

Modeling Intention to Use Deep Packet Inspection Technology in the United Arab  
Emirates

Dissertation

Submitted to Northcentral University

Graduate Faculty of the School of Business and Technology Management  
in Partial Fulfillment of the  
Requirements for the Degree of

DOCTOR OF PHILOSOPHY

by

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Prescott Valley, Arizona  
December 2011

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APPROVAL PAGE

Modeling Intention to Use Deep Packet Inspection Technology in the United Arab

Emirates

by

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## Acknowledgments

First, I would like to acknowledge the sacrifices made by family. Nush, my wife, who has stood by me throughout, and my children, Arthur and Maggie, who all deserved to have more time spent with them. I would also like to thank my Mother Eleanor, Father, Alfred, and sisters, Sharon and Kathy, who helped early on in my PhD journey when my life had many disruptions. I would also like to thank Nush's parents Sombat and Sompieng, sister Na' Nui, and their family and friends for providing safe haven while in Thailand.

I would like to thank the Higher Colleges of Technology, organization and members, for being supportive of my research. First to Vice Chancellor, Dr. Tayab Kamali for authorizing the trip to ACSBP Region 8 in Vienna and to present for publication the research method used in this deep packet inspection study. Further accolades go to Provost, Dr. Marshall Drummond and Vice Provost of Planning and Administration, Dr. Senthil Nathan who initially guided me, on my grant from the Wharton School. Then Director Mr. Mark Johnson, and subsequently the present Director Dr. Dave Pelham, of Fujairah Colleges, was supportive throughout the research process approving many opportunities for professional development.

I would like to thank Dr. Simon Jones, Director of Abu Dhabi Men's College, and the research directorate administering my Wharton grants, for giving me the final go-ahead to continue data collection which been halted, due to objection raised within the HCT organization. Furthermore, I would like to thank HCT Central Services personnel Peter Scanlan of Academic Advancement and Accreditation, and Dr. Matt Robby, Supervisor of Quality Improvement for meeting with me about the study and outlining

the critical issues in such a way as to allow a pathway for the study to continue. Dr. Erik Forsberg deserves credit for administration of my 2010 award with the Wharton Entrepreneurship Center and CERT, and the 2011 Wharton School research award with the William and Phyllis Mack Center for Technological Innovation, and my supplemental grant to attend the Wharton Global Faculty Development Program.

From the Wharton Business School, I would like to thank Professor Raffi Amit, along with Professors Ian MacMillan and Harbir Singh of the Wharton School. I would also like to thank my other professors at the Wharton school Adam M. Grant, Nicolaj Siggelkow, Martine Haas, Martin Ihrig, and Wharton staff and directors, Sylvie Beauvais, Roz Cohen, and Kayleen Palumbo. I would also like to thank my cohort, from the Wharton Global Faculty Development Program, for both support and critique of my work, professors from South Africa; John Luiz, Ralph Haman, Helena Barnard, Lyal White, Martin Butler, Daniel Malan, Thina Siwendu, Thabang Mokoaleli-Mokoteli, Jako Volschenk, Gregory Lee, Eliada Nwosu, and Linda Ronnie, with special thanks to my own cohort from UAE, Dr. Zoheir Ezziane, and Dr. Damodharan Varadarajan. Special thanks to the members of ACBSP Region 8, including, but limited to; Bruce Stetar, Martin Ulrich, Dr. Olin Oedekoven, Dr. Peter Horn, Dr. Jeremy Cripps, Dr. Mysoon Otoum, Doug Viehland, Dr. Deniz Sarak, Dr. Arthur Hirsch, and Dr. James Goodpasture.

I would like to thank those giving permission to use the survey instruments; Humaira Siddiqui Ph.D., Craig Van Slyke Ph.D., Professor Ronald Thompson, Dr. Young Hoon Kim, Professor David Gefen, Jan Travers at IGI Global on behalf of John Sagi, Perry Cartwright on behalf of Barry Babin, and Terry Childers.

From NCU school management, I would like to thank, Kim Vince, and Melissa Daniels; my principal Academic Advisor Jen Benacci, and interim advisor Tina Cliquot-Mack. From the School of Business and Technology Management, Dr. A. Lee Smith, Dina Samora, Dr. James Neiman, Dr. Oni Oludotun, Dr. Mayuresh Kelkar, Dr. Michael Millstone, my Chair, Dr. Lonny Ness to whom I am most indebted, and former Dean, Dr. Freda Turner, along with all of my former NCU mentors.

I would like to thank my supervisor Krystyna Krol, and my Associate Director Mr. Brian Keenan, for helping me secure local approval to launch the study. Furthermore, I would like to thank the following faculty and staff from Higher Colleges of Technology; from either the Men's or Women's College, Carol Lister, Dr. Najmi Junaid, Alan Nambiar, Ali El Asad, Amir Wahab, Bruce Gleason, Cameron Thrall, Colin Monaghan, Deepak Asarpota, Dr. Ameina Farhan, Eliazar Dimalapang, Geralda Moffatt, Gloria Pillay, Guy Stieglitz, Jim Tarwood, Joseph Viker, Lana Ayyash, Mark Granfield, Martha Banfa, Nathan Kawansson, Omar Ayyash, Saleimah Sebait, Shaindra Sewbaran, Shivani Ganess, Sian Khoury, Slim Khemakhem, Donna Lawson, Lukas Van Veen, Christopher Haddow, Sally McQuinn, Dawid Wosik, Alexander MacLeod, Susan Daniel, Mark Barnes, Suhair Alwahabi, Mukhlesur Rahman, Orapin Miller, Shaima'a Al Hijawi. I would like to thank my former colleagues, Lionel Hauritz, Chris Hacker, Chris Winn, Adam Lossing, Adam Davies, Andrew Scholtz, and my former Dean Dr. William Snow, who hired me to work for Keimyung University in Korea.

I would also like to thank staff and management from the various HCT campuses, including but limited to; Dr. Nadeem Khan, Dr. Kathleen Hodge, Dr. Michael Parsons, for raising critique, and for appealing to the DAT on my behalf, to administer

the survey Nick Nunnington; Associate Directors Ahmed Tabbara, Ali Al Mansoori, Brian Keenan, Christine Luscombe-Whyte, Dr. Behjat Al Yousuf, Dr. Hamad Odhabi, Dr. Michael Parsons, Ged Ryan, Nial Farrell, Philip Corcos, Timothy Smith; Supervisors and Deans, Leslie Evans, Alan Yeck, Dianne Bealer, Dr. Imre Reczey, Dr. Georgia Daleure, Dr. Monica Gallant, Fauzan Qazi, John Sutton, Julie Wasilewski, Lauralee Kilgour, Philip West, Robert Middleton, Dr. Nasser Nassiri, Ghassan Frache, Jean Witthoft, John Sutton, Michael Purcell, Robert Middleton, Salwa Abdel Aal, Nadezda Pizika, Dr. Hanan Hairab, Stephen Munns, and staff and faculty; Bonnie Milne, Rosemary McConville, Alycia Sayer, Amal Zeyad, Catherine Cosgrove, Clay Gervais, John Mckeown, Ken Pisichko, Larry Metzger, Margaret Radja, Kate Quinlan, Matt Anderson, Nicole Johnston, Omar Zenhom, Philip Borrell, Rejitha Ravikumar, Sean McPhillips, Senan Gibson and Dirk Sharer. Apologies to anyone who I have missed your help was truly appreciated.



## Abstract

The United Arab Emirates (UAE) is a prosperous country struggling with the threat of cybercrime. Deep packet inspection (DPI) technology offered an enterprise-level solution to the cybercrime problem, enhancing firewalls and threat detection capabilities. Controversy surrounded DPI because it infringed upon privacy rights and was not fully effective. Investigation of the literature revealed minimal research about perceptions that drove intention to use DPI technology in Arab countries, and absence of a systems-based, theoretical framework explaining DPI's acceptance, by UAE society. A questionnaire study of six variables using randomly sampled data of  $n = 443$ , was collected from 18-to-25-year-old Emirati national college students, at the Higher Colleges of Technology—graduates targeted by UAE law, for employment in the finance and telecommunications sectors—industries likely to use DPI. Quasi-experimentally tested data, using the maximum likelihood estimator—robust to non-normality, using confirmatory factor analysis, suggested an acceptable goodness-of-fit into the deep packet acceptance model (DPAM). Cronbach's  $\alpha$  was  $> .80$  for all constructs. Individual factor loadings ranged from .621 to .885, while construct averages were .792 for computer self-efficacy (CSE), .707 for attitudes toward information and communications technology (ATICT), .770 for perceived usefulness of e-commerce (PUEC), .800 for intention to use e-commerce (IUEC), .781 for societal trust (ST), and .711 for Internet filtration (IF). The goodness-of-fit values obtained were; Normed Chi-Square,  $(\chi^2/df) = 2.602$ , Comparative fit index, (CFI) = 0.918, Tucker-Lewis Index, (TLI) = 0.905, and Root mean square error of approximation, (RMSEA) = 0.060. Significant positive correlation existed between CSE, ATICT, PUEC, and IUEC—highest being CSE and ATICT at  $r = 0.537$  and a

significant negative correlation between PUEC and IF ( $r = -0.137$ ). Societal trust and CSE, CSE and IF, and IF and ST, were not significantly correlated. Stakeholders now have a greater understanding of network security market needs and intention to use DPI in the UAE, motivated by DPAM. Recommendations are extension of the model to the network-security practitioner community; exploration of the role of inter-firm alliance processes, in fighting cybercrime; identification of superior network-security business models; and recognition of culture as a limitation of the study.

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## Chapter 1: Introduction

The United Arab Emirates (UAE) is a prosperous Middle Eastern country, strategically located across the Straits of Hormuz from Iran. Its population is about five million, of which 78% are expatriates. The number of expatriates has continued to rise, in line with the rapid development, taking place in the country. Economic progress, control of the country, and the integrity of Islam are high priorities for the ruling sheiks. Abu Dhabi is the largest, wealthiest, and politically most powerful of the seven hereditary sheikdoms or emirates that comprise the UAE. The second largest and most populous emirate is the city-state of Dubai, a globalized financial center (Euromonitor International, 2009).

Security threats and cybercrime are serious problems in the region, and jeopardize efforts to establish the country as an international business hub (Mortleman, 2009). Deep packet inspection (DPI), a technical solution used to intercept, analyze, and block network traffic, identifies and protects against security threats—including worms, viruses, and hacking attacks—that can create extensive security, financial, and logistical problems for governmental entities and businesses. However, using DPI is controversial because it enables governments and other users to spy on individuals and organizations (Epic.org, 2009; Hanff, 2008, 2009). The main commercial uses for DPI include managing network traffic flow, ensuring quality of service, and conducting targeted behavioral advertising, in which DPI is employed surreptitiously to acquire marketing data and build a profile about each individual customer (CDT, 2008; Nakashima & Lebling, 2008). The current study aims to provide a way to examine factors that affect DPI adoption, and explain how DPI is a good fit for the UAE.



## **Background**

Cybercrime is a major problem in Gulf Cooperation Council (GCC) countries; the UAE ranked second behind Saudi Arabia in the total number of instances of what has become a regional problem (Ajbali, 2009). The UAE experienced a 33% increase in infected machines during 2010 (“Middle East,” 2010). Dubai-born K. Shankear, an Indian business owner of UAE restaurants and textile shops, had 10,000 dirham stolen in 20 Etisalat re-charge transactions, worth Dh 500 each, when funds were deducted from a Mashreq bank account overnight between December 6, and 7 (Hilotin, 2010).

Employing DPI technology in firewalls at the ISP, and enterprise level, was one possible solution in the fight against Internet crime (Matwyshyn, Slaughter-Defoe, & Paya, 2010). Deep packet inspection technology represented a paradigm shift in the fighting of Internet crime. Deep packet inspection technology has changed the Internet balance of power, by granting greater power to institutional and governmental entities, over that of individual users (Hanff, 2008, 2009; Jones, 2008). For example, in August 2010, fears in the region first surfaced, that the government was having difficulty applying DPI selectively, to filter Blackberry applications, during the previous six months, and that this would lead to outright blocking of Blackberry phone messaging, and Internet applications, such as e-mail, by the UAE government (Associated Press, 2010; see also Schreck, 2010). The government was apprehensive about encrypted messages, moved to servers located outside the region, where the government could not monitor them for security risks. The problem was ameliorated by an agreement with Blackberry’s parent company, Research In Motion, allowing server access or the sharing of proprietary encryption technology (“Getting the Message,” 2010).

An investigation of the literature revealed, the absence of a model explaining the acceptance of DPI by the UAE society. Since the initial work of Al-Khaldi and Wallace (1999), perceptions and attitudes that drive the intention to use technology in Arab countries have expanded into the realms of e-learning and e-commerce adoption (Fawwaz, 2008; Siddiqui, 2008). Any models examining the phenomenon of DPI adoption were not emergent, from academic studies pertaining to the Middle East and North Africa (MENA) regions.

### **Problem Statement**

The problem investigated is the UAE, being the second most vulnerable Gulf country, falling victim to cybercrimes, such as theft of valuable data, passwords, and credit card numbers. The UAE had 248,000 computer system crashes attributable to network security risk, during a nine-month period in 2009, accounting for 20% of the total cases, in GCC countries (Najami, 2009). Yet, the prosecution of hackers under local law, had been almost impossible, as most attacks had come from outside the region (Ajbali, 2009; Matwysbyn et al., 2010). Highlighting the malware threat at the state level was the Stuxnet worm. Nearby Iran, a UAE business partner, was a victim of 60% of Stuxnet worm infections, which crippled micro-controllers in infrastructure management devices (Benson, 2010; Pletts, 2010; Sutton, 2010). Thus, the UAE faces extensive cybercrime and security risks. Deep packet inspection offered a potential security solution to cybercrime, at a tradeoff with user privacy (Epic.org, 2009; Hanff, 2008; Lawson, 2008). For example, RIM, with over 500,000 Blackberry handsets in service in the UAE, was facing blockage of the Internet, email, and instant messaging services by the UAE government, unless they yielded server access (Associated Press, 2010;

Schreck, 2010). Systems theory, which accounts for leverage exerted by different actors in complex systems, was useful as an analysis framework, to interpret the tradeoff between user privacy and institutional security needs (Cavaleri, 2005; Morgan, 1998; Trochim & Donnelly, 2008). However, in review of the literature, there was no suitable policy model, that stakeholders, such as small and medium-sized enterprises (SMEs), and governments, could use for guidance in implementing a DPI program (Matwyshyn et al., 2010).

### **Purpose**

The purpose of this quasi-experimental, quantitative study using confirmatory factor analysis was to examine six constructs for goodness-of-fit, in a theoretical paradigm known as the deep packet acceptance model (DPAM). This study investigated the independent variable acceptance of DPI, a potentially disruptive technology, by determining which—if any—of the six constructs identified in the literature review fit into the proposed explanatory system's theory model. The DPAM model for the UAE includes six independent variables: (a) attitudes towards ICT, (b) computer self-efficacy (CSE), (c) perceived usefulness of e-commerce, (d) intention to use e-commerce, (e) societal trust, and (f) Internet filtration. To test these variables, purposively random sampled data of  $n = 527$ , was collected from a total population of  $N \approx 19,370$ , exceeding the  $n = 239$ , minimum number of participants, determined by a power analysis. The sample participants were 18- to 25-year-old Emirati national students, of the Higher Colleges of Technology, a government university, and favored by UAE law for employment in the finance and telecommunications, industry sectors (UAE Federal e-Government Portal, 2006).

## **Theoretical Framework**

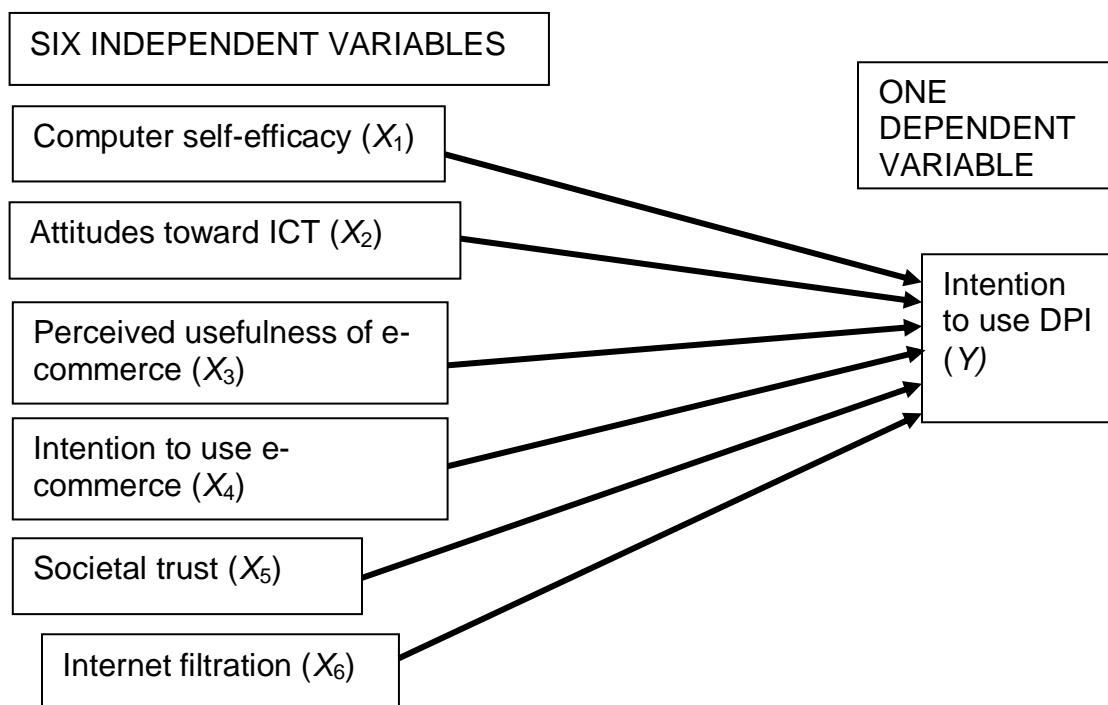
This study falls under the broad heading of applied business research, with boundaries spanning coverage of other domains, including psychology, education, sociology, and public health (T. A. Brown, 2006). The overriding theoretical concept used, is systems theory (Cavaleri, 2005). Systems theory, applied to technology adoption, typically uses models to explain people's understanding and interactions with technology (Morgan, 1998). Morgan (1998) viewed different systems as living things with varying combinations of human and machine interaction, and interdependence. Thus, Morgan (1998) modeled a socio-technical system, in which one part always has important consequences for the other part. With Burrell, Morgan studied congruence and non-congruence between organizational subsystems (Burrell & Morgan, 1979). Morgan (1998) also made use of the work of Kast and Rozenzweig (1973), who modeled interactions of subsystems.

The study of technological security issues goes back for nearly a century. In 1961, Burns and Stalker identified suitable approaches for organizations in the competitive environment of early age electronics firms that ranged from mechanistic to fully organic (as cited in Morgan, 1998). Two decades earlier, Trist and Bamforth (as cited in Morgan, 1998) investigated the impact of technological change in work methods on coal mining in 1940s England. Trist and Bamforth (1951) used a socio-technical perspective, to investigate the new long-wall mining technique, and examined how it reduced group cohesion, among the society of workers. Systems theory gradually gained acceptance by the academic community, and became expanded to encompass human and computer system interactions (Hayles, 1999). Trochim and Donnelly (2008) defined the

systems thinking approach as “a general conceptual orientation concerned with the interrelationships between parts and their relationships to a whole, often understood within the context of an even greater whole” (p. 350). Senge, Linchtenstein, Kaefuer, Bradbury, and Carroll (2007) supported this collaborative perspective, and sought to identify the correct balance ideally struck, between private interest and public knowledge.

The focus of the proposed study was to develop a systems theory model to examine the acceptance of DPI technology in the UAE. A technology adoption model for examining DPI adoption in the UAE could benefit SMEs, which lack the resources to conduct their own study. Indeed, realizing the benefits of DPI, as proposed by Allot Communications (2007) and Kassner (2008)—namely, understanding the cybercrime threat to the UAE business community, and DPI implementation as a network security tool to help businesses—requires disseminating information to the SME sector.

Deep packet inspection also has its critics, particularly in the area of user privacy; where DPI compromises communications, both corporate and personal through acts of intrusion, such as the reading of email content (Hanff, 2008; Lawson, 2008). Network security expert B. Schneier, the chief security officer at British Telecom, has been highly critical of the network security deployment of DPIs and doubted DPIs’ effectiveness to uncover and defeat threats (Thomson, 2008). However, the theories related to societal trust and Internet filtration constructs, support the constructs inherent in DPI, and help build credibility for the proposed DPAM, mainly because these are concepts related to the acquisition and acceptance of DPI technology. This dissertation has a discussion in great depth, about the theories presented. Figure 1 illustrates the relevant DPI constructs synthesized into DPAM.



*Figure 1.* Conceptual construct model: Deep packet acceptance model (DPAM). Mapping of variables thought to influence the acceptance of deep packet inspection in the United Arab Emirates—the deep packet acceptance model (DPAM). Adapted from *Investigation of Intention to Use e-Commerce in the Arab Countries: A Comparison of Self-Efficacy, Usefulness, Culture, Gender, and Socioeconomic Status in Saudi Arabia and the United Arab Emirates* by H. Siddiqui, 2008, p. 8. Used with permission (see Appendix H).

There are several theories that appraise societal trust and Internet filtration constructs. Jawahar and Elango (2001) found that Davis's (1989) technology acceptance model (TAM) affected both CSE and attitudes toward ICT. Compeau and Higgins (1995) related CSE to a subject's willingness to persist in learning a technology, even when faced with adverse circumstances, and to Bandura's (1982) social cognitive theory, which is a seminal study of self-efficacy (as cited in Sagi, Carayannis, Dasgupta, & Thomas, 2004). Fishbein and Ajzen's (1975) theory of reasoned action (TRA) suggested that beliefs influence attitudes, which in turn lead to intention, and ultimately to

actionable behavior. A related theory that evolved from this earlier work, is the theory of planned behavior (TPB), which involved if a person had favorable attitude toward technology, that ultimately led to the use of the technology (Ajzen, 1991). The extension of TRA led to the development of Davis's (1989) TAM (Lederer, Maupin, Sena, & Zhuang, 2000). Lederer et al. (2000) subsequently created and validated a measurement instrument for TAM as it applied to the World Wide Web. According to Downey (2006), TAM is a causal relationship between constructs of action and intention that can predict user acceptance of a technology initiative. Jiang, Hus, and Klein (2000) then extended the TAM to the study of e-commerce with their e-commerce user behavior model. Hsu and Chui (2004) extended TPB to e-commerce with their model for e-service acceptance.

