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RESEARCH ARTICLE

Future-proofing the Public Accounting Profession: Developing a Model of Technology Acceptance for Public Accounting Firms

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This study aims to develop a socio-technical model of technology acceptance for public accounting firms in the Philippines. To do this, human construct (teamwork competence [TC] and technology readiness [TR]) and belief construct (ethical perception [EP]) were incorporated in the 1989 technology acceptance model (TAM) of Davis, which was composed of belief construct (perceived usefulness [PU] and perceived ease of use [PEOU]) and intention to use (ITU) construct. Data were collected from 609 external auditors from 11 Philippine-based public accounting firms with international affiliations. These were analyzed using partial least squares – structural equation modeling (PLS-SEM). The final model showed that TC significantly weakens the PU-ITU link and EP significantly impacts ITU. The following are, therefore, recommended: (a) give regard to the TC of external auditors when rolling out new audit technologies; (b) institutionalize policies on ethics in technology; and (c) explore TR as antecedent to PU, PEOU, and EP. Finally, in a sea of TAM modifications, the final model is a rich addition to the list of those in the non-mainstream group. The final model has added a new construct (human construct), introduced a new variable in the belief construct (ethical perception), and made use of both direct and moderating links.

***Keywords**:* ethical perception, public accounting firms, teamwork competence, technology acceptance model, technology readiness

***JEL Classifications*:** L84, M15, M42, O14, O33

The business of public accounting profession worldwide is a US$186 billion industry (Irvine, 2016). A potent contributor to the knowledge economy, this industry is responsible for lending credibility to the financial statements of various clients that range from multinational companies (MNCs) to small and medium-sized enterprises (SMEs) through external audit services being rendered by certified public accountants (CPAs). It is primarily because of this industry that the trust and confidence of the general public in financial statements are being restored and preserved. In the absence of an external audit, information risk or the probability that

the information contained in the financial statements is false and misleading will be at a maximum. Without this industry, the likelihood of bankruptcy and collapse among businesses will be high.

In the Philippines, CPAs may choose to practice their profession in any of the following sectors: (a) commerce and industry, (b) education, (c) government, and (d) public practice or "public accounting." According to the Philippine Institute of Certified Public Accountants (PICPA), the accredited professional organization of accountants in the Philippines, public accounting has 9,694 members in good standing as of 2017. In reference to International Standard on Auditing (ISA) 200, the public accounting profession is primarily responsible for the examination of financial statements "to express an opinion on whether these statements are prepared, in all material respects, in accordance with an applicable financial reporting framework" (International Auditing and Assurance Standards Board, 2009, p. 74). In local parlance, this is known as "auditing."

From the foregoing discussion, it can be said that public accounting firms play an important role in the going concern of businesses and contribute significantly to the revenue generation of a particular country. To clarify, "going concern" is the principle in accounting that assumes that an entity will remain in business operations for the foreseeable future. The mere presence of these public accounting firms already sends a signal of increased trustworthiness among users of financial information. It is for this reason that, in rendering external audit services to clients, CPAs have to observe not only the highest level of independence, integrity, and objectivity but also the most proactive response to the drivers of change that challenge the going concern of the public accounting firms. And notable among them is technology (Fast Future, 2012).

Breakthroughs in technology are expected to create significant ripples of change and reform in the public accounting landscape, which could be either advantageous or disadvantageous (Hood, 2017; Grimes, 2017). As a matter of fact, recognizing technology as a force that will drive the future has become a concern of global priority. Effective January 1, 2016, the United Nations has officially begun the implementation of the 2030 Agenda for Sustainable Development – the transformative plan of action based on 17 Sustainable Development Goals – to address urgent global challenges over the next 15 years. Among these goals is to build resilient infrastructure, promote sustainable industrialization, and foster innovation. Technology plays a vital role for this goal to be achieved because without technology and innovation, industrialization will not happen, and without industrialization, development will not happen (www.un.org). The concern on technology is not only a global concern. In the Philippines, Chapter 14 *(Vigorously Advancing Science, Technology, and Innovation)* of the Philippine Development Plan 2017-2022 (2017) is devoted to technology.

The focus of this study is on technology affecting public accounting firms. The definition of technology coined by Mick and Fournier (1998) and Joerges (1988) is used in the entirety of this study. In a broader sense, technology "encompasses both material and non-material things (e.g., laws; Mick & Fournier, 1998, p. 124). In a narrower sense, it "refers to artificial things, and more particularly modern machines; artificial things that (a) require engineering knowledge for their design and production, and (b) perform larger amounts of operations by themselves" (Joerges, 1988, p. 221).

For public accounting firms to survive and to thrive technology-wise, they must be able to adapt. One of the ways to adapt is to use the technology and innovate how to use the technology. To "use" means to take, hold, or deploy the technology, like audit software, as a means of accomplishing a purpose or achieving a result. To "innovate" means to make changes in something established, like how external audit services are rendered to clients, especially by introducing new methods, ideas, or products. The concept of adapting technology must be taken in the context of care and prudence, being one of the fundamental principles in the Code of Ethics for Professional Accountants. Adapting technology emanates from accepting the technology. Acceptance is done by a person, and this choice is both rational and logical. As such, care and prudence must be exercised in offering technology for acceptance so as not to cause any harm and discomfort to the person making the decision.

As technology affects public accounting firms, it also affects the CPAs that comprise the public accounting firms and the delivery of external audit services to their clients. Technology affecting public accounting firms, therefore, should not be underestimated as the demise of the public accounting firms due to the inability of the CPAs to adapt to technology and to the changes that come with it, which can lead to the

demise of their clients as well. Intuitively, technology adaption requires technology use; technology use requires technology acceptance. As a matter of fact, technology acceptance plays a big role in determining whether technology can replace or complement CPAs in public accounting firms. Because of this, a model of technology acceptance for public accounting firms has to be explored. More specifically, this model has to include the human and ethical components, which are the very nature of how external audit services are rendered. It is for this reason that this study is of value and relevance.

Based on the literature review, a major concern identified with respect to technology acceptance is the absence of attention given to human (or individual differences) construct and to ethical perception under the belief construct in the original and the subsequent models (Parasuraman & Colby, 2015; Legris et al., 2003; Dabholkar & Bagozzi, 2002; Agarwal & Prasad, 1999). All constructs of TAM (Davis, 1989) relate to technology-specific characteristics, and there are none that relate to person-specific characteristics.

