT=Attitude toward ISP; BI=Behavioral Intention

Analysis of Moderated Relationships – 2-Group Analysis

To evaluate whether an employee's organizational perceptions demonstrated an influence on the relationships between perceived autonomy, competence, and relatedness toward SETA program motivation, each of these relationships was examined using a two-group analysis. When utilizing this type of test for moderation, a significant difference in χ^2 between an unconstrained model and a model constrained on the moderated relationship indicates a significantly moderated relationship based on the chosen grouping variable (Aiken & West, 1991; Cohen, Cohen, West, & Aiken, 2003; Jaccard, Turrisi, & Wan, 1990; Judd, McClelland, & Culhane, 1995; West, Aiken, & Krull, 1996). For each organizational perception variable, two groups were created (a low group and a high group), with a median-split used as the grouping criteria to ensure a relatively equal distribution of respondents per group. Because the difference in degrees of freedom between the unconstrained and constrained models is 1df, a χ^2 difference of at least 3.84 must be shown between the two models for a significant moderation to be demonstrated at an alpha level of .05 (Aiken & West, 1991; Cohen et al., 2003; Jaccard et al., 1990; Judd et al., 1995; West et al., 1996). With no $\chi 2$ difference scores exceeding 3.84, none of the hypothesized moderators were found to have a significant moderating effect on their respective relationships. Results of the two-group analysis for moderation are further illustrated in Table 33.

Table 33   Moderation testing using two-group analysis

Moderated Relationship	Moderator	χ^2 without Moderator	χ^2 with Moderator	χ^2 Difference	Supported?
H4: AUTO→SM (+)	PJ	990.090	990.628	.538	No
H5: COMP→SM (+)	OBSE	834.144	834.168	.024	No
H6: REL→SM (+)	AC	901.944	902.946	.952	No

df for model unconstrained on moderated relationship = 138; df for constrained model = 137

Analysis of Moderated Relationships – Interaction Effects

Although latent constructs are measured using categorical Likert scales, they are typically treated as continuous variables for analytical purposes (Hair et al., 2009). Because creating a two-group categorical variable from a continuous variable may oversimplify the variance observed in a latent construct, interaction effects may be alternatively used for assessing the moderating power of a latent construct on structural relationships (H W Marsh, Wen, & Hau, 2004; Schumacker & Lomax, 2004). To examine interaction effects in a structural model, interaction variables must first be created as a product of the standardized independent and moderator variables. The independent variable, the moderator variable, and the interaction variable are all included in the structural model, with each having a direct effect on the dependent variable. The path estimate of the relationship between the interaction variable and the dependent variable is then used for analysis of significant moderation. Using interaction effects in the structural model, only one of the hypothesized moderator variables was found to have a significant moderating effect on their respective relationships (OBSE: $\beta = .067$, $p = .029$). The results of moderation testing using interaction effects are further shown in Table 34.

Table 34   Moderation testing using interaction effects

Moderated Relationship	Moderator	Interaction Path Coefficient (β)	T-stat	P-Value	Supported?
H4: AUTO→SM (+)	PJ	-0.048	-1.307	.096	No
H5: COMP→SM (+)	OBSE	0.067	1.890	.029	Yes
H6: REL→SM (+)	AC	0.039	1.121	.131	No

Differences in Attitude and Intention – Paired Samples T-Test

To determine if the optional additional training program elicited higher scores in attitude toward the ISP and intention to comply with the ISP, paired samples t-tests were performed for respondents who participated in both the awareness and training programs. Although a significant increase in attitude was not shown when measured after the training program (t=.477; p=.634), intention to comply was shown to be significantly higher after the training program when compared to its corresponding post-awareness measure (t=3.621; p < .001). Results for each paired samples t-test are shown in Table 35.

Table 35   Paired samples t-test results

Hypothesis	Awareness Mean	Awareness SD	Training Mean	Training SD	T-stat	P-Value
H12a (+): Difference in Attitude after Training	4.4981	0.624	4.5119	0.62875	0.477	.634
H12b (+): Difference in Behavioral Intention after Training	4.2554	0.713	4.3793	0.65926	3.621	< .001

Logistic Regression Analysis

Because employees were offered the choice to participate in an additional training program, their decisions may be represented statistically as binary variables. Logistic regression is a probability model designed to analyze the predictive powers of

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independent variables on a binary dependent variable. As such, logistic regression was used to determine if perceived situational autonomy, competence, and relatedness were significant predictors of whether an employee would elect to participate in the additional training program.

Before proceeding with analysis of our hypotheses, the model fit of the logistic regression model must first be assessed using the Hosmer and Lemeshow test (Hair et al., 2009). A non-significant p-value indicates good model fit and provides the researcher with evidence that proceeding with further analysis is valid. For the data collected in the main study, the test yielded a p-value of .165 for our data, meaning further analysis could be conducted. In evaluating each independent variable in the regression equation, perceived situational autonomy (B=.191; p=.354) and competence (B=.431; p=.059) did not significantly contribute to the successful prediction of training program participation, but perceived situational relatedness was a significant predictor (B=.290; p=.038). If a variable is shown to be a significant predictor, it is also critical to examine the change in the odds ratio given a change of one unit in the predictor. This is represented by Exp(B) in the logistic regression output. The data show that for an increase of one unit in perceived situational relatedness during the awareness program, an employee is approximately 1.3 times as likely to participate in the training program. Results of the logistic regression analysis are displayed in Table 36.

Table 36   Results of logistic regression analysis for predicting entry to SETA training
            program

Hypothesis	IV	B	Wald	P-value	Significant?	Exp(B)
H13a	AUTO	.191	.859	.354	No	1.210
H13b	COMP	.431	3.575	.059	No	1.539
H13c	REL	.290	4.313	.038	Yes	1.337

Hosmer and Lemeshow Test: χ^2=10.438; P-value=.165;
-2 Log Likelihood=583.949; Cox & Snell R^2=.059; Nagelkerke R^2=.080
# of SETA training participants=281; # of non-participants=183; AUTO=Perceived
Situational Autonomy; COMP=Perceived Situational Competence; REL=Perceived
Situational Relatedness;
B=logistic regression coefficient;
Exp(B)=change in odds ratio per 1 unit change in predictor variable

Analysis of Mediated Relationships – Sobel Test

Our model also contains various mediator constructs, and as such, we have

conducted mediation tests to determine whether significant indirect effects exist, as well

as the nature of the mediation tested. Following Baron and Kenny's (1986) guidelines for

mediation testing, we used a Sobel test to assess the significance of each of the indirect

effects. Seven of the eleven indirect effects depicted in our research model were shown to

have significant influence on their respective dependent variable. Perceived situational

autonomy and perceived situational competence each demonstrated positive indirect

effects on attitude toward the ISP, SETA program cognition, and intention to comply

with the ISP through SETA program motivation as a mediator. Perceived situational

relatedness did not have a significant indirect effect on attitude, cognition, or intention.

SETA program motivation had a significant indirect influence on intention to comply

with the ISP through attitude toward the ISP but did not demonstrate an indirect effect on

intention through SETA program cognition. A detailed description of each mediation test

is provided in Table 37.

The nature of each mediated relationship, whether partial or full, was also examined. Post hoc analysis was conducted to determine if significant direct effects were present between variables depicted as only being related indirectly (a detailed description of all post hoc analyses is included in Chapter 5). Because post hoc analysis revealed a significant direct effect between perceived situational autonomy and attitude toward the ISP, SETA program motivation serves as a partial mediator of autonomy's indirect effect on attitude. Similarly, post hoc analysis also showed that perceived situational competence had a significant direct effect on attitude toward the ISP and intention to comply with the ISP, thus demonstrating that SETA program motivation is also a partial mediator of the associated indirect relationships.

Table 37   Mediation testing for indirect effects

Relationship	β (IV → MV)	SE (IV → MV)	β (MV → DV)	SE (MV → DV)	T-Stat	P-Value	Type
AUTO→SM→ATT	0.345	0.069	0.465	0.051	4.384	< .001	P
AUTO→SM→COG	0.345	0.069	1.150	0.179	3.946	< .001	F
AUTO→SM→BI	0.345	0.069	0.289	0.055	3.622	< .001	F
COMP→SM→ATT	0.243	0.077	0.465	0.051	2.982	.002	P
COMP→SM→COG	0.243	0.077	1.150	0.179	2.833	.005	F
COMP→SM→BI	0.243	0.077	0.289	0.055	2.705	.007	P
REL→SM→ATT	-0.018	0.034	0.465	0.051	-0.529	.597	NS
REL→SM→COG	-0.018	0.034	1.150	0.179	-0.528	.598	NS
REL→SM→BI	-0.018	0.034	0.289	0.055	-0.527	.598	NS
SM→ATT→BI	0.465	0.051	0.594	0.055	6.967	< .001	P
SM→COG→BI	1.150	0.179	-0.018	0.012	-1.461	.144	NS

β = Path Coefficient; SE=Standard Error; IV=Independent Variable; MV=Mediator Variable; DV=Dependent Variable; AUTO=Perceived Situational Autonomy; COMP=Perceived Situational Competence; REL=Perceived Situational Relatedness; SM=Motivation toward SETA Program; ATT=Attitude toward ISP; COG=SETA Program Cognition; BI=Behavioral Intention; P=Partial Mediation; F=Full Mediation; NS=Not Significant

Participation Incentive Comparisons using MANOVA

        To determine if significant differences were demonstrated in our dependent variables based on the type of participation incentive our respondents received, respondents' dependent variable mean scores were compared using MANOVA based on the type of participation incentive and the type of motivational treatment given within the SETA program. For treatment groups who received none of the motivational treatments within the program, only the autonomy treatment, or a combination of the autonomy and relatedness treatments, there were no significant differences shown between cash or certificate responses for any of the dependent variables. For treatment groups who received only the relatedness treatment or a combination of all three motivational treatments, certificate participants demonstrated significantly higher scores in attitude toward the ISP. For the treatment group receiving a combination of the autonomy and competence manipulations, certificate participants were shown to have significantly higher scores for both SETA program cognition and attitude toward the ISP. Certificate participants displayed significantly higher SETA program cognition, attitude toward the ISP, and intention to comply with the ISP when exposed to only the competence treatment. Finally, for respondents given a combination of the competence and relatedness treatments, certificate participants exhibited significantly higher scores for all dependent variables. Means and p-values used for assessing significant differences are further shown in Table 38.

