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Software Compliance: The factors impacting compliance

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ABSTRACT

Organizations and monitoring agencies continue to express concern over software piracy because of the ethical, legal and financial implications of noncompliance. This study focuses on how software license noncompliance is actually a factor in software piracy. Many organizations use a variety of software tools distributed over their workforce and tracking license compliance for turnover, upgrades, and functional reassignments is problematic. The result of this study indicates that if organizations promote an environment in which software compliance and ethical beliefs are maintained, then penalties and legal consequences are less a driver of compliance intentions. Additionally, age has a moderating effect on intent to comply indicating that as employee age increases, software piracy resulting from license noncompliance is less likely.

Keywords: Software Compliance, software piracy, structural equation modeling, partial least squares, Theory of Planned Behavior

INTRODUCTION

Software piracy continues to pervade consumer and organizational environments causing large revenue losses. As early as 2000, software piracy began its ramp-up as the Business Software Alliance (BSA) reported $60 billion in revenue losses for the years 1994-1998 (Moores & Dhillon, 2000). Recent BSA studies indicate piracy yielded a $53 billion dollar loss in revenue for 2008, up 38 percent from 2007 (Moores, Nill & Rothenberger 2009;Schibrowsky & Peltier 2010). Despite the progress of piracy deterrents and the soft economy, overall piracy rose two percentage points from 46 percent to 48 percent in 2009 (BSA, 2010). In the same study, it was reported that the number of PCs purchased globally continued to rise despite the problematic economy. The belief is that as the number of computer users grows piracy also increases, although, generally not at the same rate (Moores & Dhillon, 2000; BSA 2010).

To set piracy statistics in a contextual framework, piracy is generally regarded as unethical behavior. For example, in a brick and mortar scenario, shoplifters must physically visit the place of business, browse, and commit the unethical behavior while on-site. Businesses place security equipment throughout the store (e.g. cameras, radio frequency tags) to monitor patrons and merchandise. Additionally, on-premise warning signs affirm a security posture. In contrast, piracy, or *softlifting* (Thong & Yap, 1998) is largely an *off-premises* crime. Users can download pirated movies, software, books, and other digital items from friends, coworkers, and counterfeiters often outside of monitored channels. Calluzzo and Cante (2004) presented the concept of *very unethical behavior* in their study as the copying of software for personal use, unauthorized viewing, use and disclosure of private files, including the unauthorized destruction of files and systems. A review of websites such as YouTube shows license infringements in much of their uploaded content. Music, movies and professional sports broadcasts have become recent targets of license fraud and copyright infringement prompting some organizations and artists to pull their broadcast clips and intellectual property from public websites. These hosting websites are under legal scrutiny and are required, in some situations to monitor uploaded content (Meisel, 2009).

Although the above examples present a purposeful and unethical intent to use digital media, this research focuses on an organizations *unintentional* use of unlicensed software. Cassluzzo and Cante's (2004) definition of intentional misuse is the unauthorized copying and use of software ether for intrinsic or extrinsic benefits. In contrast, the unintentional use of unlicensed software is the degree to which the organization believes it is license compliant. For example, software developers or data analysts may use software to complete a project on an aggressive project deadline without confirming license compliance. Although this many not be an overtly dishonest action, it is a misrepresentation that goes to the heart of

compliance and presents legal and ethical challenges to the organization. In this research, software license noncompliance is defined as the unintentional use of unlicensed utilitarian software.

Software use and subsequent license tracking in typical organizations, especially so for software development institutions, can be problematic. The number of third party components used in application development is potentially large. For example, tracking of most software is done on a by-license, per-user agreement between the purchaser and the vendor. Specific types of software contain many types of functions such as the development platform (e.g. Microsoft Visual Studio) and other controls such as grid output, and special functions not offered in the base development platform, thus requiring additional software and additional licensing. Juxtaposed with the purchase of expensive development platforms are software upgrades. Software upgrades often save costs since full and upgrade versions exist on separate stock keeping units (SKU). In other words, the full version license must exist to make use of the cheaper upgrade SKU cost. Thus, software updates become a complex endeavor (who has what, how many copies) and most auditing software is unable to track licenses effectively. Additionally, heterogeneous network architectures exacerbate the issue where ephemeral systems, hardware upgrades and dual-duty employees exist. Hence, the unintentional use of previously licensed of unlicensed software presents both legal and ethical implications for many organizations.

In light of the continued diligence of legal and alliance groups, and as evidenced by current software piracy research, businesses are pushing for a greater understanding of the factors associated with software piracy. Researchers and practitioners' alike need a deeper understanding of compliance. In two recent papers (Moores, Nill, & Rothenberger, 2009) (Nill, Schibrowsky, & Peltier, 2010) on software piracy, constructs such as Knowledge, Perceived likelihood of punishment, and Fear of legal consequences were used to explain variances in the behavioral intent to commit software piracy. In the latter research, Nills et al. (2010) refer to TPB providing a list of strategic recommendations for piracy reduction such as (1) Individual companies and governments partnering to develop marketing information, (2) Increased research on a global scale to develop a communication process such as consumer education, and (3) strong enforcement strategy. Stronger penalties should be levied against agitators to reduce piracy (Nill, Schibrowsky, & Peltier, 2010). In similar fashion, recent research on Internet security awareness involved constructs based on good piracy measurements such as (1) Information security awareness programs, (2) ensuring security awareness, and (3) create appropriate security training and awareness programs, and (4) allocate time for employees to conform to security requirements that do not compete with daily job activities (Bulgurcu, Cavusoglu, & Benbasat, 2010). The purpose of the research was to determine intent to follow an organizational security policy (Bulgurcu, Cavusoglu, & Benbasat, 2010).

The purpose of this research is to identify additional variables related to the intent to conform to software license compliance. The goal is to extend the current research models by integrating latent constructs that address the following research questions.

1. How do perceived awareness and belief factors affect attitude and intent to follow or not follow software license compliance?
2. What are the beliefs about the outcome of the license compliance factors?
3. What effect do moderating factors (age, gender, education, experience, industry) have on intent to comply?

