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# Information Security Compliance regarding Security Culture, Job Satisfaction, and Perceived Organizational Support

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## ABSTRACT

Heeding recent calls for more replications in MIS research (Dennis and Valacich 2014), this study is a methodological replication of the original research (D'Arcy and Greene 2014) to investigate the drivers of employees' security compliance regarding security culture and the employment relationship. Data were collected using an online survey of respondents recruited with the snowball method. We applied the structural equation modeling technique (SmartPLS 2.0) to test three hypotheses and achieved similar results compared with the original paper. Our findings reflect that organizational security culture and employees' job satisfaction are drivers of employees' security compliance in the workplace. The results also provide empirical validation of the measurement of security culture, which consisted of a three-dimensional nature, including top management commitment, security communication, and computer monitoring.

**Keywords:** Security Compliance, Security Culture, Job Satisfaction, Top Management Commitment, Security Communication, Computer monitoring

## INTRODUCTION

Organizations are facing the major challenge of encouraging their employees to comply with information security policies, procedures, and guidelines (Renaud, Von Solms, and Von

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Solms 2019). In this study, we conducted a methodological replication of the original research by D'Arcy and Greene (2014) published in *Information Management & Computer Security*. In the original study, the authors explored the influence of employment relationship and organizational culture on employees' security compliance intentions, and found that security culture, job satisfaction, and perceived organizational support positively affected employees' security compliance intentions. Dennis and Valacich (2014) call on the MIS research community to establish a tradition of replications for scientific advancement to embrace a culture that values and expects replication studies as a normal part of science. Further, Dennis, Brown, Wells, and Rai (2020), in an editorial this year in *MIS Quarterly*, suggest that our journals and conferences should encourage and share the results of replications in our field.

The current paper replicated the D'Arcy and Greene (2014) research model to provide additional evidence of information security compliance in the context of employment status and organizational culture. The article is structured as follows. First, we review the relevant literature and address theoretical hypotheses. Then, we describe the research methodology. Moreover, we present the results and compared them to the original study. Finally, we discuss the practical implications.

## THEORETICAL FRAMEWORK AND HYPOTHESES

The original study contributed to the theory of information security behavior by exploring two additional factors that motivate employee security policy compliance behavior—organizational security culture and employment relationship. The theoretical framework is shown in Figure 1. Organizational culture, which refers to a system of shared values and beliefs among employees, has received increasing attention in academic research and management practice (Martin et al. 2006). Improving employee commitment and performance are two aspects

of the positive outcome of organizational culture. The harmonious goals between employees and organizations will build an organizational commitment and reduce employee turnover (Kawiana et al. 2018). Ogbonna and Harris (2000) suggested that organizational culture mediated the relationship between leadership style and performance.