The goal of this study, therefore, is to develop and test a model of technology acceptance that incorporates the human construct and ethical perception under the belief construct intended for public accounting firms. Building on the technology acceptance model (TAM) of Davis (1989), this research study explores three main points: (a) how teamwork competence would moderate the influence of the two belief constructs on technology acceptance; (b) how technology readiness (personality traits) would moderate the influence of the two belief constructs on technology acceptance; and (c) how ethical perception would influence technology acceptance. It is also very important to establish that technology acceptance falls under the intention to use the construct of TAM. As such, this research study focuses on intention instead of actual behavior.

Teamwork competence and technology readiness are human constructs, whereas ethical perception is a belief construct. Situating them in the 1989 TAM of Davis means that teamwork competence and technology readiness would be taking the "space" intended for the external variables construct with a moderating effect, whereas ethical perception would be part of the belief construct with a direct effect. The moderation effect is supported by King and He (2006) and Dabholkar and Bagozzi (2002). The direct effect of ethical perception under the belief construct is exploratory in nature, but the link is supported by the theory of reasoned action, TAM, the paradoxes of technology, and Rest's ethical decision model.

Highlighting further the uniqueness of this study, the instrument developed by Aguado et al. (2014) was adapted for teamwork competence, and the instrument developed by Parasuraman and Colby (2015) was adapted for technology readiness. Questions concerning ethical perception came from items in the teamwork competence and technology readiness questionnaires. This research study pioneers the use of these instruments for the human construct and ethical perception under the belief construct.

Considering all these, the resulting model in this research study is referred to as a socio-technical model for the reason that both the socio (human) component and the technical (technology) component are incorporated into one technology acceptance model.

Simply put, this research study answers the main problem: incorporating the human and ethical components into technology acceptance model, what socio-technical path model of technology acceptance for public accounting firms in the Philippines can be developed?

To answer the main problem, it would be helpful to determine the extent to which (a) teamwork competence affects the impact of perceived usefulness on intention to use; (b) teamwork competence affects the impact of perceived ease of use on intention to use; (c) technology readiness affects the impact of perceived usefulness on intention to use; (d) perceived ease of use impacts perceived usefulness; and (e) ethical perception impacts intention to use.

Referring to Figure 1, the first hypothesis deals with the investigation of how teamwork competence (TC) moderates technology acceptance. Though there is an absence of studies relating to teamwork competence and technology acceptance, this hypothesis may jump off from the understanding that most, if not all, of external audit engagements of public accounting firms are in work teams and that external audit engagements necessitate interaction with technology. As such, the need to perform external audit tasks in teams enhances the influence of perceived usefulness (PU) and perceived ease of use (PEOU) on technology use.

H_1a Teamwork competence does not significantly affect the impact of perceived usefulness on intention to use.

H_1b Teamwork competence does not significantly affect the impact of perceived ease of use on intention to use.

The second hypothesis deals with the investigation of how technology readiness (TR) moderates technology acceptance. TR relates to personality traits with respect to technology. It is expected that individuals with higher TR scores are more likely to perceive new technology as useful and easier to use than individuals with lower TR scores and, thus, are more technology-accepting (Parasuraman & Colby, 2015; Kuo, 2011; Massey et al., 2007). As a result, the former has a higher likelihood of technology use.

H_2a Technology readiness does not significantly affect the impact of perceived usefulness on intention to use.

H_2b Technology readiness does not significantly affect the impact of perceived ease of use on intention to use.

The third hypothesis deals with determining the impact of PEOU on PU. Based on the literature review, PEOU significantly impacts PU. This research study validates this in the context of public accounting firms in the Philippines. For this hypothesis and based on the findings of Davis (1986), PEOU is the independent variable and PU is the dependent variable.

H_3 Perceived ease of use does not significantly impact perceived usefulness.

The fourth hypothesis deals with determining the impact of ethical perception (EP) on technology acceptance. Though there is an absence of studies relating to EP and technology acceptance, this hypothesis may spring from the understanding that CPAs, as professionals of independence, integrity, and objectivity, are expected by the public to act ethically at all times, especially in making professional judgments. Accepting a technology or not is one of them. As such, the public expectation that CPAs are to act ethically at all times increases the likelihood that EP influences technology acceptance.

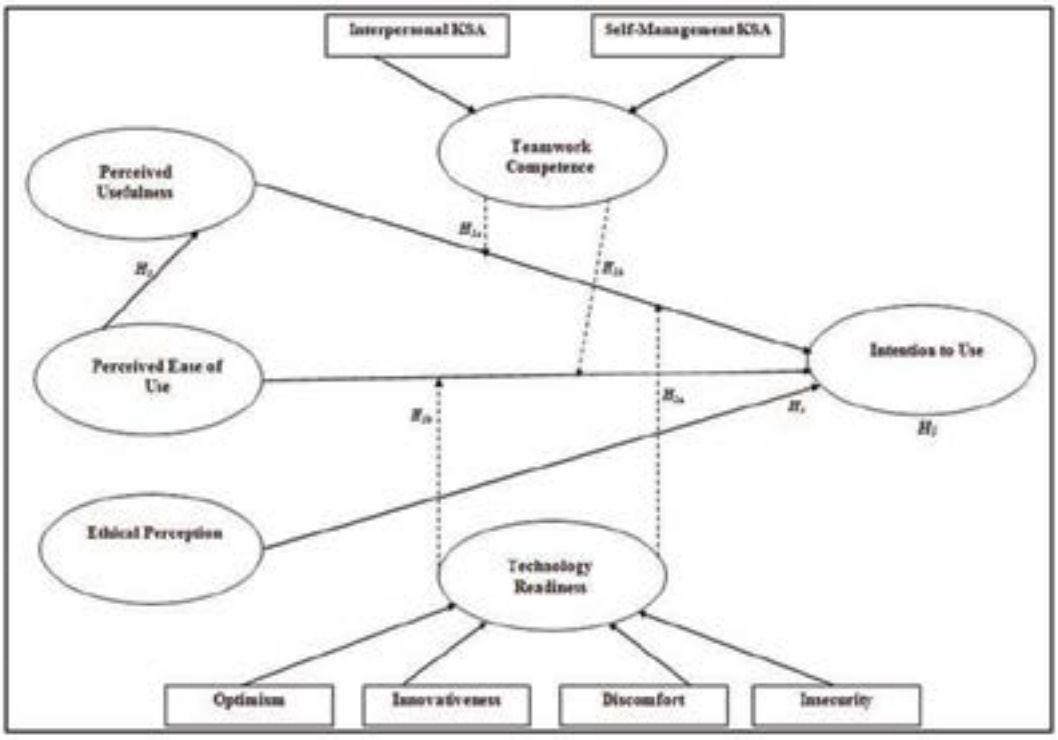

Figure 1
Schematic Representation of the Hypothesized Path Model

H_4 Ethical perception does not significantly impact intention to use.