According to TPB, the intent to adhere to software compliance is based largely on several factors such as perceived awareness (PA), perceived software ethics (PSE), perceived punishment (PP), perceived legal consequences (PLC), perceived compliance (PC), extrinsic beliefs (EB) and perceived behavioral control (PBC). The idea that low adherence to compliance defines, at least from a peripheral perspective, software piracy (intentional or not). Existing literature juxtaposed with this research presents an alternate view on the unintentional use of unlicensed software. That is, commerce electronic or otherwise operates on a system of service/product provision and payment in which adequate license tracking is the factor solidifying the spirit and letter of a software license contract. TPB is well suited in predicting and explaining behavior and both aspects are necessary in determining the intent of an organization to adhere to the software license requirements as specified by the offering vendor.

THEORETICAL FRAMEWORK

The TPB in IS research (Ajzen, 1989) is well known largely for its ability to predict behavioral intention based on three factors: Attitude toward the behavior, Subjective Norm, and Perceived behavioral control. Perceived behavioral control, or volitional control, was added to the previously dominate theory of

reasoned action (TRA). Ajzen et al. (1989) believed that in order to more correctly predict behavior, one must have complete volitional control to carry out the action. TPB is applied in numerous IS research studies. For example, Bulgurcu et al. (2010) used TPB in their research on information security policy (ISP) compliance. The intent of their research was to determine the factors involved in the intent to comply with an established Information Security Profile (ISP). From the perspective of software piracy, Liao, Lin, and Liu (2009) used TPB to capture the behavioral intent to use pirated software. In their study, it was determined that perceived prosecution risk was the dominant antecedent of intentions to pirate software. Similarly in extant piracy research, TPB was used to predict intent to pirate software in the work place finding that individual attitudes, subjective norms, and perceived behavioral control are significant determinants on intent to use software illegally. In addition, punishment severity and certainty, and software costs also shape one's attitude on illegal software use. In their study, all were significant in predicting the intent to pirate software (Peace, Galletta, & Thong, 2003).

The behavioral aspect of software compliance necessitates the use of TPB to discover an *unintentional* aspect of software noncompliance. In the same manner as the intent to pirate software or ISP compliance, the behavioral aspect is appropriate. Aligning the perspective on compliance, Webster's dictionary defines the term as the act or process of complying to a desire, demand, proposal, or regimen or with coercion or conformity in fulfilling official requirements (Merriam-Webster, nd).

RESEARCH MODEL AND HYPOTHESES

Software compliance can be modeled by first addressing what is known by the user. Perceived Awareness (PA) establishes what the individual or organization knows about the concept of software license requirements and compliance. Once awareness is established, it becomes difficult (though not impossible) to claim ignorance. TPB establishes that the intent to carry out a behavior is dependent on a number of factors. According to research (Ajzen, 1991), (Moores, Nill, & Rothenberger, 2009), and (Bulgurcu, Cavusoglu, & Benbasat, 2010), intent is dependent on a user's attitude (ATT), subjective norm (SN), and volitional control (perceived behavioral control).

Awareness

An employee's awareness of their environment, belief system, and corporate culture is an important aspect of software compliance. The organization may have strict policies for adhering to software license requirements (ramifications for noncompliance). Although standard operating procedure notwithstanding, it may be insufficient in itself, to predict a compliant outcome. For this study, perceived Awareness is an employee's overall knowledge and interpretation of compliance and its ramifications. Employees should understand the risks, benefits, and consequences of noncompliance. Valentine and Barnett (2003) present the notion of ethical behavior based on an employee's perception of an institutionalized ethics policy. Employees are more likely to exhibit ethical behavior if they know ethics codes exists. Additionally, management commitment toward this policy increases the likelihood of ethical adherence (Valentine & Barnett, 2003). The idea is the more employees are aware of the consequences involving noncompliance and the organizations ethical stance, PA should have a positive influence on how employees use software. In a similar manner, PA should have a positive influence on PLC based on the awareness of the risks of noncompliance coupled and the possible legal ramifications. For one to understand legal issues surrounding compliance PA serves as a foundational component and PLC is an additive dimension. For example, an organization presented with negative publicity may suffer irreparable damage to its reputation. Company reputation is a closely protected asset and the involvement in any improprieties may be difficult to repair.

Therefore, in order to provide forward progression into the compliance model, focus exists at what the employee knows. Hence,

> *Hypothesis 1: An employee's awareness (A) that co-workers understand software license compliance has a positive impact on Software Ethics (SE).*
>
> *Hypothesis 2: An employee's awareness (A) that co-workers understand software license compliance has a positive impact on Punishment (P).*
>
> *Hypothesis 3: An employee's awareness (A) that his co-workers understand software license compliance has a positive impact on Legal consequences (LC).*

Hypothesis 4: An employee's awareness (A) that co-workers understand software license compliance has a positive impact on Compliance (C).

Attitudinal Dimension

Understanding the behavioral aspects of ATT and its affect on IC, several latent variables attempt to explain their influence on ATT. Extent research in software piracy addresses software piracy and its antecedent behavioral structure (Moores, Nill, & Rothenberger, 2009). Moore shows that the individual must understand software compliance and maintain an awareness of the potential legal consequences and possibilities of punishment. Cognizant of these elements, Perceived Software Ethics (PSE) is the degree to which one believes they exercise ethical treatment of software use (tracks software licenses, uses only legal software). Drawing on the definition of ethics from Thong and Yap (1998), ethics is the inquiry into the grounds of morality, such as moral judgments, standards, and rules of conduct. It is an awareness of a set of circumstances where an individual identifies an ethical situation and performs the appropriate ethical behavior (Thong & Yap, 1998). Perceived Punishment (PP) is defined as the degree to which one believes following compliance will reduce or eliminate punishment. Bulgurcu et al. identifies sanctions, based on studies in deterrence theory (Kankanhalli et al. 2003; Pahnila et al. 2007; Straub 1990) as the motivating factor enabling a perception to non-adherence costs. Perceived Legal Consequences (PLC) measures similarly as PP where the elimination of non-compliance reduces the fear of legal repercussions. Perceived compliance is defined as the degree to which an employee views their co-workers as exhibiting software compliance. The idea is that a higher significance to PC reduces PLC and PP. With the exception of PC and PSE, the foundation of the remaining constructs exists in extant research in software piracy as published by Moores et al (2009) and Moores et al. (2010).