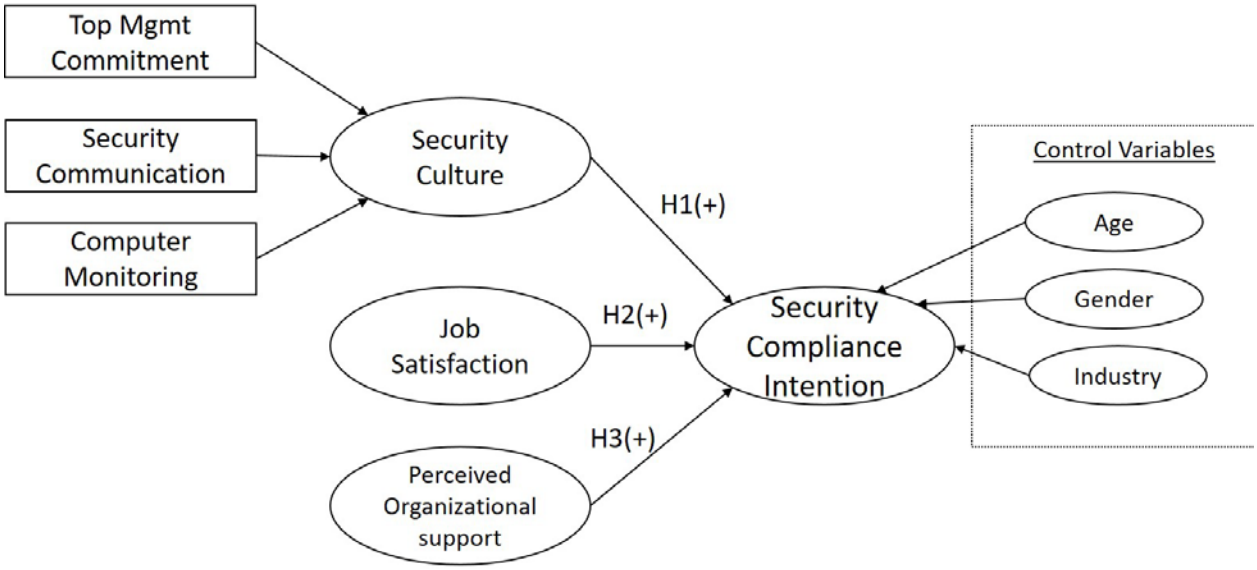



**Figure 1.** The Research Model (D'Arcy and Greene 2014)

In the context of information security, organizational culture not only reflects the values and beliefs of information security agreed by the employees across all levels of the organization, but also exerts a strong impact on information security awareness and compliance mediating by security culture (Flores and Ekstedt 2016; Tang et al. 2016). Hereby, security culture refers to an organizational culture with a specific goal of information security. D'Arcy and Greene (2014) proposed that the organizational security culture was a multi-dimensional concept consisting of top management commitment to security, security communication, and computer monitoring. Further, they revealed these three focal dimensions of security culture jointly positively affected employees' security compliance intention. Hence, we also hypothesize that the more influential

the security culture within the organization, the more likely employees intend to comply with the information security policy.

***H1***. *Security culture is positively associated with security compliance intention.*

The factor of employment relationship, such as employee perceived job satisfaction and perceived organizational support, is the most widely used variable in the organizational behavior literature (Judge et al. 2001; Rhoades and Eisenberger 2002). Job satisfaction refers to the extent to which individuals like their job and gain happiness from their job (Spector 1985). In the theory of reasoned action, it is assumed that individuals are thinking and behaving rationally (Fishbein and Ajzen 1975) so that individuals' overall attitudes of well-being at work will lead to behavioral intention, which ultimately leads to rational behavior. Also, social exchange theory states that individuals are more likely to engage in beneficial organizational action if they are satisfied and if they perceive their employment relationship as a positive exchange. Thus, happy employees tend to be more likely to comply with information security policies (van Dyne and Ang 1998). Many studies provide support for a relationship between job satisfaction and information security compliance (Chang et al. 2012; Greene and D'Arcy 2010; Judge et al. 2001; Settoon et al. 1996). We hypothesize that higher job satisfaction will increase the tendency of employees' compliant behaviors in the workplace.

***H2***. *Job satisfaction is positively associated with security compliance intention.*

Perceived organizational support refers to individuals' perception of the extent to which the organization cares for their well-being and values their contribution (Rhoades and Eisenberger 2002). Based on the social exchange theory, an employee is expected to provide dedication and loyalty to the organization to reach objectives of the organization in return if the employee considers the organizational support, such as compliant security behavior. It is

reasonable to assume that when perceived organizational support is high, a social exchange develops the more definite intention of compliant security behavior.