Table 38   Mean comparisons of dependent variables within treatment groups based on participation incentive

Treatment	SETA Program Cognition			SETA Program Motivation			Attitude toward ISP			Intention to Comply with ISP		
	CR	OC	p-value	CR	OC	p-value	CR	OC	p-value	CR	OC	p-value
None	5.67	6.59	.098	3.42	3.50	.592	4.24	4.46	.216	4.06	4.22	.412
A only	5.93	6.80	.121	3.54	3.46	.617	4.43	4.51	.621	4.36	4.19	.348
C only	5.18	6.59	.014	3.52	3.47	.730	4.04	4.70	.000	3.81	4.26	.033
R only	6.63	7.40	.131	3.55	3.53	.910	4.36	4.74	.018	4.20	4.37	.307
A+C	5.79	7.25	.004	3.56	3.53	.865	4.37	4.73	.010	4.21	4.07	.430
A+R	6.66	6.26	.554	3.67	3.51	.338	4.49	4.61	.518	4.07	4.46	.061
C+R	5.41	7.33	.003	3.34	3.67	.014	4.29	4.86	.000	4.06	4.48	.020
A+C+R	6.04	6.39	.627	3.60	3.42	.238	4.33	4.72	.021	4.22	4.18	.790

CR=cash reward participation incentive; OC=organizational certificate participation incentive; A=autonomy treatment received; C=competence treatment received; R=relatedness treatment received; Significant differences at an alpha level of .05 are highlighted; SETA Program Cognition was measured on a 0-10 scale; all other dependent variables were measured on a 1-5 scale

Analysis of Measured Control Variables

To determine whether factors external to the hypothesized structural model demonstrated a significant influence on the included dependent variables, various control measures were collected in the main study, including demographic information described earlier in this chapter. An employee's contextual motivation toward the workplace was also collected as a potential control. To examine the influence of the control variables, each of the measured controls (age, gender, ethnicity, years of computing experience, years of experience in the current profession, years of experience at the current organization, and work motivation) was included in the structural model with a direct path toward each of the model's dependent variables (SETA program motivation, SETA program cognition, attitude toward the ISP, and intention to comply with the ISP). Work motivation demonstrated a positive significant influence on SETA program motivation (β

= .234, *p* < .001), SETA program cognition (β = .313, *p* < .001), and attitude toward the

ISP (β = .580, *p* = .004). Years of experience in the current profession was shown to have

a significant negative relationship on SETA program cognition (β = -.030, *p* = .022).

Years of computing experience had a significant positive relationship with attitude

toward the ISP (β = .012, *p* = .002). Although respondents who identified as Hispanic

demonstrated a significant influence of ethnicity on intention to comply with the ISP (β =

.338, *p* = .015), this result may not be interpretable due to the low number of Hispanic

respondents in the dataset (n=23). All other control relationships did not provide evidence

of a significant influence on the dependent variables. Significant relationships

demonstrated by control variables are further shown in Table 39.

Table 39   Path estimates for control variables demonstrating significant influence on
            dependent variables

Relationship	Path Coefficient (β)	T-stat	P-Value
WM → SM	.234	4.657	< .001
WM → ATT	.313	4.948	< .001
WM → COG	.580	2.642	.004
WorkExp → COG	-.030	-2.010	.022
CompExp → ATT	.012	2.854	.002
Hispanic → BI	.338	2.181	.015

WM=Work Motivation; SM=Motivation toward SETA Program; COG=SETA Program
Cognition; ATT=Attitude toward ISP; BI=Behavioral Intention to Comply with ISP;
WorkExp=Number of Years in Current Profession; CompExp=Number of Years of
Computing Experience; R^2 for SETA program motivation=42%; R2 for SETA program
cognition=32%; R^2 for attitude=36.2%; R^2 for intention to comply=46.8%

Summary

In this chapter, pilot study results were discussed, followed by analyses of the

data collected for the main study. To ensure construct validity for the latent variables

included in the research, the two-step approach consisting of exploratory and

confirmatory factor analysis was conducted. SPSS 21 was used for EFA, and AMOS version 22 was used for CFA. AMOS was also used for analysis of the structural model and its associated hypotheses. Moderation effects were tested with both two-group analysis and multiplicative interaction variables. Mediation tests were conducted to determine the full or partial nature of the mediating effects depicted in the model. Paired samples t-tests were used to detect significant differences in attitude and intention for respondents who elected to participate in both the awareness program and the optional subsequent training program. Logistic regression was used to determine the predictive power of respondents' perceptions of autonomy, competence, and relatedness on their decision to participate in the training program. Control variables were tested to determine the explanatory power of individual respondent characteristics on the structural model's dependent variables. Interpretation of the data analyses is further discussed in Chapter 5.

CHAPTER V

CONCLUSION

Introduction

In this dissertation, the influence of self-determined motivation toward a SETA

program on employees' overall cognition of the policy's contents, their attitudes toward

an information security policy, and their intentions to adhere to the policy has been

explored. Prior research in information systems security and self-determined motivation

highlighted a novel research gap and informed the design of our research methods. To

thoroughly examine the nuances of SDT within a SETA program context, an

experimental design was used to parse the influence of an employee's perceived

autonomy, competence, and relatedness while engaged in the program. The research also

studied the impact of specific motivational tactics to encourage initial participation in a

SETA program – cash rewards and certificates of achievement. This chapter presents a

detailed discussion of the findings shown in Chapter IV, post hoc analyses based on a

priori theory, the implications of this research on both theory and practice, the limitations

associated with the present study, and future research that may build on our conclusions.

Post Hoc Analysis

The previous chapter provided a detailed description of the data analyses

conducted to determine support for the hypotheses proposed in Chapter II. Post hoc

analysis is necessary to offer further theoretically-driven evidence for supported

hypotheses, as well as to help determine the reasons for hypotheses not being supported.

In the following section, post hoc examinations are described for structural model

analysis involving an alternative theory-driven research model, structural model analysis

using perception captured during the optional additional training program, and logistic

regression analysis with additional predictor variables included.

Alternative Structural Model with Work Motivation as Moderator

Although the proposed research model was largely supported, the moderating

effects of employees' perceptions of the organization (procedural justice, organizational-

based self-esteem, and affective commitment) were not significant. Because these

organizational perceptions were not the only theoretically plausible moderators of

autonomy, competence, and relatedness, an alternative model was developed to better

determine the moderating influence the organization may have on situational motivation

toward SETA programs.

An alternative moderator may be an employee's overall motivation toward work.

As depicted in Vallerand's hierarchical model of motivation (see Figure 4), work

motivation (a type of contextual motivation) should have a direct effect on SETA

program motivation (a type of situational motivation) but would not have a direct impact

on other situational variables, such as perceptions of autonomy, competence, and

relatedness. However, a moderating effect may be present. As an individual's motivation

toward work becomes more self-determined, the individual influence that autonomy,

competence, and relatedness has on SETA program motivation should be strengthened.

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AMOS 22 was again used to first assess the alternative structural model's fit. The

χ^2 index (χ^2=883.665; df=209; χ^2 index=4.228) for the structural model was below the

recommended threshold. The remainder of the analysis indicated that the model

adequately fit the data (NFI=.918; IFI=.936; CFI=.936; TLI=.915; RMSEA=.08), and the

model fit statistics indicate that analysis may proceed toward examining individual

relationships within the model. Fit statistics for the alternative model are shown in Table

40.