The fifth hypothesis pertains to the main problem. It is necessary to develop a path analysis model between human construct variables and EP variables under the belief construct and technology acceptance. As the relationship between the independent variables and the dependent variables is multi-dimensional, a path analysis approach is deemed more appropriate because this approach explores the relationship most, especially with the moderating and direct variables. As this research study covers all the possible changes (validation, antecedent/extension, construct modification, and the link) made on earlier mainstream TAMs, the likelihood that the proposed socio-technical model of technology acceptance will get a comparable R^2 is high. R^2 reflects the percentage of the variance in the latent variable that is explained by the latent variables that are hypothesized to affect it (Kock, 2017).

H_5 The proposed socio-technical model of technology acceptance does not yield a comparable R2.

Framework Development and Literature Review

From the steam, water, and mechanical production equipment of the First Industrial Revolution to the more sophisticated and advanced cyber systems of the Fourth Industrial Revolution, it has become apparent that people have to deal with technology every day. As a concept, human-computer interaction (HCI) or human-technology interaction recognizes that technology has many uses and that an open-ended dialog also exists between the user and the technology. HCI aims to improve this interaction in such a way that people adapt to technology with due emphasis on its usability (Dix, et al., 2004). To understand adaption is to understand how people perceive technology. Building on people's perceptions, HCI suggests that people simultaneously have favorable and unfavorable views about technology-based products and services (Parasuraman, 2000). HCI also presupposes a belief system and an attitude that lead to such a view. This belief system and attitude are best captured by the paradoxes of technology (Mick & Fournier, 1998). Building on this point and factoring in that these individuals are logical and rational beings, their views are influenced by the same beliefs and attitudes, which may or may not bring them or others harm. This is now where ethics comes in. Therefore, ethical perception, under the belief construct, is worth considering when framing determinants of technology acceptance.

Advocated by Mick and Fournier (1998), the paradoxes of technology, as a concept, posits that technology is both an enabler and an inhibitor to the user. It identifies eight central paradoxes with which users of technology have to cope. These paradoxes are (a) chaos and control; (b) freedom and enslavement; (c) new and obsolete; (d) competence and incompetence; (e) efficiency and inefficiency; (f) fulfills needs and creates needs; (g) assimilation and isolation; and (h) engaging and disengaging (Mick & Fournier, 1998). As the concept implies, paradoxes of technology recognize that technology can trigger both positive and negative feelings to the user. It can facilitate the feeling of intelligence or ignorance in the same way that it can also result in the feeling of efficacy or ineptitude. Worded differently, technology can both complement and alienate. Seeing its applicability, Parasuraman (2000) and Parasuraman and Colby (2015) used this as the conceptual underpinning of their works on technology readiness. As service marketing and technology researchers, they related this to the pyramid model (Parasuraman, 1996). An extension of the triangle model of Kotler (1994), the pyramid model factors in the added complexities brought by technology to the marketing of goods and services. The resulting pyramid model incorporated technology as a new dimension into the two-dimensional triangle model and highlighted three new links that need to be managed well to maximize marketing effectiveness: (a) company-technology, (b) employee-technology, and (c) customer-technology (Parasuraman, 1996). From this, it is evident that human-technology interaction is explicit in the pyramid model. This research study, therefore, makes use of the link between employee (human) and technology.

Human-technology interaction is at the forefront of socio-technical systems theory. To reiterate, as cited by Trist (1981), socio-technical systems theory is largely human-technology interaction. There is a need to realize that work organizations exist to do work that involves people using technology to carry out a set of tasks related to specified overall purposes. Socio-

technical systems theory fosters arriving at the best match or "goodness of fit" between social and technical relations in work organizations (Trist, 1981). As a matter of fact, work organizations today are viewed as socio-technical systems that consist of a cluster of elements, including technology, regulation, user practices and markets, cultural meaning, infrastructure, maintenance networks, and supply networks (Geels, 2005).

Anchoring on the theories earlier mentioned and having established the links among human-technology interaction, pyramid model, and socio-technical systems theory and putting them together to come up with the pursued socio-technical model of technology acceptance, it is, at this point, apt to stretch this understanding in the context of technology acceptance model of Davis (1989) and explore on opportunities to introduce the human construct and ethical perception under the belief construct in a technology-specific and -laden TAM.

Fundamental to a technology acceptance model is to answer the question: *what causes people to accept or reject technology?* Answering this question helps us understand why people accept or reject technology. As a post-disposition, people who will accept technology are more likely the same people who will use technology as acceptance precedes use (Venkatesh & Davis, 1996). Apparently, TAM does this from the vantage point of technology-specific characteristics. This research study posits that understanding technology acceptance can be improved by introducing a construct and a variable that uses human-specific characteristics as a vantage point. Technology acceptance is a behavior that is affected by learning. Individual differences, such as those driven by knowledge, skills, and ability (KSA), and personality traits, affect learning (Dabholkar & Bagozzi, 2002; Agarwal & Prasad, 1999; Bandura, 1988). Individual differences, therefore, can affect technology acceptance. More specifically, understanding technology acceptance is increased when moderated by KSA and personality traits (King & He, 2006; Dabholkar & Bagozzi, 2002). In a similar manner, technology acceptance as a behavior can also be influenced by ethical perception.