***H3***. *Perceived organizational support is positively associated with security compliance* intention.

## METHOD

### Data Collection

Data were collected using the Qualtrics online survey platform. In this study, two aspects contrast with the data collection procedures of the original paper. First, authors of the original paper applied two-stage online surveys. Their first survey measured the dependent variable and several demographic variables, whereas the second survey measured the independent variables. The advantage in the two-stage survey, separating the collection of the dependent variable and independent variables, is the potential reduction of negative bias from common method effects (Podsakoff et al. 2003). However, any two-stage survey also takes longer and may lose participants over time. This replication study collected all the variables of interest at one time. Second, rather than using personal professional contact list to recruit survey participants as the original study did, this present study used a snowball sampling approach. We recruited participants via personal email list as well as social media, such as Facebook, Twitter, LinkedIn, and Reddit discussion forums. These initial respondents were further encouraged to ask other potential subjects to complete the survey and then recruit more people who might be qualified to complete the survey. Between March and October 2020, our sample consists of 80 complete responses. Table 1 summarizes the respondent demographic characteristics.

The survey used the same questionnaire as the original study, and all scales were previously validated. Top management commitment to security (TMCS) was a three-item measure from Knapp (2006). Security communication (COM) is a six-item scale developed by

D'Arcy and Greene (2014). Computer monitoring (MON) was measured with three items based on previously established awareness of the MON scale (D'Arcy et al. 2009). Job satisfaction (JS) had five items based on Brayfield and Rothe's job satisfaction index (Brayfield and Rothe 1951). Perceived organizational support (POS) was measured by a seven-item scale (Eisenberger, Huntington et al. 1986). The JS and POS scales exhibited strong validity and reliability in prior studies (D'Arcy and Greene 2014; Settoon et al., 1996). The items are listed in the Appendix. All survey items were measured based on five-point scales ranging from "strongly disagree" to "strongly agree," except for control variables.

**Table 1.** Respondent Demographic Characteristics

| Survey participants (n = 80) | | |
|---|---|---|
| | Frequency | (%) |
| *Gender* | | |
| Male | 41 | 51.2 |
| Female | 39 | 48.8 |
| *Age* | | |
| 18-24 | 2 | 2.5 |
| 25-34 | 24 | 30.0 |
| 35-44 | 27 | 33.8 |
| 45-54 | 18 | 22.5 |
| 55 and over | 9 | 11.2 |
| *Position* | | |
| Managerial | 11 | 13.8 |
| Technical | 13 | 16.2 |
| Professional staff | 51 | 63.8 |
| Administrative | 5 | 6.2 |
| *Industry* | | |
| Academic/education | 45 | 56.2 |
| Financial services | 9 | 11.2 |
| Government | 10 | 12.5 |
| Healthcare | 4 | 5.0 |
| Information technology | 10 | 12.5 |
| Wholesale or retail trade | 2 | 2.5 |
| *Work status* | | |
| Full-time | 69 | 86.2 |
| Part-time | 7 | 8.8 |
| Contract | 4 | 5.0 |
| *Location* | | |
| United States | 36 | 45.0 |
| Other countries | 44 | 55.0 |
| *Job tenure* | | |
| Range | One month - 45 years | |
| Mean | 12.2 years | |

## Scales

## Data Analysis

The SmartPLS 2.0 software package was used for the partial least square (PLS) modeling to analyze the data. Lower-order factors, including top management commitment to security

(TMCS), security communication (COM), and computer monitoring (MON), are the indicators to create the higher-order factor security culture. Standard procedures were used to assess the psychometric properties of the measurement scales—convergent validity, discriminant validity, and reliability, as well as structural relationships. For convergent validity, all factor loadings should exceed 0.70, and the average variance extracted (AVE) for each construct should exceed 0.50. For discriminant validity, the square root of the AVE for each construct should be greater than the inter-construct correlations, and items should load more strongly on their corresponding construct than on other constructs. The reliabilities of all constructs were using the threshold of 0.7. Multicollinearity typically is considered based on the correlation between two variables and variance inflation factor values. Table 2 summarizes the comparison factors between the existing and the original study.