Table 40   Alternative structural model fit statistics

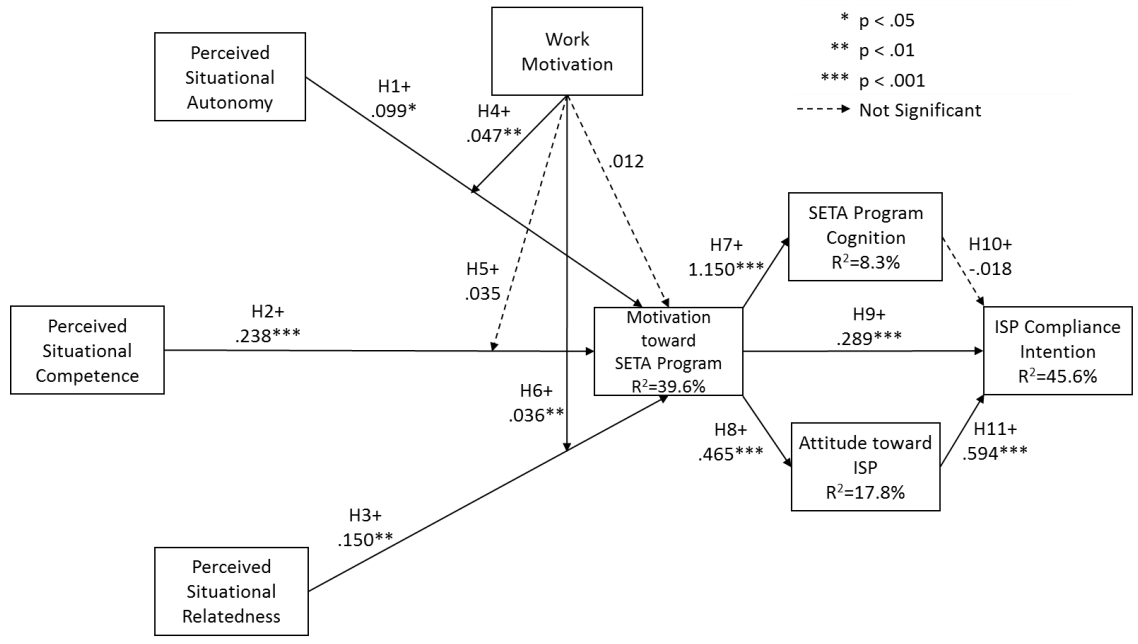| Goodness of Fit Statistic	Recommended Value	Calculated Value
χ^2	--	883.655
Degrees of Freedom (df)	--	209
χ^2 statistical significance (p-value)	--	.000
χ^2 index (Chi-square/df)	$\leq 3; \leq 5$	4.228
Normed Fit Index (NFI)	$\geq .90$	.918
Incremental Fit Index (IFI)	$\geq .90$	.936
Tucker-Lewis Index (TLI)	$\geq .90$	.915
Comparative Fit Index (CFI)	$\geq .90$	.936
Root Mean Square Error of Approximation (RMSEA)	$\leq .06; \leq .08$	.08

Figure 10   Alternative path model with work motivation as a moderator

Individual path estimates were analyzed next. With work motivation modeled as a moderator, all but two hypotheses were supported, including those modeling moderation. Perceived situational autonomy (β = .099, p = .011) and perceived situational competence (β = .238, p < .001) each had a significant positive effect on SETA program motivation, while perceived situational relatedness now demonstrated a significant positive influence on SETA program motivation (β = .150, p = .001). As shown by the interaction path estimates, work motivation significantly moderated the influence of perceived situational autonomy (β = .047, p = .003) and relatedness (β = .036, p = .009) on SETA program motivation, but not the relationship between perceived situational competence and SETA program motivation (β = .035, p = .053).

SETA program motivation had a significant positive influence on SETA program cognition (β = 1.150, p < .001), attitude toward the ISP (β = .465, p < .001), and

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behavioral intention to comply with the ISP ($\beta = .289$, $p < .001$). Attitude toward the ISP

again demonstrated a significant positive effect on behavioral intention to comply ($\beta =$

.594, $p < .001$), but SETA program cognition did not show a significant influence ($\beta = -$

.018, $p = .149$). The overall findings for hypothesis support are shown in Table 41. As

illustrated in Figure 10, the model explains 39.6% of the variance in SETA program

motivation, 8.3% of the variance in SETA program cognition, 17.8% of the variance in

attitude toward the ISP, and 45.6% of the variance in behavioral intention to comply with

the ISP.

Table 41   Path estimates and hypothesis support for alterative structural model with
              work motivation as a moderator

Hypothesis (with Direction)	Path Coefficient (β)	T-stat	P-Value	Supported?
H1: AUTO → SM (+)	0.099	2.282	.011	Yes
H2: COMP → SM (+)	0.238	3.858	< .001	Yes
H3: REL → SM (+)	0.150	2.944	.001	Yes
H4: AUTO*WM → SM (+)	0.047	2.715	.003	Yes
H5: COMP*WM → SM (+)	0.035	1.614	.053	No
H6: REL*WM → SM (+)	0.036	2.351	.009	Yes
H7: SM → COG (+)	1.150	6.423	< .001	Yes
H8: SM → ATT (+)	.465	9.191	< .001	Yes
H9: SM → BI (+)	.289	5.217	< .001	Yes
H10: COG → BI (+)	-.018	-1.442	.075	No
H11: ATT → BI (+)	.594	10.840	< .001	Yes

AUTO=Perceived Situational Autonomy; COMP=Perceived Situational Competence;
REL=Perceived Situational Relatedness; SM=Motivation toward SETA Program;
COG=SETA Program Cognition; ATT=Attitude toward ISP; BI=Behavioral Intention

In addition to interaction effects, moderation was also tested using a two-group

analysis. As conducted for our previously tested moderators, two groups were created (a

low-motivation group and a high-motivation group) based on an individual's work

motivation scores, with a median-split used as the grouping criteria to ensure a relatively

equal distribution of respondents per group. Because the difference in degrees of freedom between the unconstrained and constrained models is 1df, a χ^2 difference of at least 3.84 must be shown between the two models for a significant moderation to be demonstrated at an alpha level of .05 (Aiken & West, 1991; Cohen et al., 2003; Jaccard et al., 1990; Judd et al., 1995; West et al., 1996). With only one $\chi2$ difference score exceeding 3.84, work motivation demonstrated a significant moderating effect on the relationship between perceived situational relatedness and SETA program motivation but not on the other relationships. Results of the two-group analysis for work motivation's moderating effect are further illustrated in Table 42.

Table 42   Post hoc moderation testing using two-group analysis

Moderated Relationship	Moderator	χ^2 without Moderator	χ^2 with Moderator	χ^2 Difference	Supported?
AUTO→SM (+)	WM	811.398	811.644	.246	No
COMP→SM (+)	WM	811.398	812.404	1.006	No
REL→SM (+)	WM	811.398	822.921	11.523	Yes

Alternative Structural Model Analysis with Training Program Perceptions

Because the variables in the research model were collected again during the training program for those who chose to participate, alternative structural model analysis was also conducted using these measurements. The structural model was again assessed for model fit using AMOS 22. The χ^2 index (χ^2=642.901; df=203; χ^2 index=3.167) for the structural model was below the recommended threshold. The remainder of the analysis indicated that the model fit the training program data as well (NFI=.904; IFI=.928; CFI=.927; TLI=.901; RMSEA=.08).

Table 43   Alternative structural model analysis – training participants only

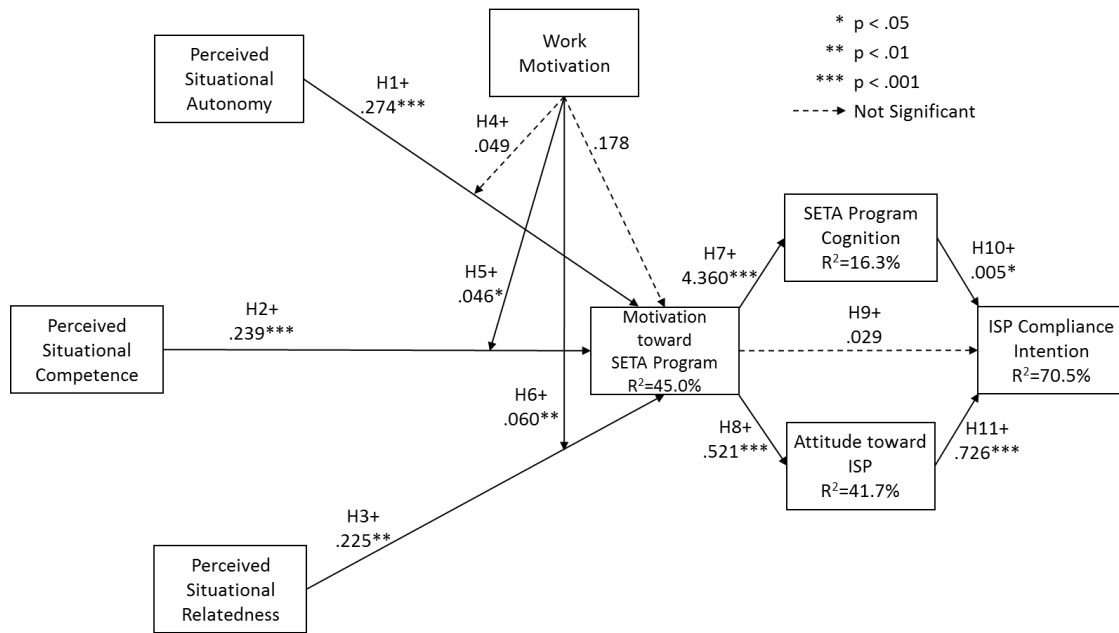| Goodness of Fit Statistic	Recommended Value	Calculated Value
χ^2	--	642.901
Degrees of Freedom (df)	--	203
χ^2 statistical significance (p-value)	--	.000
χ^2 index (Chi-square/df)	$\leq 3; \leq 5$	3.167
Normed Fit Index (NFI)	$\geq .90$	.904
Incremental Fit Index (IFI)	$\geq .90$	.928
Tucker-Lewis Index (TLI)	$\geq .90$	.901
Comparative Fit Index (CFI)	$\geq .90$	.927
Root Mean Square Error of Approximation (RMSEA)	$\leq .06; \leq .08$	.08

Figure 11   Alternative path model using training program measures with hypothesis
support– training participants only

Next, relationships in the structural model were analyzed by examining individual

path estimates. Some interesting differences occurred when using training program

perceptions. Perceived situational autonomy ($\beta = .274$, $p < .001$), perceived situational

competence (β = .239, p < .001), and perceived situational relatedness (β = .225, p = .009) again each had a significant positive effect on SETA program motivation. As shown by the interaction path estimates, work motivation significantly moderated the relationship between perceived situational relatedness and SETA program motivation (β = .060, p = .019) and the relationship between perceived situational competence and SETA program motivation (β = .046, p = .050), but not the relationship between perceived situational autonomy and SETA program motivation (β = .049, p = .054).