While Moores focuses on the negative influences of PP and PLC to ATT, this research focuses on the positive aspects (e.g. knowing the environment of what is software licensing and its positive effect on ATT). In other words, employees and their co-workers understanding of the above items positively affect their attitude on maintaining compliance. Cronan and Al-Rafee (2007) show attitude to be a strong factor in prediction since its direction is alterable from persuasion or other means. Therefore, the following hypothesis determines the effect of ATT on IC.

Hypothesis 5: An employee's belief that co-workers maintain software ethics toward software compliance has a positive impact on the employee's attitude (ATT).

Hypothesis 6: An employee's perception that co-workers maintain software compliance due to punishment has a positive impact on the employee's attitude (ATT).

Hypothesis 7: An employee's perception that co-workers maintain software compliance due to legal consequences has a positive impact on the employee's attitude (ATT).

Hypothesis 8: An employee's perception that co-workers are software compliant even when tempted to use unauthorized software, has a positive impact on the employee's attitude (ATT).

Intention

Intentions involve motivating factors, which are indications of intensity in willingness to try, and the effort exerted in carrying out the behavior (Ajzen, 1991). Moore et al. (2009) indicates several contributing factors to intent such as PBC, SN, and ATT. ATT indicates the degree to which one has a favorable or unfavorable evaluation of the behavior. Internal and external measures are formed by ones beliefs about behavior, both positive and negative. In this case, interest lies in the attitudes toward software license compliance and its effect on the intent to comply (IC). In this case, how would others (e.g. co-workers, or management) see the behavior of non-compliance? Additionally, how would fellow co-workers feel about the behavior? For most organizations, the social pressure on software users can be significant. The institution of Sarbanes-Oxley now presents added pressure to public companies, where the motivation to adhere to transparency in their network and software holdings is paramount (Palmer, 2004). Therefore, the following hypotheses address the prediction of the intent of compliance based on ATT:

Hypothesis 9: An employee's attitude (ATT) toward software compliance positively influences the intention to comply (IC) with software license requirements.

METHODOLOGY

To test the research hypotheses, a survey method was used to collect data from a diverse set of organizations. Instead of targeting the high ranking IT executive, commonly defined in extant research as the CIO (Preston, Chen, & Leidner, 2009), all members of the organization that use software were targeted. The development of the measurement items stems from extant research of Bulgurcu et al. (2010) and Moores et al. (2009). Specifically, Bulgurcu's model is the study of the antecedences of an information security policy (ISP) juxtaposed with information security compliance. In this study, since this model deals directly with compliance, many variables were similar in meaning and were applied to the concept of software license compliance. The idea is that these two phenomena closely mirror each other. The latter model also contains aspects of the former model but defines and measures fewer variables. Both models make use of TPB to predict intent to comply based on the three key constructs (ATT, SN and PBC).

Item development

Measurement items were taken from extant research to retain the measurement validity already existent with these variables. Item wording was altered slightly to conform to the nature of this research. However, the Agents' of socially desirable response items was extracted from Manning et al. (2008) in its entirety. Table A1 presents the latent variables, their types (reflective or formative), and the source and the number of measurement items assigned to each.

Data Collection Procedure

A web-based survey was conducted using the measurement items presented in table A2 and sent to 200 respondents. A web-based approach was found to be easier to track and deploy since the target population uses software at their place of employment. The target population consists of respondents working in a professional organization that use computers and software in some capacity. The survey was administered by contacting local small, medium and large sized businesses and upon receiving permissions, a link to the web-based survey was sent. The survey link was sent to 200 respondents in which 159 usable responses were received. The sample data was reviewed to ensure each respondent correctly completed the entire survey. Twenty-one unusable responses were identified (the respondent aborted the process). Out of the 159 responses, 138 usable exist, for a total response rate of 80 percent and a non-response rate of 20 percent.

Respondents first answered a set of demographic questions (see table 1). Of the valid sample data, 58 percent were male and 42 percent were female. Half of the respondents were in the 40 to 49--age range. In education, 51 percent of the sample population has a 4-year degree and 22 percent with a Masters degree. This appears to indicate a large portion of respondents to be fairly well educated. In terms of experience, 30 percent of respondents have at or over 25 years of experience. Finally, 69 percent of respondents work in the computer software industry, the next closest industry being retail at 8 percent. The data focuses largely on computer software industry, with all other data showing low heterogeneity. Certainly, other industries use software to carry out daily functions. However, the software industry is believed to have a larger percentage of workers using several software applications and is bound to some type of organizational compliance mandate.

	#	Description	Frequency	Percentage
Gender	1	Male	80	58%
	2	Female	58	42%
Age	1	18-19	0	0%
	2	20-29	8	6%
	3	30-39	34	25%
	4	40-49	50	36%
	5	50-59	39	28%
	6	60-69	7	5%
	7	70-79	0	0%
Education	1	Less than High School	0	0%
	2	High School/GED	4	3%
	3	Some College	18	13%
	4	2-year College Degree (Associates)	13	9%
	5	4-Year College Degree (BA/BS)	71	51%
	6	Masters Degree	31	22%
	7	Doctoral Degree	0	0%
	8	Professional Degree (MD,JD)	1	1%
Experience	1	0-5	9	7%
	2	5-10	9	7%
	3	10-15	21	15%
	4	15-20	32	23%
	5	20-25	26	19%
	6	25+	41	30%
Industry	1	Agriculture	0	0%
	2	Construction	2	1%
	3	Finance, Insurance, Real Estate	7	5%
	4	Government	0	0%
	5	Health Care	4	3%
	6	Internet	0	0%
	7	Manufacturing	6	4%
	8	Retail, Wholesale	11	8%
	9	Services	3	2%
	10	Transportation	1	1%
	11	Communications, Utilities	2	1%
	12	Nonprofit	1	1%
	13	Computer Hardware	0	0%
	14	Computer software	95	69%
	15	Education	4	3%
	16	Distribution	2	1%

Table 1. Respondent Profile

DATA ANALYSIS AND RESULTS

Measurement Validation

Data and model analysis uses Structural Equation Modeling (SEM) techniques, specifically, Partial Least Squares (PLS). PLS was chosen for this study due to its predictive power with small sample sets, handling of multiple independent variables (IV) despite a possible multicollinearity, and multiple IVs on multiple dependent variables (DV). PLS is also suited well for exploratory and theory building, complex models, and is easier to assess. In addition and unlike first generation tools, PLS assess the outer model

(component measurements) and the inner model (structural causal paths) in a single pass (Vinzi, Chin, Henseler, & Wang, 2010).