## RESULTS

### Measurement Reliability and Validity

For convergent validity, all factor loadings exceed 0.70, and the minimum value of the average variance extracted (AVE) is 0.70, which exceeds the threshold value of 0.50, as shown in Table 3. For discriminant validity, Table 4 displays the loadings, cross-loadings, and the square roots of the AVE for each construct. The discriminant validity is satisfied because the square root of the AVE for each construct is greater than the inter-construct correlations, and items load more strongly on their corresponding construct than on other constructs. Composite reliability for each construct equals or exceeds 0.90, as shown in Table 4.

**Table 2.** Comparison Factors

| Research study factor | The original study | The replication study |
|---|---|---|
| Theoretical foundations | Moral development research models; the theory of reasoned action/planned behavior; social bond theory; differential association; neutralization | Same |
| Experimental design | Two-stage survey to separate collection of the independent from the dependent variables | One survey to collect the independent and dependent variables |
| Survey environment, survey platform, and technology | Online;<br>Email to author's professional contact list | Online survey information collection system—Qualtrics; weblink, social media, discussion forum, authors' contacts |
| Sampling frame | Computer-using professionals located in various organizations throughout the mid-Atlantic region of the USA | 18 or older, use a computer on a job; around the globe, no location restriction |
| Response rate | 65.5% for the first survey<br>60.1% for the second survey | snowball sampling, not available |
| Sample size | 127 | 80 |
| Analysis tool | SmartPLS 2.0 | SmartPLS 2.0 |
| Hypotheses supported | H1 (+) and H2 (+) supported<br>H3 (+) significant, but different direction | H1 (+) and H2 (+) supported<br>H3 (+) not supported |
| R-squared for the dependent variable | 0.45 | 0.40 |

**Table 3.** Loadings, Cross-loadings, and AVE's

| Construct | Item code | TMCS | COM | MON | JS | POS | COMP | AVE |
|---|---|---|---|---|---|---|---|---|
| Top management commitment (TMCS) | TMCS1 | **0.86** | 0.43 | 0.31 | 0.24 | 0.28 | 0.22 | 0.74 |
| | TMCS2 | **0.90** | 0.43 | 0.22 | 0.20 | 0.33 | 0.27 | |
| | TMCS3 | **0.83** | 0.43 | 0.34 | 0.17 | 0.22 | 0.22 | |
| Security communication (COM) | COM1 | 0.37 | **0.84** | 0.47 | 0.26 | 0.35 | 0.38 | 0.76 |
| | COM2 | 0.45 | **0.88** | 0.52 | 0.43 | 0.41 | 0.45 | |
| | COM3 | 0.48 | **0.89** | 0.46 | 0.36 | 0.37 | 0.52 | |
| | COM4 | 0.40 | **0.86** | 0.37 | 0.39 | 0.39 | 0.52 | |
| | COM5 | 0.47 | **0.84** | 0.49 | 0.34 | 0.32 | 0.50 | |
| | COM6 | 0.46 | **0.91** | 0.54 | 0.42 | 0.41 | 0.57 | |
| Computer monitoring | MON1 | 0.34 | 0.57 | **0.89** | 0.38 | 0.43 | 0.26 | 0.81 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (MON) | MON2 | 0.33 | 0.48 | **0.93** | 0.30 | 0.36 | 0.24 | |
| | MON3 | 0.23 | 0.42 | **0.89** | 0.30 | 0.32 | 0.22 | |
| Job satisfaction (JS) | JS1 | 0.25 | 0.45 | 0.40 | **0.82** | 0.71 | 0.35 | 0.76 |
| | JS2 | 0.19 | 0.40 | 0.25 | **0.88** | 0.67 | 0.43 | |
| | JS3 | 0.25 | 0.38 | 0.31 | **0.91** | 0.68 | 0.46 | |
| | JS4 | 0.18 | 0.32 | 0.36 | **0.88** | 0.69 | 0.42 | |
| | JS5 | 0.16 | 0.30 | 0.28 | **0.86** | 0.64 | 0.43 | |
| Perceived organizational support (POS) | POS1 | 0.20 | 0.31 | 0.42 | 0.61 | **0.79** | 0.27 | 0.76 |
| | POS2 | 0.20 | 0.33 | 0.41 | 0.68 | **0.89** | 0.30 | |
| | POS3 | 0.40 | 0.43 | 0.36 | 0.61 | **0.83** | 0.34 | |
| | POS4 | 0.33 | 0.37 | 0.37 | 0.68 | **0.90** | 0.28 | |
| | POS5 | 0.38 | 0.41 | 0.40 | 0.69 | **0.90** | 0.29 | |
| | POS6 | 0.25 | 0.32 | 0.31 | 0.74 | **0.92** | 0.26 | |
| | POS7 | 0.19 | 0.43 | 0.27 | 0.71 | **0.86** | 0.35 | |
| Security compliance intention (COMP) | COMP1 | 0.22 | 0.43 | 0.08 | 0.36 | 0.35 | **0.79** | 0.70 |
| | COMP2 | 0.27 | 0.54 | 0.28 | 0.42 | 0.31 | **0.90** | |
| | COMP3 | 0.13 | 0.46 | 0.17 | 0.41 | 0.28 | **0.76** | |
| | COMP4 | 0.27 | 0.46 | 0.33 | 0.41 | 0.24 | **0.89** | |