SETA program motivation had a significant positive influence on SETA program cognition (β = 4.360, p < .001) and attitude toward the ISP (β = .521, p < .001), but not on behavioral intention to comply with the ISP (β = .029, p = .308). Attitude toward the ISP again demonstrated a significant positive effect on behavioral intention to comply (β = .726, p < .001), but SETA program cognition demonstrated a significant influence (β = .005, p = .021). The overall findings for hypothesis support are shown in Table 47. As illustrated in Figure 11, the model explains 45.0% of the variance in SETA program motivation, 16.3% of the variance in SETA program cognition, 41.7% of the variance in attitude toward the ISP, and 70.5% of the variance in behavioral intention to comply with the ISP.

Table 44   Path estimates and hypothesis support for alternative structural model with
            training program measures – training participants only

Hypothesis (with Direction)	Path Coefficient (β)	T-stat	P-Value	Supported?
H1: AUTO → SM (+)	0.274	3.809	< .001	Yes
H2: COMP → SM (+)	0.239	2.749	< .001	Yes
H3: REL → SM (+)	0.225	2.351	.009	Yes
H4: AUTO*WM → SM (+)	0.049	1.607	.054	No
H5: COMP*WM → SM (+)	0.046	1.644	.050	Yes
H6: REL*WM → SM (+)	0.060	2.349	.009	Yes
H7: SM → COG (+)	4.360	3.700	< .001	Yes
H8: SM → ATT (+)	0.521	8.366	< .001	Yes
H9: SM → BI (+)	0.029	0.502	.308	No
H10: COG → BI (+)	0.005	2.036	.021	Yes
H11: ATT → BI (+)	0.726	11.219	< .001	Yes

AUTO=Perceived Situational Autonomy; COMP=Perceived Situational Competence;
REL=Perceived Situational Relatedness; SM=Motivation toward SETA Program;
COG=SETA Program Cognition; ATT=Attitude toward ISP; BI=Behavioral Intention

Post Hoc Logistic Regression Analysis

        Although logistic regression was previously used to determine the predictive

power of autonomy, competence, and relatedness on an individual's decision to

participate in an additional training program, the previous analysis did not account for the

impact of an individual's motivation toward the SETA program. SDT states that an

outcome of an individual's self-determined motivation is behavior (Deci & Ryan, 1980;

Robert J Vallerand, 1997). One such behavior could be the participation of additional

training. In a post hoc logistic regression analysis, SETA program motivation was

included in the predictive model. SETA program cognition, attitude toward the ISP, and

intention to comply with the ISP were also included in the predictive model to determine

if the downstream effects of an individual's self-determined motivation during a specific

task also contributed to an individual's decision to perform a related task – participating in additional training.

Before proceeding with analysis, the model fit of the logistic regression model was first assessed using the Hosmer and Lemeshow test (Hair et al., 2009). The test yielded a non-significant p-value of .839 for our data, meaning further analysis could be conducted. In evaluating each independent variable in the post hoc regression equation, perceived situational autonomy (B=-.013; p=.987) and competence (B=.309; p=.215) did not significantly contribute to the prediction of training program participation, but perceived situational relatedness was a significant predictor (B=.313; p=.031). SETA program motivation served as a significant predictor (B=.698; p=.003), while SETA program cognition (B=-.036; p=.478), attitude toward the ISP (B=-.165; p=.441), and intention to comply with the ISP (B=.009; p=.961) were not significant predictors.

If a variable is shown to be a significant predictor, it is also critical to examine the change in the odds ratio given a change of one unit in the predictor. This is represented by Exp(B) in the logistic regression output. The data show that for an increase of one unit in perceived situational relatedness during the awareness program, an employee was approximately 1.3 times as likely to participate in the training program. For an increase of one unit in SETA program motivation, an employee was approximately 2 times as likely to participate. Results of the logistic regression analysis are displayed in Table 45.

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Table 45   Post hoc logistic regression analysis for predicting entry to SETA training
              program

IV	B	Wald	P-value	Significant?	Exp(B)
AUTO	-0.013	0.003	0.954	No	0.987
COMP	0.309	1.535	0.215	No	1.362
REL	0.313	4.647	0.031	Yes	1.368
SM	0.698	8.546	0.003	Yes	2.009
COG	-0.036	0.502	0.478	No	0.965
ATT	-0.165	0.594	0.441	No	0.848
BI	0.009	0.002	0.961	No	1.009

Hosmer and Lemeshow Test: χ^2=4.201; P-value=0.839;
-2 Log Likelihood=558.678; Cox & Snell R^2=0.074_; Nagelkerke R^2=0.100
# of SETA training participants=281; # of non-participants=183; AUTO=Perceived
Situational Autonomy; COMP=Perceived Situational Competence; REL=Perceived
Situational Relatedness; SM=SETA Program Motivation; COG=SETA Program
Cognition; ATT=Attitude toward ISP; BI=Intention to Comply with ISP;B=logistic
regression coefficient;
Exp(B)=change in odds ratio per 1 unit change in predictor variable

Discussion

Employees' perceptions of autonomy, competence, and relatedness while

participating in the SETA program significantly influenced SETA program motivation,

although perceived relatedness was dependent on employees' overall work motivation.

The predicted organizational perceptions possessed by employees (procedural justice,

organizational-based self-esteem, and affective commitment) did not have a moderating

effect as hypothesized, but the moderating effect of work motivation was significant.

SETA program motivation significantly influenced each of its hypothesized dependent

variables, demonstrating its appropriateness for inclusion in information security

research. Attitude toward the ISP significantly influenced intention to comply, but SETA

program cognition curiously did not. For participants who completed both the awareness

and training programs, intention to comply was significantly higher after the training

program when compared to its post-awareness measure; there was no significant difference observed in attitude toward the ISP. Perceptions of autonomy and competence were not significant predictors of an employee's decision to participate in the additional training program, but perceptions of relatedness and SETA program motivation were significant. Each of these findings is further discussed below.

Structural Model Results

Embedding motivational enhancements within the SETA program bolstered employees' perceptions of autonomy, competence, and relatedness, either individually or in tandem depending on the treatment group. As predicted in the research model, employees' motivation toward the SETA program subsequently became more self-determined as employees' perceptions of autonomy and competence increased but was not significantly affected by increased perceptions of relatedness. This finding indicates that autonomy and competence are individually significant in improving an employee's self-determined motivation, regardless of other factors. As demonstrated in post hoc analysis, discussed below, the significant influence of relatedness perceptions is dependent on contextual factors related to the situation at hand.

Examining potential moderators of the relationships between autonomy, competence, relatedness, and SETA program motivation provided more insight about the contextual factors that contribute to the influence of one's self-determined situational motivation. In the original research model, procedural justice served as a moderator of the relationship between autonomy and SETA program motivation, organizational-based self-esteem was hypothesized to moderate the relationship between competence and SETA program motivation, and affective commitment was modeled as a moderator of the

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relationship between relatedness and SETA program motivation. None of these moderator variables was found to have a significant impact on the hypothesized relationships, whether tested using a two-group analysis or using interaction variables. This finding indicates that each of these organizational perceptions occurs purely at the contextual level and that the do not have an impact on employees' task-level behaviors within the organization.

However, post hoc analysis was conducted on an alternative structural model that included an employee's contextual motivation toward work as a moderator for all three of the previously mentioned relationships (Vallerand, 1997). The findings demonstrate that the degree to which an employee is self-determined throughout the entire workplace context has a significant impact on the strength of motivational antecedents while completing specific work-related tasks. When tested using interaction variables, work motivation had a significant positive moderating effect on the relationship between autonomy and SETA program motivation. While autonomy demonstrated a significant influence on SETA program motivation independent of work motivation, the relationship between autonomy and SETA program motivation becomes significantly stronger as an employee perceives a higher degree of self-determined work motivation.

The moderating effect of work motivation is even stronger with regard to the relationship between relatedness and SETA program motivation. Although relatedness did not have a significant effect on SETA program motivation when tested with affective commitment as a moderator, the inclusion of work motivation as a moderator resulted in both a positive direct effect and a positive interaction effect on SETA program motivation. Work motivation had a significant moderating effect on this relationship

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when tested using a two-group analysis as well. While autonomy and competence appear to have a significant impact on SETA program motivation independent of other contextual factors, relatedness is only a significant factor when an employee's self-determined motivation toward work is sufficiently high. This finding points to an attribute of relatedness that is unique among the SDT antecedents and is described further in the discussion of logistic regression results.