Analysis of the model begins with the outer structure or measurement items. Factor loadings are important to ensure the measurement items show convergent and discriminatory results as well as their proper loading onto their respective latent construct. Table 2 presents each measurement item with its mean, standard deviation, and subsequent factor loading. All factors should load above the threshold of .70 (Straub & Boudreau, 2004) and show to load appropriately onto their respective latent variables including AVE (see table 4) which are above the recommended .50 Chin, 1998; Höck & Ringle, 2006 as cited by (Garson, n.d.).

	ATT	IC	PA	PC	PLC	PP	PSE
ATT1	**0.821**	0.122	0.285	0.623	0.501	0.431	0.572
ATT2	**0.879**	0.161	0.394	0.653	0.476	0.525	0.591
ATT3	**0.778**	0.238	0.668	0.636	0.423	0.506	0.480
ATT4	**0.840**	0.227	0.484	0.662	0.449	0.422	0.581
IC1	0.219	**0.979**	0.236	0.263	0.117	0.172	0.161
IC2	0.238	**0.989**	0.250	0.275	0.123	0.204	0.199
IC3	0.208	**0.990**	0.237	0.227	0.084	0.199	0.169
PA1	0.408	0.323	**0.732**	0.364	0.245	0.299	0.296
PA2	0.480	0.193	**0.932**	0.536	0.371	0.515	0.308
PA3	0.542	0.166	**0.925**	0.563	0.390	0.505	0.363
PC1	0.696	0.277	0.437	**0.892**	0.497	0.419	0.555
PC2	0.748	0.180	0.557	**0.944**	0.601	0.453	0.582
PC3	0.733	0.241	0.596	**0.950**	0.607	0.494	0.597
PC4	0.716	0.278	0.535	**0.946**	0.627	0.496	0.575
PLC1	0.546	0.125	0.423	0.677	**0.913**	0.392	0.482
PLC2	0.556	0.076	0.422	0.618	**0.928**	0.397	0.495
PLC3	0.458	0.083	0.294	0.479	**0.908**	0.267	0.415
PLC4	0.461	0.125	0.275	0.489	**0.926**	0.285	0.435
PP1	0.513	0.228	0.499	0.478	0.357	**0.913**	0.382
PP2	0.575	0.125	0.508	0.507	0.306	**0.870**	0.379
PP3	0.416	0.197	0.417	0.368	0.382	**0.869**	0.347
PP4	0.481	0.143	0.396	0.391	0.279	**0.886**	0.358
PSE1	0.598	0.161	0.385	0.613	0.463	0.350	**0.807**
PSE2	0.596	0.169	0.382	0.558	0.516	0.411	**0.849**
PSE3	0.482	0.174	0.188	0.370	0.235	0.305	**0.782**
PSE4	0.448	0.057	0.175	0.396	0.345	0.243	**0.791**

Table 2. Cross Loadings

Discriminate validity tests to ensure the measurement items appropriately construct the latent variable. Confirmation of adequate discriminate validity appears in the square root of AVE (in bold) where the value should load higher than its associated correlational elements (Gefen, Straub, & Boudreau, 2000). All AVE values in table 3 show to load correctly on its construct whereas its correlational items load lower then AVE.

	ATT	IC	PA	PBC	PC	PLC	PP	PSE	PSN
ATT	**0.831**								
IC	0.226	**0.986**							
PA	0.551	0.245	**0.868**						
PBC	-0.260	-0.082	-0.188	**0.876**					
PC	0.775	0.260	0.572	-0.308	**0.933**				
PLC	0.557	0.111	0.394	-0.279	0.627	**0.919**			
PP	0.567	0.195	0.520	-0.103	0.500	0.373	**0.884**		
PSE	0.670	0.179	0.371	-0.161	0.619	0.501	0.416	**0.808**	
PSN	0.616	0.261	0.562	-0.269	0.571	0.548	0.537	0.491	**0.913**

Table 3. Latent Variable Correlations

Confirming the internal reliability and consistency of the constructs involves Cronbach's Alpha and composite reliability. Table 4 shows the values well above the minimum value of .70 (Gefen, Straub, & Boudreau, 2000). All Cronbach's alpha values are well above the minimum threshold, as is composite reliability thus, showing the internal reliability to be sufficient.

	ATT	IC	PA	PC	PLC	PP
ATT	**0.830**					
IC	0.226	**0.986**				
PA	0.552	0.245	**0.868**			
PC	0.775	0.260	0.572	**0.933**		
PLC	0.556	0.111	0.394	0.627	**0.919**	
PP	0.568	0.195	0.520	0.500	0.373	**0.884**
PSE	0.670	0.180	0.371	0.619	0.501	0.416

Table 4. Composite Reliability, and AVE

Structural Model

Assessment of the inner or structural model was estimated using PLS with the bootstrap re-sampling method. The number of cases is 138 (N=138) with 500 re-sampling iterations. The resulting path estimations and R^2 variance explained are presented in figure 2. All hypotheses in the model are satisfied with the single exception of H_7: LC to ATT (see table 5). This may indicate the significance of PSE and PC removes the concern of legal consequences. In other words, the more compliant and ethical employees believe they are, the less of a factor the legal consequences become.

Examining the percent of variance explained on intent to comply was unexpectedly low. Further refinement of this model (e.g. addition of relevant constructs) may help increase the variance explained. An equally surprising discovery exists in variance explained for ATT. Here, the outcome of the PLS analysis shows to explain .708. Examination of the path estimations indicates PSE, and PC are important elements impacting ATT to IC. PP and PLC are non-significant possibly indicating that although awareness exists for the possible legal consequences and sanctions for non-compliance, respondents may feel confident that is they are compliant, there should be no fear of reprisals.