*Note.* Boldface numbers are loadings (correlations) of indicators to their own construct; other values are cross-loadings.

**Table 4.** Reliability and Inter-construct Correlations

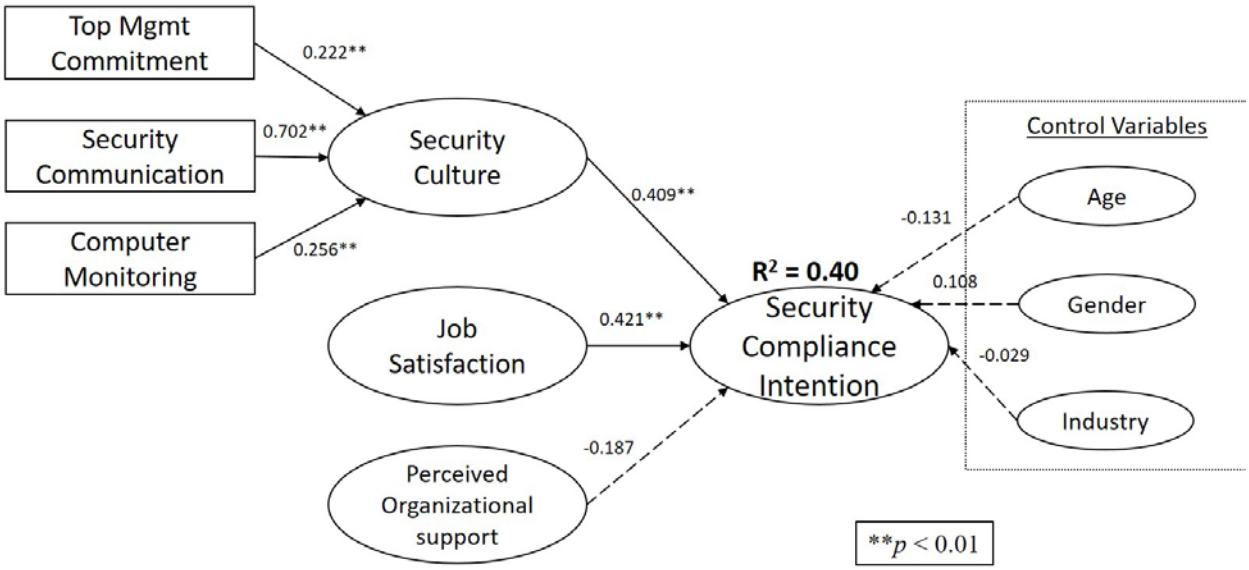
| | | **Inter-construct correlations** | | | | | |
|---|---|---|---|---|---|---|---|
| **Construct** | **Composite reliability** | **TMCS** | **COM** | **MON** | **JS** | **POS** | **COMP** |
| TMCS | 0.90 | **0.86** | | | | | |
| COM | 0.95 | 0.50 | **0.87** | | | | |
| MON | 0.93 | 0.34 | 0.55 | **0.90** | | | |
| JS | 0.94 | 0.23 | 0.42 | 0.36 | **0.87** | | |
| POS | 0.96 | 0.32 | 0.43 | 0.41 | 0.77 | **0.87** | |
| COMP | 0.90 | 0.27 | 0.57 | 0.27 | 0.48 | 0.35 | **0.84** |