As predicted in the research model, SETA program motivation had a significant positive influence on each of its dependent variables: SETA program cognition, attitude toward the ISP, and intention to comply with the ISP. These findings align with previous motivational research, which shows that as an individual's motivation becomes more self-determined, positive effects on cognition, attitude, and behavior are observed (Vallerand, 1997). The findings also provide evidence that SDT is an applicable theory in the context of SETA program research, specifically at the situational, task-based level of motivation. As an employee perceived a higher degree of self-determination while participating in the SETA program, cognition, attitude, and intention improved.

Attitude toward the ISP had a significant positive influence on intention to comply with the ISP, aligning with previous findings in information security research. However, SETA program cognition did not have a significant positive influence as hypothesized when measured as a post-awareness program quiz score; in fact, cognition is nearly significant in the opposite direction hypothesized. This at first seems to be a counter-intuitive finding, considering the long stream of SETA program research that has established the alignment of intentions and cognition upon SETA program completion. However, this finding may point toward the importance of employees' participation in

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subsequent training programs after basic security principles have been communicated in awareness programs. For employees who participated in the additional training program, SETA program cognition, measured as an employee's confidence in his or her ability to perform various tasks in an antivirus software solution, had a significant positive effect on intention to comply. This finding also aligns with the significantly higher scores in intention as demonstrated in the paired samples t-test analysis and helps establish a more complete picture of motivation's influence.

Paired Samples T-tests Comparing Post-Awareness and Post-Training Measures

Employees who participated in both the awareness and training programs were measured on attitude and intention to comply after each program, allowing for comparisons of post-awareness and post-training measures. Intention to comply significantly increased after the training program when compared with its corresponding post-awareness measure; attitude toward the ISP did not significantly increase. This finding offers interesting insight toward motivation's role in affecting employees' attitudes. After the awareness program, during which employees' SETA program motivation was enhanced with embedded motivational manipulations, employees' attitudes were substantially positive, and being exposed to further motivational manipulations in the training program likely did not move attitude in a significantly more positive direction. The results of the comparison of employees' intentions demonstrates the importance of participating in a subsequent training program following successful completion of an awareness program. While the awareness program provides general knowledge about security concepts and principles, which creates an initial alignment of employees' intentions and the desires of the organization, the training program

demonstrates how to execute these principles. Some employees may intend to comply after the awareness program but do not possess sufficient knowledge about how to do so. The training program fills this gap through actual demonstration, offering further support of Guttman and Roback's (1995) SETA program framework.

Logistic Regression Results

In the original logistic regression analysis, only perceived autonomy, competence, and relatedness were included as predictors of an employee's decision to participate in the additional training program, with relatedness being the only significant predictor. However, because autonomy, competence, and relatedness serve as antecedents to an individual's self-determined motivation, and because behavior is an outcome of motivation, it was important to include SETA program motivation in our logistic regression model. Post hoc analysis revealed that in addition to perceived relatedness, an individual's overall motivation toward the SETA program served as the most powerful predictor of an individual's decision to participate in an additional training program, with a change in the odds ratio showing that an individual was twice as likely to enter the training program for every unit increase in SETA program motivation. This is a key finding because it emphasizes the importance of an individual's motivation in predicting future behavior, while other more commonly studied variables in information security research – particularly attitude and intention – did not significantly predict participation.

Logistic regression analysis also offers interesting insight toward understanding the nature of motivation's antecedents. Perceptions of autonomy and competence significantly influenced SETA program motivation without moderators included in the structural model, while perceived relatedness did not significantly affect SETA program

motivation until work motivation was included as a moderator. Yet perceived relatedness significantly predicted training program participation, while perceptions of autonomy and competence did not. This could be due to some employees participating in the study having a high need for relatedness. Prior research in SDT has shown that in conditions where team cohesion and the sharing of ideas is emphasized, perceptions of relatedness tend to have a more significant impact on self-determination (Vallerand, 1997). As a result, the manipulation of relatedness in the experimental design may have elicited a greater influence than the manipulations of autonomy or competence. This elevated perception of relatedness may have also contributed a greater impact on an employee's decision to participate in the additional training program based on the ability to share ideas with other trainees being embedded in the SETA program.

This finding also aligns with the observed moderating effect of work motivation on the relationship between relatedness and SETA program motivation. If an employee has a high need for relatedness, lowered perceptions of work motivation will negatively impact the influence of perceived relatedness on situational motivation more than the influence of perceived autonomy or perceived competence, while elevated perceptions of self-determined work motivation will satisfy the need for relatedness at the contextual level and strengthen the influence of relatedness at the situational level.

MANOVA Results

The MANOVA results showed that the motivational incentive for participation in the SETA program – cash reward or organizational certificate – largely did not generate a significant difference in the study's dependent variables. This finding again demonstrates the importance of the embedded motivational manipulations rather than the overall

incentives. Regardless of how an employee was initially motivated to participate by the administration, the motivational manipulations significantly influenced an employee's motivation while participating in the SETA program.

Overall Findings

Although motivating employees by either control-oriented or self-determined means – via cash rewards or organizational certificates – did not significantly contribute to the findings, the inclusion of motivational enhancements within the SETA program significantly improved employees' self-determined motivation toward the SETA program. An employee's perceptions of autonomy, competence, and relatedness while participating in the SETA program significantly influenced his or her motivation toward the SETA program, with work motivation serving as a moderator on the influence of both autonomy and relatedness.

SETA program motivation was shown to significantly influence cognition of ISP principles, attitude toward the ISP, and intention to comply with the ISP, but possibly most importantly, an employee's self-determined motivation toward the awareness program was shown to be a significant predictor of participation in the training program. Training programs are critical in reinforcing high-level security principles by demonstrating how to perform specific tasks within the security controls available to employees. Prior SETA program research has proposed the increasing importance of training and education programs – not just awareness programs. In the present study, the findings indicate that while employees' attitudes toward the ISP were sufficiently elevated after participating in only the awareness program, the training program establishes the connection between cognition and intention to comply. Highly self-

determined motivation during the awareness program, more than incentives such as cash or certificates, can be considered an important factor in eliciting an intrinsic desire within employees to not just know about an organization's recommended information security responses, but learn how to actually perform them.

Research Contribution

The overall findings in this research offer interesting contributions and insights for both researchers and practitioners. The present study provides insight toward motivational research as a whole, as well as work motivation theory and the development of SETA programs based on theoretical foundations. This research also proposes practical solutions for managers to motivate their employees to participate in training programs by bolstering their self-determined motivation. Theoretical and managerial contributions are individually discussed further below.

Contribution to Theory

Information security research has extensively explored the role of deterrence in influencing employees' behavior toward alignment with organizational policies. An ongoing criticism of the adaptation of deterrence theory in information security research is that its original context was that of criminology (Crossler et al., 2013; D'Arcy & Herath, 2011) – is it truly appropriate to equate violation of organizational policies to criminal acts? One of the key contributions of the present study is its offering of a counterpoint to deterrence research by demonstrating the influence of self-determined, rather than control-oriented, motivation on employees' attitudes, cognition, and ultimately intention to comply with policies. SETA program motivation, which was

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measured as a motivational index to capture the degree to which an employee's

motivation was self-determined during SETA program participation, was a powerful

contributor both in the research model and as a predictor of subsequent SETA

participation. The findings presented here offer evidence of the validity of motivation's

inclusion in the information security research domain, as well as interesting future

research avenues related to alternative methods of motivating individuals to better protect

their information assets.

The present study also provides evidence of the efficacy of SDT within an

organizational research context, as well as research related to the development of SETA

programs. Although SDT has been widely validated in educational research contexts

(Deci et al., 1991; Noels et al., 2000; Patall et al., 2010; R J Vallerand et al., 1997), its

use in organizational contexts had yet to be fully tested, specifically through the

experimental manipulations of SDT's antecedent variables – autonomy, competence, and

relatedness. An organizational setting also provided an interesting counterpoint to self-

determination, as the workplace is inherently control-oriented due to salary, raises, and

other control-oriented mechanisms not present in student-focused educational research

(Deci et al., 1991; Noels et al., 2000; Patall et al., 2010; R J Vallerand et al., 1997). SDT

was shown to be a valid theoretical foundation for developing SETA programs based on

organizational policies.

Contributing to motivational research across many contexts, the present study

empirically demonstrated the influence of autonomy, competence, and relatedness on

self-determined motivation individually and in combination. Prior SDT research typically

selected just one or two of the three motivational antecedents for inclusion in

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experimental designs (Robert J Vallerand, 1997). By including all three antecedents in a full factorial experimental design, we were able to test the individual influence of each antecedent with the other antecedents included as well. This was particularly insightful when testing the relationship between perceived relatedness and situational-level motivation.

Another contribution to motivational research is the moderating effect of contextual-level motivation on situational-level relationships. The present study demonstrated that work motivation moderated two of the three relationships between our motivational antecedents and SETA program motivation, with a particularly strong moderating influence on the relationship between perceived relatedness and SETA program motivation. Prior motivational research has focused on motivation at a single level, whether global, contextual, or situational. By capturing employees' motivation scores at multiple levels, we were able to examine the nature of the top-down proximal effects of contextual-level motivation (work motivation) on situational-level motivation (SETA program motivation). This is a novel finding which had not yet been demonstrated empirically in motivational research and should help inform future studies examining motivation at multiple levels.