	Hypothesis	Path coefficient	t-value	Result
H1	Awareness -> Software Ethics	0.371	5.119***	Supported
H2	Awareness -> Punishment	0.520	8.051***	Supported
H3	Awareness -> Legal Consequences	0.394	4.962***	Supported
H4	Awareness -> Compliance	0.572	10.352***	Supported
H5	Software Ethics -> Attitude	0.265	3.297***	Supported
H6	Punishment -> Attitude	0.199	3.007**	Supported
H7	Legal Consequences -> Attitude	0.047	0.793 n.s.	Not Supported
H8	Compliance -> Attitude	0.482	6.506***	Supported
H9	Attitude -> Intent	0.226	2.512**	Supported
p < 0.05	**			
p < 0.01	***			

Table 5. Tests of Hypotheses

Validation of the Agents Socially Desirable Responding (ASDR) scale

One necessity of this study is to validate respondent data and ensure measurement items are devoid of desirable response bias, The Agents Social Desirable Responding (ASDR) method is used to detect patterns of bias in respondents. As such, respondents are sometimes prone to answer according to what is socially acceptable rather than the realities of the environment (Noderhof 1985, as cited by Manning, et al 2009). All ASDR measurement items were used in the data analysis and were found to be non-significant. As is suggested by the authors, the effect is non-significant and therefore affirms that the respondents are answering correctly.

DISCUSSION

Model results

This research examined antecedents necessary to influence ones intention to comply with software compliance. The idea was to present the necessary constructs that would adequately define the antecedent variables for an understanding of their influence on ATT. The inclusion of these variables exists from extant research and considered for their use in a compliance model. It was found that the intent to conform to software compliance is formed by ones attitude toward software ethics, perceived legal consequences and punishment, an organizations perception of compliance and perceived subjective norms. The resulting model presents good support for the theoretical model.

From the stated hypothesis, it was determined a positive influence on attitude exists and was significant, therefore supporting the intent to comply. Historical research indicates, as does this research, that a positive increase in ATT leads to greater intention to comply (Peace, Galletta, & Thong, 2003). The perceived behavioral control hypothesis is supported but not significant. Hypotheses 3a and 3d are supported and significant. Co-workers are generally against the illegal use of software and believe tougher sanctions should be imposed for non-compliance. This indicates the higher perceived software ethics the more stable the path between PSE and ATT. This path positively influences ones attitudes on compliance adoption. Hypothesis 3d is supported and more significant that PSE. The two unsupported hypotheses, 3b and 3c are in fact positive. However, the ß value is not significant and therefore, overall, is not supported. Hypotheses 4 through 7 are positive and supported in this research. The general awareness of software compliance on the IV's is significant indicating that one's general awareness of software compliance is important to creating a positive effect on ATT, and therefore supports the intent to comply.

The implications of the results indicate in order to predict the intent to comply, in this model, one must first be aware of software compliance, must understand and exhibit ethics in the use of software licenses, understand the implications of not following compliance, as indicated perceived punishment and legal consequences. One must have an accurate view of their current compliancy situation. Finally, one

must be aware of how their co-workers believe and act toward compliance and non-compliant issues. As presented in the research of Moores et al. (2009), approximately 14 percent ($R^2 = 0.138$) of the variance in software ethics, 27 percent ($R^2 = 0.270$) of the variance for punishment, 16 percent ($R^2 = 0.155$) of the variance for legal consequences, and 33 percent ($R^2 = 0.327$) of the variance for compliance are explained. The path coefficients range from .199 to .572 exceeding the minimum value of .20 (Chin, 1998). This furthers current theory by presenting an initial extended view of possible alternate conditions to software compliance.

In summary, how well do the statistical results apply to the original research questions? First, perceived awareness, belief factors (software ethics, punishment, legal consequences, and perceived compliance) provide the foundation for the interpretation of ATT, ultimately Intent. The measurement results seem to indicate reasonableness of construct adequacy in supporting the high coefficient of determination on ATT (69 per cent). Ones beliefs of software ethics and punishment seem to indicate a level of understanding of both concepts. In other words, software ethics is important and the possibility of sanctions for unethical behavior is not desired. Legal consequences (from a path perspective) shows to be less of an issue when on understands the ethics and sanctions. Likewise, compliancy appears to shows respondents believe themselves to adhere to this requirement. It is believed that a high ATT values shows, if anything, the believe system appears to be in place for intention to comply. Second, it is believed outcome of the believe system explains a large portion of ATT which is an antecedent for intent to comply. Finally, the control factors in compliance appear to resonate with education and experience. Higher levels of experience and education provide the necessary *a priori* support for the understanding of the advantages and disadvantages of software compliance. Although in this study, the effect size on these two control variables is weak, further research in this area could bolster these numbers.

Practical Implications

The result of this study presents some important practical implications to information technology and software practitioners. The findings in this research indicate that the intent to comply is based on motivational factors from perceived software ethics and perceived compliance. A suggestion to raise the level of software ethics is to conduct formal training classes directed at compliance, including its importance to the organization. These training sessions should be ongoing to include all new employees to the organization. Smaller reminders to staff members can be addressed through company screen savers, occasional emails, and small presentations at organizational meetings.

Perceived compliance is an important facet in overall license health. Regular internal reviews should be conducted to ensure compliance. This entails software audits (manual or software) on all systems for all products the organization uses. Some systems, such as Microsoft's System Management Server, or other similar inventory process can achieve the necessary goals of compliance. Additionally, checklists and other procedural solutions can address compliance at the beginning of the process. The process of auditing can impede work which can be costly causing staff members to view this process negatively (Bulgurcu, Cavusoglu, & Benbasat, 2010). Conducting the audits on scheduled maintenance times allows an easier method of obtaining data.

In this research, perceived subjective norm indicates how one views their co-workers. Co-worker attitudes and actions on legal and illegal use of software can influence one's view of the action of the behavior. Management staff and peers alike should present a positive stance on the legal aspects of software use. An increased compliant workforce presents a co-worker a positive view of compliance.

Finally, the intent to comply extends theory by presenting the importance of compliance. A circumvention of license adherence may explain a stratum of software piracy. Organizations are bound to adherence more than consumers where noncompliance can yield large costs, both monetarily and reputability. Therefore, sound auditing controls and compliance policies are necessary.