Teamwork competence (TC) is a cognitive and work-related variable that refers to knowledge, skill, and ability (KSA) requirements for teamwork. Drawing on the socio-technical systems theory on work teams, it has its roots in the studies conducted by Stevens and Campion (1999, 1994). TC focuses on KSAs rather than on personality, on a team rather than on technical KSAs, and on the individual in the team. In other words, its emphasis is on KSAs needed to be an effective team member within the team. Spencer and Spencer (1993) defined competencies as the "underlying characteristics integrated with an individual's knowledge, skills, and abilities that are causally related to a referential criterion of effective and/or superior action in a specific job or situation" (p. 103).

Pursuing KSAs in the context of TC, Stevens and Campion (1999, 1994) identified two main dimensions: (a) interpersonal competence and (b) self-management competence. Each main dimension has sub-categories. Interpersonal competence dimension revolves around a person's ability to maintain healthy working relationships and to react to others with conscious respect for ideas, emotions, and differing viewpoints (Varney, 1989). This dimension covers conflict resolution, problem-solving, decision-making, and communication (formal and informal; Aguado et al., 2014). On the other hand, the self-management competence dimension revolves around an individual's ability to direct his or her actions to carry out the tasks, making reference to a job description assigned by the organization (Aguado et al., 2014). This dimension covers planning and coordination, monitoring and assessment, and offering feedback (Aguado et al., 2014).

On the second human construct variable, technology readiness (TR) is a personality-related variable appropriate for technology acceptance. Built on the tenets of human-computer interaction, paradoxes of technology, and pyramid model, TR refers to "people's propensity to embrace and use new technologies for accomplishing goals in home life and at work" (Parasuraman, 2000, p. 308). As a construct, it represents the "overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine a person's predisposition to use new technologies" (Parasuraman, 2000, p. 308). TR, therefore, is an individual-level characteristic that does not change in the short term, nor does it change suddenly in response to a stimulus (Parasuraman & Colby, 2015). It is multi-faceted, comprising four dimensions: (a) optimism – a positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives; (b) innovativeness – a tendency to be a technology pioneer

and thought leader; (c) discomfort – a perceived lack of control over technology and feeling of being overwhelmed by it; and (d) insecurity – distrust of technology, stemming from skepticism about its ability to work properly and concerns about its potential harmful consequences. The first two dimensions make up the technology adoption motivators, whereas the last two comprise the technology adoption inhibitors (Parasuraman & Colby, 2015, p. 60).

Furthermore, TR 2.0 classifies people into five segments based on distinct combinations of technology-related beliefs associated with each (Parasuraman & Colby, 2015, p. 71): (a) skeptics – tend to have a detached view of technology, with less extreme positive and negative beliefs; (b) explorers – tend to have a high degree of motivation and low degree of resistance; (c) avoiders – tend to have a high degree of resistance and low degree of motivation; (d) pioneers – tend to hold both strong positive and negative views about technology; and (e) hesitators – stand out due to their low degree of innovativeness.

Parasuraman (2000) suggested the examination of more detailed models (focusing on antecedents and consequences of the construct), whereas Parasuraman and Colby (2015) recommended the use of TRI 2.0 to assess TR levels of professionals. They also encouraged the investigation of the causes and correlates of TR. For them, the interaction between TR, an inherent individual-level trait, and the characteristics of technology-based offerings and TAM are also worth exploring because TRI 2.0 is a robust predictor of technology-related behavioral intentions as well as actual behaviors.

Finally, the third variable being explored is ethical perception (EP) under the belief construct of TAM. Though the link is exploratory in nature, placing the EP variable under the belief construct is supported by TRA and TAM with respect to the thought processing involved in arriving at an ethical decision or behavior and, in this case, technology acceptance. Substantiated further by the paradoxes of technology, deciding to accept technology or not can have an ethical implication. As espoused by Rest's (1994) ethical decision model, making an ethical decision entails a process that begins with sensitivity to the presence of an ethical dilemma. And a person has to go through each component of the process. In the "process" of going through the process, the person has to exercise logic and reason to evaluate the available courses of action. Here, ethical perception plays a huge part. As the person goes through the process, their beliefs contribute to the formation of an attitude, which may result in a decision that can be manifested through a behavior or an action. For the purposes of this study, EP is to be construed as the perception of a person on specific characteristics arising from TC and TR, which can ethically affect his or her acceptance of technology.

Related Studies

Kuo (2011) investigated the effect of bank customer's personal factors on their TR, customer relationship management (CRM) of the financial services and relationship quality (RQ) with the bank, and the relationships among TR, CRM, and RQ. Data were collected from 713 customers from 12 local banks in Taiwan. Results showed that personal factors significantly influence TR and CRM, that TR has a significant impact on CRM and RQ, and that CRM has significant influences on RQ. Similarly, Massey et al. (2007) related TR with usability. Data were collected from 160 students in the United States. Their results indicated that TR customer segments vary in usability requirements, and usability evaluations of specific online service interfaces are influenced by complex interactions among site type, access method, and TR segment membership.

Moreover, Gupta and Garg (2015) applied TR among e-banking users in India. In South Africa, Berndt et al. (2010) applied TR in assessing the banking industry. In Brazil, De Souza and Luce (2003) assessed the applicability of TR in the context of consumer adoption of technology-based products and services. In the Philippines, an unpublished undergraduate thesis by Illescas et al. (2009) assessed the TR of accounting educators. Aside from the fact that TR is practical in application, the growing literature on technology readiness makes it a relevant, value-adding, and worth-pursuing research topic.