Jegade (2007) provided support for CSE that was more recent, concluding, "that self-efficacy is a critical and potent factor in determining attitudes ... toward computers" (p. 279). Compeau and Higgins's (1995) research to validate their CSE measurement instrument, further supported Bandura's "Social Cognitive Theory perspective on computing behavior" (p. 202). Likewise, R. Thompson, Compeau, and Higgins's (2006) research into instrument validation "revealed strong influences of both personal innovativeness and computer self-efficacy" (p. 1).

The survey instrument used for this current study used portions of Siddiqui's (2008) instrument. Siddiqui (2008) drew from a pool of theoretically supported, previously validated and reliable components to produce an instrument tested for validity and reliability for the Arab culture. Siddiqui used a sample size of  $n = 1080$  to compare e-commerce adoption in the UAE and Saudi Arabia using regression. In addition, Ghobakhloo, Zulkifli, and Aziz (2010); Sam, Othman, and Nordin (2005); and Ramayah,

Mohamad, Omar, and Marimuthu (2009) all pursued the strategy of constructing a culturally targeted instrument.

Departures from the Siddiqui (2008) study, were theoretically necessary to provide support for DPI, as a dependent variable for the proposed DPAM study. The gender and socioeconomic status variables, from Siddiqui's survey, lacked validity and reliability, and were not included in the new study. Siddiqui (2008) found that gender had low reliability, for the UAE, which therefore warranted removal of gender from the model, while socioeconomic status data did not the measurement model. Sagi et al. (2004) also found that, although culture influenced e-commerce adoption, gender did not. According to Siddiqui (2008), for the UAE, the gender variable was least significant for computer self-efficacy (CSE), perceived usefulness of e-commerce (PUEC), and attitudes toward IT. Furthermore, Woszczyński, Myers, and Moody's (2007) North American study of student IT career choices found no difference based on gender. Sam et al. (2005) also found gender equivalence regarding interest, use, and skill level with computers among Malaysian university students.

In addition, intention to use e-commerce is now an independent variable, rather than a dependent variable, as it was in Siddiqui's (2008) research. Because e-commerce is an area of cybercrime vulnerability in the UAE (Najami, 2009), intention to use e-commerce has been incrementally revised from a dependent variable, to an independent variable affecting intention to use DPI. In other studies, such as Kim and Kim (2005); Kim, Kim, and Hwang (2009); and Van Slyke, Lou, Belanger, and Sridhar (2010)—researchers validated perceived risk as an important component of e-commerce adoption.



Regarding the content-based theoretical validity, of including both perceived usefulness (PU) and perceived ease of use (PEOU), as independent variables, Straub, Keil, and Brenner (1997) found a disassociation within TAM, of PU and actual use of a technology. According to Straub et al. (1997), this was mainly due to culture; and perceived usefulness of e-commerce and culture being separate constructs. Gefen and Straub (2000) further substantiated the differentiation of PU and PEOU, concluding that although both constructs are important, PU is the stronger determinant of e-commerce use between these two variables. Kim and Kim (2005), Ghobakhloo et al. (2010), and Van Slyke, Lou, Belanger, and Sridhar (2004) subsequently confirmed Gefen and Straub's (2000) findings.

Gefen, Rao, and Tractinsky (2003), and Gefen and Straub (2003) specified that in business relationships, stimuli that increase perceived risk and trust, are from a practical standpoint, similar in behavioral outcomes, and that perceived risk influences the relationship early on, whereas trust dominates in the later stages of the buyer-seller relationship. Gefen (2002) separated risk into areas of high and low involvement, and stated that risk aversion, would take precedence over trust, when the stakes were high. Any system implementation faces increased risk of failure by not identifying and taking into account differences that can inhibit the adoption of information technology (Harris & Davison, 2002).

Another deviation from the Siddiqui survey (2008) was the changing of culture, a moderating variable, to an independent variable called societal trust. According to Harris and Davidson (2002), economic, political, cultural, and behavioral factors vary from society to society. The influence culture has on trust is supported in theory by Kim and

Kim (2005), Kim et al. (2009), Sagi et al. (2004), Van Slyke et al. (2004), and Van Slyke et al. (2010).

Verweij (2005), Beatty et al. (2011), and Yousafzai et al. (2007) connected culture and trust, via extensions of social capital theory and cultural theory, with the type of relational trust present in cultural affinity, as persons seek accommodation horizontally between group members, and vertically with government. Al-Ali (2008) stated the relevance of culture and social capital factors for the UAE, particularly in the area of Arab patronage or *Wasta*, a form of nepotism. While Salem and Jarrar (2010) thought this was important for social acceptance of technology in the UAE and resulted in changes in societal trust dynamics.

The theories that consider trust as a component of culture were policy-relevant theories and demonstrated alignment with the purpose of the study. Therefore, a preponderance of evidence supported the importance of changing the interpretation of culture from a broadly defined moderating variable that affects trust, to an independent variable that explicitly measures societal trust. Thus, one feature of DPAM is the inclusion of societal trust as a separate independent variable construct.

The variable of Internet filtration did not have a previously validated measurement instrument for use in the UAE. Sagi et al. (2004) and Van Slyke et al. (2010) articulated the Internet filtration variable in issues of national control and privacy. These researchers considered both issues in their validated e-commerce instruments. The construct of Internet filtration has UAE-specific support in research by the Open Net Initiative (2009a), which identified 41 areas of content filtration. In practice, Etisalat (2009a), the UAE's largest state telecommunications carrier, proposed that certain

content be blocked, and published a 13-item list of blocked content. Internet filtration as a construct in this study provides a way to measure the Internet blocking of material not conforming to Islam or perceived as threats to the state and the moral character of individuals. The validation of the Internet filtration constructs is one of the goals of the proposed study.

Fawwaz (2008) used Roger's (1995) diffusion of innovation model, to study the adoption of e-learning in the UAE. Although Gher (2002) theorized that the UAE government had blocked the free exchange of information by claiming to protect the public from pornography and cultural invasion, in actuality it was controlling the right of entry to modern entertainment and information services. Support for the discriminant validity of the Internet filtration and societal trust variables, also comes from El-Sheikh's (2008) claim of an Islamic model of moral economy, rooted in a strict and classic interpretation of Islamic teachings. Moreover, additional support for trust at the societal-level was in Hofstede's (2009) claim that a highly autocratic governing apparatus is rooted in high uncertainty avoidance, coupled with a high power distance—a characteristic of Arab society.

In contrast, Kurzman and Naqvi (2010) observed that Muslims tend to vote for secular political parties where such parties are allowed, partially supporting Lewis (1996), who claimed that Muslims of the region are now looking to democracy as a way to achieve freedom. Furthermore, Wright (1996) explained the revisionist perspective of Islam based on a reformist philosophy. Wright (1996) examined Al-Ghannouchi's (1996) scriptural interpretation of liberalism, coupled with Soroush's (1996) tenet that a democratic, secular rationality is complementary to Islam's main objectives of freedom.

The testing of the six theoretical constructs for inclusion in the DPAM model serves as the basis for a possibly new paradigm to explain the acceptance and implementation of DPI in the UAE. A better understanding of the intention to use DPI could enable a multitude of stakeholders in the high-need area of the UAE's SMEs (Mortleman, 2009) to promote the use of DPIs in their firms. This creation of new knowledge could result in a more effective analysis of e-business, network security, and user privacy concerns while helping to identify—through the application of research—what content and applications fit the market needs of the UAE.

### **Research Questions**

This quantitative method, quasi-experimental study had six research questions, which were testable through six hypotheses. By operationalizing the variables into a validated measurement instrument, the goodness-of-fit for each variable within DPAM—the proposed model, was tested. The observed measures of the independent variables were evaluated using confirmatory factor analysis against the expected measures in order to explain the model's dependent variable—namely, acceptance of the implementation of DPI.

- Q1.** To what extent, if any, does computer self-efficacy relate to intention to use deep packet inspection in the UAE?
- Q2.** To what extent, if any, do attitudes toward ICT relate to intention to use deep packet inspection in the UAE?
- Q3.** To what extent, if any, does the perceived usefulness of e-commerce relate to the intention to use deep packet inspection in the UAE?

- Q4.** To what extent, if any, does intention to use e-commerce relate to intention to use deep packet inspection in the UAE?
- Q5.** To what extent, if any, does societal trust relate to intention to use deep packet inspection in the UAE?
- Q6.** To what extent, if any, do attitudes toward Internet filtration relate to intention to use deep packet inspection in the UAE?

### **Hypotheses**

The quantitative investigation of six research questions occurred through the study of six associated hypotheses pairs. The basis for evaluation of the model was statistical correlation, employing confirmatory factor analysis, to assess each of six independent variables for alignment with the dependent variable and goodness-of-fit within the proposed model.

- H1<sub>0</sub>.** Computer self-efficacy is not related to the intention to use DPI in the UAE.
- H1<sub>a</sub>.** Computer self-efficacy is related to the intention to use DPI in the UAE.
- H2<sub>0</sub>.** Attitude toward ICT is not related to the intention to use DPI in the UAE.
- H2<sub>a</sub>.** Attitude toward ICT is related to the intention to use DPI in the UAE.
- H3<sub>0</sub>.** Perceived usefulness of e-commerce is not related to the intention to use DPI in the UAE.
- H3<sub>a</sub>.** Perceived usefulness of e-commerce is related to the intention to use DPI in the UAE.
- H4<sub>0</sub>.** Intention to use e-commerce is not related to the intention to use DPI in the UAE.

**H4<sub>a</sub>.** Intention to use e-commerce is related to the intention to use DPI in the UAE.

**H5<sub>0</sub>.** Societal trust is not related to the intention to use DPI in the UAE.

**H5<sub>a</sub>.** Societal trust is related to the intention to use DPI in the UAE.

**H6<sub>0</sub>.** Internet filtration is not related to the intention to use DPI in the UAE.

**H6<sub>a</sub>.** Internet filtration is related to the intention to use DPI in the UAE.

### **Nature of the Study**

This study of constructs thought to affect the intention to use DPI in the UAE used a quasi-experimental design. Although the study featured random selection of multiple groups, the random assignment of population members to groups—a key feature of a true experiment—was not an employed sampling method (Trochim & Donnelly, 2008). The method aims to sample the population, to enable the interpretation of the suitability of the proposed theoretical model to explain DPI's implementation. According to Albright and Park (2009), confirmatory factor analysis (CFA) is theory driven; they described the method for using CFA to test an explicit hypothesis, such as the inclusion of individual factors in a model. Four of the proposed model's DPI variables—namely, CSE, attitudes towards ICT, PEOU, and intention to use e-commerce—relate to understanding and acquiring the use of technology. The two remaining DPI variables—societal trust and Internet filtration—are representative of the specific impact of underlying attitudes on the adoption of DPI technology.

The survey instrument for the current research on DPI adoption is a modification of the survey used by Siddiqui (2008). Siddiqui (2008) drew questions from five validated instruments and modified the wording for use with Arab society. Siddiqui

achieved validation and reliability standards in that study of e-commerce adoption in the UAE and Saudi Arabia, on four of six independent variables; computer self-efficacy, attitudes toward e-commerce, perceived usefulness of e-commerce, intention to use e-commerce, and for the moderating variable, culture. Two of the six independent variables, gender, and socioeconomic status were not supported. Further modification of the instrument for this new study, included the use of blocked content constructs to define Internet filtration as a variable. This DPI study's Internet filtration foundational support, used blocked content information provided by the state telecommunications provider Etisalat (2009a), and independent research conducted by the Open Net Initiative (2009a).

### **Significance of the Study**

The UAE has played an important role in regional development and joined the United States and other developed countries as a Stage 3 Economy on the Global Competitiveness Index (Porter & Schwab, 2009). Several important success factors contribute to the UAE economy. First, the UAE—Dubai in particular—is growing in importance as a global financial center (Aalbers, 2009). Second, 40% of the world's oil flows through the Straits of Hormuz (Freidman, 2008). Finally, the port city of Fujairah on the Indian Ocean, having grown steadily as a logistics hub since the Iraq-Iran conflict due to interdicted shipping lanes in the Arabian Gulf, is the second-largest ship bunkering port in the world (Bhoopathy.com, 2009).

With the UAE participating in globalization as an important and interconnected player, the country has an imperative to maintain ICT connectivity and prevent cybercrime and hacking. Cybercrime and the criminal misuse of technology remains a persistent threat in the UAE (Mortleman, 2009). Siddiqui (2008) and Meddah (2008)

found that UAE society is highly engaged in e-commerce. The Arab Advisors Group's (2008) A. Snobar reported that the UAE leads all Arab states with an e-commerce penetration rate of 25.1% (Shaikh, 2008). R. Rangin (as cited in Mortleman, 2009) offered this view:

In large companies, CIOs have a good understanding of the risks that they face and the ways in which that information can be compromised. But in the mid to small businesses, there is not that much of an understanding. Most [Middle East] SMEs don't have a comprehensive IT strategy. (p. 2)

A contribution to the body of knowledge about technology adoption in the UAE occurred by testing variables for inclusion into a new model that explained DPI's implementation, using behavioral and societal factors. Such a study is significant because of the necessity to protect e-commerce, and ICT sectors of the economy. Deep packet inspection is an important technology to study because it is a disruptive technology, capable of transforming the dynamics of the market for information. By helping to concentrate greater inspection power and control in the hands of government and institutions, DPI can tip the balance of power against the general user (Jones, 2008).

Understanding restrictions on the free exchange of information in an expectant economy (Gher, 2002) such as the UAE—defined as an economy featuring an upward trending GDP; a dominance in specialized business sectors such banking, oil, and telecommunications; and a fluid administration policy—is valuable information in the application of systems theory to interpret the cybercrime problem. Although the knowledge gained is specific to the UAE, the quasi-experimental design permits extension of the interpretations of the study outcomes, beyond the UAE. For example,



the results are transferable to those societies exhibiting similar characteristics, particularly other Arab cultures, in the GCC and MENA regions.

Thus, the goal of this study was the creation of new knowledge specific to the UAE that would contribute to closing the gap in the literature. By disseminating network security attitudes toward the community, it helped foster an understanding of the societal acceptance of DPI, and provided justification for the study since it is an economically important topic. Indeed, Li (2007), No (2007), and King (2008) conducted research on DPI in countries other than the UAE and found a lack of public awareness of the implications of DPI.

Creswell (2008) stated in his text on research design that “The most rigorous form of quantitative research follows from a test of a theory and the specification of research questions or hypotheses that are included in the theory” (p. 109). By collecting primary data and quantitatively testing the variables identified in the study using CFA, those constructs thought to be relevant to describing the intention to use DPI have become the basis of a theoretical model that explains Emirati intentions to implement DPI. Although the results are specific to the host population, the robust methods of research allow generalizations (Linstrom, 2009) applicable to the larger population (Eysenck, 2004; Trochim & Donnelly, 2008).

### **Definitions**

Several constructs are critical to understanding the topic. Supplying definitions to those constructs is a prerequisite for understanding deep packet inspection (DPI). The following definitions illustrate and contextualize this understanding.

**Computer self-efficacy (CSE).** Computer self-efficacy is an individual's perception of his or her ability to use computers to accomplish a task (Compeau & Higgins, 1995).

**Confirmatory factor analysis (CFA).** CFA refers to a variety of structural equation modeling that is hypothesis driven and used to measure the relationship between observed indicators and latent factors. In CFA, the measurement model must be entirely pre-specified based on past evidence and theory (T. A. Brown, 2006).

**Deep packet inspection (DPI).** DPI is a firewall application that uses signature-based comparisons; heuristic, statistical, or anomaly-based techniques; or a combination of methods to scrutinize Internet data transmissions, including packet payloads at OSI levels 3-7 as they traverse the firewall (T. Porter, 2005).

**Diffusion of innovation theory (DOI).** DOI is a model of technology adoption including five stages: (a) developing specific knowledge of the technology; (b) persuasion, which has two levels of outcome—either a favorable or an unfavorable impression of the technology; (c) decision; (d) implementation; and (e) confirmation where the technology implementation is evaluated (Rogers, 1995).

**Distributed computing.** This is a decentralized peer-to-peer computer network. Through the collusion of its many users, whose cumulative contributions often underutilize the capability of computer resources, distributing computing gains its processing power as opposed to a single large supercomputer (Merz, Kolter & Priebe, 2009).

**E-commerce penetration rate.** The e-commerce penetration rate is the number of firms that have adopted computer automation, typically through a company website, IT

department, and Internet connection. It provides the marketing of product to clients (B2C), marketing of product to industry, online payments, delivery and orders, and online processing (Walter, 2005).

**Emiratisation.** Emiratisation is an Emirati government policy enacted partially in response foreigners in the workforce. The policy aims to ensure greater employment of Emirati nationals. The policy gives Emirati nationals job training assistance, preference in hiring, and guarantees of continued employment once hired (UAE Federal e-Government Portal, 2006).

**Etisalat.** Etisalat is the state-affiliated telecommunications services provider based in the UAE. Etisalat claims 85 million customers and operates in 17 countries across Asia, the Middle East, and Africa. The entire region of the service area has a total population of 1.6 billion (Etisalat, 2009b).

**Expectant economy.** A country with an expectant economy is a serious regional player that experiences an uneven but upward trending GDP growth rate and is dependent economically upon its dominance in specialized industries. These economies typically have a fluid, ever-changing administrative policy (Kamalipour, 2002).

**Gulf Cooperation Council (GCC).** The Gulf Cooperation Council is a unified regional trade and economic agreement that includes the Persian Gulf states of the UAE, the State of Bahrain, the Kingdom of Saudi Arabia, the Sultanate of Oman, the State of Qatar, and the State of Kuwait. These member countries signed the charter agreement on November 11, 1981, in Riyadh, Saudi Arabia (Gulf Cooperation Council, 2010).

**Middle East and North Africa (MENA).** This business and academic term refers to a regional grouping of Middle Eastern and North African nations comprising

approximately 6% of the world's population and consisting of Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, the UAE, and Yemen (Dumper & Stanley, 2007).

**Perceived ease of use (PEOU).** PEOU refers to how using a particular technology seems free from effort and ultimately leads to the use of IT (Davis, 1989; Hayashi, Chen, Ryan, & Jiinpo, 2004).

**Perceived usefulness (PU).** PU refers to a person's perception that his or her job performance will improve, through using a particular technology, ultimately leading to that person's use of a technology such as IT (Davis, 1989; Hayashi et al., 2004).

**Privatization of the Internet.** Privatization of the Internet refers to wealthy corporate and commercial interests that aspire to dominate the market by developing content or technology favored by market forces as well as regulation that threatens the development of a democratic network of individuals and institutions (Campbell, Martin, & Fabos, 2006).

**Targeted behavioral advertising.** Behavioral targeting technologies anonymously track the content read and sites visited by a designated unique user or IP address by serving tracking codes (i.e., cookies) to a user's computer. Online advertising networks use tracking codes to send advertisements to the user's computer. Sites visited, content viewed, and length of visit are all stored in a database and analyzed to predict a user's online behavioral pattern, thereby classifying that user by his or her online demographic. Behavioral advertising networks serve advertising related to that user's behavioral classification, regardless of where he or she visits (Baker, 2005).

**Technology acceptance model (TAM).** This information systems paradigm models how users come to accept and use a technology (Davis, 1989).

**Theory of planned behavior (TPB).** This theory features a proposed link between attitudes and behavioral intentions. If a person has a favorable attitude toward a technology, he or she will be more likely to use or support that technology (Ajzen, 1991).

**Theory of reasoned actions (TRA).** This theory holds that a person's behavior is correlated with an individual's intention to perform the behavior (Ajzen & Fishbein, 1980).

**Traffic flow management.** Traffic flow management is the improvement of network performance by throttling undesirable or non-business uses of the network and enabling the deployment of critical, time-sensitive applications. Traffic flow management is necessary because as little as 10% of the users account for up to 80% of the bandwidth, often for non-business purposes (Huawei Technologies, 2010).

**Uncertainty avoidance (UAI).** This cultural dimension describes "the degree to which people in a culture feel uncomfortable with uncertainty and ambiguity" (Hofstede, 1980, p. 31).

## **Summary**

Computer crime is a major problem in the MENA region, specifically in the UAE, which ranks second in the GCC with 20% of the total number of the region's cybercrime related to computer system crashes (Ajbali, 2009). One possible network security solution to the crime problem is the implementation of DPI technology, studied through the specification of a technology acceptance model. Deep packet technology changes the balance of power by granting government and institutions greater ability to protect their

systems through the ability to inspect, filter, and block Internet usage by individual users (Allot Communications, 2007; Hanff, 2008; Kassner, 2008; Lawson, 2008; Yu, 2007).

There were no previous studies identified in the literature, that assessed the tradeoff between the parameters of user privacy and institutional and governmental security needs for the UAE. The creation of new knowledge by developing and testing a systems theory model (Cavaleri, 2005) called DPAM, to explain the implementation of DPI in the UAE, is the intended outcome of this study.

The rest of this dissertation focuses on examining the evidence related to the DPI model's factors, and defining the proposed study in detail. Chapter 2 reviews the existing literature related to DPI and the identified factors. Chapter 3 outlines the proposed research methods. Chapter 4 delivers the findings, while Chapter 5 offers a discussion of implications, recommendations, and conclusions.

## Chapter 2: Literature Review

This chapter organized the background of research for the proposed study. As discussed in the previous chapter, cybercrime is a major problem in the UAE, and DPI technology offers a possible solution for identifying and blocking malicious behaviors and technologies. To develop a more comprehensive understanding of the topic in order to determine how best to conduct the investigation—the emergent properties of the research strategy, organized around key themes, were examined in this chapter.

The literature strategy included using as much high-level academic source material as possible. Core sources used in the literature were typically peer-reviewed documents published in academic journals, including Tier 1 journals such as *MIS Quarterly* or *Academy of Management Journal*, conference proceedings, or doctoral dissertations, and most were less than five years old. The need to establish the historical context of topics such as systems theory, origins of seminal thoughts in technology adoption, and validation of scale items, motivated the use of older articles. The use of books, news articles, whitepaper reports, theses, unpublished manuscripts, personal communications, organizational websites, think tank reports, lecture notes, and statistical guides, particularly where these sources triangulated with the core academic sources, was helpful in supporting the background of research.