POST ANALYSIS

The initial theoretical model presented possible interactive effects on the control variables to ATT. The control variables in this case are age, education, experience, gender and industry. Each variable was tested for moderating effects on PSE to ATT, PP to ATT, PLC to ATT, and PC to ATT. Most of the tests failed to unveil any such moderating effect, with the exception of two: Experience on PP and Education to PLC. Based on work on moderators (Baron & Kenny, 1986), a moderator is a qualitative or quantitative that affects, directionally or by strength, the relationship between the independent and dependent variables.

For this study, only one qualitative variable is significant on intent to comply. Presented in figure 3 are the moderation models.

With Experience as the moderating variable, the first test is to run the model without the interactive effect. The resulting condition shows PP is significant (t=3.109, α=0.263) and Experience is non-significant (t=0.420, α=0.022). The R2 for ATT for this iteration was 0.691. Next, the interactive effect is calculated (PP x Experience). The results shows PP (t=3.211, α=0.262) to be significant, Experience is non-significant (t=.870, α=.042) and the interactive effect is significant (t=2.068, α=0.132, p< 0.05). An effect size calculation (Cohen, 1992) measures the strength of the effect of the interaction. A result in the .02 to .15 indicates a weak effect. Values in the .15 to .35 are moderate, and values greater than .35 indicates a strong effect. Based on the effect calculation, strength of the interaction test is weak (.06).

The final test involves Education as the moderating effect. Again, the initial test without the moderator shows PLC to be significant (t=3.168, α=.264), Education to be non-significant (t=0.420, α=-0.019) and the resulting R^2 as 0.691. Next, the interactive effect is tested. PLS shows to be significant (t=2.844, α=0.253), Education is non-significant (t=0.936, α=-0.037), and the interactive effect is significant (t=2.218, α=.106). The resulting R2 shows .702. The effect size is tested and is weak (0.04). The interpretation of this result shows that a one standard deviation change in Education impacts ATT by -0.037 and increases PLC by .106 (0.253 + 0.106 = 0.359).

In summary, moderating effects do exist within the context of this research. Although the effect size is small in both cases, each exists and provides additional explanatory power of the model. Further research is needed to determine any additional moderating or mediating effects are present.

LIMITATIONS AND FUTURE RESEARCH

One limitation of this study exists in data heterogeneity. Most of the data, 69 percent, came from software companies. An improved approach would be to increase the data diversity to present a clearer picture of the results.

Another shortcoming of this research involves the support of the control variables on the model. Moores et al. (2009) suggest in their research a possibility of furthering research on software piracy would be to examine the interactive effect control variables such as age, gender, and education, have on ATT. The initial model indicates control variables to have a moderating effect on attitude. However, none of the hypotheses was met and therefore, was removed from the research. Additional analysis on the interactive effects may provide a stronger yield on the current research model.

Finally, the coefficient of determination for Intent to comply was insignificant. This indicates a need for additional and more refined constructs to unveil the additional factors at work. A positive consequence of this observation is the R^2 for ATT at 69 per cent.

Additional analysis of perceived punishment and perceived legal consequences is needed, in the context of software compliance. Peach et al. (2003) present a similar model with respect to software piracy. In this model, the juxtaposition of the antecedent's punishment severity, software cost and punishment certainty is important. Each is modeled using deterrence theory Tittle (1980) as cited by Peace et al. (2003). Deterrence theory proposes that as the value of punishment severity and punishment certainty rise, the belief of the illegal action diminishes. More importantly, these elements were hypothesized to provide a positive influence on ATT. While there was a positive influence of these two elements, it was non-significant. A more complete analysis can be accomplished by replacing perceived punishment and perceived legal consequences with these constructs.

The motivation behind this research stems from the continued high cost of software piracy. As such, there may be many causes for the continued rise of this behavior. For example, research presents many possible reasons for mitigating compliance. For some, the cost of the software appears to be more than is considered *reasonable* and provides, depending on the environment, a small justification for the aberrant behavior. Additionally, software costs are perceived as a way for software vendors to recoup lost sales due to piracy (Cheng, Sims, & Teegen, 1997). Future research into software compliance using TPB and deterrence theory can possibly determine the how significant compliance fits into the overall picture of software use.

The model developed in this research extends current literature by presenting a possible, alternate explanation for software piracy by specifically addressing compliance. The addition of software ethics and compliance, in this research, provides indicators as to how well organizations adhere to licensing and thus provides a window into a possible contributor to piracy.

CONCLUSION

Generally, organizations exist as "for profit" entities. Software companies are in the business of software development usually for commercial use. A requirement for profitability is to acquire profit margins on product sold, based on quantity. Elements distracting from this logic provide the potential for revenue losses. Maximizing profits and reducing losses demand appropriate regulatory controls. Software license compliance is method to introduce the control into such a system to minimize profit losses due to non-compliant use. This paper provides an initial starting point in uncovering the why's and how's of accidental contributors to compliance issues attributed to accidental non-compliance. With the pervasive nature of software and the complexities of maintaining accurate license counts (unit or per-seat licensing), compliance alignment can be easily transgressed. The intent of this research is to determine a possible set of antecedent events that offers some predictability of intent to compliance.

Further empirical research is needed to expand the papers model and applicable theory(s) to provide a better explanation and to increase the predictive model. This progression of predictability and explanation can assist researchers and practitioners on the assessment of license compliance. I invite future researchers to build on and challenge the findings to the license compliance model. From this research arises several questions such as ethical values and may need support from compliance models in other areas such as security (Bulgurcu, Cavusoglu, & Benbasat, 2010).