The present study contributes to work motivation research by offering empirical evidence of the potential interaction that employees' perceptions of the organization may have with situational-level motivation. By measuring employees' perceptions of the organization (operationalized as procedural justice, organizational-based self-esteem, and affective commitment), we were able to test for interaction effects between these perceptions and motivational antecedents at the situational level. Although moderating

effects were not significant, these results provided evidence for the establishment of causality at the contextual level. Prior research in work motivation has been unclear about the direction of the relationship between employees' work motivation and their perceptions of the organization (Deci & Ryan, 1987; Gagne et al., 2004; Gagne & Koestner, 2002; Gardner & Pierce, 1998; Pierce et al., 1989; Zapata-Phelan et al., 2009). By exhibiting a significant moderating effect on antecedents of SETA program motivation, work motivation should be modeled as an antecedent to individuals' organizational perceptions. These findings provide further empirical evidence that employees' perceptions of the organization as a whole are outcome variables of work motivation and are unrelated to situational (i.e. task-related) motivation and further corroborate the propositions developed by Gagne and Deci (2005).

Contribution to Practice

Our findings indicate that embedding motivational enhancements within a training program significantly improved employee motivation and that task-related motivation had significant positive effects on attitude, cognition, and behavioral intention. Managers should be encouraged to formulate SETA programs which enhance self-determined motivation toward security education, such as embedding motivational enhancements for bolstering autonomy, competence, and relatedness among employees.

This finding can be especially critical if managers attempt to implement a two-phase SETA program similar to the program examined in this research. SETA program motivation was a significant predictor of training program participation. If managers identify training programs (i.e. the demonstration of how to protect information assets according to the policies described in the awareness program) to be a key component in

improving the organization's overall security profile, enhancing employee motivation during the awareness program should produce further positive results in subsequent programs.

This study has provided empirical evidence that the modification of organizational artifacts (i.e. SETA programs) toward more self-determined motivation results in better alignment of employee intentions with security-compliant behavior, along with improved attitude and cognition. As such, managers may also be advised to construct compliance policies that do not rely solely on sanctions and rewards to entice changes in employee behavior. By establishing an organizational culture where employees have the freedom to explore alternative security solutions and present them to administration or IT personnel, organizations may create a more autonomy-supportive environment and enhance employees' self-determined motivation toward security. Similarly, employees may be encouraged to partner with fellow workers to share helpful security tips (enhancing relatedness - see also Mutchler, 2012; Warkentin, Johnston, & Shropshire, 2011) or participate in quick refresher quizzes (enhancing competence).

A SETA program can also be utilized as a vehicle for introducing more autonomy, competence, and relatedness into a work-related task. The hierarchical structure of motivation posits that the more self-determined an employee becomes with individual tasks at work, the more self-determined the employee will become at work as a whole, leading to positive effects on attitude, cognition, and behavior. Managers are now equipped with examples of how to introduce such organizational change via reform of a specific organizational artifact.

Because of work motivation's interaction with SETA program motivation, managers may also wish to assess potential employees on levels of motivation prior to hiring. Avoiding the hire of amotivated employees is favorable for organizations for several reasons, but could be especially important with regard to protecting an organization's information assets. It may also be important to not only survey employees about their work motivation prior to being hired but also periodically survey them once they are employees. This could help ensure that employees have not developed an amotivated work ethic and could also help identify appropriate motivational tactics for a particular employee. For example, employees who are more control-oriented in their work motivation will likely not be as responsive to training programs embedded with self-determined enhancements.

Limitations

Although procedures were followed to ensure the validity of the research, this study is not without limitations. The operationalization and methodology of a research study will inherently have strengths or weaknesses in three areas: realism, precision, and generalizability (Dennis & Valacich, 2001; McGrath, 1982, 1994). No study can be exceptionally strong in all three, and often the strength of two areas are maximized to the detriment of the third area. The generalizability of the present study could be compromised due to the selected research design. The realism of the study is heightened due to the inclusion of organizational end users in the sampling frame and the formation of a SETA program based on actual organizational policies. The precision is also maximized by using an experimental design that limits potential interference from extraneous variables. However, studying a single type of organization's SETA program

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(studying employees in K-12 school systems) reduces the generalizability of this particular study across sample populations. The findings may need to be replicated at other types of organizations to strengthen the argument of the theory's application across a variety of firms, especially involving organizations with differing cultures and motivational tactics used on employees in comparison to those typically used in educational systems.

An additional consequence of examining a single type of organization may be a lack of variance in contextual organizational variables, such as affective commitment, organizational-based self-esteem, or procedural justice. Although there were individual differences among the sampled employees, the variance may have been limited due to each employee being exposed to a similar environment at his or her respective workplace. While a strength of the present study is the use of a single security policy across all respondents, the inclusion of a variety of firms with different organizational profiles could expose a stronger moderating effect for overall work motivation and related organizational perceptions on employees' motivation toward SETA programs. A potential solution could be to select an organization with branches dispersed over distance, creating an opportunity for a branch to adopt a unique identity within the overall organization culture based on differing management styles possessed by branch managers.

A related limitation may involve the respondents studied in this research. The selection of employees working in the educational sector may have resulted in the respondents largely sharing a highly self-determined contextual motivation toward their respective workplaces. Employees working in educational environments often score

highly in socio-economic well-being despite not earning particularly high wages. This could indicate that, in general, teachers are not primarily driven by control-oriented means, such as monetary rewards. Educators could possess a more self-determined work motivation than employees belonging to other sectors of the work force. Sampling employees who largely share a more control-oriented work motivation – such as sales representatives, whose livelihood is highly dependent on monetary incentives – could reveal interesting new findings related to both work motivation and motivation toward participating in SETA initiatives.

Another limitation could be the size of the incentives chosen for enticing employee participation in the SETA program. Due to the scale of the research and amount of funding available, small cash rewards were the most practical means of incentivizing respondents monetarily while still achieving a sufficient sample size for data analysis. Research has shown small monetary incentives to be effective in eliciting respondent participation in academic surveys (Warriner et al., 1996), but larger monetary incentives could further negatively influence SETA program motivation. The response rate of participating employees, while already relatively good in comparison to other academic research in our field, would also likely improve. In addition to larger cash rewards, more substantial certificates or credits could be awarded to respondents being incentivized via intrinsic motivation to learn and achieve. Allowing respondents to earn university credits or university-certified continuing education hours may provide a sufficient counter-balance to the larger cash rewards given to extrinsically incentivized respondents. This would also allow us to expand the current research design to include an education program in addition to the awareness and training programs, as education

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programs require the earning of a professional certificate or university credit (Guttman &
Roback, 1995).

A final limitation could be the exclusion of other trait-based constructs in the
measurement instrument. Because other nomologically pertinent constructs were
measured during the SETA program, the inclusion of other constructs may have resulted
in survey fatigue. Future research may build on the findings reported here to include
certain trait-based constructs (e.g. Big Five personality traits, espoused cultural values,
etc.) while excluding other contextual variables (e.g. organizational justice,
organizational-based self-esteem, affective commitment).

Future Research

Although the scope of the present study was limited to a specific phenomenon in
security and motivational research, there are a number of interesting potential avenues for
future research that builds on the findings presented here.

One of the key tenets of Vallerand's Hierarchical Model of Motivation
(Vallerand, 1997) is the recursive nature of motivational influence. Top-down effects
(global to contextual to situational motivation) can be measured using cross-sectional
data, but bottom-up effects are formed over time as an individual continually experiences
motivational perceptions toward a specific task. Future studies examining the impact of
motivation in organizations may be designed to explore the recursive nature of
organizational culture and task-related motivation over time. This conceptualization of
motivation is not currently captured in the present study but could be especially
informative for work motivation research and security policy implementation in practice.

The present study was also focused primarily on the interaction of individual employees' dispositional factors (i.e. motivation, organizational justice, organizational-based self-esteem, and organizational commitment) and situational factors (such as organizational compliance policies, SETA program, and organizational-induced motivators). Group-level perceptions (such as national cultural values, normative beliefs, subjective norms, social influence) as depicted in the interaction of organizational culture and behavior remain unexplored in the present study. As demonstrated in prior IS research (Lowry, Zhang, Zhou, & Fu, 2010; Sarker, Valacich, & Sarker, 2005), group-level perceptions have a significant influence on behaviors related to IS usage and may prove to be important components of motivational research centered on security policy compliance.

One such group-level perception may be espoused cultural values. Originally characterized by Hofstede (1983) as national-level cultural differences, these perceptions have since been reclassified by cross-cultural researchers as espoused values that are generally shared by a particular geographic population but allow for individual differences among group members (Srite & Karahanna, 2006). For example, individuals with espoused collectivist values may possess a greater need for relatedness in order to develop adequately self-determined motivation. Conversely, those who identify as individualists may need to perceive a greater sense of autonomy to become more self-determined in his or her actions. An individual who is comfortable with a large disparity of power in an organization may experience a diffused sense of autonomy. Someone who is uncomfortable with uncertainty may value an increased sense of competence. Currently, these relationships can only be proposed based on the conceptualizations of

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extant theory regarding both cross-cultural and motivational research, but an empirical investigation of the potential connections between these constructs may yield interesting implications for both theory and practice.

Outside of an organization-derived SETA program, other organizational artifacts or attributes were not explored in the present study. Future research may investigate the organizational differences, from both a cultural and behavioral vantage, which contribute to the composition of an organization's overall information security profile.