The strategy for conducting the literature review proceeded from a general overview of the DPI topic to specific circumstances salient to the UAE. First, a general discussion of some of the commercial uses of the technology is presented, followed by the role of DPI in customer relationship management. Next, an examination is made of arguments against DPI, along with the context of privacy advocacy groups, which tended

to oppose DPI. Then, a discussion of a broad range of perspectives of how media reporting portrayed DPI became the focus. Addressed next is network security, as it relates to DPI technology, as well as the threats of distributed computing and the effectiveness of encryption and security protocols. The final section of this chapter focused on review of existing research, highly specific to the UAE, including material that was critical to understanding effects on the constructs that are specific to Islam.

### **Commercial DPI Market**

Kassner (2008) identified several commercial applications and uses of DPI. These consisted of; (a) network security; (b) network access; (c) compliance with government required surveillance; (d) enforcement of service level agreements, such as acceptable use policies regarding illegal content or bandwidth use; (e) quality of service related to peer-to-peer traffic and bandwidth allocation; (f) the ability for ISPs to create different service plans with tailored service levels in bandwidth and traffic shaping prioritizing; (g) curtailment of the illegal distribution of copyrighted material; and (h) behavioral advertising.

Hahn and Wallsten (2009) described the broadband market as the overall state of the high-speed Internet infrastructure, content, and adoption. A large investment in infrastructure, ubiquitous coverage, and increasingly fast speeds delivering a wide range of economically viable services was the desired state of affairs. Etisalat (2009b) and du Telecom (2011) are the state-led providers that exist to serve these needs in the UAE. Etisalat is the regional leader in international voice traffic, ranking 12th overall globally, and is the 15th largest mobile network operator in the world (Etisalat, 2009b). Etisalat has 85 million customers and operates in 17 countries across Asia, the Middle East, and



Africa—a region with a total population of 1.6 billion. In October 2008, Etisalat reported net profits of USD \$1.989 billion on a reported net revenue of USD \$5.204 billion (Etisalat, 2009b). Etisalat is primarily a state-owned company, although it does have approximately 30% private ownership (Etisalat, 2009b). Du Telecom is a smaller private company with 2.9 million subscribers operating in the UAE market (du Telecom, 2011). Du went public in April 2006, with 40% of the company owned by the UAE government, while UAE and non-UAE investors own 60% (du Telecom, 2011). The liberalization perspective (Hahn & Wallsten, 2009), which promotes a system that does not benefit specific stakeholders, is too broad to be used in a specific antitrust analysis of competing firms in the UAE, due to the extensive government involvement.

Legislation in the United Arab Emirates requires that customers purchase VoIP services directly from Etisalat making service provided by Skype, Sook Sook Tel Tel, and Vyke illegal (Etisalat, 2009a, 2009b; “Skype Blocked in UAE,” 2009). This became an issue when Etisalat (2009a) and Du Telecom (“Skype Blocked in UAE,” 2009) blocked Skype service. Metz and Vanacore (2009) explained the private spin-off of Skype by owner eBay as it evolved in late 2009. Metz and Vanacore (2009) maintained one market opinion: that eBay overvalued Skype in the original purchase. eBay’s executives originally viewed the purchase of Skype as a good fit for the firm’s portfolio. However, the deal turned out to be otherwise, potentially because of actions similar to that taken by Etisalat and du, and the firm had to take a write-down of the asset’s value.

Although Skype had done well after the buyout financially, there was frustration regarding service blockage in some countries (Metz & Vanacore, 2009). In 2009, the Skype website advertised a virtual private network (VPN) that would act in essence as a

tunnel through the Internet, bypassing filtration regimes. A VPN service may be either purchased outright or downloaded free of charge. Hotspot Shield and U99 are examples of free VPNs that may be effective in circumventing the UAE blocking regime, but may also subject the user to security threats as well (Sophos Plc., 2010a, 2010b).

Scheer's (2005) empirical study of technology users' experience with VoIP technology quality and industry players provided a measurable data set for analyzing perceptions about the quality of service outcomes achieved using the VoIP technology. Yet Scheer's (2005) study is ironic, in light of Etisalat's and du Telecom's legal monopoly of VoIP services (Etisalat, 2009a, 2009b; "Skype Blocked in UAE," 2009). The consumer friendly commercial bonanza of services, equivalent in quality to existing telecommunications technology, yet offered at low-cost by a range of market players has yet to be realized in the UAE. Instead, DPI has enabled the duopoly providers the means to implement a competition-reducing policy in line with Kassner's (2008) claim of using DPI to block illegal content and applications.

Bauer (2008) focused on traffic flow management using DPI and investigated how technological and economic forces affect network operators. He used game theory and elemental economic analysis to explain the motivations behind the competitive choices made by network operators. Furthermore, he investigated why network operators have inefficient congestion management, pricing schemes, and contractual arrangements, concluding that bandwidth and architecture are inadequate and that peer-to-peer and video usage are demanding an increasingly large share of the traffic. Bauer (2008) recommended the DPI strategy proposed by Briscoe (2009) to analyze traffic, and set pricing-levels directly on congestion levels, using local policy or a market-based solution.

Bauer (2008) and Briscoe (2009) both seemed to fall short however, of endorsing the use of DPI for the seemingly anticompetitive behavior practiced by Etisalat and du Telecom vis à vis strictly regulating other VoIP applications.

Allot Communications (2007), a DPI provider, advocated DPI's use. In a white paper study posted on the company's website, Allot supported the conclusions of Bauer (2008) and advocated DPI as a way for telecommunication firms to monitor, capture, and control their revenue stream (Allot Communications, 2007). For example, DPI can identify bottlenecks in Internet traffic flow; problem areas can then be broken up or charged a higher service fee (Allot Communications, 2007; Bauer, 2008). Gaining control over traffic flow would help a service provider, guarantee quality of service. Through using DPI to monitor traffic usage patterns, service providers can offer differentiated service levels and enable real-time subscriber management (Allot Communications, 2007).

If DPI is used to identify specific users, coupled with their wants and needs, then on-demand, product offerings are possible; such offerings are in addition to using DPI to throttle access, or restrict users who are not paying for a certain level of access (Allot Communications, 2007; Kassner, 2008). In addition to solving bottleneck flow issues, and supporting guarantees on quality of service, through behavioral advertising, firms can employ ways to get to know the customer better in order to reduce customer churn (Allot Communication, 2007; Kassner, 2008).

However, encryption technology used by operators such as Skype and obfuscation technology used by eMule and BitTorrent have frustrated the employment of DPI (Allot Communications, 2007). Furthermore, the Tor software created by the Electronic

Frontier Foundation in San Francisco disguises a message's origin by bouncing it between several different routers (Giles, 2009). This creates a problem in the UAE, because the government would like to conduct surveillance on all communications transmissions. Witness the situation with BlackBerry, where routing encrypted traffic to servers overseas in Canada, prompted the UAE government to take action.

First, there was the ill-conceived service upgrade offered to Blackberry users by Etisalat, which was actually a patch. Theoretically, this patch was to enable surreptitious eavesdropping, however the strategy proved problematic as many customers refused to download the patch, which even when downloaded by users, proved ineffective on BlackBerry's parent company, RIM's encryption technology (Associated Press, 2010; Schreck, 2010). The ineffectiveness of the patch led to outright blocking threats by the UAE and negotiations with RIM over server and encryption code access ("Getting the Message," 2010).

NebuAd was one of the first movers to use DPI in the targeted behavioral advertising industry. NebuAd advertised the first consumer-centric targeted behavioral system on its website (NebuAd, 2008). In behavioral advertising, after analyzing the data of customer behavior collected by DPI, a customer profile is developed and targeted advertisements are directed at users (Gross, 2008). Embarq, a NebuAd partner and an Internet service provider, cited in the *Washington Post* on September 21, 2008, and in other media reports for using DPI technology provided by NebuAd to gather marketing information on its customers, rebranded, and has reportedly distanced itself from NebuAd (CenturyLink, 2011). Phorm Inc. (2008) is another revolutionary player in the implementation of DPI. As an innovator, Phorm created the open internet exchange

(OIX) for online advertising. In the threat to privacy arena, Phorm introduced Webwise, a data mining application (Phorm, 2008).

Hanff (2008) was jointly suing Phorm starting in 2008, along with BT Webwise (a UK partner) in a high profile lawsuit, which is a unit of the BT Group (British Telecom), a global telecommunications services provider. In a summary of achievements of the year by anti-DPI privacy advocates, Phorm was not able to achieve the roll out of Webwise on British telecom's system (Hanff, 2009). Hanff (2009) reported that NebuAd had also been targeted, taken to court with a change of venue from California to Chicago, and had gone out of business midway through the year to be resurrected first as InsightReady, which subsequently failed, and arising again as Red Aril. Red Aril is now owned by Trinity Ventures, a large technology-oriented, venture capital firm with financial interests in over 100 firms, primarily niche technology sector start-ups (Trinity Ventures, 2011). The relevance of the legal battles taking place in Western countries is that the success of privacy arguments and advocacy groups would be unprecedented in the MENA and GCC, as borne out by the literature review.

### **Customer Relationship Management**

Kassner (2008) has highlighted the use of DPI in behavioral advertising. From the literature review, privacy proponents have objected to data mining in Western countries and that some lawsuits against firms conducting commercial data mining have been successful. However, this has not been the case in the Middle East. For arguments in favor of this type of data mining, there are those who advocate that a firm must undertake data mining and behavioral advertising as a primary thrust of the modern competitive environment.

Greenberg (2009) advocated a textbook approach to implementing a customer relationship strategy (CRM) as part of an overall business strategic plan. According to Greenberg, CRM is a strategic imperative for today's firms, toward creating a profitable exchange of customer value. Bucchi (2007) concurred, stating that the firms of today must collect and manage data well in order to know the customer. As such, CRM was essential to developing a sustainable competitive advantage, for firms taking a marketing approach to business, and particularly those Internet-based firms that seek to overcome their limitation of the lack of a physical presence, with a customer-focused approach (Bucchi, 2007; C. Chen, 2004).

Data accumulated with DPI can be analyzed for behavioral marketing by reducing customer churn and helping firms understand their customers better (Allot Communications, 2007). Bucchi (2007) investigated the competitive imperative that firms must undertake personalization and customization as an essential part of CRM to gain a competitive advantage. Bucchi (2007) surveyed consumer online purchasing behavior to develop a universal set of rules governing e-business. Bucchi (2007) advised firms to personalize their content, based on characteristics of predefined demographic categories.

Factors used to effect personalization can be uncovered through the data mining of information, collected either discretely using DPI (Giles, 2009) or overtly, where data are expressly provided by the individual—for example, data collected by Tehrani (2008). Scavarda and Gorla (2010) proposed that a Servqual-type approach identify consumer expectations, followed by a service quality zone of tolerance implemented and maintained, through a yield management focus, using a linear equation. This strategy

could lead to a competitive advantage, provided the data collection strategy was comprehensive, there was a well-fitted model, and there was an accurate, cost minimizing and service-maximizing algorithm deployed.

In contrast, Brezgina, Debouchaud, and Frehse (2008) employed a mixed methods research approach to study personalization, taking the position that personalization in advertising is counterproductive. The quantitative portion of their study used bivariate and univariate analysis of survey results from 153 university students. The authors concluded that people were so wary of online data collection, particularly when the data were personal in nature, that the general perception of online advertising is negative. As such, the study concluded that e-personalization is a threat to privacy (Brezgina et al., 2008).

Li (2007) studied the gathering and analyzing of data mining information, pursuant to both gaining a commercial competitive advantage, and how that nexus competed with personal privacy. A key dynamic identified by Li (2007) is the privacy contradiction. The dichotomy identified occurred where personal privacy concerns did not match actual privacy behaviors. In certain contexts, individuals felt comfortable divulging private information outside the scope of their general privacy-protective behavior (Li, 2007).

In 2006, Van Slyke, Shim, Johnson, and Jiang reported that concern for information privacy was mediated by risk perceptions and trust, and that these factors, along with having familiarity with the Web-merchant, may be more important barriers to e-commerce than privacy concerns. Van Slyke et al. (2006) went on to state that privacy concerns seemed more important with a well-known merchant, rather than with a less-

known merchant. In the high-trust context of online banking, Glennie (2010) connected trust, subjective norms, perceived usefulness, perceived ease of use, computer self-efficacy and computer anxiety to use of a Website. Therefore, it is possible to affect a firm's competitive advantage by improving customer perceptions in areas of, trust, familiarity, and reduced risk in dealing with a given firm.

C. Chen (2007) also took a proactive approach and examined how to facilitate customer retention, and doing so through efforts spent on developing consumer trust. C. Chen's (2007) approach examined CRM and transaction cost analysis (TCA), key themes in e-commerce marketing, through a mixed study. The researcher then developed an elaborate consumer trust model for online shopping (C. Chen, 2007). The qualitative portion examined trust literature, global evaluations theory, and TCA to set up the quantitative investigation into the relationship between trust and either consumer dependence, or external uncertainty, as moderating variables. C. Chen (2007) used global relations theory, as the explanatory paradigm, to define the change in perspective that took place within the individual from reviewing the trust literature itself. The researcher concluded that trust was "the single most important factor for consumers choosing an online supplier" (p. 13).

There are two relational systems-theory paradigms, which provide an understanding salient, to the interactions of actors, and exchange partners affected by deep packet inspection in the UAE—the business model concept and transaction cost analysis. The business model approach and transaction-cost analysis can both play a role in developing an entrepreneurial DPI strategy and can lead to value creation and competitive advantage. Firms involved with DPI should develop a business revenue



model focusing on efficiency-and novelty-centered, boundary spanning transactions (Zott & Amit, 2007). Transaction-cost analysis is the match of governance structures with proposed transactions as an economizing measure based on transaction frequency and investment characteristics (Williamson, 1979).

Study of the business model concept has by the phenomena of silos of interest, depending on researcher's respective areas of study. Emerging themes among business model scholars that relate to using DPI to fight cybercrime are; a) e-business and use of information technology in organizations, strategic issues such as value creation, competitive advantage and firm performance, and c) innovation and technology management (Zott, Amit, & Massa, 2011). Under Williamson's transaction-cost analysis model, DPI hardware and services transactions would be characterized as either (a) mixed (more specific), or (b) idiosyncratic (highly specialized and unique) investments.

The occasional DPI purchase frequency, would call for the trilateral governance model, also known as neoclassical contracting. The trilateral governance model used third party assistance, in the form of an independent expert arbitrator, to evaluate vendor performance. Principals to transactions have a stake in sustaining the relation, due to the specialized investment by in the DPI package, specific for a given firm, and the opportunity costs of switching to a successor supplier (Williamson, 1979).

Relational contracting is good fit for recurring DPI hardware and service transactions for both the mixed and idiosyncratic investment characteristic. The best fit for the bilateral governance model was the mixed application. The bilateral governance model is an obligational contracting mode. This model maintains autonomy parties, and both parties have incentives through separate profit streams, to sustain the relationship,

rather than permit it to unravel. The bilateral model would be favored as the DPI industry matures (Williamson, 1979).

The unified governance model, implying an internal organizational, vertical integration, by the party with superior adaptive properties, is a fit for idiosyncratic applications. The unified governance model removes the DPI transaction from the market and subjects it to an authority relationship of administration (Williamson, 1979).

The argument that a firm's critical resources led to a competitive advantage, spanned firm boundaries, and was relationship-based, was later made by Dyer and Singh (1998). The view is that competitive advantage for DPI industry firms, could be embedded in; (a) relation-specific assets, (b) knowledge sharing routines, (c) complementary resources and capabilities and (d) effective governance. From a strategic interpretation, the relational prescription may differ from the resource-based or industry structure view for DPI industry firms. Chances for success with the relationship-based competitive advantage model, increased with greater partnership experience, and the creation of a dedicated alliance function. Firms with this functional attribute had higher stock market gains of 1.35% to 0.18%, and a greater long-term success rate 63% to 50%, than firms that did not employ this specialized function (Kale, Dyer, & Singh, 2002).

Tehrani (2008) used a qualitative survey to uncover six additional Ps: people, partnership, productivity, personalization, physical image, and protocols. Tehrani subsequently argued adding these Ps to the traditional marketing mix. The thrust of Tehrani (2008) closely aligned with Greenberg's (2009) CRM approach. Tehrani (2008) surveyed  $n = 1293$  respondents in a mixed methods enquiry and used descriptive statistics only to describe the mature female market segment. The researcher surveyed

respondents on their attitudes toward online marketing, and any evaluations made by the respondents that led them to purchase online, concluding that firms marketing to the mature female market segment could benefit by implementing a customized marketing strategy (Tehrani, 2008).

Van Slyke, Belanger, and Hightower (2005) conducted research using  $n = 507$ , 212 males and 295 females, and concluded that there were gender-based differences in e-commerce adoption. There were no differences in the perceived ease of use and trustworthiness of Web-merchants. However, for males, Web-merchants should stress the advantages of Web-based shopping, and evidence provided in the marketing message should highlight successful e-commerce outcomes. For females, Web-merchants should stress compatibility through developing a sense of community to meet women's social needs, while working to increase the visibility of e-commerce's availability as a shopping option (Van Slyke et al, 2005).

Tehrani's (2008) and Van Slyke et al.'s (2005) studies were illustrative of how classes of information could be collected as an aid to the implementation of Bucchi's (2007) recommendation to use data mining on data collected by DPI. It is possible to analyze data from a commercial provider, such as Allot Communications (2007), Phorm (2008) or NebuAd (2008), subsequently using the data with an algorithm to target behavioral advertising (Giles, 2009).

### **Privacy Advocacy Groups and Arguments against DPI**

Several non-governmental organizations advocate for a free and open World Wide Web. For example, the privately funded Center for Democracy and Technology (CDT) is a group of foundations, corporations, international institutions, and trade

associations focused on keeping the Internet open, innovative, and free (CDT, 2008). The CDT accepts no government funding; although based in the United States, it is committed to building a global consensus to promote democratic values, and constitutional liberties for the Internet, and new communications media. The CDT has expertise in law, technology, and policy (CDT, 2008). In addition, Reporters Without Borders—a Paris, France-based humanitarian NGO—recently scolded the tech giants Yahoo, Google, and Microsoft for cooperating with repressive governments (MacMillan, 2009).

The UAE's Etisalat acts contrary to the opinion of privacy advocacy groups. Etisalat published a document online in 2009 acknowledging its Internet filtration regime, noting that 13 specific categories of content are blocked, such as pornography, blogs, dating sites, terrorism sites, and top-level domain for (.il) Israel (Etisalat, 2009a). The blocking of blogs in the MENA region is typical, and Reporters Without Borders had accused Egypt of jailing activist bloggers (Macmillan, 2009). To further this thrust, U.S. Senator Specter called for the large firms that dominate the Internet to stop turning over cyber-dissidents to their respective governments (Specter, 2009).

Included in the sites Etisalat blocks is Flickr, which is a file-sharing site where users typically share photos. Du Telecom, the private service provider (York as cited in Giles, 2009), also blocked Flickr in the UAE. The Flickr photo-storing application has proven to be quite popular in the UAE, with more than 120,000 photos geo-tagged for that country location while Sweden, with a similar population of 5 million people, has only 5000 geo-tagged photos (CDT, 2008). One of the problems is that some of the photos on Flickr, while not necessarily pornographic, are artistic nudes; in the UAE, any

depictions of nudity is forbidden, even in art museums (York as cited in Giles, 2009). Furthermore, blocking applied to any photos that show children smoking, as well as information about the Dutch anti-Islamic film *Fitna*.

In North America, P2PNet News, (2011) a Canadian privacy advocacy website, included links leading to many news stories about privacy infringement, including the Hanff lawsuit story. A blog commentary featuring Hanff promoted personal rights over the interests of corporations and big government (P2PNet, 2011). Hanff reported on the anti-DPI stance, resulting in a lawsuit, pitting Hanff against the BT Group (British Telecom), a UK Telecom operator, and Phorm, the British division of an American DPI provider (Hanff, 2009). Hanff was ultimately successful in preventing Phorm's DPI rollout (P2PNet, 2011).

Artan (2007) and Martellaro (2008) noted that the examination of a communication's content could identify threat signatures and applications that might contain malware; inspecting data packets down to the seventh level, however, raises a significant privacy issue (Kassner, 2008). In fact, using DPI to enable the identification of a user behind the keyboard constitutes Internet wiretapping (Hanff, 2008; Lawson 2008; see also Hanff, 2009; Jones, 2008). Indeed, a firm could be called to testify in a lawsuit based on data collected (Hanff, 2008). Data Foundry, a firm working in Texas disaster recovery, filed suit with the FCC against its broadband providers over intrusive monitoring of its customers' communications (Anderson, 2008; Lawson, 2008).

Studies suggest that the surreptitious use of DPI by both governments and the behavioral advertising industry has privacy experts worried (CDT, 2008; Epic.org, 2008; Gross, 2008; Hanff, 2008; Phorm, 2008). However, the public critique in the United

States, Canada, and the United Kingdom regarding the use of DPI seems largely absent in the UAE (Anderson, 2007; Gross, 2008; Hanff, 2008).

Bell Canada and Bell Sympatico, as voiced in a formal legal complaint by Lawson (2008), Director of Canadian Internet Policy and Public Interest Clinic, were not only engaging traffic management, but also inspecting content and collecting personal information beyond that which was necessary to ensure integrity of service. Lawson contended that Bell never obtained consent from its customers, and that the specific details of what the company was doing in its data collection efforts was not made available to the public. Critics have suggested that Bell is using DPI to slow down competitors' traffic speed, be they competing ISPs or P2P— individual users (Lawson, 2008).

Deep packet inspection is a tool used to privatize the Web, which goes against the principles of free-Web advocates. For instance, DPI is effective against peer-to-peer BitTorrent style downloads of Internet videos, software, and music, which is a distributed computing application, with multiple networked users not confined by geography, thereby enabling the sharing of copyrighted media (Raahemi, Hayajneh, & Rabinovitch, 2007). Jones (2008) sees the Internet as an arms race, in which commercial DPI vendors such as Procera Networks (Sethgarnar, 2010), Ellacoya, and Narus (Anderson, 2007) are selling breakthrough technology, giving governments and corporations the upper hand against the mass of free web advocates (Jones, 2008). Installing DPI capability is expensive, costing firms several hundred thousand dollars per firm-wide installation (Anderson, 2007).