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APPENDIX A

Construct	Theory	Value	Type	Items
Attitude	Theory of Planned Behavior	ATT	Reflective	4
Intention to comply	Theory of Planned Behavior	IC	Reflective	3
Awareness	Bulgurcu, Cavusoglu, Benbasat (2010)	PA	Reflective	3
Software Ethics	Developed for this study	PSE	Reflective	4
Punishment	Moores, Nill, and Rothenberger (2009)	PP	Reflective	4
Legal Consequences	Moores, Nill, and Rothenberger (2009)	PLC	Reflective	4
Compliance	Developed for this study	PC	Reflective	4

Table A1. Sources of Measurement Items

Items	Dimensions/Questions	Mean	STD	Loading
IC1	Co-workers intend to comply with the software license requirements in the future.	5.971	1.404	0.979
IC2	Co-workers intend to account for each software license according to the requirements of the software vendors in the future.	5.957	1.434	0.989
IC3	Co-workers intend to carry out responsibilities prescribed in the software license requirements when the software is used in the future.	5.978	1.432	0.990
PA1	Overall, Co-workers are aware of the potential problems with license noncompliance and its negative consequences.	5.283	1.533	0.732
PA2	Employee's have sufficient knowledge about the cost of potential software license noncompliance problems.	4.543	1.666	0.932
PA3	Employees understand the concerns regarding software license compliance and the risks noncompliance poses in general.	4.833	1.512	0.925
ATT	**To co-workers, complying with software license requirements is _____.**			
ATT1	unnecessary…necessary	5.899	1.006	0.823
ATT2	unbeneficial…beneficial	5.891	1.009	0.879
ATT3	unimportant…important	5.304	1.316	0.777
ATT4	unimportant…important	5.587	1.225	0.839
PSE1	Co-workers are against the unauthorized installation of software.	5.630	1.256	0.807
PSE2	Co-workers would support tougher legal penalties for the unauthorized use of software.	4.500	1.553	0.849
PSE3	Co-workers are against the production of counterfeit software.	5.957	1.231	0.782

Table A2. Measurement items and Item loadings

Items	Dimensions/Questions	Mean	STD	Loading
PSE4	Co-workers would support tougher legal penalties for the unauthorized production of software.	5.203	1.548	0.791
PP	**_____ they don't comply with software license requirements.**			
PP1	Co-workers will probably be punished or demoted if	4.399	1.745	0.913
PP2	Co-workers will receive personal reprimand in oral or written assessment reports if	4.942	1.593	0.870
PP3	Co-workers will incur monetary or non-monetary penalties if	3.601	1.815	0.869
PP4	Co-workers facing tangible or intangible sanctions is tied to whether	4.116	1.683	0.886
PC1	Co-workers adhere to the appropriate software license requirements.	5.957	1.052	0.892
PC2	Co-workers ensure the highest levels of license compliance when I use software.	5.529	1.319	0.944
PC3	Co-workers carefully follow software license policies.	5.457	1.357	0.950
PC4	Co-workers consistently comply with software license policies.	5.594	1.277	0.946
PLC1	Co-workers do not use unauthorized copies of software, because they are afraid of the legal consequences.	5.225	1.414	0.913
PLC2	Co-workers would not knowingly install illegal copies of a software product on their home computer because they fear the legal consequences.	5.196	1.523	0.928
PLC3	Co-workers do not purchase counterfeit software because they are afraid of the legal consequences.	5.587	1.333	0.908
PLC4	Co-workers would not knowingly buy unauthorized copies or reproductions of a software product for their home computer, because they fear the potential legal consequences.	5.543	1.399	0.926
ASDR1	None of the managers at my firm feel dissatisfied with their jobs	4.696	1.448	0.763
ASDR2	Different functional areas within my firm, such as marketing, and production, sometimes lack cohesion	3.928	1.498	0.523
ASDR3	At my company , all of the employees are outstanding performers	4.645	1.403	0.825
ASDR4	Sometimes my firm fails to execute good judgment	4.457	1.529	0.699
ASDR5	Managers at my firm are sometimes afraid to voice their disagreement with a higher level manager's ideas	3.942	1.624	0.452
ASDR6	Employees at my company are always trustworthy	5.094	1.398	0.621
ASDR7	At my company, hiring decisions have always been based only on qualifications	4.370	1.566	0.144
ASDR8	My firm has downplayed an event that customers might view as negative	4.659	1.427	0.559

Table A2. Measurement items and Item loadings continued

APPENDIX B

Term	Expanded
ASDR	Agents Socially Desirable Responding
ATT	Attitude
AVE	Average Variance Extracted
BSA	Business Software Alliance
DV	Dependent Variable
EB	Extrinsic Beliefs
IC	Intent to Comply
ISP	Information Security Plan
PA	Perceived Awareness
PBC	Perceived Behavioral Control
PC	Perceived Compliance
PLC	Perceived Legal Consequences
PLS	Partial Least Squares
PP	Perceived Punishment
PSE	Perceived Software Ethics
R	Regression
SKU	Stock Keeping Units
SN	Social Norms
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action