Although the role of organizational policy mandates has been previously explored in information security research (Boss et al., 2009; Smith, Winchester, Bunker, & Jamieson, 2010), this phenomenon has yet to be examined in concert with SDT in SETA program contexts. The SETA program administered in the present study was completely voluntary, but placing a mandate on employees' participation in both an awareness and training program may yield interesting results. For example, a mandate may negatively affect an employee's self-determination and produce control-oriented perceptions among employees. A mandatory SETA program could also diffuse the influence of embedded motivational enhancements within the program.

Because the impact timeframe of training is greater than awareness, being intrinsically motivated to learn about information security through both awareness and training programs may have long-term effects that could not be measured in the research design of the present study. Future research in the lasting effects of self-determined SETA programs could observe the longitudinal impact of SETA program motivation on contextual work motivation and other organizational perceptions.

The present study was designed to measure the influence of SDT within the SETA program context by embedding motivational enhancements within the program, but an organization may not be limited to only incorporating self-determined features during awareness and training programs. Future research could examine employers' inclusion of other self-determined appeals in the workplace by modifying standard organizational artifacts and physical attributes. Some examples may include administrative reminders that employees possess the ability to perform secure actions (competence), reminders that they have the freedom to seek and present to administration ways to keep organizational information safe (autonomy), or reminders that there is a strong connection between the employee and the organization (relatedness).

An individual's motivation at the global level is a fairly stable trait that can only be influenced over a long period of time by experiencing motivation across several contexts (Robert J Vallerand, 1997). Research in information security has examined trait-based personality differences among individuals (Shropshire, Warkentin, & Sharma, 2015; Warkentin, Carter, & McBride, 2011), but global-level motivation has yet to be tested in the InfoSec domain among more commonly measured constructs. Measuring an individual's global-level motivation could potentially fill a gap not yet addressed in current information security literature and could also serve as an important control variable for research occurring at the contextual level (i.e. work motivation).

Incorporating motivational enhancements within a SETA program inherently creates a richer media delivery mechanism. Media richness theory (Daft & Lengel, 1986; Dennis & Kinney, 1999) and media synchronicity theory (Dennis, Fuller, & Valacich, 2008) could offer an interesting counterpoint by examining the effects of lean SETA

programs against those that contain motivational enhancements. Employees who are largely self-determined at work Individuals who are more control-oriented, especially at work, may prefer a lean form of SETA, as the motivational enhancements would not have a significant influence on the individual's self-determination during the SETA program.

Similarly, future research may incorporate a "motivational fit" for employees participating in a SETA program. In the present study, employees were placed into treatment groups randomly to fully assess the efficacy of SDT in SETA program contexts, but by assessing employees on their work motivation prior to the SETA program, researchers may then dynamically include certain motivational features based on an employee's motivational assessment.

The incentives for participation included in the present study were representing the extremes of the SDT continuum (external regulations and intrinsic motivation to learn and achieve). Future research could utilize incentives that focus on the other types of extrinsic motivation not currently represented. Introjected regulations could be operationalized as a strong endorsement from upper management with an emphasis on how favorable participating in the SETA program would be viewed within the organization. Identified regulations may be represented via persuasive communication focusing on the end result of an employee's participation and successful completion of a SETA program (i.e. safer work environment, ensured data integrity, peace of mind, or confidence in being able to protect your work and the organization's assets). Integrated regulations could be introduced as an altruistic appeal to an employee's innate desire to be a good steward for the organization. Exploring all types of motivation on the SDT

continuum will contribute to a more complete research agenda within the stream of studies related to work motivation.

Future research may also be conducted to examine other alternative learning theories as factors that influence employees' understanding of security policies, several of which may be appropriate for adaptation toward an organizational context (Karjalainen & Siponen, 2011). SDT was adapted in the present study, and other theories studied in the SETA program domain include UCIT (Puhakainen & Siponen, 2010) and adult learning theory (Offor & Tejay, 2014). A meta-analysis of the varying theories within SETA program research may also be useful in determining the relative explanatory power of each theory.

Information security researchers have adapted deterrence theory in examining the influence of sanctions on employee behavior, achieving decidedly mixed results (Crossler et al., 2013; D'Arcy & Herath, 2011). In addition to potential problems of adapting deterrence theory to an organizational environment, motivating employees via extrinsic means, such as sanctions, may have adverse effects on other aspects of their organizational experience. Because most individuals desire to perform self-determined actions (Deci & Ryan, 1980, 2000; Ryan & Deci, 2000a), sanctions may negatively impact the organization by exerting an undesired level of control over employee's behaviors and subsequently impacting employees' effectiveness. According to applications of SDT in work motivation literature, excessively motivating someone via control-oriented means can lead to negative impacts on organizational-based self-esteem, organizational justice, job satisfaction, organizational commitment, and overall job performance. Future studies may examine the potentially detrimental effects policy-based

sanctions may have on employees' motivation toward other work-related tasks and overall work motivation at the contextual level.

While affect was operationalized as an employee's attitude toward an ISP in this study, affect may also be explicitly studied as an outcome of situational motivation toward tasks related specifically to information security. Recent information security research has explored the role of an individual's emotion in making rational decisions regarding the protection of their information (Ormond, 2014; P. Zhang & Li, 2005; P. Zhang, 2013). To contribute to this emerging stream of InfoSec studies, future research could be designed to examine the influence of trait-based negative affective absorption on motivation toward specific security-related tasks, as well as the effect situational motivation may have on negative affective flow, which is state-based.

The influence of SDT may not be limited to organizational end users. Understanding the motivation of home computer users toward performing secure behaviors is also an important avenue for research. Protection Motivation Theory (PMT) has been widely adapted to the context of behavioral information security research. Although results derived from InfoSec studies have been generally aligned with the findings provided from health care, the native discipline of PMT, results have not been as consistent within InfoSec research contexts (Crossler et al., 2013; D'Arcy & Herath, 2011). Additional constructs have commonly been tested in relation to the original PMT model in order to explain a greater amount of variance in behavioral intention or to determine antecedents of constructs comprising threat and coping appraisals. One construct that has thus far remained unexplored in PMT research is motivation. One of the key elements of effective application of PMT is the use of fear appeals (Johnston &

Warkentin, 2010), which focus on the danger of an outside threat and may be classified as a more control-oriented (i.e. extrinsic) form of communication. Motivation may provide an interesting counterpoint to prior PMT research by incorporating self-determined (i.e. intrinsic) forms of persuasive communication in motivating the end user to perform secure behaviors related to information protection.

Although the present study was designed to measure all forms of motivation to determine their effects on SETA program participation, cognition, attitudes, and intentions, the primary focus of the research was toward differences in extrinsic types of motivation, whether more control-oriented or self-determined. In adding to the research stream related to information security non-compliance, researchers may explore the specific role of amotivation in contributing to employees' performance of non-compliant behaviors. According to Padayachee's taxonomy (2012; see Figure 12), amotivation may be the overarching theme that connects similar studies focused on apathy, disobedience, low self-control, incompetence, and other negatively-valenced non-compliance factors. By examining the psychological reasons for employees' performance of non-compliant behavior, future studies in amotivation toward performing security-based tasks could add substantially to information security research related to deviant behavior.
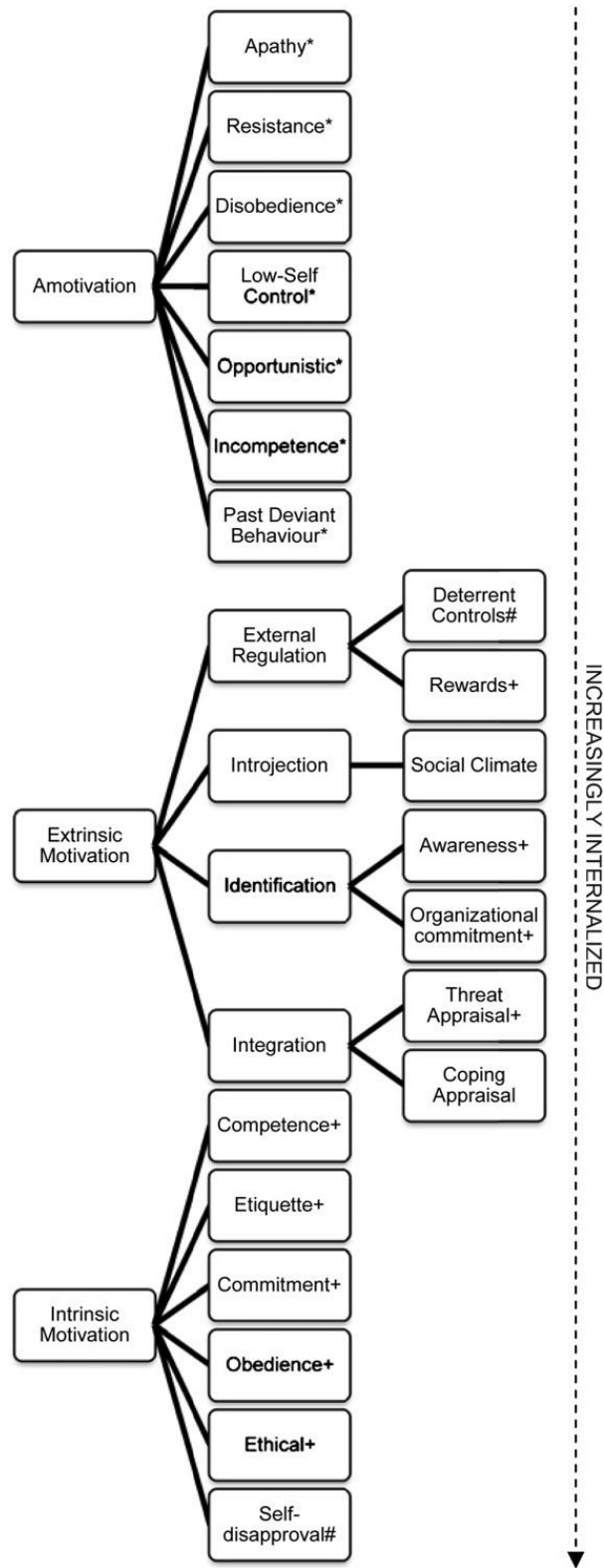
Figure 12   Padayachee's Classification of Security Compliant Behavior predicated on SDT (2012)

Conclusion

Occurrences of organizational security breaches do not appear to be subsiding, and it is imperative that information security researchers achieve a better understanding of the various factors that contribute to the successful implementation and execution of organizational information security policies. SETA programs are an important tool in imparting concepts to employees, but SETA programs possess the potential to accomplish more than simply present information to employees. SETA programs that enhance employees' perceptions of autonomy, competence, and relatedness result in positive outcomes for the organization through improved employee perceptions.