## **Media Reports on DPI**

Ajbali (2009) reported that the UAE had 248,000 computer system crashes during a nine-month period in 2008, accounting for 20% of the total cases in GCC countries, making the UAE the second most vulnerable Gulf country in falling victim to cybercrimes, such as website hacking to steal valuable data, passwords, and credit card numbers. Prosecuting hackers under local law has been almost impossible because most attacks come from outside the region (Ajbali, 2009). The statistics are particularly threatening, because the UAE leads all Arab states with an e-commerce penetration rate of 25.1% (Shaikh, 2008). Snider (2008) highlighted the inability of governments in general to protect consumers from online fraud.

Deep packet inspection offers a technical solution to the problem of cybercrime in the UAE by providing institutions and governments with the technological ability to inspect network traffic and implement ICT security (Allot Communications, 2007). However, this security is not 100% effective (Thomson, 2008) and comes at the expense of user privacy (Epic.org, 2009; Hanff, 2008; Lawson, 2008; see also Hanff, 2009; Jones, 2008). The UAE nearly banned BlackBerry mobile phone handsets in 2010, because the transmissions were so well encrypted that the UAE government was unable to decipher the transmissions. A patch disguised as an upgrade, distributed by Etisalat was actually spyware and easily discovered by BlackBerry. Ultimately, the parties negotiated a settlement regarding the disposition of proprietary encryption technology, allowing BlackBerry to remain in service in the UAE (Associated Press, 2010; Schreck, 2010). Major Al Hajiri, director of the Dubai police cybercrimes department, stated in an interview that there were 316 incidences of stolen data investigated by his department in

2009. One industrial espionage case caused more than Dh 2 million in losses, attributable to two collection agency employees who leaked information and contact details to another company intending to form a new company in the future using stolen data (Najami, 2009).

The *Washington Post* reported that Embarq was under investigation by a congressional subcommittee in the United States for using DPI technology surreptitiously to collect data on consumers without obtaining prior consent. The article characterized marketing-focused, privacy-collecting agents as unwanted intermediaries (Nakashima & Lebling, 2008). Gross (2008) reported that Kansas-based Embarq, which provides Internet services for 18 states in the United States, has been using DPI to conduct behavioral advertising by collecting data useful for directing targeted ads at users.

ARS Technica, a media journalism website, reported on the latest trends in Internet technology (Anderson, 2007). One ARS Technica article critiqued DPI being used to identify and screen Internet traffic in real time, at least down to the application layer. Ellacoya, Procera Networks, and Narus were several DPI vendors identified. Deep packet capability is expensive to deploy, potentially costing several hundred thousand dollars to install (Anderson, 2007). Many firms are interested in DPI's marketing capabilities, yet DPI also enables compliance with the Communications Assistance to Law Enforcement Act (CALEA), a law requiring businesses in the United States to collect certain information required by the U.S. government (Anderson, 2007).

Montreal's *Gazette* reported on an interview with R. Deibert, director of the Citizen Lab at the Munk Centre for International Studies at the University of Toronto, a partner institution of the Open Net Initiative (ONI). Deibert characterized the Middle



East as a battleground where commercially available filtration technology, intimidation, targeted surveillance, and self-censorship compete with enhanced tools to circumvent censorship (Chapman, 2009). This echoes the sentiments of Jones (2008), who characterized DPI as a breakthrough technology in the Internet arms race. Jones published his claims in a blog. Hanff's (2008) and Lawson's (2008) legal briefs independently substantiated Jones's claims.

The situation reported by Jones (2008) and echoed by other authors (Hanff, 2008; Lawson, 2008) was a technology situation likened to the Cold War, where two sides were fighting a war by proxy. The battle underway was between the mass of free web advocates and the wealthy and powerful establishment, represented by governments and corporations (Giles, 2009). Giles (2009) portrayed DPI as a powerful weapon in the privatization of the web. For example, DPI is a threat to users making distributed computing downloads of Internet videos, software, and music using technology such as bit-torrent software.

With the recent extension of bit-torrent capability to mobile devices, DPI is a necessity to maintaining the security architecture of credit-based, incentive-distributed computing applications (Suomalainen, Pehrsson, & Nurminen, 2009). Internet service providers can use DPI to throttle the bandwidth on excessive users. Recording industry lobby groups, such as the MPAA, and advertisers would like to build a profile of their users; DPI is a tool to this end (Jones, 2008). In fact, DPI is essentially Internet wiretapping, and for legal purposes, a firm could be called to testify and meet requirements to forward DPI records to enable the identification of a user behind the keyboard (Hanff, 2008; see also Hanff, 2009).

According to Deibert at the ONI, much of the best technology used in the Middle East originates in the United States (Chapman, 2009). As of January 2008, Secure Computing supplied SmartFilter, which was the national filtration regime in the UAE (Open Net Initiative, 2009a). Since Dubai is a major hub for commerce, the Telecommunications Regulatory Authority was considering the selective unblocking of certain content for businesses in order to encourage growth. For example, the definition of pornography subject to blocking in the UAE includes lingerie sites (Hilotin, 2008). Yet these restrictive measures may be harmful to e-business, and business in general, engaged in this end of the fashion industry. Thus, on a case-by-case basis, selective unblocking is possible, depending on the situation. According to D. Burt of Secure Computing, as a vendor, this firm provides the filtration software, deploying it in a tailored-fashion per the user's specifications (Hilotin, 2008).

In the Middle East, 14 out of 18 MENA countries employ some sort of censorship (Chapman, 2009). H. Norman (Open Net Initiative, 2009b), one of the authors and lead researchers at the ONI, claimed that government political censorship is a common thread connecting all of the blocking filtering regimes. Furthermore, DPI used for political censorship is disguised and its deployment surreptitious. Meanwhile, UAE leadership openly acknowledges social filtering. You Tube, Amazon.com, and Facebook are among the blocked sites. In the Middle East, special operating licenses, and permits obtained from local information ministries, are increasingly required of online media outlets (Chapman, 2009).

Giles's (2009) discussed the growing awareness of the global trend of governments restricting their citizens' access to the Internet. Giles gave special treatment

to those voicing the position of free web advocacy, and broadcasting the issue of governments clamping down on political free speech. The UAE government spared banning BlackBerry phones at the last minute. Had the ban gone through, it would have been a form of Internet blocking, as these devices have Web access capability. Saudi Arabia had announced a potential ban; other GCC states, such as Bahrain, also reportedly showed concern about the device (Schreck, 2010).

Google and Yahoo have bowed to pressure from the Chinese government and shared some of their source codes (Giles, 2009). Both Web Sense and Secure Computing have complained about deployment of their technology without their knowledge (Giles, 2009). Norman, a lead researcher for ONI from Harvard's Berkman Center (Open Net Initiative, 2009b) quoted in *NewScientist*, that Orkut, a social networking site, is blocked in the UAE and that overall in the MENA region, most censorship is political (Giles, 2009).

MacMillan (2009) observed that major Internet players such as Google, Microsoft, and Yahoo, work with foreign governments, and partners designated by these governments. Governments and designated partners are the Internet gatekeepers, acting as enablers of censorship. In these cases, firms mentioned have provided technology and expertise in exchange for market access. One example of technology firms, cooperating with repressive regimes in order to gain market access, is how Yahoo has handled its minority venture with the Alibaba search engine of China. The main offenders putting collaboration pressure on these large firms are the governments of China, Vietnam, and the Middle East (MacMillan, 2009). However, Miller's (2007) key finding highlighted the limited effectiveness of government censorship on a target group comprised of

middle- and upper-class computer literate Vietnamese college students who were attending an English language international university.

In contrast to those firms helping repressive governments, many Western-based organizations are helping people abroad defeat censorship (Giles, 2009). Giles (2009) noted, “The University of Toronto in Canada, released software called Psiphon that allows users to evade access restriction imposed by China, on communications from abroad” (p. 1). J. Zittrain of the Berkman Institute (Deibert, Palfrey, Rohozinski, & Zittrain, 2008) developed Herdict, a website where censorship cases are reportable. U. S. Senator Specter (2009) advocated awarding large federal contracts to those firms that can show evidence of their breaching of Internet blocking, practiced by what he terms oppressive regimes. Such an approach is threatening not only to Iran, the UAE’s neighbor across the narrow Gulf of Hormuz, but also to a host of other traditional fundamental Islamic societies (Specter, 2009).

Lloyd (2008) advocated that the U.S. government stop funding anti-jamming software as a way to defeat censorship by foreign governments. Lloyd also stated that the government should facilitate private action, aimed at defeating state-imposed blocking. Lloyd recommended allowing anonymizer websites focused on foreign countries to have minimal involvement by the U.S. government and taking steps to minimize American corporate assistance to foreign governments that implement censorship. According to Lloyd (2008), censorship can be defeated from within the countries that practice censorship if technology to do so is available.

Because the United States is a relatively open society, it typically sees diverse courses of action operating in a dichotomous fashion. For example, an American firm

such as Google or Yahoo may aid foreign censorship interests by sharing security codes or blocking certain materials (Giles, 2009). Other firms such as McAfee serve as technology providers to countries that employ extensive censorship, as is the case with the UAE (Open Net Initiative, 2009b). Some in the United States take the position of Lloyd (2008) and support the use of United States soft power to effect a major societal change in other countries by supporting opposition movements to repressive regimes.

Senator Specter (2009) has advocated for a free Web, using American soft power as a means to influence and facilitate regime change in Iran and the spread of liberal democracy in general. Senator Specter commented on the opposition movement in Iran using YouTube, Twitter, and Facebook to report from inside Iran during the summer 2009 political upheaval (Specter, 2009). Twitter, is an example of unblocked social media used as a real-time channel, by the political opposition, to report on the political unrest that took place in Iran (Specter, 2009).

Twitter technology, had originally been embraced mostly by IT professionals; however, acceptance has now spilled over to communications, media, and marketing professionals (Hazley, 2009). As of August 2009, G. Hazley of O'Dwyer's PR Report reported that the UAE led the GCC and the MENA region in early adopters of the use of Twitter in the Middle East, and overall, the UAE claimed 60% of the total number of users in the six GCC states of the Gulf region (Hazley, 2009). Twitter experienced 261% growth in the number of Middle Eastern and African users during the second quarter of 2009, compared to 100% the first quarter and only 25% growth for quarter four of the previous year.

## Network Security Threat Characterization

A graphic model attributable to Stein and Culkin (2008) was located on a teaching website that explained Internet transmission architecture, depicting the seven-layer OSI model. This model explained which Internet and data-handling activities take place at each layer. Some of the network security models used DPI at level 3, which is session level or higher. What is most threatening to privacy advocates is using DPI at the presentation and application layers (Hanff, 2008). The examination of a communication's content can identify threat signatures and applications that might contain malware (Artan, 2007; Martellaro, 2008). To employ DPI to protect against cybercrime, Dickinson (2005) recommended a combination of three capabilities offered by DPI: (a) a self-learning heuristic filter, (b) behavior analysis that downloads suspected viruses and simulates running them on end users' computers, and (c) the acquisition of data using traffic analysis.

Yu's (2007) dissertation focused on network security threats that DPI can defeat. Beginning with the preemptive detection of worms and viruses, Yu presented DPI processing algorithms that scan the entire data transmission packet. Technologies presented in Yu's dissertation could detect network intrusion and facilitated high-speed firewalls, network address translation, hypertext-transfer protocol load balancing, XML processing, and TCP offloading (Yu, 2007). Allot Communications (2007), a DPI vendor, identified in a white paper how DPI can inspect every byte in a packet of data that passes through the DPI device, making it effective for detecting malware in data transmissions. Fidelis Security Systems (2011) offers a packet-sessionizing package focusing primarily on security applications, including patching of legacy systems.

The experience of the United States and South Korea with the slammer worm in January 2003 taught the UAE an important lesson about protecting its ICT sector. The slammer worm reportedly infected 75,000 hosts within 10 minutes of activation, causing \$1 billion in damages in the first 5 days. Victims included Bank of America and Washington Mutual ATMs; Continental Airlines, whose computer system malfunctioned, causing extensive delays; and Seattle's 911 service failure. The slammer worm caused most of South Korea's Internet service to fail for hours (Yu, 2007).

The Stuxnet worm and similar malware is a threat to the UAE, as it is to most countries. A Stuxnet worm attacks by attaching to factory and infrastructure control devices manufactured by Siemens for supervisory control and data acquisition, such as those at nuclear power plants, causing them to malfunction (Pletts, 2010). Stuxnet, it is rumored originated in a government-sponsored lab. One theory explained that the United States or Israel—in a state-sponsored attack—targeted Iranian nuclear facilities (Benson, 2010; "Cyber warfare," 2010). Sixty percent of the World's Stuxnet worm infestations have occurred in Iran, where the worm has attached itself to infrastructure micro-control devices called PLCs (Benson, 2010; Titterington, 2010). K. Maskell, of Kaspersky Labs illustrates the threat (cited in "Cyber warfare," 2010):

With the kind of serious threats you are seeing today, which Stuxnet represents, it's even more critical to have a malware strategy, because these are malware and they are driven by malware. If you have a good security system in place then you have the foundation. (p. 1)

As with all national security threats, UAE companies, and the government need to be prepared for the worst.

Several relevant privacy issues came out of published interviews held by Knowledge@Wharton with Matwyshyn et al. (2010). Matwyshyn is a legal expert on privacy who highlighted the disparity in extradition laws worldwide, given the wide geospatial distribution of criminals. For example, what is illegal in one country may not be against the law in another. This is particularly true of countries with a poorly developed legal system. This opens the door to issues of extraterritoriality from stronger states. Hackers with impunity, because they were physically located outside the United States, illustrated how the harmonization of laws worldwide is incomplete when they compromised the job-seeker database at Monster.com. A good example from this case is that in the United States alone, 45 states, the District of Columbia, Puerto Rico, and the U. S. Virgin Islands all have differing legislation in place to require customer notification of a data breach, yet there is no harmonization (Matwyshyn et al., 2010).

According to Giles (2009), child protection is one area where censors in the West and Middle East seem to form a consensus-of-opinion. Slaughter-Dafoe discussed the weaknesses in protecting children and minors, vis-à-vis Facebook, and legislation such as the Child Online Protection Act of 1998, which is inadequate because it states what can, and cannot be done; however, the actual outcomes cannot be measured (Matwyshyn et al., 2010). Matwyshyn et al. (2010) commented that a 13-year-old might be more technologically adept than their parents might be. Major Al Hajiri claimed that Dubai police cybercrime department has stopped children and teenagers from hacking other people's computers and from using information and pictures to manipulate or harm the victim (Najami, 2009). Although Hajiri appeared to be posturing for the media, the report supports the claims of Giles (2009) and Matwyshyn et al. (2010).



Paya recommended a top-down process, an organizational culture of security, and mandated information security training for employees as ways to compensate against financial data security breaches (Matwyshyn et al., 2010). Matwyshyn et al. (2010) claimed that not enough key employees know where data are stored; as such, a team approach to top-level data security is necessary. According to Slaughter-Defoe (Matwyshyn et al., 2010), organic knowledge of the data systems by key employees is, integral to performing the security role—so important that it is a state-level security issue to protect families as well. Paya claimed that the security problem is so pervasive and the Internet so ubiquitous that the strategic hedging of risk is mandated (Matwyshyn et al., 2010). Snider (2008) also highlighted the relative inability of the government to protect consumers from online fraud.

Z. Chen and Ji (2005) provided two mathematical models of malware propagation that can approximate the total size of a malware infection. In the study, both the independent and Markov models were spatially superior to previous models; the authors' Markov model had greater accuracy than the independent model. According to Sellke, Shroff, and Bagchi (2008), computer worms are self-propagating computer codes that adversely affect the Internet by sending out multiple scans emanating from infected computers that consume network bandwidth. Reddy and Reddy (2009) realized that viruses and malware are costly in terms of lost productivity. Reddy and Reddy (2009) also created a peer-reviewed model, which they tested via a simulation, to model the spread of malware in Wi-Fi networks.

Modeling the propagation pattern, as well as whether the spread of a worm is likely to cease or continue to expand, was presented as a necessity by Sellke et al. (2008),

who proposed an automatic worm containment scheme, that effectively contained both uniform scanning worms and local preference scanning worms. Their containment method is effective and non-intrusive. Simulations and real trace data validated the method (Sellke et al., 2008). Sellke et al. (2008) then developed an implementation plan to employ the strategy. Reddy and Reddy's (2009) model and simulation identified the following parameters that come into effect during a viral attack: (a) replication rate of email worms, (b) mail checking frequency, and (c) the effect of firewalls. Reddy and Reddy (2009) also demonstrated through inductive reasoning that, although basic firewalls systems using DPI were desirable, after a certain point, expensive anti-virus software was not cost effective in preventing viral infections.

C. Chen (2005) noted, "Malware is a broad term including computer viruses, worms, Trojan horses, rootkits, spyware, adware, and other forms of unwanted software which intend to harm the efficiency of systems" (p. 5). According to Dickinson (2005), the worm is a virus variant that replicates itself in such a way that a computer's disk and memory resources—or a network's bandwidth—became overloaded. Such activity would inevitably bring the system or network down. Dickinson (2005) defined a computer virus as:

Software used to infect a computer, commonly implemented within a program that purports to do something else. The virus code is given a signal to execute the payload, which, activates and attaches copies of itself to other programs in the system. When a virally infected program is run, it copies the virus to other programs. The effect of a virus may range from literally nothing, to a practical joke or simple prank, on up to total destruction of all data on the infected

computer. Sometimes viruses are written to delay their destructive force until a specified date. (p. 29)

Dickinson (2005) also defined another security threat—namely, the Trojan:

Trojans are similar to viruses except that they do not replicate themselves. A Trojan appears to be a legitimate program, but when it is run, it performs some illicit activity, such as locating the system password or making the system more vulnerable to a future action by another program. One form of Trojan used by spammers creates an email server on the target computer that is later used to send large numbers of spam messages. (p. 30)

Alkarobi (2007) explained the workings of firewalls and first recommended using a stateless firewall that would block user datagram protocol (UDP), which is a faster way to evaluate possible unwanted noisy communications traffic, including streaming video, online gaming, and VoIP. In addition, and in conjunction with the stateless firewall, Alkarobi (2007) recommended employing a stateful firewall that monitored transmission control protocol (TCP) permissions and data strings, which used technology that could distinguish and evaluate attribute specific communications. Furthermore, Alkarobi (2007) recommended using the deep packet inspection engine as an intrusion prevention system (IPS), although filtering at the application layer is difficult and consumes throughput capability. Ultimately, the system remains vulnerable to Internet protocol (IP) tunneling (Alkarobi, 2007).

Encryption technology, used by operators such as Skype, as well as obfuscation technology used by eMule, Hotspot Shield, and BitTorrent can frustrate the use of DPI (Allot Communications, 2007). B. Schneier, an Internet security expert, was highly

critical of the world's first quantum key distribution encryption application. The initial deployment of the quantum key system occurred in Austria during the week of October 6, 2008 (Thomson, 2008). Schneier reported quantum key distribution as a security system vulnerable to compromise. Although the physics-based system is theoretically secure, a conventional and less secure mathematical algorithm, discoverable using DPI, is required at each end of the transmission (Thomson, 2008).

### **DPI Deployment Against Distributed Computing Threats**

This section explains some of the technical issues surrounding the deployment of a DPI system, such as compensating for the reduction of system throughput when deeper firewalls are employed (Alkarobi, 2007). The section focused on four implementation strategies that elevate DPIs' capability in dealing with a distributed computing threat. The solution recommended by Martellaro (2008) used advanced computing capacity to collate data and so detect malware. Others, such as Raahemi et al. (2007), proposed shallow-layer data mining to first, model peer communities. Then they prescribed the use of a decision tree algorithm, one specified by the service provider, to screen for threats. Schafer, Malinka, and Hanacek (2009) advocated the use of a covert DPI listening device that identified users working together to initiate an attack. Merz et al. (2009) offered a cost-effective, super-peer management system, distributing the Internet policing functions to super-peers, who would serve as gatekeepers. This was similar to Chiang's (2007) efficient distributed computing solution. Yu (2007) examined a proposal to implement elevated software standards for highly capable hardware systems used to deploy DPI.

Martellaro (2008) promoted achieving greater DPI device throughput by implementing a hardware intensive solution, using the best available, state-of-the-art

computing hardware. Martellaro, wanted to use the IBM Broadband Cell processor, to group related packets together, even if they arrived out of order, helping to detect malicious software hidden across several packets. Such cross-packet inspection helps defeat distributed malware applications. Martellaro (2008) held that some malware arrived distributed through multiple data packets, and proposed technology to enhance DPI's ability to detect this type of attack, by using an IBM computer chip as a preprocessor to collate the data. The next step is to scan the collated data collectively for the presence of malware. Martellaro (2008) was able to obtain single-unit processing rates ranging from three Gbs (gigabytes per second) to 20 Gbs. Martellaro (2008) recommended using multiple pre-processor units in parallel to achieve the desired throughput.

Raahemi et al. (2007) claimed that peer-to-peer network traffic consumes as much as 70% of the broadband services' available bandwidth. Whereas Martellaro (2008) used the inherent capacity of the computer chip, Raahemi et al. (2007) advocated a different approach, proposing a data-mining technique at the IP layer using a modeling approach to enable the classification of peer-to-peer traffic and detection of communities of peers. These researchers accomplished their objective through the inclusion of two specific attributes in the data model. Raahemi et al, (2007) proposed using decision tree analysis at the Internet service provider level, and that the algorithm needed to be periodically fine-tuned to ensure that it is fair and accurately deployed. The purported advantage of this particular system is that all detection occurs at the IP layer while privacy intrusion at the deeper levels never occurs, making this technology appealing in privacy sensitive societies (Raahemi et al., 2007).

Schafer et al. (2009) also considered the problems posed by distributed computing. Their report dealt with inherent risks specific to decentralized peer-to-peer network security problems. Risks investigated included attacks on servers initiated by malware, viruses, and combined attacks, and those emanating from peer-to-peer networks. The researchers advocated modeling as a way to view and understand the threat. They recommended a DPI application called P2P Network DirectConnect++, a listening device that investigates the bit-torrent stream to see who is sharing what information with whom, as attacks from distributed networks, tend to be carried-out by only a few individuals, working in concert (Schafer et al., 2009).