Table B1. Terms

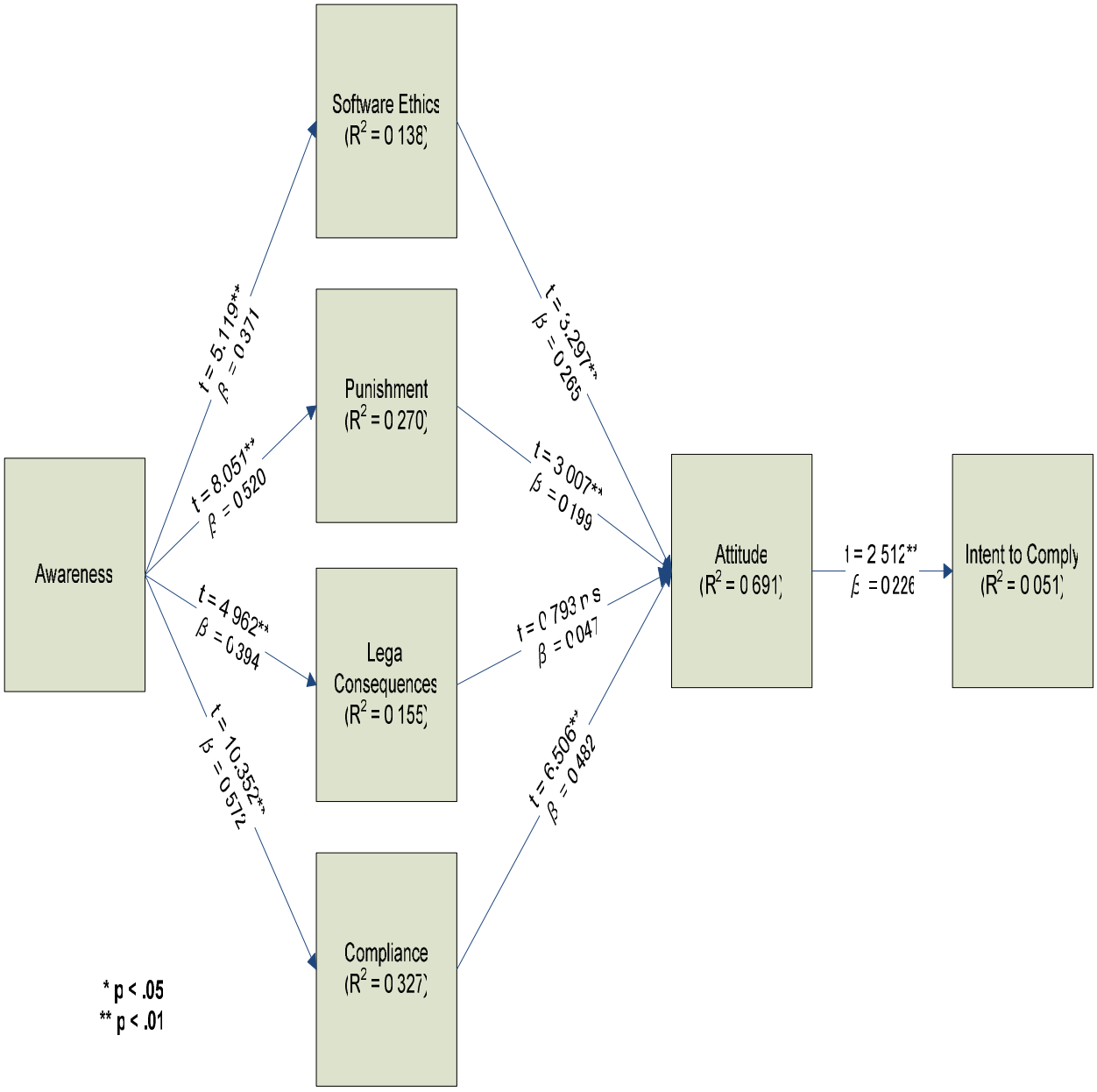

Figure 2 Structural Model Result

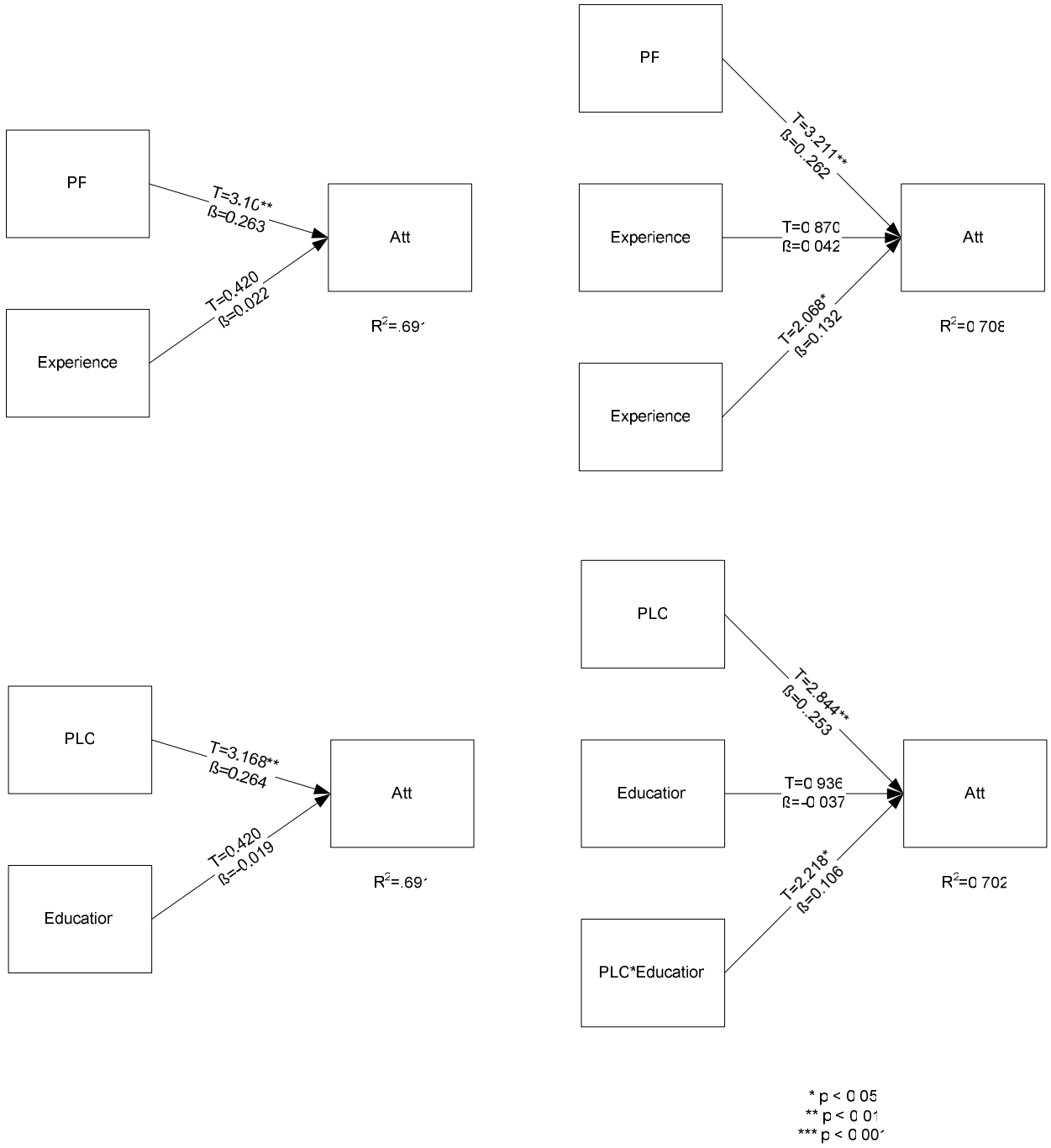

Figure 3 Moderating Model Result