One of the objectives of this research study is to relate TR to TAM. As such, it is helpful to identify and review several studies conducted relating TR to technology acceptance. Guhr et al. (2013) examined how TR influences customers' perception and acceptance (TR as antecedent to PU and PEOU) of mobile payment. Data were collected from 270 respondents in Finland, Germany, the United States, and Japan. Their results confirmed that TR influences the belief constructs of TAM. Walczuch et al. (2007)

made use of TR as antecedent to PU and PEOU. Data were collected from 810 employees of a multi-site financial service provider in Belgium. Their results showed that personality traits have the expected impact on user perceptions and that innovativeness is negatively related to PU. Lin et al. (2007) integrated TR into TAM as an antecedent to PU and PEOU. Data were collected from 406 participants from online investment discussion forums in Taiwan. Their results revealed that integrating TR into TAM substantially broadens the applicability and the explanatory power of TAM. Moreover, Erdoğmuş and Esen (2011) investigated the effects of TR (as antecedent) on TAM in e-HRM field. Data were collected from 65 human resources (HR) managers representing the top 500 largest private sector companies in Turkey. Their results showed that optimism and innovativeness dimensions positively influence PU and PEOU, but discomfort and insecurity dimensions have no positive effect on them. Kuo et al. (2013) investigated the effect of TR on the acceptance of mobile electronic medical record systems. Data were collected from 665 nurses from a large hospital in Taiwan. Their results revealed that TR has a significant effect on PEOU and that only optimism has a significant effect on PU. They also confirmed the relationships among the original constructs of TAM. On the other hand, Yi et al. (2003) incorporated TR in TAM as a moderating variable of hypothesized relationships within TAM. Data were collected from 201 undergraduate students in Singapore. Their results showed that innovativeness and optimism interact with PU to determine ITU. PU does not significantly influence ITU for people who are either optimistic or innovative. Furthermore, Hallikainen and Laukkanen (2016) made use of TR as an antecedent to PU and PEOU. Data were collected from 385 business-to-business customers of a healthcare service company in Finland. Their results revealed that TR explains the acceptance of digital services but to a lesser extent than expected.

In summary, the wealth of literature relating TR to technology acceptance reveals that (a) TR is either used as an antecedent or a moderating variable, with the former being significantly more frequently used than the latter; (b) none of the studies used TRI 2.0; (c) none of the studies had public accounting firms as their organizational context; and (d) none of the published studies had Philippines as their geographical context.

Research Method

This is a quantitative research (as to approach) with a descriptive and causal design that is geared toward the development of a path analytic model as an output using human construct and the constructs of TAM (Davis, 1989). It also has an exploratory design with respect to the moderating effects of the human construct and the direct effect of ethical perception under the belief construct.

The actual data collection period was from April 19, 2017 to June 16, 2017, to external auditors in 11 public accounting firms with head offices located in the National Capital Region. These public accounting firms represent more than the majority of the public accounting firms in the Philippines. Data collection was done through a survey. Both hard copy and electronic means of data collection were utilized. The use of an electronic means was upon the request of one public accounting firm. A total of 648 accomplished survey forms were received, 39 of which were defective due to skipped items and items with more than one answer. This resulted in 609 usable responses, 241 responses more than the targeted number. All, except two, of the public accounting firms were able to return at least the targeted number of responses. The other two public accounting firms lacked a total of 50 responses. This was compensated by a total excess of 291 responses from the nine public accounting firms that returned more than the targeted number of responses.

This study made use of nine model fit and quality indices provided by WarpPLS version 6.0. These are average path coefficient (APC), average R-squared (ARS), average adjusted R-squared (AARS), average block variance inflation factor (AVIF), average full collinearity VIF (AFVIF), Tenenhaus GoF (GoF), Simpson's paradox ratio (SPR), R-squared contribution ratio (RSCR), and statistical suppression ratio (SSR). For the APC, ARS, and AARS, p-values were calculated through a process that involves resampling estimations coupled with corrections to counter the standard error compression effect associated with adding random variables. According to Kock (2017), such is needed because the model fit and quality indices are calculated as averages of other parameters. As the p-values obtained for APC, ARS, and AARS are all lower than 0.05, the structural model is of good fit and quality indices. Moreover, the effect on the model fit and quality associated with adding new latent variables

are taken care of by AVIF and AFVIF indices. Because both indices are lower than 3.3, the structural model is of good fit and quality indices. The Tenenhaus GoF measures a model's explanatory power and is computed using the square root of the product between the average communality index and ARS. As the value computed (0.44) is larger than 0.36 (large effect), the explanatory power of the structural model is high. The SPR index measures the extent to which a model is free from Simpson's paradox instances, which is a possible indication of a causality problem, suggesting that a hypothesized path is either implausible or reversed (Kock, 2017). Because the SPR obtained is the ideal 1, the structural model is free from causality problems. The RSCR measures the extent to which a model is free from negative R-squared contributions, which occur together with Simpson's paradox instances and result in variance reduction (Kock, 2107). As the RSCR computed is ideal at 1, the structural model is free from negative R-squared contributions. Lastly, SSR measures the extent to which a model is free from statistical suppression instances, which occur when a path coefficient is greater, in absolute terms, than the corresponding correlation associated with a pair of linked variables (Kock, 2017). As the SSR arrived at is higher than 0.7, the structural model is free from statistical suppression instances. Therefore, based on the foregoing discussion, the goodness of fit and quality indices of the structural model, taken as a whole, are acceptable. This is an indication that the theories considered in this research study fit the data. After establishing the acceptability of goodness of fit and quality indices of the structural model, path coefficients presented in Table 1 were analyzed.

Discussion of Results

With TC and TR moderating, the PU-ITU link returns a positive and significant path coefficient of 0.71. The sign and significance are consistent with the findings of most studies reviewed. The magnitude of the impact of PU on ITU in those studies ranges from 0.20 to 0.78. The effect size (f^2) of 0.56 indicates that the variability caused by PU on ITU is large. F^2 captures the change in R^2 when an exogenous construct is omitted from the structural model (Hair et al., 2014).

Moreover, with TC and TR moderating, the PEOU-ITU link returns a positive and insignificant path coefficient of 0.06. The sign is consistent with the findings of all studies reviewed. Though the literature is mixed with respect to significance, the insignificant impact obtained is consistent with the results of Guhr et al. (2013) and Erdoğmuş and Esen (2011). The magnitude of the impact of PEOU on ITU in those studies ranges from 0.05 to 0.38. The effect size (f^2) of 0.04 indicates that the variability caused by PEOU on ITU is between small and medium. TC negatively and significantly affects the impact of perceived usefulness on intention to use. Hypothesis 1a is, therefore, rejected (ß = -0.09; p-value = 0.01).