Merz et al. (2009) recommended a super-peer managed reputational-based system to combat selfish participants and free-riders. The designated super-peers of the system are network servers that manage the edge peers, which are those units able to add additional distributed computing resources (Merz et al., 2009). Entry into the peer network was determined based on prior feedback, and the reputation of the peer-computing resources under consideration, for inclusion in the network (Merz et al., 2009). Chiang (2007) recommended a similar plan to construct a virtual organization using a grid-computing model. Grid security members provide security in a distributed fashion using X.509 architecture to those requesting security. Compared to a super-computer, distributed computing is a more efficient way to utilize available computing resources (Chiang, 2007; Merz et al., 2009).

Whereas Martellaro (2008) recommended advanced hardware, Yu's (2007) qualitative dissertation focused on highlighting the way that elevating software capabilities was a better method to implement DPI. The primary thrust was on presenting

workable DPI processing algorithms that scan the entire data transmission packet (Yu, 2007). The topic focused on how to effectively implement and use the technology. Technologies presented addressed network intrusion detection, high-speed firewalls, network address translation, hypertext-transfer protocol-load balancing, extensible markup language processing, and transmission control protocol offloading (Yu, 2007).

### **Encryption and Security Protocols**

This section discusses advantages and disadvantages of five methods used in encryption and security protocols as privacy preservation strategies. Bhargav-Spantzel (2007) advocated a three-level digital identity. Chiang (2007) advocated quantum key distribution technology. However, Internet security expert Bruce Schneier (Thomson, 2008) criticized the use of quantum key technology to secure a transmission. The security limitation noted by Schneier (2008) is the use of a breachable technology as a gateway, on either end of a secure transmission, thereby making the transmission subject to DPI listening devices. Smit (2006) argued for a privacy protocol-based system. Meanwhile, Vangala and Sasi (2004) recommended biometric-based systems such as Iris scans, which—while unique—remain deficient as they are a secret-based system.

An investigation of privacy profiles conducted by Bhargav-Spantzel (2007) used a qualitative study of protocols and systems for the privacy preserving protection of a digital identity. Bhargav-Spantzel (2007) addressed digital identity security on three levels. Protocols recommended for multifactor identity verification included (a) biometric and history based identifiers under the zero-knowledge proof of knowledge (ZKPK) protocol utilizing multiple secrets, (b) the use of algorithms to generate biometric keys from the individual's biometric images, and (c) protocols to manage

transaction history records including those stored on portable devices such as mobile phones (Bhargav-Spantzel, 2007).

Chiang (2007) examined the feasibility of using a secure public key infrastructure with quantum key distributions in grid computing. King (2008) recognized the public key infrastructure (PKI) approach as being a widespread, yet deficient technology for security purposes. Security coding using quantum key distribution technology is an upgraded measure over public key distribution, the current standard (Chiang, 2007). Thus, Chiang (2007) focused on addressing network security vulnerability and Web services security standards to improve PKI.

King (2008) studied the awareness, perceptions, and understanding of Internet users, vis-à-vis online privacy, and the promise of security provided by Internet digital certificates. King (2008) used statistical analysis of socioeconomic constructs to measure awareness, understanding, perception of privacy concern, and Internet experience. The author suggested that the Internet experience of the user held the greatest significance in relation to the other constructs (King, 2008).

Snider's (2008) qualitative phenomenological dissertation investigated the propensity of online consumers on their willingness to self-regulate themselves as a way to combat Internet fraud. The work of Snider (2008) in part supported King's (2008) assertion of the importance of user experience in combating fraud. Snider (2008) found self-regulation to be an acceptable means for fraud prevention, although many consumers felt they lacked the necessary skills and resources to be effective.

Smit (2006) presented a framework and methodology to detect privacy infractions in e-commerce software applications and to manage an enterprise's privacy policy. For



security creation and compliance, Smit (2006) took a systems thinking approach, and based the focus of the study on the firm's interaction with its internal and external environment. Factors included internal verification, external regulations, and consumer preferences (Smit, 2006). However, Hwang's (2008) quantitative dissertation investigated—and supported—the claim that 95% of individuals are reluctant to provide personal data to websites because of a lack of trust in those collecting the data. Hwang (2008) investigated the ineffectiveness of privacy and security signaling regimes used by e-commerce websites, thus affecting customer behavior and not building trust.

By applying the proposed framework to an existing e-commerce software application, Smit (2006) validated his model. A sample protocol-based privacy policy was the outcome of the study, and Smit procedurally specified a means to deal with privacy infractions in the policy. However, a study by No (2007) quantitatively investigated aspects of Internet-related privacy policy disclosures and found a statistically supported gap between individual and firm preferences.

Procedural security noncompliance by individuals under Smit's (2006) regime triggered either as a stoppage in workflow or by generating a report and notifying an administrator. Meanwhile, Hwang's (2008) survey results showed that sites merely having privacy/security links and privacy/security statements had a positive effect on building customer trust and could help fuel e-commerce purchase intentions, whereas links to third-party security providers do not.

Vangala and Sasi (2004) recommended a web-based security authentication architecture, using encrypted iris patterns as a unique identifying characteristic. The authors proposed an iris image or scan as a secure means to conduct e-commerce

transactions. Identity theft and false identification is a major security issue in e-commerce. Iris patterns are ideal because they are unique to each individual (Vangala & Sasi, 2004). Hemery, Mahier, Pasquet, and Rosenberger (2008) also advocated a morphology-based approach for use in the banking sector, based, however, on face recognition. The technology required more development due to perturbations in facial expressions, which produced recognition accuracy rates ranging from 41.63% to 97.68%.

As Paya discussed, the legacy design problems of nearly all privacy-based systems is that they all rest on the disclosure of secrets (Matwyshyn et al., 2010). Iris scans, as are facial patterns, legacy designs, and therefore secret-based systems just as are passwords and secret questions. Unique iris scan data, once disclosed—can be hijacked and interjected into the system by criminal hackers in a manner of malicious intent (Matwyshyn et al., 2010).

S. Guo (2007) conducted a quantitative study examining the tradeoff between the data utility afforded by data mining versus that of privacy preservation. An important factor was the risk of disclosing any information at all due to the accurate capabilities of data mining to separate noise from relevant data (S. Guo, 2007). In retrospect, S. Guo's (2007) position of individual's perceived risk of data disclosure, achieved validation with by Hwang's (2008) study, revealing customer reluctance to reveal any personal information.

S. Guo (2007) used statistical and enumerative analysis theoretically to examine malware attacks. S. Guo's (2007) based their practical inquiry on simulated attacks. The additive noise-based model, along with, the projection-based model, were both tested using proven privacy-breaching technology (S. Guo, 2007). S. Guo (2007) employed two

attack methods to breach the systems: data reconstruction, using spectral filtering, additive-noise where greater noise is more likely to obscure data reconstruction, and *a priori* knowledge-based independent component analysis (ICA), where a small subset of known correct data extrapolated through perturbation, achieved a high degree of data reconstruction. S. Guo's (2007) method performed attacks under different scenarios, and both methods tested proved effective against all projection-based models.

Blei's (2009) video lecture illustrated how latent Dirichlet allocation (LDA) which is a form of machine learning, salient to implementing deep packet inspection, functions in data mining to exploit information gathering from large electronic archives. The process is to search for thematically related words or qualia in a prior document. Implementation of the model yields a distributional probability of seeing a given topic out of possible topics assignments related to simultaneously observing a given word or qualia, given a particular topic. Thus, the Dirichlet is a joint distributional mixed membership model, to fulfill an approximate posterior inference.

Birrer, Raines, Baldwin, Oxley, and Rogers (2008) proposed using such qualia-based systems to identify malicious codes, as static predefined signatures and anomaly-based thresholds failed to account for hierarchical and contextualized messages operating at different levels of the transmission. According to Birrer et al. (2008), it was becoming increasingly necessary to employ inspection at multiple packet layers to defeat metamorphic malware, which is evolutionary in scope. The significance of the results of S. Guo (2007) and Birrer et al. (2008) were to validate Paya's concern with all legacy-based privacy disclosure systems (Matwyshyn et al., 2010). In addition, S. Guo (2007)

validated Li's (2007) work, identifying that qualitative psychological and social factors can contribute to situational contexts, where privacy can be compromised.

### **Support for Constructs**

Structural equation modeling (SEM) can facilitate verification of the constructs for inclusion in the model. Factor analysis is a statistical method used in SEM to find a small set of unobserved or latent variables that can account for the covariance manifested in a larger set of observed variables (Albright & Park, 2009). Material support for DPI constructs examined for variable definitions in the DPAM model aims to explain DPI adoption in the UAE. The purpose of this part of the review is to provide either evidence of the internal validity of the constructs, or evidence of a cause and effect relationship between the DPI constructs and adoption of the DPI technology. This section also explored and assessed content validity—namely, whether the variables selected could accurately measure DPI constructs (Trochim & Donnelly, 2008). The Burros Institute of Mental Measurements (2009) was not a source of relevant instruments to measure DPI and it was necessary to develop first a model, and then a customized instrument.

Albright and Park (2009) described the use of factor analysis and SEM to verify constructs for inclusion in a model. Their description of quantitative methods illustrated how this particular study on DPI, with only six independent variables and one dependent variable, is a simple model. The study is related to principle component analysis, where intention to use DPI is a principle component from the weighted linear combination of observed variables. The method described can handle ordinal data (Albright & Park, 2009). In his *Overview of Factor Analysis*, and with further support from Widaman and Thompson (2003), DeCoster (2009) stated that the objective of confirmatory factor

analysis was the fitting of a predetermined model to an observed set of data. The adequacy of the model can be evaluated dependent upon the fitting of data to the model (DeCoster, 1998).

According to Mamahlodi (2006), “The chi-square statistic is a nonparametric statistical technique used to determine if a distribution of observed frequencies differs from the theoretical expected frequencies” (para. 1). Nominal and ordinal data are usable with chi-square statistics, which use frequencies rather than the means and variances used with ANOVA (Mamahlodi, 2006; Field, 2009). According to DeCoster (1998), the most common test used to test the adequacy of a model is the  $\chi^2$  or chi-square goodness-of-fit test. In comparing any model to the null-model, the chi-square is sensitive to sample size, while the Tucker-Lewis index is less sensitive to sample size (DeCoster, 1998). In comparison with earlier intermediate statistics tests such as Aczel and Sounderpandian (2002), the Field (2009) text elaborates more on factor analysis.

Karmel and Jain (1997) addressed integrating characteristics of populations used with model development and random sampling in the context of sampling design and the necessity to use available information to produce an accurate estimate of a given populations’ parameters. Karmel and Jain (1997) supported purposive stratification by strata size, systematic selection, and ratio estimation particularly in the country and industry-wide study of capital expenditure in manufacturing in Australia. The study of Karmel and Jain (1997) was useful, as purposive sampling schemes of a model-based sampling design are optimal and efficient in cases of large-scale national, organizational, and industry-based studies. Bernard (2002) further supported these findings by stating

that the built-in bias contributed to the proficiency of this method by improving reliability through the selection of competent participants.

Methodologically, the quantitative study of S. K. Rose (2009) illustrated the use of an ANOVA-based analysis. S. K. Rose was also a source for demonstrating the validity of the purposive sampling regime, which is an aspect of the proposed DPI study. S. K. Rose studied emotional intelligence (EI) in IT professionals versus professionals in other job categories. The methodology of S. K. Rose (2009) employed a comparison of means and variances using ANOVA, as well as factor correlation between EI and years of IT experience, using regression in a non-experimental study. S. K. Rose employed the emotional intelligence appraisal (EIA), validated as an instrument by Bradbury and Greaves (2002) through the use of exploratory factor analysis with varimax rotation and the Kaiser test for normality (S. K. Rose, 2009). However, the work was a non-experimental study, in contrast to this DPI modeling study, which has the quasi-experimental feature of random selection of participants from a purposively selected population and geographic stratification.

Boomsma (2000), Sakiz (2007) and Wu, Tsai, and Chen (2008) all demonstrated the use of SEM in an educational setting to measure variables such as self-efficacy, attitudes, and behaviors. Boomsma (2000) presented a method for effective reporting of these types of quantitative results. Sakiz (2007) employed two pilot studies using students as part of model development and subsequently, through quantitative evidence, showed the importance of psychological factors. Parallels drawn between the studies of Sakiz (2007), who worked with students to validate an instrument, align with the action research methodology in educational research described by E. Brown (2000). Pham and

Jordan (2009) looked at the effect of IT capabilities within the organization to determine whether they could somehow affect organization performance. The authors found that the IT capability of human resources was extremely important. Wu et al. (2008) integrated the expectation/confirmation model (ECM), which has been validated in marketing and IS with Compeau and Higgins's (1995) CSE, to study 187 management information systems (MIS) students' continued use of online technology. Wu et al. (2006) concluded, "A well-designed system might reduce learners' frustration and attract them to continue using the system" (p. 8).

Cavaleri (2005) presented a pragmatic active learning model for understanding and improving complex situations, as well as the interdependencies of stakeholders, in work that fell within the body of knowledge known as systems thinking. The work of Morgan (1998), one of the seminal theorists of modern system thinking, cumulatively identified early contributors, such as Trist and Bamforth (1940s-1950s), Burns and Stalker (1950s), Lawrence and Lorsch (1960s), and Kast and Rosenzweig (1970s), synthesizing the earlier contributions to his modern perspective of systems thinking. Morgan's perspective is that systems have varying degrees of organistically interdependent behavior ranging from machine like to fully organic. In contrast, Hayles's (1999) post-modernist perspective of human-machine interactions is one of a union of humankind and machine giving rise to cyborgs. Regardless of which approach is favored, systems thinking is an ideal way to view organic/machine interaction problems. The systems model works particularly well in situations with multiple stakeholders, characterized by a blurring between the internal systems, and external systems, and featuring the existence of a complex exchange-relationship pattern among system

members (Cavaleri, 2005). Cavaleri (2005) and Trochim (2006) claimed that the systems thinking perspective is a paradigm suitable for creating new knowledge.

Illustrative of the complexities of the real world, Ajbali (2009) defined the major cybercrime problem of the UAE, highlighting that the UAE is second only to Saudi Arabia in computer crashes, with 248,000 in the first 9 months of 2009. An update to this statistic, was that computer crashes attributable to cybercrime and malware, was up for 2010 over 2009 by 33% ("Middle East," 2010). The greatest problem quantified was in the financial sector with the theft of passwords and credit card numbers. News agencies are also vulnerable to this threat. For example, Dubai-based Al Arabiya News channel's servers, based out of the region in the United States, had their domain name hacked (Najami, 2009). The Al Arabiya website came under attack by hackers who claimed that the website favored Sunni over Shiite Muslims, forcing the site to shut down in October and November 2008, until the attack could be resolved (Najami, 2009).

In an early study of technology adoption in Saudi Arabia, Al-Khaldi and Wallace (1999) found a lack of studies conducted in the Arab world; consequently, they found very little data available about internet adoption for Saudi Arabia. Accordingly, and in comparison to industrialized countries, the Saudi users were not fully aware of the effect that technology may have on their economy (Al-Khaldi & Wallace, 1999). Al-Khaldi and Wallace tested the attitudes of 200 knowledge workers in Saudi Arabia toward personal computers and concluded that intention, attitude, social norms, habits, and expectations guided Saudi technological actions. As one of the earliest evaluations of the adoption of modern computer technology in the Arab world, the study revealed the ICT learning curve for the Saudis, how Saudis perceived benefits to the technology, and that



they were pleased with it. The line of enquiry by Al-Khaldi and Wallace (1999) was similar to that of the Canadian study of knowledge workers by Compeau and Higgins (1995). The subjects in the earlier study from Canada were concerned with the long-term effects of the technology and its complexity (Compeau & Higgins, 1995), whereas with Saudis, education, culture, and previous experience with computers were important (Al-Khaldi & Wallace, 1999).

Ajzen (1991, 2002), and Ajzen and Fishbein (1975, 1980) investigated human behavior through the lens of several theories. Consequently, Ajzen and Fishbein advanced two theories applicable to technology adoption: the theory of reasoned action (TRA) and the theory of planned behavior (TPB). These are important theories that highlight the necessary connection between the independent variables that help define behavior towards intention to use technology, such as DPI. Their work also touched on the concept of the subjective norm, which was defined as “an individual’s perception of whether people important to the individual think the behavior is acceptable or not” (Ajzen & Fishbein, 1980, p. 22).

The technology acceptance model (TAM) developed by Davis (1989), is an evolution of TRA and TPB, who researched TAM further with Bagozzi and Warshaw (Davis, Bagozzi, & Warshaw, 1989, 1992) to examine how CSE influences ICT adoption. These theoretical technology adoption models, and the studies that produced them, are widely cited in research works of others, such as these CSE studies from Malaysia, another predominantly Muslim culture (Ghobakhloo et al., 2010; Sam et al., 2005). Davis and Venkatesh (2000) extended the TAM model to include e-commerce adoption, including evidence that CSE and e-commerce adoption were separate

constructs within their proposed model. Davis (1989) also provided linked PEOU to technology and defined it as “the degree to which a person believes that using a particular technology would be free of effort” (p. 320). According to Downey (2006), self-efficacy does not measure skill; instead, it is a measure of personally perceived capabilities about one’s own self with regard to being able to use a given technology.

Hayashi et al. (2004) also studied the role of CSE, using a similar mode of inquiry as the method proposed for this study of DPI adoption. By aligning the proposed DPI study to previous studies that have already used CFA to test a similar model, methodologically, the research achieved seminal support. Hayashi’s (2004) main theoretical reference was to Davis’s seminal (1989) work on developing TAM, which is a behavioral model, as well as Lederer et al. (2000). Kim and Kim (2005) supported Hayashi (2004) methodologically and theoretically. These studies described measures of survey instrument validation that covered CSE, attitudes toward use, and intended use of technology, such as the variables proposed for this DPI study.

Additional key concepts for understanding technology adoption, such as PU and PEOU, along with TAM, were explained in Compeau and Higgins (1995), Kim and Kim (2005), Lederer et al. (2000), Sagi et al. (2004), R. Thompson et al. (2006), and Van Slyke et al. (2004). The TAM 2 model suggested external variables related to both cultural factors rooted in subjective norms, and esteem-related factors such as self-image, job relevance, output quality, and result demonstrability (Venkatesh & Davis, 2000). A parallel study by Venkatesh and Morris (2000) delineated the influence of gender and selective norm related to culture on perceived usefulness, which was a greater factor for men, and ease of use, which was a greater factor for women.

Meta analyses, conducted by Yousafzai, Foxall, and Pallister (2007), and also Beatty, Reay, Dick, and Miller (2011), on TAM related studies, identified online trust, as a separate construct from trust rooted in cultural affinity, as described by Yousafzai et al. (2007), and in social processes as they existed in community formats for Beatty et al. (2011). Beatty et al. (2011) explained that relational trust granted between different individuals, and general trust, which, applied toward peoples view of society in general, were separate constructs in empirical studies, such as Yousafzai, Pallister and Foxall (2005) examining online trust.

Yousafzai et al. (2007) identified Davis's argument of not using any moderating variables in TAM based studies. However, both Beatty et al. (2011) and Yousafzai (2007) clearly identified variables from other empirical studies with workable variables external to TAM. Thus, the perspective of Beatty et al. (2011) toward trust as a sociocultural construct, aligned with Verweij's (2005) comparison of social capital theory and cultural theory.

Thompson (2010) tested an extended TAM using individual and organizational factors applied through a structural equation model and sampled 428 public sector workers in Jamaica. The research by Thompson (2010) examined Jamaica's wasteful government spending on IT, plagued by underutilization and non-acceptance of the technology. The research supported the connection of CSE to intention to use IT, through perceived ease of use, and perceived usefulness at the individual user level, mediated by IT tech support. Thompson (2010) substantiated for the Jamaican public sector context— assertions by other researchers, that National culture is an important

influence on adoption and intention to use technology (Chen, Chen, & Kazman, 2007; Gallivan & Sprite, 2005; Lippert & Volkmar, 2007; Rouibah & Hamdy, 2009).

Chuttur (2009) was critical of TAM, claiming that while TAM is a widely cited model, through an assay of several meta-analyses of a range of technology acceptance studies it was difficult to extend perceived usefulness, and perceived ease of use and identify specific reasons for the general findings. Chuttur (2009) suggested that Fishbein and Azjen's (1975) theory of reasoned action (TRA) could be used as the basis for interviewing subjects to develop relevant constructs, and could be used to facilitate deployment employment of Azjen's (1985) theory of planned behavior (TPB). Both TRA and TPB incorporated attitude and subjective norms, while TPB is extends TRA with the addition of perceived behavioral control.

Chuttur (2009) concluded that TAM had attracted greater attention because it was a simpler model to implement than either TRA or TPB. The TAM 2 of Venkatesh and Davis (2000) was essentially TAM, extended with additional behavioral, and subjective norm aspects as antecedents, to perceived usefulness, and intention to use, that enabled improved identification of reasons why individuals found technological systems useful (Chuttur, 2009). Chuttur (2009) observed that TAM research was saturated, and that future research should focus on developing new models derived from TAM by exploiting TAM's strengths such as the models simplicity, and discarding its weaknesses, such as the deficiency of the basic TAM to identify reasons behind a given action toward technology (Chuttur, 2009).

When considering research philosophy, what relevance or salience do such anomalies have for the viewpoint proposed by Kuhn (1996)? From the perspective of

Kuhn (1996), anomalies serve to allow a paradigm to be overturned, or in the case of anomalies, which can be accounted for, can lead to the establishment of a new paradigm, or lend support to existing views. Lakatos (1970) was in philosophical opposition to Kuhn, and contributions to methods and conduct of research Lakatos advocated a behavioral model of science, which tended to explain peoples research behaviors.

A negative heuristic was identified by Lakatos (1970) where research program adherents, defended the program against assaults upon a paradigm's core tenets to the protective outer-belt, consisting of extensions of a research program—the positive heuristic. The status quo of the system, promoted long-term existence for established paradigms, having substantial support in the scientific community (Lakatos, 1970).

Lakatos (1970) critiqued Kuhn's normal science, as only being science that had gained a monopoly. Furthermore, Lakatos (1970) theorized that monopoly theories only gain prominence and exist for a fleeting instance, because people are constantly working with competing paradigms, thus instead promoting a realm of pluralism (Lakatos, 1970).