Employees who are appropriately motivated while engaged in SETA endeavors experience a positive change in attitude, intention, and behavior. Self-determined motivation during the awareness program is not only a key driver of an employee's attitude toward policies and intention to comply but is also a significant predictor of an employee's desire to proceed into further training programs. Moving employees from simply learning about concepts in the awareness program toward learning how to align their behavior with organizational policy through specific actions in the training program can have a significant impact on an organization's security. Training programs, in concert with awareness programs, are critical in forming the connection between cognition and intention, and self-determined motivation may serve as the bridge between awareness and training.

The findings described in this research are novel for both information security researchers examining the information security phenomenon and managers looking to protect their organizations. By demonstrating the efficacy of SDT in information security

contexts, this study provides researchers with a multitude of interesting future research opportunities by examining security through the lens of self-determination and hierarchical motivation. This study also provides managers with a tangible framework for initiating organizational change from a security policy standpoint – the implementation of a SETA program that effectively communicates important policy details; enhances employees' perceptions of autonomy, competence, and relatedness; and elicits an intrinsic desire among employees to learn even more about security controls for protecting organizational information. Although there is more yet to be explored in this research domain, this study contributes an important piece to the overall construction of an organization's security profile and a novel building block for future works.

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APPENDIX A

ORGANIZATIONAL PARTICIPANT RECRUITMENT LANGUAGE

Organizational Participant Recruitment Language

Hi [Employee Name],

I wanted to inform you about some additional training that we're offering you through our school. The security of your technology devices (desktop computers, laptops, or tablets) and the information they hold is extremely important. As such, I want to share with you an opportunity to make you aware of the potential threats, solutions, and best practices associated with protecting your device and its data. This program is completely voluntary. If you would like to participate, please do so by [deadline date]. If you successfully complete the program, you will receive [$2 / a certificate signifying your knowledge about basic information security principles]. Clicking the link provided below will begin program.

Click here to begin the program

Have a great day,

[administrator name]

[organization name]

[administrator contact information]

APPENDIX B

ANALYSIS OF ORIGINAL STRUCTURAL MODEL USING ONLY TRAINING

PROGRAM PARTICIPANTS

Analysis of Original Structural Model Using Only Training Program Participants

Because the variables in the research model were collected again during the training program for those who chose to participate, structural analysis was also conducting using these measurements. The structural model was again assessed for model fit using AMOS 22. The χ^2 index (χ^2=549.728; df=143; χ^2 index=3.844) for the structural model was below the recommended threshold. The remainder of the analysis indicated that the model did not fit the training program data as well as the awareness program data (NFI=.859; IFI=.892; CFI=.890; TLI=.854; RMSEA=.101).

Table 46   Structural model analysis – training participants only

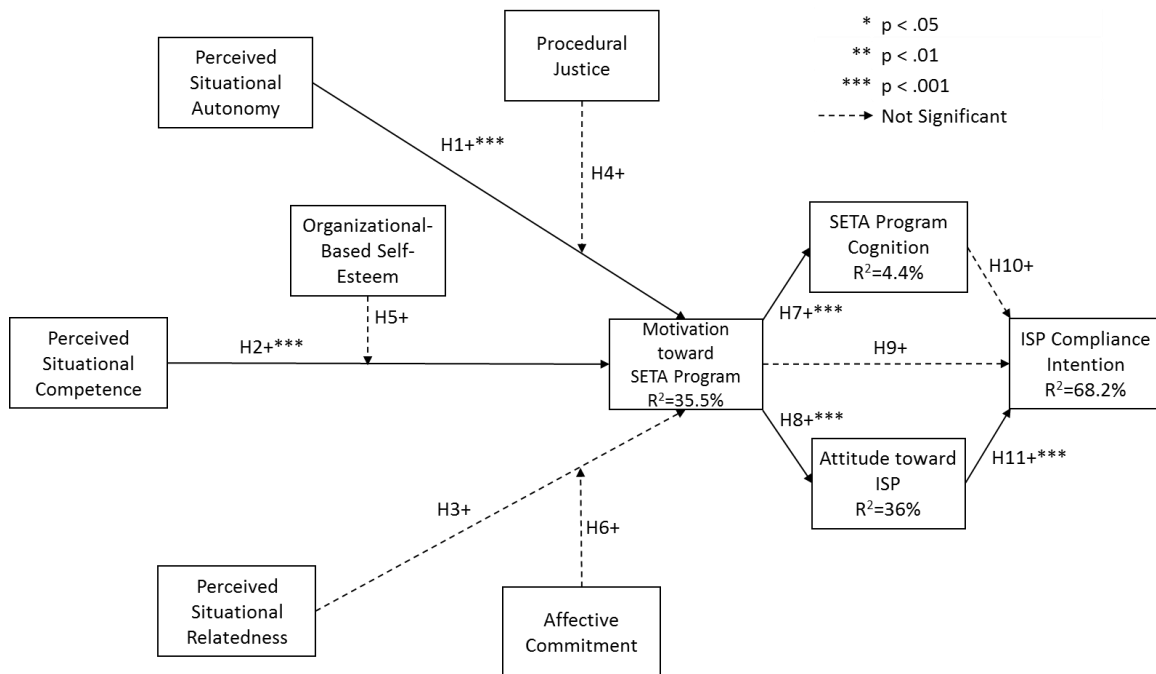| Goodness of Fit Statistic	Recommended Value	Calculated Value
χ^2	--	549.728
Degrees of Freedom (df)	--	143
χ^2 statistical significance (p-value)	--	.000
χ^2 index (Chi-square/df)	$\leq 3; \leq 5$	3.844
Normed Fit Index (NFI)	$\geq .90$	.859
Incremental Fit Index (IFI)	$\geq .90$	.892
Tucker-Lewis Index (TLI)	$\geq .90$	.854
Comparative Fit Index (CFI)	$\geq .90$	.890
Root Mean Square Error of Approximation (RMSEA)	$\leq .06; \leq .08$	.101

Figure 13   Path model using training program measures with hypothesis support–
training participants only

Next, relationships in the structural model were analyzed by examining individual path estimates. Similar hypothesis support was demonstrated for the training program data. Perceived situational autonomy ($\beta = .299$, $p < .001$) and perceived situational competence ($\beta = .339$, $p = .001$) again each had a significant positive effect on SETA program motivation, while the relationship between perceived situational relatedness and SETA program motivation was still not significant ($\beta = -.063$, $p = .084$). SETA program motivation had a significant positive influence on SETA program cognition ($\beta = 3.750$, $p < .001$) and attitude toward the ISP ($\beta = .618$, $p < .001$), but not on behavioral intention to comply with the ISP ($\beta = .080$, $p = .083$). Attitude toward the ISP again demonstrated a significant positive effect on behavioral intention to comply ($\beta = .710$, $p < .001$), and SETA program cognition did not show a significant influence ($\beta = .003$, $p = .152$). The

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overall findings for hypothesis support are shown in Table 47. As illustrated in Figure 13,

the model explains 35.5% of the variance in SETA program motivation, 4.4% of the

variance in SETA program cognition, 36% of the variance in attitude toward the ISP, and

68.2% of the variance in behavioral intention to comply with the ISP.

Table 47   Path estimates and hypothesis support for structural model with training
            program measures – training participants only

Hypothesis (with Direction)	Path Coefficient (β)	T-stat	P-Value	Supported?
H1: AUTO → SM (+)	0.299	3.817	< .001	Yes
H2: COMP → SM (+)	0.339	3.569	< .001	Yes
H3: REL → SM (+)	-0.063	-1.376	.084	No
H7: SM → COG (+)	3.750	3.363	< .001	Yes
H8: SM → ATT (+)	0.618	10.245	< .001	Yes
H9: SM → BI (+)	0.080	1.384	.083	No
H10: COG → BI (+)	0.003	1.028	.152	No
H11: ATT → BI (+)	0.710	10.066	< .001	Yes

AUTO=Perceived Situational Autonomy; COMP=Perceived Situational Competence;
REL=Perceived Situational Relatedness; SM=Motivation toward SETA Program; COG=SETA
Program Cognition; ATT=Attitude toward ISP; BI=Behavioral Intention