*Note.* Bold items are the square root of the average variance extracted (AVE).

## Hypothesis Testing

Figure 2 includes the $R^2$ and path coefficients of the test for the structural model. The $R^2$ of the model was 0.40, suggesting the variance in the dependent variables explained by all the independent variables. In other words, after controlling for age, gender, and industry type, the combination of security culture (including top management commitment, security

communication, and computer monitoring), job satisfaction, and perceived organizational support explained 40% of the variance in employees' security compliance intention.




***Note.*** Paths in dash are not significant ($p > 0.05$).

**Figure 2.** Structural Model Results

The path coefficients indicate the strength of the relationship between the independent and dependent variables. The results indicate that each of the three dimensions of security culture has a significant path. In other words, all three first-order constructs, including top management commitment ($\beta = 0.222$, $p < 0.01$), security communication ($\beta = 0.702$, $p < 0.01$), and computer monitoring ($\beta = 0.256$, $p < 0.01$) make a unique contribution to the second-order construct—security culture. The result also supported H1 as security culture had a significant positive relationship with security compliance intention ($\beta = 0.409$, $p < 0.01$). In addition, H2 was supported ($\beta = 0.421$, $p < 0.01$), as job satisfaction had a significant positive relationship with security compliance intention. However, the relationship between perceived organizational support and security compliance intention was not significant, so H3 was not supported. None of the control variables was significantly associated with security compliance intention.

## DISCUSSION AND IMPLICATIONS

This paper replicated and tested an empirical model regarding the effect of security culture, job satisfaction, and perceived organizational support on employees' intention of security policy compliance. The results provide evidence that security culture and job satisfaction are positively associated with employees' intention of security policy compliance, but don't show a significant relationship between perceived organizational supports with security compliance intention.

Regarding H1, the positive relationship found in this study between security culture and security compliance intention supports the original research that security culture is an essential factor for supporting and guiding information security management programs (D'Arcy and Greene 2014). It also contributed to provide content validity of the security culture construct that consists of three dimensions—top management commitment, security communication, and computer monitoring. Among the three dimensions, security communication achieved the highest path coefficient (0.702) as the original study (0.661), and both studies indicated the most significant impact on the second-order construct security culture.

The positive relationship (H2) found between job satisfaction and security compliance intention advanced our understanding of factors of employment status that motivate employees' behavior in the workplace. The finding supports the social exchange theory perspective that employees tend to engage in positive actions that are beneficial actions to their organizations if they are satisfied with their employment roles as a positive exchange. In other words, happy employees appear more likely to comply with information security mandates.

No significant influence of perceived organizational support on security compliance intention as hypothesized (H3) instead of negative significance in the original study, which

warrants future discussion. We speculate that employees were not aware of the degree of organizational support on security compliance. In general, most organizations adopt sanctions to promote security policy compliance, but rarely implement reward policies. Based on the deterrence theory and fear appeal theory, a combination of perceived certainty of sanction and perceived severity of the sanction is often considered as a factor associated with non-compliant behaviors, resulting in the mixed results between perceived self-efficacy and policy violation.