Hofstede (1980, 1997, 2009) studied global differences in culture and devised a series of cultural dimensions according to which cultures can vary. Hofstede's work on cross-cultural relations ranges from a current Website to a 1980s study of differences in work-related values, to 1997's *Culture and Organizations: Software of Mind*. Bahameed (2008) noted the popularity of Hofstede's work in the information sciences literature and the importance of distinguishing between collective culture, shared within the group and individual level. The applicability of Hofstede's studies (1980, 1997, 2009), across cross-cultural relations, is toward understanding local markets in terms of intermediaries, not by discounting the effect of local culture. Of particular interest for the UAE is the

application of the cultural dimension of uncertainty avoidance, which captures a given culture's degree of trust placed individually in its members while also representing a society's predisposition for having rules and procedures that govern everyday life (Hofstede, 2009). Bahameed (2008) noted the prevalence of trust as a construct in academic literature on information systems, although culture was complex topic and difficult to define.

An important cultural dimension for the study of DPI in the UAE is power distance. This dimension addresses the feelings of powerlessness by the least powerful members of society (Hofstede, 2009). Siddiqui (2008) considered the issue of gender roles, and the structural inequality of Arab society, where men had more rights than women did—a situation captured by Hofstede's (2009) masculinity versus femininity dynamic. However, the results of testing Siddiqui's (2008) model demonstrated that gender was an independent variable with little or no effect on intention to use e-commerce.

Hsu and Chiu (2004) modeled technology adoption, concluding that efficacy with technology and intention to use a technology were predictors of actual use. Hsu and Chiu (2004) argued for the validity of the CSE and perceived usefulness of e-commerce measurement instruments of their surveys taken from their study of Internet self-efficacy and electronic service acceptance. They argued that the use of computers is a consistent correlate with CSE. Their study of 256 MBA students empirically showed that web-specific self-efficacy is a predictor of e-commerce use, and they extended this understanding to self-efficacy in the context of e-commerce services (Hsu & Chiu, 2004).

The Open Net Initiative (ONI) is a think tank affiliated with several academic institutions and organizations, including the Citizen Lab at the Munk Centre for International Studies, University of Toronto; Berkman Center for Internet & Society at Harvard Law School; the Oxford Internet Institute (OII) at the University of Oxford; and the SecDev Group. The principal researchers of the ONI are R. Deibert, J. Palfrey, R. Rohozinski, and J. Zittrain, who in *Access denied: The practice and policy of global internet filtering*, described Internet filtration taking place throughout the world (2008). Their study described topics relevant to the problem of Internet filtration through a collection of articles contributed to by a variety of authors. The topics ranged from the philosophy behind the filtering to the actual technical details and mechanics of implementing and evading filtration regimes. The second half of the book reported on regional and country studies carried out by the ONI, including one on the UAE (Deibert et al., 2008).

Prior to the addition of the SecDev Group, the ONI included the Advanced Network Research Group at the Cambridge Security Programme, University of Cambridge. The ONI organization sent researchers into every country they sought to do a report on to conduct firsthand testing of the extent of web filtering. In the case of the UAE, ONI published a recent report that lists the actual content areas that they found were being filtered (Open Net Initiative, 2009b). ONI revealed the workings and specific applications used to implement the filtration regime. The Telecommunications Regulatory Authority of the UAE, was using SmartFilter by Secure Computing as the national filtration regime. Secure Computing, purchased by McAfee, is now the provider of this software package. The published report of the ONI's investigation of Internet

blocking in the UAE was very useful for identifying constructs usable in an item analysis to define the Internet filtration variable (Open Net Initiative, 2009a).

Siddiqui (2008) studied technology adoption in the UAE, comparing e-commerce adoption with neighboring Saudi Arabia. This quasi-experimental quantitative research was the source of both the validated survey instrument and the predominant structure of the theoretical constructs underlying the DPAM study. It used a very similar study strategy to that proposed for studying intention to use DPI. The constructs identified for use in the model were gender, socio-economic status, computer self-efficacy, attitudes toward e-commerce, perceived usefulness of e-commerce, intention to use e-commerce, and culture, which was an intervening variable (Siddiqui, 2008).

Sagi et al. (2004), who were major contributors to Siddiqui's (2008) survey, developed and validated a 43-question, seven-point Likert-type scale to measure attitudes about e-commerce using CFA. This was done using a sample of  $n = 17$  in the pilot study and  $n = 195$  business college students from Greece, the United Kingdom, and the United States for the main portion of the study (Sagi et al., 2004). This work was refined further by Kim and Kim (2005), who using  $n = 218$  and factor analysis, also used a seven-point Likert-type scale ranging from strongly disagree to strongly agree. The earlier study of Kim and Kim (2005) updated and published later, by Kim et al. (2009) had resurfaced as a journal article, and contained CSE questions salient to e-commerce.

The validation of the questions that measure CSE is also in work related to an instrument developed and validated by Lederer, Maupin, Sena, and Zhuang (1998). Lederer et al. (1998) performed a multiple regression study on convenience samples of email surveys returned by 5% of workers who used the web for their job. Hayashi et al.



(2004) used Compeau and Higgins's (1995) validated scale for CSE, blended with expectation-confirmation models on a sample size of  $n = 110$  business majors at two accredited colleges using CFA and MLM. Yi and Hwang (2003) surveyed 109 male and female students, in an experiment to prove an augmented TAM model. Ultimately, it was the more current evolutions of these studies—as they arose first in Kim and Kim (2005) and later in Kim et al. (2009), both of which investigated online self-efficacy, and R. Thompson et al. (2006), which measured self-efficacy through self-perceived ease of use—that seemed to align most closely with the source of the CSE component.

Siddiqui (2008) found intention to use e-commerce was higher in the UAE than Saudi Arabia. In both countries, PU of e-commerce, CSE, and attitudes toward IT had a greater correlation than gender, which was inconsistent with what the author expected to find, and the socio-economic (SES) and culture variables, had low reliability scores (Siddiqui, 2008). The socio-economic variable, which is based mostly on demographic factors and less on attitudes and behavior, did not carry the same significance in e-commerce adoption for the Arab world as it did in studies from other cultures in work by Dutton, Rogers, and Jun (1987); Bozionelos (2004); Hassani (2006); and Tien and Fu (2008).

The SES construct of Siddiqui's (2008) study yielded data not arrayed in a Likert-type format and only collected categorically. The data type was inconsistent with the other measures, all of which collected a minimum of ordinal-level data. Data incompatibility was one reason not to carry SES forward into the new study. Using the criteria of face validity, the culture variable appears to represent societal trust. Siddiqui's (2008) outcomes did not align closely with other studies on e-commerce, where culture

and trust played a significant role (Kim & Kim, 2005; Sagi et al., 2004; Van Slyke et al., 2004; Van Slyke et al., 2010).

Ball (2008) investigated three constructs using MLR and OLR for inclusion in a model to predict the behavioral intention of instructors to employ a new technology in the classroom. Only CSE showed a strong correlation, while computer anxiety and experience using technology were not significant predictors (Ball, 2008). Ball's (2008) study measured CSE using the 10-item CSE instrument developed by Compeau and Higgins (1995). This instrument has been widely used in IS research according to Aboelmaged (2010), and Hasan (2006). Compeau and Higgins (1995) achieved a reliability estimate of .80 for their instrument, which demonstrated that the instrument was reliable. Aboelmaged's (2010) analysis of the data provided evidence of the validity of the CSE construct and followed a similar strategy to Hasan (2006). Compeau and Higgins' (1995) CSE survey polled the respondents as to how confident they were with completing a job with an unfamiliar software package under varied conditions. The original instrument developed by Compeau and Higgins (1995) used a 10-point Likert-type scale.

Moon and Kim (2001), and Tan and Chung (2005), both tested extended versions of TAM based on the approach of Compeau and Higgins (1995), that included the construct of extrinsic motivation. Moon and Kim (2001) seeking to validate perceived playfulness substantiated that CSE was an important determinant of actual use in an online information search context while Tan and Kim (2005) connected perceived usefulness and perceived ease of use affecting attitude toward using internet search technology, which in turn encouraged actual use. In a corollary study, Singletary,

Akbulut, and Houston (2002) compiled an instrument from seven separate sources, piloted it to establish validity and reliability, and investigated “identifying and understanding highly motivated individuals who expand their software use in new and unanticipated ways” (p. 655). Sam et al. (2005), working Malaysia, connected attitude toward Internet use with motivation to use the technology.

Chu (2003) investigated the effects of web page design on improving instructors’ pre-service ability. Although some have used a 10-point scale and others a 7-point scale for their surveys, Chu adapted the original scale to a five-point Likert-type scale. Responses ranged from one (strongly disagree) to five (strongly agree). Chu’s (2003) 5-point scale was both reliable and valid for measuring CSE. Chu (2003) achieved a Cronbach’s alpha of over .70 for both pre- and post-test. Ball (2008) followed the method used by Chu (2003), using a 5-point Likert-type scale for the 10 CSE items. DeYoung and Spence (2004) utilized a 5-point Likert-type scale, for their 95 question TPI, and assessed attitudes toward information technology. These studies show that researchers have successfully used the 5-point, Likert-type scale instead of similar scales using a greater range of Likert-type responses.

I. Brown and Jayakody (2008) carried out a test that validated a seven-factor e-commerce model that included perceived usefulness and trust. The researchers compiled measures from four different validated instruments. A pilot study of 10 information systems master’s degree students helped researchers uncover ambiguity in the survey questions prior to collecting convenience data from 166 South African students from the University of Cape Town who were users of e-commerce (I. Brown & Jayakody, 2008). One drawback noted was the lack of a statistical power analysis. Jegede (2007) used

multiple regression and spearman correlation to study 218 teachers in southwestern Nigeria, concluding,

that self-efficacy is a critical and potent factor in determining attitudes sub scores towards computers. The implication of this, is that any intervention appropriate for increased computer self-efficacy will also impact greater acceptance, control and intention to use of computers. (p. 279)

Van Slyke et al. (2010) updated the validation of the instrument from Van Slyke et al. (2004) to further this group's research on the adoption of innovation theory, culture, and IT literature. Van Slyke et al. (2010) conducted a multi-country survey to gather data for an empirical investigation of consumers' intentions to purchase goods or services online. Van Slyke et al.'s (2010) team administered the survey to 413 consumers enrolled in university programs in seven countries—India, Hong Kong, China, Brazil, Malaysia, the Netherlands, and the United States—with more than two thirds coming from outside the United States. The results, using partial least squares (PLS) analysis, indicated that national culture does influence intentions to purchase online (Van Slyke et al., 2010).

Earlier work by Ein-Dor, Segev, and Orgad (1993) also stressed that national culture influenced all factors affecting information systems. They proposed a global information systems research model. These researchers aimed to explain that frustrations in e-commerce and Web-site design were due to technology not being technologically neutral, and not being effectively transportable across national boundaries (Ein-Dor et al., 1993). However, Straub and Loch (2007) reported, that in a series of funded studies taking place from 2000-2004, TAM was extendable to the Arab World.

Van Slyke et al. (2010) noted that, although most studies used a TAM-based model, Al-Gahtani (2003) had successfully employed Rogers' (1995) framework consisting of five characteristics—perceived relative advantage, complexity, compatibility, observability, and trialability—in Saudi Arabia. This was the approach used in Van Slyke et al.'s (2010) study as well. Another competing approach is the technology profile inventory (TPI) of DeYoung and Spence (2004). DeYoung and Spence (2004) sampled 394 participants using 95 items representing seven factors consisting of interest, approval, confidence, anxiety, Internet transactions, entertainment, and complex design preference. They were able to collapse their factors into the three most important; and found (a) confidence (as opposed to anxiety) toward using information technology, (b) approval of the functions and uses of IT, and (c) interest in IT, accounted for 40% of variance in attitudes toward information technology (DeYoung & Spence, 2004).

Eachus and Cassidy (2006) postulated a different view. In testing the Web-user self-efficacy (WUSE) model, they postulated that negative attitudes toward Internet usage self-efficacy could inhibit ICT adoption in areas such as e-learning. Eastin (2002) suggested that task-specific self-efficacy was an important variable in e-commerce adoption and that Web-based self-efficacy did not predict all e-commerce behaviors. Eastin (2002) stated that because people are likely to persist in behaviors they can competently perform, computer self-efficacy accurately captured both e-commerce usage and Web-specific self-efficacy.

Predominantly Muslim Malaysia (Nye, 2009) has hosted several recent studies on technology adoption in order to give the perspective from this region. Sam et al. (2005)

studied 81 females and 67 males from diverse faculties at Universiti Malaysia Sarawak. Participants completed a test of CSE, computer anxiety, and attitude toward the Internet. Sam et al. (2005) used a one-way ANOVA to test and support gender-based equivalence in the areas of computer interest, use, and skill level. Ghobakhloo et al. (2010) investigated technology adoption at SMEs in Malaysia. In their qualitative study, they reviewed more than 11 models that they felt were applicable, developing the interactive model of technology acceptance and satisfaction (IMTAS), which is an elaborate all-inclusive model that captures 19 constructs (Ghobakhloo et al., 2010).

Ramayah et al. (2009) also outlined a research study to validate a model of technology adoption for SMEs in Malaysia. Ramayah et al. (2009) planned to validate their model, using six components: (a) confirmatory factor analysis using structural equation modeling; (b) internal consistency of items, assessed using Cronbach's alpha; (c) discriminant validity, tested by using intercorrelation; (d) convergent validity, established for the items representing each individual construct; (e) nomological/predictive validity, assessed by looking at the relationship between the new measure of antecedents and the technology adoption index on SME performance; and (f) adequacy of model fit, determined by applying four indices recommended by Vandenberg and Lance (2000). The indices recommended by Vandenberg and Lance (2000) are denoted by the following acronyms: the root mean square of approximation (RMSEA), standardized root mean squared residual (SRMR), relative noncentrality index (RNI), and non-normed fit index (NNFI) (Ramayah et al., 2009). The RMSEA and SRMR are absolute indices of model fit and discern between well and poorly fit models while RNI and NNFI are incremental indices that distinguish between a baseline-fitted

model and a model that offers potentially a better fit (Guo, Aveyard, Fielding & Sutton, 2008; see also Polly, 2002).

Another study by Dwivedi, Choudrie, and Brinkman (2006) validated a 39-question instrument comprised of 10 scales to measure consumer adoption of broadband. Dwivedi, Williams, and Lal (2008) extended this study to TAM, TPB, diffusion of innovation (DOI), and institutional theory. Based on the literature reviewed, Dwivedi et al. (2008) classified this realm of e-commerce study as nearing maturity. Technology acceptance (TAM-based) studies were more prevalent, than research based on technology diffusion, or technology adoption. The current thrust of research is explained by Dwivedi et al. (2008), who noted that “researchers were now extending their reach beyond commonly addressed organization and user perspectives [...] Review and profiling existing literature on IS/IT adoption and diffusion is likely to be of use for researchers in helping them to identify under-explained themes” (p. 4). This statement supports the extension of research into the less understood context of DPI acceptance in the UAE.

Woszczyński et al. (2007) conducted a study using the diversity perceptions index, using an exploratory factor analysis followed by a multiple analysis of variance to work through a series of demographic variables, all related in some way to diversity. Woszczyński et al.’s (2007) study sampled 162 students from three universities in the United States. A similar study by Shelley, Shulman, Lang, Beiser, and Mutiti (2004) in 2002 used a random sample of  $n = 167$  from universities in the Midwestern United States. Shelley et al. (2004) conducted research that investigated attitudes toward technology, and how demographics influenced digital citizenship and the digital divide.

Woszczyński's et al.'s (2007) research indicated that, although gender had a strong correlation toward the selection of IT as a college major, evidence indicated that there were other equally strong correlations (e.g. ethnicity) and that further studies should incorporate and test for these other correlations. Shelley et al. (2004) found differences based on ethnicity and education levels. Socio-economic status (SES) was one of the seven variables investigated using CFA, which placed variables into three categories: desire for computer skills, technological information power, and computer usage (Shelley et al., 2004). Suggestion of differences in culture, gender, attitudes toward IT, and socioeconomic status as important variables affecting adoption of e-commerce surfaced from a study of Finland, Israel, New Zealand, and Singapore (Dor, Myers, and Raman, 2008).

Fairlie and London (2006), investigating Latina girls ages five to 17 found that as home Internet penetration increased, Latina girls of this age group became the fastest technology adopters of any Latina group by age or gender. Shelley et al. (2004) concluded that, rather than being divided along gender lines, United States society showed variation based on ethnicity. Non-whites, more so than whites, felt that technological literacy was a key to citizen empowerment, and that the acquisition of education and computer skills played a major role in advancing digital citizenship. Generally, for all persons at a lower education level, there was a greater desire to acquire computer skills, while persons that are more educated were more likely to use computers at home and at work (Shelley et al., 2004). The results of Shelley et al.'s (2004) and Woszczyński et al.'s (2007) studies supported the removal of SES as a construct. If SES results and those pertaining to gender are transferrable to the UAE, then together with the



notion of the universality of Islam, overriding membership in a specific ethnic group and in consideration of the findings of Siddiqui (2008), the effect of SES should be minimal.

Some studies used a smaller population. Shelley et al. (2004) used a sample size of  $n = 167$ . The mixed methods research approach employed by Brezgina et al. (2008) to study personalization in advertising used a smaller sample size. The quantitative portion of this study used bivariate and univariate analysis survey results from only  $n = 153$  university students to show that personalization in advertising is counterproductive (Brezgina et al., 2008).

Woszczyński et al. (2007) used an even smaller sample, a census of  $n = 11$  for faculty (only eight responded) and  $n = 54$  for students, obtaining a 95% response rate. A census is preferable to a sample when the population size permits cost and time containment (Jackson, 2000). In comparison, Siddiqui (2008) was able to poll more than  $n = 1,000$  subjects. Field (2009) stated a rule-of-thumb that for CFA, where five to 10 participants per variable was designated, and heuristically, that  $n = 300$ , was considered acceptable, and  $n = 100$  was considered poor.

Anckar (2003), using a stratified sampling method, conducted a study in Finland, gathering 1,000 subjects between 16 and 74 years of age. Anckar (2003) revealed that 79.6% of respondents strongly agreed that perceptions about accessibility and convenience were the most important factors in e-commerce adoption. Subsequently, this motivated communication of accessibility and convenience toward increased PU where e-commerce is concerned.

Cohen (1992) recommended using effect size and significance level to choose an appropriate level of statistical power based on degrees of freedom as parameters when

determining an appropriate sample size. The 2007 version of G\*Power 3, developed by Faul, Erdfelder, Lang, and Buchner (2007), offers an easy-to-use linear equation to select sample size while taking all four variables of effect size, Type I error probability, Type II error or statistical power, and degrees of freedom into consideration. Instructions for providing ease of use for the most current version of G\*Power 3.1 are described by Erdfelder, Faul, and Buchner (2009). An alternative method to determine sample size and estimate statistical power is the Monte Carlo study as prescribed by Muthén and Muthén (2002).

As far as analysis using EFA is concerned, Hair, Anderson, Tatham, and Black (1998) and Holmes-Smith, Cunningham, and Coote (2009) recommended factor loading cut-off values of 0.3. A cut-off value greater than 0.4, is considered acceptable by Widaman (1993), provided no significant crossloadings occur across variables. To meet test criteria in order to accept the inclusion of a construct or variable as a measurement item in CFA, loadings of indicator values  $\geq 0.5$  or a significant  $t$  value of 2.0—or both—indicate convergent validity (Fornell & Larcker, 1981). Correlation coefficients  $\geq 0.6$  but not greater than 0.9 are necessary to reject the null hypothesis and accept the alternate hypothesis in each case of variable fit within a specified model. A correlation coefficient greater than 0.9 indicates that factors are probably too closely related. Highly correlated factors are likely to measure similar attitudes or behaviors and not show discriminant validity (T. A. Brown, 2006).

A defined Internet filtration construct was not located through the literature review. However, material in the literature related to Internet filtration in the UAE, supported an item analysis, usable to produce a valid survey instrument (Field, 2009).

The Open Net Initiative's (2009b) report on the UAE and Etisalat's (2009a) own description of blocked content were the primary sources for identifying DPI constructs. Deep packet inspection filtration constructs were broken down into different categories of content that were most likely to be subjected to blocking by web servers, such as the telecommunications providers Etisalat or Du Telecom (2011). These filtration items or topics corresponded to the 13 blocked content categories displayed on Etisalat's (2009a) website and the 41 areas of blocked content measured by the Open Net Initiative (2009a).

The categories of blocked content are included in Appendices C and D. The types of content being blocked are: (a) sites assisting users to evade firewalls, and access blocked content; (b) sites for learning criminal skills; (c) dating and matchmaking sites, contrary to morals of society and Islam; (d) sites that promote illegal drugs; (e) sites with pornography and nudity; (f) sites promoting hacking, malicious codes, spyware, or phishing; (g) sites providing unlicensed VoIP service; (h) terrorist group websites; and (i) prohibited top-level domain, the IP address of .il, for Israel (Open Net Initiative, 2009a; see also Chapman, 2009).

### **Influence of Islamic Culture and Moral Economy on Trust and Internet Filtration**

Harris and Davison (2002) concluded that many societies experience extreme anxiety when dealing information technologies. They noted, "Systems are implemented within a social context consisting of ... cultural and behavioural factors which differ greatly between societies and countries" (Harris & Davison, 2002, p. 1). This extreme anxiety in turn leads to the perception, according to Harris and Davison (2002) that developing societies are "particularly vulnerable to threats from developed nations" (p. 1) as well as other developing countries. When actors fail to account for these cultural

differences, it inhibits information technology acceptance (Harris & Davison, 2002). Accordingly, the Telecommunications and Regulatory Authority of the UAE took an unprecedented step and solicited public feedback on its Web-blocking regime.

As reported by York (cited in Giles, 2009), who is employed with the Open Net Initiative, filtering in the UAE is more often than not based on objectionable social content rather than political content. Examples of blocked content include sex and sexuality; lesbian, gay, bisexual and transgender (LGBT) issues; alcohol; and gambling. Some blocked sites interpreted as innocuous by some, although not by others; included portions of Facebook and MySpace as well as a number of blogs (Malin 2010; York as cited in Giles, 2009).