The negative sign indicates that TC moderation decreases the magnitude of the impact of PU on ITU. The effect size of 0.02 indicates a small moderation effect on the variability caused by PU on ITU. F^2

Table 1. *Operational Model: Path Coefficients from the PLS-SEM Running on WarpPLS Version 6*

Hypothesis	Path Coefficient	SE	p-value	Effect size (f^2)*
H1a: TC on PU-ITU	-0.09	0.04	0.01	0.02
H1b: TC on PEOU-ITU	-0.02	0.04	0.32	0.01
H2a: TR on PU-ITU	-0.03	0.04	0.24	0.01
H2b: TR on PEOU-ITU	0.04	0.04	0.15	0.01
H3: PEOU on PU	0.63	0.04	<0.01	0.40
H4: EP on ITU	0.10	0.04	<0.01	0.05
PU on ITU	0.71	0.04	<0.01	0.56
PEOU on ITU	0.06	0.04	0.06	0.04

**Effect size: 0.02=small; 0.15=medium; and 0.35=large (Hair et al., 2014)*

captures the change in R^2 when an exogenous construct is omitted from the structural model (Hair et al., 2014). On the other hand, TC negatively and insignificantly affects the impact of perceived ease of use on intention to use. This, therefore, fails to reject hypothesis 1b (ß = -0.02; p-value = 0.32). The negative sign indicates that TC moderation decreases the magnitude of the impact of PEOU on ITU. The effect size of 0.01 indicates a less than small moderation effect on the variability caused by PEOU on ITU.

Furthermore, TR negatively and insignificantly affects the impact of perceived usefulness on intention to use. This, therefore, fails to reject hypothesis 2a (ß = -0.03; p-value = 0.24). The negative sign indicates that TR moderation decreases the magnitude of the impact of PU on ITU. With respect to the discomfort and insecurity dimensions of TR, this result is consistent with the findings of Yi et al. (2003). The effect size of 0.01 indicates a less than small moderation effect on the variability caused by PU on ITU. On the other hand, TR positively and insignificantly affects the impact of perceived ease of use on intention to use. This, therefore, fails to reject hypothesis 2b (ß = 0.04; p-value = 0.15). The positive sign indicates that TR moderation increases the magnitude of the impact of PEOU on ITU. The effect size of 0.01 indicates a less than small moderation effect on the variability caused by PEOU on ITU.

Perceived ease of use positively and significantly impacts PU. Hypothesis 3 is, therefore, rejected (ß = 0.63; p-value = <0.01). External auditors regard PEOU as important in determining whether or not a new technology is useful. The positive sign indicates that the more an external auditor finds that a new technology is easy to use, the more that they will find it useful, increasing their acceptance of new technology. Conversely, the less likely an external auditor finds that a new technology is easy to use, the less likely that they will find it useful, resulting in a decrease in their acceptance of new technology. The sign and significance are consistent with the findings of all studies reviewed. The magnitude of the impact of PEOU on PU in those studies ranges from 0.23 to 0.83. The effect size of 0.40 indicates that the variability caused by PEOU on PU is large.

Furthermore, ethical perception positively and significantly impacts the intention to use. Hypothesis 4 is, therefore, rejected (ß = 0.10; p-value = <0.01). External auditors regard EP as important in their acceptance of new technology. The positive sign indicates that technology acceptance increases as an external auditor resolves ethical issues related to teamwork and technology. The effect size of 0.05 indicates that the variability caused by EP on ITU is between small and medium.

Finally, the structural model resulted in a coefficient of determination (R^2) of 0.69. R2 measures the predictive accuracy of the model (Hair et al., 2014). The mainstream TAM studies were able to generate R^2 ranging from 0.34 to 0.69. The most recent TAM – the unified model of Venkatesh et al. (2003) – yielded an R^2 of 0.69. As such, the R^2 of this research study's structural model is comparable to the R^2s of mainstream TAM studies. **Hypothesis 5 is, therefore, rejected.**

To refine the proposed model, path links that returned insignificant path coefficients are dropped. These path links are TC on PEOU-ITU link, TR on PU-ITU link, and TR on PEOU-ITU link.

Determining the Final Model

Focusing on those path links that returned significant path coefficients, very glaring is the negative sign in the path coefficient of TC as a moderating variable in the PU-ITU link. To verify and investigate on this, three additional procedures were performed. Using the same set of data, the first procedure was to compare and contrast the operational model with the 1989 TAM of Davis. The second procedure was to compare and contrast the 1989 TAM of Davis with the model that retains only those path links which yielded significant path coefficients. The third procedure was to compare and contrast the operational model with the model that retains only those path links which yielded significant path coefficients. The aforementioned three models are referred to as Model 1 (operational model), Model 2 (1989 TAM of Davis), and Model 3 (the model that retains only those path links which yielded significant path coefficients).

The final model was arrived at using the following criteria: (1) goodness of fit and quality indices; (2) significance of the path coefficients; (3) parsimony of the model; and (4) coefficient of determination (R^2). In terms of goodness of fit and quality indices, all the three models fit in the criterion. In terms of significance of the path coefficients, three path coefficients (TC on PEOU-ITU link, TR on PU-ITU link, and TR on PEOU-ITU link) in Model 1 did not fit in this criterion. In terms of parsimony, Model 2 is the most parsimonious but it

Table 2. *Final Model: Path Coefficients from the PLS-SEM Running on WarpPLS Version 6*

Hypothesis	Path Coefficient	SE	p-value	Effect size (f^2)*
H1a: TC on PU-ITU	-0.11	0.04	**<0.01**	0.03
H1b: TC on PEOU-ITU**	n/a	n/a	n/a	n/a
H2a: TR on PU-ITU**	n/a	n/a	n/a	n/a
H2b: TR on PEOU-ITU**	n/a	n/a	n/a	n/a
H3: PEOU on PU	0.63	0.04	**<0.01**	0.40
H4: EP on ITU	0.11	0.04	**<0.01**	0.05
PU on ITU	0.69	0.04	**<0.01**	0.55
PEOU on ITU	0.07	0.04	**0.04**	0.04

**Effect size: 0.02=small; 0.15=medium; and 0.35=large (Hair et al., 2014); **added for emphasis*

fails to capture human construct and ethical perception in the model. In terms of coefficient of determination (R^2), all the models achieved values (0.69, 0.65, and 0.67, respectively) comparable to the range of R^2 values (0.34 to 0.69) obtained from the literature. As such, Model 3 surfaces to be the best model. Model 3, therefore, is the final socio-technical model of technology acceptance for public accounting firms in the Philippines. This is presented in Table 2.