Compared with the original study, the current study's structural model explained a similar amount of variance in security compliance intention (45% in original research and 40% in this study). Both studies showed that H1 and H2 were supported, but H3 was not supported. However, this replication research didn't find any one of the three control variables (age, gender, or industry type) was significantly influenced security compliance intention, while the original study reported age had a significant positive effect. This discrepancy might contribute to a different percentage of age cohort—62.2% of respondents in the original research and 30.0% in this study were between 25-34 years old. Age in this study was more normally distributed than the original research.

One limitation of this research could be the sampling frame. By the time of reporting, this study has fewer valid respondents (127 in the original study and 80 in this study). Furthermore, our respondents had no regional restriction, but came from all locations around the globe. Further extension of this work could analyze specific cultural influences by collecting data from various cultures (Menard, Warkentin, and Lowry 2018). Additionally, the replication study collected all variables in one survey questionnaire rather than the two-stage sampling of the original study, so the present study is susceptible to common method bias. We performed Harman's one-factor test by entering all the items in an un-rotated factor analysis and found only 40.3% (rather than the

majority) of the total variance was explained by a single factor, so common method bias was not a significant issue in this study. Even though the original study conducted a two-stage sampling strategy to separately collect the dependent variable from independent variables, it did not separately collect all the independent variables; to some extent, it may still have common method effects. Hence, future studies could use the latent method factor and marker variables to decrease the sources of common method bias (Podsakoff et al. 2003).

## CONCLUSION

Overall, the findings of this study showed that security culture and job satisfaction are positively associated with employees' intention of security policy compliance and reflected both practice and research implications of security policy compliance issues. (1) From a practice perspective, employees' security compliance intention has a positive influence on driving security culture as well as employees' job satisfaction. Thus, the IT department could integrate administrative and human resources to create a satisfied and happy work environment and advocate information security policy compliance. (2) From a research perspective, on the one hand, this study offers a validated measurement and analysis of security culture that can be applied to future research. In addition, the two factors (security culture and job satisfaction) that positively influence security compliance intention are associated with organization-level and individual-level, respectively. Future studies could extend this research to investigate the relationships in two dimensions and could conduct multilevel research to test hypothesized relationships with multilevel statistical models.

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## APPENDIX – VARIABLES AND SURVEY ITEMS

Top management commitment to security (TMCS)

1. Senior management actively champions security goals
2. Top management considers information security an important organizational priority
3. Top managers adhere to security policies themselves

Security communication (COM)

1. Employees in my company have a clear understanding of their computer security responsibilities
2. My company provides adequate IT security training
3. My company's security policy is clearly defined
4. My company makes employees aware of its security policies and regulations
5. I am aware of the procedures for reporting security policy violations
6. My company's security policy is strongly enforced

Computer monitoring (MON)

1. I believe that my organization monitors any modification or altering of computerized data by employees
2. I believe that my organization reviews logs of employees' computing activities on a regular basis
3. I believe that employee computing activities are monitored by my organization

Job satisfaction (JS)

1. Generally speaking, I am very satisfied with this job
2. At this moment, I am finding real enjoyment in my work
3. I am generally satisfied with the kind of work I do on this job
4. Right now, I feel fairly satisfied with my present job
5. At this very moment, I am enthusiastic about my work

Perceived organizational support (POS)

1. The organization values my contribution to its well-being
2. The organization strongly considers my goals and values
3. Help is available from the organization when I have a problem
4. The organization really cares about my well-being
5. The organization is willing to help me when I need a special favor
6. The organization cares about my general satisfaction at work
7. The organization tries to make my job as interesting as possible

Security compliance intention (COMP)

1. I am likely to follow organizational computer security policies
2. I do my best to strictly follow computing rules and procedures
3. I attend or read all required training on information security
4. I am certain that I will follow organizational security policies