In their comparison of Muslim adolescents from Malaysia and American adolescents, Jaafar, Kolodinsky, McCarthy, and Schroder (2004) applied a test of Kohlberg's (1973) stages of moral development. Jaafar et al. (2004) assert that contrary to Kohlberg's initial claim that sociocultural content does not have a significant effect on moral reasoning, cultural and religious values do have an effect on moral reasoning. The test of Jaafar et al. (2004) placed Americans with females scoring lower at Stage 2 and American males slightly higher but still in the range of Stage 2. Stage 2 morality corresponds to individuals who are primarily concerned with protecting their own best interests. Jaafar et al. (2004) postulated that American society reflects this mindset. Muslim Malays, on the other hand, scored at Stage 3 with Malay females outscoring the males. Stage 3 Morality, was defined as maintaining one's social contracts and social responsibilities, which included adherence to religious principles. Jaafar et al. (2004)

found that for Malay Muslims, commandments found in the Holy Quran primarily determined moral judgments.

A study taking place in the Louisiana prison system used the established defining issues test two (DIT-2) and the Myers-Briggs type indicator (MBTI). Validity and reliability for Myers-Briggs, and DIT-2, to measure moral reasoning has already been established (Sabin, 2006). According to Sabin (2006), the MBTI, which is a theoretical view of personality variations, and the DIT 2 test, which proposes to measure moral reasoning, both have proven validity with roots in Kohlberg's Theory of Moral Development. The defining issues test presents a series of moral dilemmas that the respondents must answer with questions about the right action to take (Linstrum, 2009). Respondents rank certain characteristics of the dilemma by importance. The DIT 2 test and Kohlberg's Theory, show a corresponding relationship between age, education, and moral cognition, as individuals' progress through stages of moral development. According to Sabin and Jaafar's research, both the DIT 2 and MBTI were sufficiently universal test instruments, workable with the Muslim Emiratis (Jaafar et al., 2004; Sabin, 2006). This means that other scales developed elsewhere may also work with Emiratis.

Specific to Islam, El-Sheikh (2008) provided a modern revisionist perspective on Islam's moral economy and explained the goal of the revisionist thinkers reconciling those constructs of culture that are modern or different from the traditionalist view by making them either Shari'a compliant, or rejecting them. Lewis (1996) discussed the dichotomy faced by the autocracies of the Arab Muslim world as they seek concurrent levels of censure by the polity and how this can be an avenue for democracy to develop. Wright (1996) also examined these two contrasting views and considered both

perspectives in a variation of the Islamic reformist movement—namely, that of Al-Ghannouchi (as cited in Wright, 1996), who advocated re-interpreting the traditionalist view to allow reconciliation with modern society, and Soroush (as cited in Wright, 1996), who saw democracy as a central tenet of Islam. Recent blogging activity in the Middle East serves as a voice for pro-democracy activists (Malin, 2010).

Lewis (1996) explored Islamic political culture and the link between theology and governance. Although autocracy has been the typical political tradition in most Islamic states, mainly because leadership is to some degree censured by the needs of its polity and cannot rule arbitrarily, leadership must gain some measure of consent from its constituency (Lewis, 1996). Coyne and Witter (2002) quantitatively investigated the importance of a select group of key players on a single dependent variable. Their work indicated that the behavior of 100 or fewer key individuals could have a major leadership impact on perceived stakeholder opinions (Coyne & Witter, 2002). Lewis (1996) argued that through theological conformance to expectations of the polity regarding behavior that accommodates established traditions, rulers are able maintain their mandate. However, this measure of approval by those who rule, received from their polity, is an avenue of exploitation, usable by those in pursuit of democratic freedoms in these autocratic Islamic states. According to Lewis (1996), many Muslims now look to liberal democracy as a way to achieve the freedom they lack.

Furthermore, Islam is not monolithic, and opposite from the traditionalists, who are rooted firmly in a strict interpretation of classic Islam and imposition of Shari'a law are proactive individuals and groups working for reformation and change. A. K. Soroush, a Shi'ite Muslim from Iran, promoted a rational secularism complementary to

Islam that embraces liberal democracy. R. Al-Ghannouchi, a Sunni Muslim from Tunisia, proposed an interpretation that claims democracy has a scriptural basis in Islam with freedom, equality, and secular and moral ideals. Thus, each reformist thinker respectively represented one each of the two major strands of the Islamic reformist movement (Wright, 1996).

El-Sheikh's (2008) study, "The moral economy of classical Islam: A fiqhiconomic model," found that in the Muslim world, the influence of classical Islam was ripe for exploration for its implications and challenges for today's world. Sharf-ah, also known as Shari'a and Shariah, is the body of legal and moral discourse laid out in the second and third centuries of Islam by Islamic scholars; it proposes to prepare followers for paradise in the afterlife by defining what constitutes a virtuous life. The historical perspective of these writings corresponds to the Middle Eastern world of the end of the eighth century A. D. Theologian and jurist scholars debated the issues of the day and reached varying degrees of resolution on each issue. El Sheikh (2008) reported that some remaining issues were undecided and passed on to posterity. Later, the different sects of Islam subjected these undecided issues to their own interpretations. Because of the intertwining of faith and government of that time, Shari'a law defined the moral economy of classical Islam while shaping the micro and macro social institutions. The classical model of Islam is both a symbol and basis for revivalist Islamic movements as they seek to Islamicize their polities and economies (El-Sheikh, 2008).

The classical view of Islam, according to Hofstede (2009), is that the truth has already been discovered and that Muslims are in possession of that truth. This has led to a perspective based on Shari'a law, the code of Islam, to yield a moral economy

supportive of the autocratic political structure of the state (El Sheikh, 2008). The significant role in mediating state affairs played by Islam, coupled with the dynamics of high uncertainty avoidance and high power distance, created a situation where leaders are feared—wielding ultimate power and authority. Strict reliance on rules, laws, policies, and regulations has helped leaders to assert their control while helping society avoid the unexpected; this strict reliance has created both a rigid and risk-averse authoritarian state apparatus, and a similarly ascribed culture (Hofstede, 2009; see also Nye, 2007). Other theorists have proposed views that this is changing.

Some ideas that compete with the traditionalist view are liberal democratic viewpoints. Kurzman and Naqvi (2010) claimed that when people in Islamic countries have voting rights, they prefer secular leadership. Lewis (1996) proposed that Islamic societies will achieve democracy incrementally and from within the system. Wright (1996) compared the reformist viewpoints of Soroush and Al-Ghannouchi. Soroush, as cited in Wright (1996), argued that freedom is a central tenet of Islam, ideally expressed through democracy. Al-Ghannouchi (as cited in Wright, 1996), called for a reinterpretation of the Islamic system, in light of the advances of modern society. Thus, through examining the literature, the need to sample the perspective of the polity and investigate if revisionist perspectives have any prevalence in UAE society drew precedence as a goal of the study.

### **Information Specific to the UAE**

The E-Case 2009 regional conference, held on January eighth to 10th, 2009, in Singapore, focused on all aspects of e-commerce, including the subroutines of e-administration, e-education, and e-society. The conference website was the principal



investigator of this study's first exposure to the Higher Colleges of Technology (HCT), a large state-funded university system in the UAE that promoted—among other technology areas—the study of e-commerce (E-Case 2009). The principal investigator then sought out the Higher Colleges of Technology as a possible future employer and host organization for this DPI research.

AME Info is one of the top and most informative media sites dedicated to UAE business resources. AME Info offers a white papers library, businesses for sale, and technology news. The AME Info website reported that Dubai Men's College, which is part of the HCT network of campuses, had enhanced the colleges' IT curriculum employing and studying DPI with the region's first Nortel Security Lab ("Dubai Men's College," 2005). Resources on AME Info ranged from what was then a breaking report on a BlackBerry phone service block to providing information on available jobs, particularly in high technology fields and engineering.

BlackBerry's parent, Research in Motion (RIM), and the UAE federal government had reached an agreement on continuing to allow BlackBerry to service the UAE after RIM agreed to share access to encrypted communications with the UAE federal government. AME Info revealed that in the case of BlackBerry, business persons had a preference for the encrypted communications offered by BlackBerry service, which, highlights the awareness business persons and firms have of maintaining the confidentiality of competitive intelligence, the terms that allow BlackBerry to continue to offer email, instant messaging, and Internet services were not disclosed ("Getting the Message," 2010).

The Telecommunications Regulatory Authority (TRA) of the UAE prohibits non-licensed firms from competing in the VoIP or Internet-based telephone call market. This regulation was justification to shut down and prosecute unlicensed Internet cafés that offer phone services, typically from places such as private apartments, and block competing services such as Skype. Third-party service providers such as Skype want to compete with UAE-based Etisalat and Du Telecom (Etisalat, 2009a). Barriers to market entry are important to the study of DPI because the established market players seeking to protect their competitive advantage can use DPI as a competitive weapon.

Skype is blocked by UAE-based Etisalat (“UAE Restricts VoIP,” 2010), which likely affected the value of Skype to online auction firm eBay. In 2005, eBay purchased Skype for \$3.13 billion. eBay ultimately sold 65% control of Skype for \$1.9 billion in cash and a \$125 million note to a group of private investors instead of spinning the firm off into an IPO. After \$530 million was paid to certain Skype investors in 2007 for meeting growth and profitability targets, and after taking a \$900 million dollar write-down, eBay took a loss because the deal was then valued at only \$2.75 billion. However, Skype had been successful in capturing 8% of the international call market and had continued growth of 42% throughout 2009. Skype it is believed turned a profit on its \$551 million in revenue and is expected to grow to \$1 billion by 2011 (Metz & Vanacore, 2009).

McAfee was the primary vendor for the large enterprise, national-level firewall used in the UAE at the ISP level (McAfee Inc., 2009a). At the time of the study, for network systems protection, the UAE used, U. S. Defense Department-approved, McAfee-branded, Network User Behavior Analysis *Securify* Monitor, as the primary

high-level DPI application (Hilotin, 2008; McAfee Inc., 2009b). This is the technology used by Etisalat; Du Telecom uses a similar technology (Open Net Initiative, 2009a). McAfee also purchased Secure Computing, the original service provider of the prior application known as Smart Filter (McAfee Inc., 2009b). This is in direct opposition to Lloyd (2008), who from a transnational law perspective, opposed U.S. corporate assistance to foreign governments practicing censorship.

The most serious cybercrimes in the UAE, according to the Dubai police, are industrial espionage, misuse of private information by computer hackers to steal money and passwords, and illegal activities and cyber-bullying by minors (Najami, 2009). In 2009, the Al Arabiya News Channel reported 248,000 cases of crashed computers due to hacking as well as cases of website vandalism and conflict, including hate speech on blogs and forums between rival Sunni and Shiite Islam supporters (Ajbali, 2009). In 2010, Trend Micro reported that computer crimes were up 33% over 2009 (“Middle East,” 2010).

Freidman (2008) examined the Straits of Hormuz incident, in which Iran threatened to close the strait and interdict oil tanker traffic by confronting the U. S. Navy from December 2007 through January 2008 near the chokepoint between Dubai and Iran (CIA, 2010). This incident underscores the realist geopolitical motivations of maintaining secure computer systems in this strategically important region (Nye, 2007). Abadie (2009) warned that the United States and its allies were unprepared for the next generation of cyber warfare. The UAE is an ally to many Western nations, including the United States, along with the six member countries of the GCC (Gulf Cooperation Council, 2010), all of whom depend on the 40% of the world’s oil supply that flows

through the Straits of Hormuz (Freidman, 2008). According to management at the Fujairah branch of United Arab Bank, Fujairah is poised to overtake Singapore, to become the largest port of its type. This is due in part to a new pipeline, oil refinery, and storage infrastructure improvements in this resource sector (M. A. Al Salami, Branch Manager, Retail Banking Group; M. M. Al Bloushi Service Relationship Manager, Sadara Wealth Management, Personal communication, October 9, 2011).

The UAE has seen more widespread adoption of e-commerce than Saudi Arabia (Siddiqui, 2008). Fawwaz (2008) dissected the social factors affecting the adoption of e-learning in the UAE and investigated the bias present in the Arab world toward distance learning. Arab culture is primarily an oral culture, not a written one, and face-to-face interaction is extremely important (Fawwaz, 2008). Al-Busaidi and Al-Shihi (2010), at Sultan Qaboos University in neighboring Oman, conducted a qualitative TAM-based study advocating the use of an organizationally supported, teacher-based collaborative learning management system (LMS). These studies highlight leadership's growing awareness of e-learning in the Middle East.

Information about the use of DPI in the UAE is restricted because it falls within the realm of firms' protection of trade secrets and because it is a national security issue. Helms, a security consultant for CloudShield, which is a security operations company, has advocated using DPI for investigations and intelligence. Helms discussed using DPI as a national security imperative at a regional telecom trade conference on February 24, 2009, in Dubai ("CloudShield," 2009). The HCT, a large university system with 18 campuses, 16 of which have a high student population, uses DPI in its firewalls ("Dubai Men's College," 2005). The college employs Nortel's multi-layered security regime,

which includes switches at the network edge, followed by stateful firewalls using Nortel VPN Router 5000, and then DPI for intelligent traffic management using technology based on Nortel Application Switches 2208 (“Dubai Men’s College,” 2005). In general: “The media environment of the Middle East and North Africa region is a battle-space where commercially enhanced blocking, targeted surveillance, self-censorship and intimidation compete with enhanced tools of censorship circumvention” (Deibert, as cited in Chapman, 2009, p. 1).

### **Summary**

Employing DPI technology in firewalls and network security at the ISP and enterprise level (Allot, 2007), represented a possible solution in the fighting of Internet crime (Matwyshyn et al., 2010). Internet crime is a major problem in the GCC region; the UAE ranks second behind Saudi Arabia in the total number of instances of what has become a regional problem (Ajbali, 2009). However, deep packet technology changes the Internet balance of power by granting significantly greater power to institutional and governmental entities to protect their systems over that of individual user privacy rights, which is of concern to privacy advocates (Hanff, 2008; Jones, 2008). Several sources (Abadie, 2007; Anderson, 2007; Chapman, 2009; Sethagarnar, 2010) highlighted the arms race-like state-level security imperative of blocking against threats posed by cyberwarfare.

The magnitude of the cyber-crime problem, and the nexus of commercial protection of UAE industry which experienced financial losses related to weaknesses in protecting the e-commerce sector was widely reported in news media (Ajbali, 2009; Hilotin, 2010; Najami, 2009), including academic sources such as *Knowledge at Wharton*

(Matwyshyn, et al., 2010). Etisalat (2009b) and newcomer du Telecom (2011) block VoIP services such Skype in the UAE (“Skype Blocked in UAE,” 2009) and RIM’s BlackBerry was threatened with blockage unless they turned over access codes to Etisalat and du Telecom (“Getting the Message,” 2010).

The literature review defined the study in important areas. First, Kassner (2008) identified several areas of utility for DPI technology: (a) network security; (b) network access; (c) compliance with government required surveillance; (d) enforcement of service level agreements, such as acceptable use policies regarding illegal content or bandwidth use; (e) quality of service, related to peer-to-peer traffic and bandwidth allocation; (f) the ability for ISPs to create different service plans, with tailored service levels, in bandwidth and traffic shaping prioritizing; (g) curtailment of the illegal distribution of copyrighted material; and; (h) behavioral advertising. These areas were investigated through other sources such as Bauer (2008), Briscoe (2009), both dissertations, and Allot Communications (2007), Fidelis Security Systems both DPI vendors, who substantiated the DPI utility claims of Kassner (2008).

Bucchi, (2007); Giles (2009); Scarvarda and Gorla, (2010); and Tehrani (2008), all supported use of DPI for data warehousing, mining and customer relationship management, a position supported quantitatively by Van Slyke (2010). Brezgina, Debouchaud, and Frehse (2008) took an opposing position in their quantitative study, stating that the e-personalization as a privacy infraction was simply too obvious, and subjected the offending firm to backlash. Deep packet inspection vendors Phorm (2008), and NebuAd (2009) conducted behavioral advertising for its commercial partners, in the U.S. and U.K., and were forced out of business by a combination of lawsuits and negative

publicity (Hanff, 2009; Lawson, 2008; NebuAd, 2009; Phorm, 2008; see also Century Link, 2011). On one hand, Brezgina, et al. (2008) found that people were quite wary of data collection, whereas Li (2007) discovered a contradiction in privacy behavior, and people often divulged personal secrets, despite holding core values against doing so.

The technical issues of identifying malware threat signatures and implementing DPI as a solution motivated the research of Artan (2007), and Martellaro, (2008). Birrer (2009) proposed the use of latent Dirichlet allocation, explained in depth in the video lecture of Blei (2009), while Yu (2007) proposed coupling this approach with a hardware intensive strategy. Distributed computing exacerbated threats were by making malware attacks much more elusive to detect, yet these can be defeated with DPI although greater deployment of DPI resources is required (Raahemi et al., 2009; Schafer et al, 2009; Suomalainen et al., 2009).

Systems thinking, which is an interactive-dependency model was the overarching explanatory theoretical approach. Ranging from the organic approach of Morgan (1998) to Hayles (1999) post-human perspective—both evolutions of earlier work by Trist and Bamforth (1951), a modernist perspective emerged. Post modernist revision rooted in the e-business model approach of Zott, Amit and Massa (2011) and Kale and Singh's (2007) analysis of alliance performance for technology partners, which was based on an evolution of Williamson's (1979) transaction-cost analysis model—emerged as being a good fit for the relationship-based Middle –East business environment.

However, an investigation of the literature revealed the absence of a systems model explaining DPI's acceptance by the UAE society, and minimal academic knowledge about the perceptions that drove the intention to use technology Arab

countries (Al-Khaldi & Wallace, 1999). While e-learning (Fawwaz, 2008) and e-commerce adoption (Siddiqui, 2008) have been studied, DPI technology—particularly a model that explains the phenomenon—has not been the subject of significant academic study in the MENA region.

Fawwaz (2008), Hayashi et al. (2004), Shelley et al. (2004), and Woszczyński et al. (2007) all used a CFA-type approach to test their models, using roughly the same numbers of variables proposed for the current study. Likert-format response data collected in these studies had enough questions to develop an index for each variable. Under these circumstances, and if the data is normally distributed, data were treated as interval-level.

Siddiqui's (2008) study of ecommerce adoption comparing UAE and Saudi Arabia developed an aggregated instrument to measure computer self-efficacy, attitude toward ICT, perceived usefulness of ecommerce, intention to use ecommerce, gender, and socio economic status with culture as a moderating variable. Socioeconomic status and gender were not robust as variables; however, there were grounds to pursue a study on network security adoption with deep packet inspection using the other constructs. Therefore, the primary investigator sought permission to reuse measurement instrument components, and successfully obtained such, from H. Siddiqui, and seminal authors B. Babin, T. Childers, D. Gefen, Y. H. Kim, J. Sagi, R. Thompson, and C. Van Slyke or their respective publication rights representatives.

In the conceptualization of culture as a construct, there was no commonly accepted definition. However, Siddiqui (2008) sought to define culture by including several questions that were trust-based, in consideration of face validity of questions



about ecommerce adoption comparing Saudi Arabia and UAE, a position supported by Bahameed (2008) who found the trust component of culture widely used in information systems literature. Beatty et al. (2011), Verweij (2005) Yousafzai et al. (2007), provided a sociocultural perspective of trust—one that could be connected to social capital and cultural theory.

Internet filtration in the UAE portrayed from an external perspective by the ONI (2009a; 2009b) in research reports, and by Chapman (2008) is largely mirrored qualitatively by corporate communications, that delivered the internal perspective from Etisalat, on Internet filtration Etislat (2009a; 2009b). Gher (2002) had commented on blocking threats to free access to media in the expectant economies of the Arab World under the guise of protecting the population from cultural invasion. This perspective of Internet filtration was in alignment with Hofstede's view, of the role of cultural trust in high-uncertainty avoidance, as a characteristic of society.

While Kurzman and Naqvi (2010), Lewis (1996), and Wright (1996), through the perspectives of Soroush and Al-Ghannouchi explored implementing democracy, and saw the lack of trust as a behavior shown by the governing autocracies of the Arab World toward their polities. El Sheikh (2008) subscribed to a similar perspective; and sought to do so through a revisionist reconciliation of Shari'a Law with the demands of modernity. Important cultural issues intertwined with trust found increasing relevance with the phenomenon of the *Arab Spring* ("Arab Spring Undermines," 2011; "The Arab Awakening," 2011).

At the state-security level, the Stuxnet worm and similar malware can cause data acquisition and infrastructure devices to malfunction (Benson, 2010; Pletts, 2010;

Titterington, 2010). Stuxnet is reputed to have originated as a state sponsored on Iranian nuclear facilities (Benson, 2010; “Cyber warfare,” 2010). Kaspersky Lab’s Keith Maskell characterized this malware threat (cited in “Cyber warfare,” 2010).

Research methodologies suggested analysis using EFA, and accepting factor loadings above a cut-off value of 0.30 (Holmes-Smith et al., 2009; Hair et al., 1998) and greater than 0.40 without significant cross loadings by (Widaman, 1993). For CFA loadings, indicator values of  $\geq 0.50$  or significant *t* values of 2.0 or higher—or both markers occurring together—would show convergent validity (Fornell & Larker, 1981). Correlation coefficients  $\geq 0.60$  but not greater than .90 were desirable and enable acceptance of the alternate hypothesis in each of the six cases of variable fit within the model. A correlation coefficient greater than .90 evidenced factors that are probably too closely related and not displaying the property of discriminant validity (T. A. Brown, 2006). Some instruments proposed for the current study, indicated correlation coefficients in original validation higher than .90; thus warranting, undertaking an analysis of discriminant validity for the DPI constructs.

Seminal works, and those leading up to the present on reliability coefficients, evoked a targeted .70 or greater (Agarwal & Selen, 2009; Cronbach, 1951; Field, 2009; Nunnally, 1978; Sellitz, Wrightman, & Cook, 1976). An alpha value  $\geq 0.60$  can be acceptable in cases where the literature provides theoretical support and the analysis uses modified scales (Nunnally, 1978). Furthermore, Cramer (2003) believed that for newer scales, alpha values of  $\geq 0.60$  were acceptable. Bagozzi and Li (1988) advanced an even more liberal threshold on the average variance extracted for a construct at alpha value  $\geq 0.50$  and argued that a lower alpha value was justified in cases where there were fewer

items. Cronbach's Alpha measures range from zero to 1.0, with values of .60 to .70 deemed the lower limit of acceptability (Hair et al., 1998). The closer the measure is to the upper limit of 1.0, the higher the internal consistency reliability (Sekaran, 2003).