This study was able to establish that teamwork competence negatively and significantly moderates the impact of PU on ITU resulting in the rejection of hypothesis 1a. This means that teamwork competence will weaken how perceived usefulness contributes to technology acceptance. Though there is paucity in the literature with respect to moderating effects of TC on PU-ITU links, other TAM links were moderated using demographic variables (Hallikainen & Laukkanen, 2016; Venkatesh et al., 2003), consumer traits and situational factors (Dabholkar & Bagozzi, 2002), and experience and voluntariness (Venkatesh & Davis, 2000; Venkatesh et al., 2003). With individual differences characterizing the variables of interest, these studies yielded mixed results.

The context of this study is public accounting firms where teamwork is essential. Results bring to light a concern that though external auditors see the usefulness of technology as important in deciding whether or not to accept new technology, the knowledge, skills, and ability that comprise their teamwork competence may get along the way. It goes like this: they will always give a premium to usefulness when accepting a new technology. But the moment they realize that teamwork is jeopardized, the premium will diminish. Mick and Fournier's (1988) paradoxes of technology can explain this. There will always be two sides to every technological product: the side that builds and the side that destroys. In this case, technology usefulness is on one side and teamwork compromise is on the other side. When not managed properly, external auditors may view technology acceptance as a replacement rather than a complement. Factoring in human-technology interaction and socio-technical systems theory, there will always be that sweet spot where benefits are maximized and constraints are taken care of. This is an important input for the leaders in public accounting firms.

Despite the negative moderation, the PU-ITU link remains strong (0.69) by itself and stronger when pitted against the other established belief construct of the TAM, the PEOU-ITU link. Unlike the paucity of TC on PU-ITU literature, there have been numerous studies conducted on PU-ITU link to the extent that two groups can be formed when summarizing them: the mainstream or the Davis group and the non-mainstream group. The magnitude of the impact of PU on ITU in these studies ranges from 0.20 to 0.78. In the count of Legris et al. (2003), 16 studies yielded positive PU-ITU relationships, with only three turning out to be insignificant. The PU-ITU results indicate that the usefulness of the new technology is an important determinant of a person's acceptance of technology. Once an external auditor is convinced that a new technology will enhance their audit performance, the likelihood of acceptance is high. This insight will be helpful every time new audit technologies are introduced.

The PEOU-ITU link in the final model returns a positive and significant path coefficient of 0.07, with the sign consistent with the findings of all studies reviewed. The magnitude of the impact of PEOU on ITU in those studies ranges from 0.05 to 0.38. In the tally of Legris et al. (2003), 10 studies yielded positive PEOU-ITU relationships, with seven turning out to be significant. Though it is a weaker link when pitted with the PU-ITU link, its contribution to ITU is still significant. Most TAM scholars believe that PEOU significantly affects PU in the latter's influence on ITU. This means that a person who finds a new technology easy to use will most likely find it also useful. For external auditors, new audit tools are considered useful. This is one of the reasons why public accounting firms invest heavily in training how to use new audit technologies before deploying them. Training will enable them to find the new technology easy to use.

On the PEOU-PU point, the final model yields a positive and significant path coefficient of 0.63, with the sign and significance consistent with the findings of all studies reviewed. The magnitude of the impact of PEOU on PU in those studies ranges from 0.23 to 0.83. In the books of Legris et al. (2003), 21 studies resulted in positive PEOU-PU relationships, with 16 of them turning out to be significant. Relating this to the earlier paragraph, when external auditors find new technologies easy to use, they will most likely find them useful, which results in their technology acceptance. In technology acceptance, perceived usefulness is the deal breaker. It is for this reason why other researchers are also interested in the PU-ITU link. Likewise, the public accounting firm must also give importance to whether or not the new audit technology will increase audit performance when rolling out new technologies.

Peculiar in this study is the EP-ITU link. This study pioneers the integration of ethical perception in determining one's acceptance of new technology. Based on the final model, the EP-ITU link posts a positive and significant path coefficient of 0.11. Its effect size (f^2) is 0.05, which means that the variability caused by EP on ITU is between small and medium. Similar to TC-PU-ITU literature, there is also a dearth of EP-ITU literature. Nevertheless, with respect to relating ethics and technology use, there were studies on the ethical use of technologies in journalistic work (news gathering and reporting; Ramaprasad et al., 2012) and on ethical challenges with welfare technology (Hofmann, 2013). Ethical perception items in the questionnaire relate to privacy, conflict of interest, technology control, distraction, and freedom from mobility, which are directly associated with the issues and challenges highlighted by Ramaprasad et al. (2012) and Hofmann (2013). In the public accounting sector where ethics is of primordial importance, ethical perception is expected to have a significant impact on technology acceptance. In fact, external auditors always include ethical implications when making decisions. Because technology acceptance is a decision, it has to go through a process that will consider ethics. Applying Rest's ethical decision-making model, external auditors are sensitive to acknowledging ethical issues and they are more likely to weigh their options in arriving at an ethical decision. Going back to technology acceptance, they are more likely to factor in privacy, confidentiality, prudence, alienation, and conflicting goals in their decisions. Furthermore, ethical perception significantly affecting technology acceptance is a good check and balance when conflicts between teamwork competence and perceived usefulness arise. The extent to which concern for teamwork weakens the usefulness of technology can be compensated by the ethical perception in the final model.

The decision to drop TR in the final model is supported by the mixed results, mostly insignificant on the inhibitors, in the literature on the moderating effect of TR on belief construct-intention to use link (Kuo et al., 2013; Guhr et al., 2013; Walczuch et al., 2007; Lin et al., 2007; Erdoğmuş & Esen, 2011; Yi et al., 2003; Hallikainen & Laukkanen, 2016). Besides, they made use of TR dimensions rather than TRI. In addition, similar to TR, the belief constructs of TAM are already technology-specific (Davis, 1986).

Conclusions and Recommendations

The results provide statistical evidence that TC significantly affects the PU-ITU link. This is one of the theoretical contributions of this research study. However, not enough statistical evidence was able to support that teamwork competence significantly affects the PEOU-ITU link. Similarly, there was not enough statistical evidence to support that TR significantly affects both the PU-ITU link and the PEOU-ITU link. On a positive note, the results provide statistical evidence that ethical perception significantly impacts ITU. This is also one of the theoretical contributions

of this research study. Moreover, results also provide statistical evidence that PEOU significantly impacts PU. This empirically supports and reinforces the prevailing results on the PEOU-ITU link in the literature. To conclude, the results of this research study yielded four notable insights.

Firstly, teamwork competence weakens the PU-ITU link. Teamwork is essential in public accounting firms. Though external auditors see the usefulness of technology as important in deciding whether or not to accept new technology, the knowledge, skills, and ability that comprise their TC may get along the way. It is, therefore, recommended that leaders in public accounting firms give regard to the TC of their external auditors when rolling out new audit technologies. They have to understand that the use of technology decreases human interaction, which can diminish teamwork. In addition, as teamwork is important in public accounting firms, firm leaders have to use the moderation caused by teamwork competence on the PU-ITU link to monitor if technology use goes overboard and the needed teamwork is compromised. On a different note, teamwork competence scores can also be used as valuable input when human resources (HR) personnel design training modules for external auditors. It is also recommended that public accounting firms make use of the technology belief segmentation when implementing new technologies. The segmentation can be more useful when corroborated with technology readiness scores.

Secondly, ethical perception matters in technology acceptance. Ethics is of primordial importance to external auditors when making decisions. They observe the Code of Ethics for Professional Accountants at all times. Accepting new technology is a personal decision where they apply ethics. It is, therefore, recommended that public accounting firms craft and disseminate policies specific to ethics in technology. As much as possible, trainings with simulations should be done to ensure depth in understanding and appreciation.

Thirdly, focus on the PU-ITU link. This has always been the strongest link. Public accounting firms have to understand the criticality of this link. Conscious effort must be exerted to ensure that the usefulness of the new technology is cascaded thoroughly from top to bottom and that employees from bottom to top understand it. The top management has to be cautious of the reduction effect in the PU-ITU link due to TC moderation. Technology and teamwork can be used as a check and balance to ensure that technology use is kept at a level that will not compromise teamwork. Also, in designing training modules, TC scores can also be used as valuable input, especially on leadership and human behavior in organizations.

And lastly, in a sea of TAM modifications, the final model is a rich addition to the list of those in the non-mainstream group. The final model has added a new construct (human construct), introduced a new variable in the belief construct (ethical perception), and made use of both direct and moderating links. Though results showed that all path links related to technology readiness were insignificant, the researchers still believe that TR has a place in the technology acceptance model, as theories and studies support this. It is, therefore, recommended that future researchers validate this and still use technology readiness as either a moderating variable or antecedent to belief construct variables but separate TR into (a) motivators and inhibitors groups or (b) optimism, innovativeness, discomfort, and insecurity dimensions. This will manage the varying effects of the two groups or the two dimensions. In connection with the insignificant findings on TR, the researchers are also reflecting on whether or not it can be attributed to the new version of TR, as the earlier studies on TR-TAM made use of TR version 1.0. It is also recommended that future studies conduct comparative studies on this.

Theoretical Implications

In reference to theories and literature on technology affecting productivity, it is recommended that future researchers explore audit quality to capture productivity and technology acceptance to capture technology. Thereafter, the relationship between the two can be determined. Human construct can still be included in the proposed model to validate whether or not it negatively moderates the relationship between technology acceptance and audit quality. Finally, future researchers can also explore scientific construct as a modification in the existing technology acceptance models. Unlike in the human construct, variables under this construct should be more technology-specific.

Practical Implications

One of the key insights from the results of this research study is that teamwork competence weakens acceptance of new technology. This is supported by the very fact that external audit is a team activity. As

such, teamwork competence matters when making a decision to accept a new technology or not. Leaders in public accounting firms have to have this frame of mind: technology increases audit productivity. Teamwork competence increases audit productivity. But, in the presence of teamwork competence, the usual increase in technology contributes to a decrease in audit productivity. This is supported by this frame of mind: technology increases audit productivity. The use of technology is affected by acceptance. Acceptance is affected by perceived usefulness, but in the presence of teamwork competence, the effect of perceived usefulness on acceptance decreases. It is, therefore, recommended that leaders in public accounting firms give regard to the teamwork competence of their external audit CPAs when rolling out new audit technologies. They have to understand that the use of technology decreases human interaction, which can diminish teamwork. Results of this research study established that statistical evidence supports the claim that older external audit CPAs have higher TC scores. Therefore, it can be expected that acceptance of new technologies will be lower among older external audit CPAs than the younger external audit CPAs. In addition, as teamwork is important in public accounting firms, firm leaders have to use the moderation caused by teamwork competence on the PU-ITU link to monitor if technology use goes overboard and the needed teamwork is compromised.

On a different note, teamwork competence scores can also be used as valuable input when human resources (HR) personnel design training modules for external audit CPAs. It is also recommended that public accounting firms make use of the technology belief segmentation when implementing new technologies. The segmentation can be more useful when corroborated with technology readiness scores. Results of technology readiness can also be used as valuable input in coming up with business and IT strategies so that they will be more appropriate and realistic. As per alignment, the usual business-IT alignment can be extended to include humans. The resulting human-business-IT alignment can make use of TR scores as one of the ways to calculate human-technology interaction competencies. With respect to ethical perception, as this affects acceptance of new technologies, it is recommended that public accounting firms craft policies specific to ethics in technology. These should be disseminated to all external audit CPAs. As much as possible, trainings with simulations should be done to ensure depth in understanding and appreciation.

Moreover, external audit CPAs face the threat of technology replacement. To manage this, it is recommended that they willingly subject themselves to a firm-wide survey to assess their TC and TR scores. This is usually done by the HR groups. They can also monitor their own TC and TR scores to strike a balance between the two. During self-assessment, they have to be aware of those control variables that significantly affect TC and TR: (a) that the higher their rank, the higher their relative teamwork competence score should be, and (b) that as they age, their technology readiness scores have to relatively increase also. Moreover, they are also expected to attend seminars and trainings related to IT and teamwork to increase their knowledge and understanding and to comply with the accreditation requirements of the regulators.

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