By revealing the variables and underlying constructs that relate to the perceptions held by UAE nationals regarding the implementation of DPI, the review has provided illumination of the basis of an appropriate model. The review also helped identify theoretical support for the constructs and provided support for both purposive sampling (Rose, 2009), and confirmatory factor analysis CFA as a suitable quantitative method through Albright and Park, (2009); DeCoster, (1998); Karmel and Jain, (1997) and Thompson, (2009). Furthermore, a validated survey instrument was identified that can be modified for this proposed study; it is derived from a study of e-commerce adoption in Saudi Arabia and the UAE from Siddiqui (2008) and is available in both English and Arabic.

### Chapter 3: Research Method

The UAE accounted for 20% of the total cybercrime cases in GCC countries, making it the second most vulnerable Gulf country in falling victim to cybercrimes such as website hacking and theft of valuable data, passwords, and credit card numbers. Prosecuting hackers under UAE law was almost impossible because most attacks come from outside the region (Ajbali, 2009). According to R. Ragan (as cited in Mortleman, 2009):

In large companies, CIOs have a good understanding of the risks that they face and the ways in which that information can be compromised. But in the mid to small businesses, there is not that much of an understanding. Most [Middle East] SMEs don't have a comprehensive IT strategy. (p. 2)

Deep packet inspection is a recommended enterprise-level approach to a comprehensive IT security strategy. Deep packet inspection offers a technical solution to the problem of cybercrime in the UAE, providing institutions and the government with the technological ability to inspect network traffic and implement ICT security (Allot Communications, 2007). However, a DPI-centric security program is an infringement on user privacy (Epic.org, 2009; Hanff, 2008; Lawson, 2008). Such systems are not 100% effective, and employment in conjunction with other security technologies is a requirement to maximize effectiveness (Thomson, 2008). The business-related problem is that although system theory is a relevant paradigm to examine the acceptance of DPI in the UAE, the literature review revealed no systems theory model specific to the situation in the UAE that relates to using DPI to fight cybercrime. A theoretical model that examined DPI's acceptance, developed from the quantitative testing of the variables

identified in the literature, and tested using a relevant segment of UAE society, could guide technology stakeholders—particularly at the SME level—to understand technology adoption, security, and firewall technology, fighting cybercrime and the tradeoffs between security and user privacy in the UAE.

The purpose of this quantitative study was to examine six constructs for possible inclusion into a proposed theoretical model: the deep packet acceptance model (DPAM). The six constructs identified in the literature review, investigated by model fit, into an explanatory system's theory model called DPAM, focusing on understanding the acceptance and implementation of the potentially disruptive DPI technology in the UAE, was the aim of the study. Each of the proposed variables contained in the model were tested quasi-experimentally using confirmatory factor analysis (CFA) for goodness-of-fit and inclusion in the model. The six independent variables tested for explaining the adoption of DPI, and hence inclusion in the DPAM model for the UAE, were (a) computer self-efficacy (CSE), (b) attitudes towards ICT, (c) perceived usefulness of e-commerce, (d) intention to use e-commerce, (e) societal trust, and (f) Internet filtration.

To test these variables, purposively sampled data of at least  $n = 239$  (a number based on a power analysis) was required to be collected using a survey of a population of 18- to 25-year-old Emirati nationals with business and IT training. Primary data collection resulted in  $n = 527$  being collected. These students attended a government university, the Higher Colleges of Technology (HCT), whose campuses were located throughout the various emirates of the UAE. The HCT had 19,370 enrolled students for the academic year that began in September 2010 (Higher Colleges of Technology, 2011a). Higher Colleges of Technology students were logical participants to target for

the study because, by federal law, graduates of HCT were favored for future employment in important sectors of the economy, including those likely to benefit from using DPI, such as finance and telecommunications (UAE Federal e-Government Portal, 2006).

This quasi-experimental, quantitative research methodology tested six research questions, through six hypotheses. Operationalizing the variables into a validated measurement instrument allowed evaluation of each variable for goodness-of-fit within the prescribed model. The evaluation of the observed measures of the independent variables using exploratory factor analysis (EFA), successively on two consecutive pilot studies, established initial validity of individual constructs and structural validity of the proposed DPAM model. Assessment of the observed measures of reliability for the independent variables, from these two pilot studies used Cronbach's  $\alpha$ , which is equivalent to conducting all possible iterations of the split half method and taking the average (Trochim, 2006). Exploratory factor analysis employed within the CFA framework, applied to the primary data, explored the relevance of the data to the proposed model the structure. Using the maximum likelihood method within CFA allowed the primary data, evaluated against the expected measures in order to explain the model's dependent variable: acceptance of the implementation of DPI. The six research questions that drove this study restated are:

- Q1.** To what extent, if any, does computer self-efficacy relate to intention to use deep packet inspection in the UAE?
- Q2.** To what extent, if any, do attitudes toward ICT relate to intention to use deep packet inspection in the UAE?

- Q3.** To what extent, if any, does perceived usefulness of e-commerce relate to intention to use deep packet inspection in the UAE?
- Q4.** To what extent, if any, does intention to use e-commerce relate to intention to use deep packet inspection in the UAE?
- Q5.** To what extent, if any, does societal trust relate to intention to use deep packet inspection in the UAE?
- Q6.** To what extent, if any, do attitudes toward Internet filtration relate to intention to use deep packet inspection in the UAE?

Answering the six research questions through the quantitative testing of six hypotheses was the primary goal of the study. The evaluation of model factors used the statistical correlation of CFA for each of the six independent variables, with the dependent variable for goodness-of-fit within the proposed model. The hypotheses that were tested are:

- H1<sub>0</sub>.** Computer self-efficacy is not related to the intention to use DPI in the UAE.
- H1<sub>a</sub>.** Computer self-efficacy is related to the intention to use DPI in the UAE.
- H2<sub>0</sub>.** Attitude toward ICT is not related to the intention to use DPI in the UAE.
- H2<sub>a</sub>.** Attitude toward ICT is related to the intention to use DPI in the UAE.
- H3<sub>0</sub>.** Perceived usefulness of e-commerce is not related to the intention to use DPI in the UAE.
- H3<sub>a</sub>.** Perceived usefulness of e-commerce is related to the intention to use DPI in the UAE.
- H4<sub>0</sub>.** Intention to use e-commerce is not related to the intention to use DPI in the UAE.

**H4<sub>a</sub>**. Intention to use e-commerce is related to the intention to use DPI in the UAE.

**H5<sub>0</sub>**. Societal trust is not related to the intention to use DPI in the UAE.

**H5<sub>a</sub>**. Societal trust is related to the intention to use DPI in the UAE.

**H6<sub>0</sub>**. Internet filtration is not related to the intention to use DPI in the UAE.

**H6<sub>a</sub>**. Internet filtration is related to the intention to use DPI in the UAE.

This chapter begins with an explanation of the research method and design, followed by a description of the participants and the survey instrument. Each variable had an operational definition describing its role in the study. After defining variables, there was a description of methods for collecting, processing, and analyzing data. The section on methodological assumptions, limitations, and delimitations included a critical evaluation of the research method. There was a statement of the necessary ethical assurances, followed by a summary of the research methods.

### **Research Methods and Design(s)**

This investigation was a quasi-experimental, quantitative research design. The study was not a pure experiment because, although area-based random sampling was employed to collect data, random selection was not used for the assignment of participants to groups, in the stratified random sampling portion, of the multistage random sampling regime (Trochim & Donnelly, 2008). The purposively targeted, sampling frame consisted of HCT students—members of a group likely to be subsequently employed by DPI stakeholders. This frame consisted of the entire university student population from 16 of HCT's 18 locations. These were from campuses



devoted primarily to teaching, not administration (Higher Colleges of Technology, 2011b).

The research design to examine the DPAM model for the UAE had five main phases: (a) literature review, (b) field study, (c) a pilot study, (d) a second field study and pilot study, and (e) testing of the model using CFA. Literature review (see Chapter 2) was the first research method employed. This consisted of a review and organization of available literature, to build an understanding of the theoretical background, of the deep packet inspection (DPI) topic in the UAE. To gain an understanding of DPI as a possible solution to the cybercrime problem in the UAE it was required that the literature be synthesized into relevant topics. The synthesis of the meaning of these topics through development was by conducting a critical analysis of the information provided by each source. The critical analysis included an evaluation of each source's credibility and an assessment of how the information could be compared with other data—in particular, how it related to a study on DPI.

The material of the literature review was split into ten concepts or themes, as follows: (a) the commercial DPI market; (b) customer relationship management; (c) privacy advocacy groups and arguments against DPI; (d) media reports on DPI; (e) network security threat characterization; (f) DPI deployment against distributed computing threats; (g) encryption and security protocols; (h) support for constructs, (i) influence of Islamic culture and moral economy, on societal trust and Internet filtration; and (j) information specific to the UAE.

The literature review helped identify a previously validated instrument specific to Arab culture: Siddiqui's (2008) study of e-commerce adoption comparing the UAE and

Saudi Arabia. The adaptation of Siddiqui's instrument was based on previously validated instruments by Gefen (2000), Gefen and Straub (2000), Kim et al. (2009), Sagi et al. (2004), R. Thompson et al. (2006), Van Slyke et al. (2004, 2010) and Xu and Cai (2004). Siddiqui (2008) validated some but not all parts of this instrument, for use with the Arab culture (e.g., SES not validated by study). Only those measures relevant to a study of DPI and shown to be valid and reliable were acceptable for use in this study.

Internet filtration—identified from the literature review as a relevant DPI construct, did not have a validated measurement instrument. Hence, after an exhaustive search for alternatives, the principal investigator proposed a self-developed instrument to assess Internet filtration. A method to develop this instrument and demonstrate its validity and reliability was required.

To this end, in November 2009, a focus group of five faculty members with expertise and experience with Arab culture convened for professional development during independent learning week as part of a field study to develop the Internet filtration instrument. The first meeting to evaluate the instrument, using faculty—augmented nine months later, with action research in a classroom setting to teach the learning outcomes of validity and reliability in the context of e-commerce marketing, resulted in 20 e-commerce students evaluating the Internet filtration constructs as an extension of the first field study. The group of students generated 15 questions from the 54 constructs provided, for inclusion in the Internet filtration instrument. On December 21, 2010, a third focus group comprised of business faculty reproduced the action research lesson sustained by the students and reviewed the English and Arabic versions of the survey.

The purpose was to validate the student generated constructs with further review by the faculty's expertise.

E. Brown (2000) and Sakiz (2007), who employed similar methods with students to validate an e-learning instrument, provided support for the action research-based focus group approach. Shockley-Zalabak (2008) provided support from an organizational communications perspective, while Silverblatt (1995) provided support for the media literacy approach in interpreting media messages. Gaining feedback on the credibility and appropriateness of the potential survey questions, in order to build validity, was a goal of both the faculty-based focus group, and the action research-based focus group with the students. By seeking and evaluating feedback on the survey questions for Internet filtration, a new measurement instrument was formulated—albeit not yet validated—and subsequently added to the survey.

Pilot studies were then necessary to enhance validity and reliability of the instrument. I. Brown and Jayakody (2008) and Sakiz (2007), who have used pilot studies in similarly constructed studies, supported the use of a pilot study to assess validity and reliability. According to Wallace (2003), a pilot study is useful for discovering if there are any problems with the data collection methodology for the survey, such as wording or the interface with Smart-Survey (2011).

The first pilot study took place with 54 participants the week of March 20, 2011, after securing approval of dissertation proposal and institutional approval from the Higher Colleges of Technology and NCU's Internal Review Board. The primary investigator administered the pilot test and obtained 50 usable test results. The primary investigator withheld four out of 54 cases from analysis, because they were missing

substantial data. The purpose of this initial pilot test was to determine the reliability and validity of the 66-question instrument that resulted from the earlier field tests. The preliminary analysis that took place with the data from the initial pilot study was to determine if any of the questions do not correlate with any of the others, while another goal of the pilot study was identification of multicollinearity (i.e., questions are too highly correlated), and subsequent removal of the necessary questions from the instrument.

Iterations performed on the data with EFA determined quantitative factor loadings, namely—performing a principle component analysis (PCA) using PASW-18, which often yields results similar to factor analysis. Using a correlation matrix for analysis, the aim of the factor analysis was to enable extraction of six total factors, generate a scree plot, and an unrotated factor solution (Field, 2009). Factors were rotated, first using varimax rotation, which is an orthogonal method most suitable for factors that are differentiated (Field, 2009). As indicated in the literature review, there is theoretical support that the technology adoption variables of CSE, attitude toward ICT, intention to use e-commerce, and perceived usefulness of e-commerce, as possibly related to each other, but likely unrelated to trust, and Internet filtration, which suggested using an alternative rotation method for correlated items. By rotating factors using direct oblimin, and promax, which are oblique rotation methods, exploration of the data suitable for factors that are correlated took place (Field, 2009).

The first pilot study yielded a 24-item instrument with four questions aligned to each of six factors. There was a competing nested solution retaining 16 questions, and aligning them to four factors. A subsequent focus group rejected that solution in a

process, where both instrument versions were assessed side-by-side. A second pilot test was required to test the revised instrument. The internal review board (IRB), approved the second pilot test on June 1, 2011. Further assessment of the DPAM model began with the collection of a purposively selected, multistage random sample from the HCT students at 8 of the 16 campuses. A holdout sample of  $n = 51$  of the first survey results collected in this phase of the research was used for the second pilot test. The 51 surveys collected for the second pilot test were all usable, with much less missing data overall in comparison to the first pilot test. A usable instrument, developed from results of the second pilot test, based on statistically established validity and reliability estimates, enabled advancement into the primary study.

The level of relationship between six independent variables and a single dependent variable that defined DPAM, was interpreted first using EFA, then using statistical correlation based on CFA (Trochim & Donnelly, 2008). Confirmatory factor analysis is an appropriate technique for the test, provided the data meets conditions of normality (T. A. Brown, 2006). The Kaiser, Kolmogorov-Smirnoff, (*K-S*) and Shapiro-Wilk (*S-W*) tests were used to assess the univariate normality of the data subject to confirmatory factor analysis. Multivariate normality assessment was by the suitable Mardia's test, and Srivastava's test (Enomoto, Okamoto, & Seo, 2010). Meanwhile, the maximum-likelihood estimator MLM, which is robust to non-normality for samples  $n > 400$ , assessed the goodness-of-fit of the DPI model (Albright & Park, 2009; Field, 2009; Garson, 2009; Zhang, 2009). Final validation of the model using a holdout sample can occur later, once it has been tested using industry practitioners. The final validation is beyond the scope of the research for the dissertation and represents a subsequent study.

## Participants

The identified population (i.e., sampling frame) for the purposively selected random sample was the enrolled college students of the HCT campuses of the UAE. The total possible sampling frame consisted of  $N \approx 19,370$  students, all of whom were Emirati nationals (Higher Colleges of Technology, 2011a). Students in the sampling frame tended to be between the ages of 18 and 25. The gender ratio was skewed system wide 65% to 35% in favor of women (Higher Colleges of Technology, 2011a).

The 16 campuses selected for possible participation in the study had a full-time student population. The two campuses ruled-out of possible participation were administrative in function. Data defining the sampling frame is in Appendix A. Sampling frame data were by geographic area, total enrollment, and percentage contribution to the system population of students. Geographic-based area sampling ensured the efficient sampling of colleges that were widely dispersed by area of the country. Stratified random sampling, assured representation of at least one campus of each size category in the study, and that the smaller campuses were not under-represented in the test population. According to Karmel and Jain (1997), and Trochim and Donnelly, (2008) this was an important consideration in having a truly representative sample.

When examining the enrollment numbers by geographic area, a pattern emerged that allowed the pairing of roughly equal size campuses. The purpose of having campus pairings was to achieve randomization through the random selection of one campus from each pair. These campus pairings are in the second half of Appendix A, as area sample/size pairings one through eight. The sampling plan was to select one campus at random from each pair and then survey the entire student population of that particular

campus. The names of campus pairs was written on pieces of paper that were folded and placed into a hat, such that it was not possible to know which campus name was on which piece of paper. A series of random drawings without replacement was held to select eight out of 16 paired campuses, yielding eight randomly selected test populations to be sampled. The following HCT campuses were selected as a result of the random process, (a) Abu Dhabi Men's College, (b) Dubai Women's College, (c) Al Ain Women's College, (d) Fujairah Women's College, (e) Sharjah Men's College, (f) Ras Al Khaimah Men's College, (g) Ruwais Women's College, and (h) Madinat Zayad Men's College.

Using G\*Power 3.1, to compute chi-square as a measure of goodness-of-fit, a value of  $n = 239$  was obtained, in accordance with the recommendations of Cohen (1992). These parameters were: (a) significance level of  $\alpha = .01$ , to minimize the risk of any false rejections or Type I errors; (b) statistical power of .80, which is the failure to reject a false hypothesis or Type II error (a smaller value here would have meant the procedure incurred too great of risk of a Type II error, while a larger value would have placed constraints survey resources available); (c) medium effect size of .3; and (d) degrees of freedom,  $df = 9$ . Degrees of freedom were calculated using the formula  $df = k - c$ , where  $k =$  number of non-empty cells and  $c =$  number of estimated parameters, yielding  $9 = 21 - 12$ .

Larger sample sizes minimize threats to validity and build statistical power by minimizing the chance of a Type II error (Houser, 2007). To determine the potential effects of a high survey response rate, a sample size of  $n = 2143$  would have been required to reliably identify a smaller effect size in the data. This was more than double the  $n = 1,000$  considered excellent by the rule-of-thumb employed by Comrey and Lee

(1992). According to Zhang (2009),  $n \geq 400$  allows for a statistically robust measurement that overcomes the limitations of a non-normal data set when utilizing MLM as the evaluation criteria.

### **Instrumentation**

The instrument, preceded by the statement of informed consent, is included in Appendix B. The instrument used, is adapted from the instrument employed by Siddiqui (2008), and with permission granted by the author. For the Siddiqui survey (2008), validated components were assembled into a survey that was used to collect data in two languages (i.e. English and Arabic) to investigate e-commerce adoption in the UAE and Saudi Arabia. Each survey question validated by Siddiqui (2008) aligned with its seminal author and original source of validation, organized by construct are in Appendix C. Both English and Arabic translated versions of Siddiqui's (2008) original 66-question instrument can be found in Appendix D.

Instrument development for the Internet filtration construct included action research with several focus groups. The instructions for the student-centered focus group are in Appendix E. The Internet filtration constructs, used in focus groups with students and HCT faculty are in Appendix F, and Appendix G. Permissions from the authors and copyright agencies for instrument materials not developed by the primary investigator are in Appendices H through O.

According to Straub (1989), in addition to the acceptability of assembling an instrument from a pool of validated work, an accurate language translation—in this case, Arabic—was essential for maintaining an error-free measurement; Straub, thus pointed toward the necessity of independent verification of the translation (as cited in Siddiqui,



2008). Drawing previously validated and reliability-tested questions from separate survey components is an accepted approach in technology adoption research. Straub (1989) stated “that a survey instrument can be considered valid in content if the survey draws representative questions from a universal pool of questions” (as cited in Siddiqui, 2008, p. 104). The components adapted and brought forward into Siddiqui’s (2008) study and validated for use with Arabic culture were originally taken from previously validated instruments (i.e. Gefen, 2000; Gefen, Karahanna, & Straub, 2003; Gefen and Straub, 2003; Kim et al., 2009; Sagi et al., 2004; R. Thompson et al., 2006; Van Slyke et al., 2004; Xu & Cai, 2004).

Siddiqui’s (2008) original questions for testing the SES construct (Cronbach’s  $\alpha = .471$ ) were not be used in the DPI study because this construct was shown to be an unreliable measure for Arab society (Siddiqui, 2008). The culture variable of the Siddiqui (2008) study had a lower reliability as well, as evidenced by a Cronbach’s  $\alpha$  of .561, and did not pass the regression tests for validity. However, there were arguments to consider culture as a valid construct. For example, the e-commerce technology adoption models of other authors (e.g. Kim & Kim, 2005; Sagi et al., 2004; Van Slyke et al., 2010) all included an interpretation of culture. Research by Thompson (2010) has exemplified that National culture is an important influence on adoption and intention to use technology (Chen, Chen, & Kazman, 2007; Gallivan & Sprite, 2005; Lippert & Volkmar, 2007; Rouibah & Hamdy, 2009). The importance of culture highlights the divergence of competing social systems of governance. The trust component of culture is important because it is a component of Hofstede’s uncertainty avoidance (UAI), in which Arab societies score high (Hofstede, 2009). The dynamic of high UAI and high power

distance acting together in the Arab world has produced a leadership structure that seeks to keep itself in power by controlling uncertainty as much as possible through rules, regulations, and other constraints (Hofstede, 2009).

A validated measurement instrument did not exist for Internet filtration, making it necessary to create a self-developed instrument and validate questions for this construct. Three focus groups from the early field studies, followed by pilot testing, was the initial validation strategy. Pertaining to this part, was an initial question about if the respondent was age 18 or over, and understood the survey instructions followed by the 66-item survey. Questions 1-8 related to computer self-efficacy (CSE), questions 9-24 related to attitude toward information and communication technology (ATICT), questions 25-36 related to perceived usefulness of e-commerce, questions 37-42 related to intention to use e-commerce (ITUEC), questions 43-51 related to culture/societal trust (ST), while Internet filtration questions were numbered 52 through 66 (see Appendix B).

The pilot test results and further field studies that involved analysis by student focus groups and meetings with HCT management, culminated in a second application made to NCU's IRB on May 27, 2011, and approval on June 1, 2011, to revise the 66-question survey to 24 questions. This 24-question survey retained four of the most valid and reliable questions for each of the six original DPI constructs. For the 24-question survey, validity and reliability established post hoc through a holdout sample, triangulated with the results from other studies, with established validity and reliability was acceptable before moving into primary data collection (Golafshani, 2003).

### **Initial Instrument Validation**

In Siddiqui's (2008) reliability measurement, using Cronbach's alpha, some reverse worded questions were included to assess internal consistency. Siddiqui's (2008) measurement yielded the following  $\alpha$  values: (a) attitude towards ICT: 0.902; (b) PUEC: 0.939; (c) CSE: 0.861; (d) intention to use e-commerce: 0.903; (e) culture: 0.561; and (f) SES: 0.459. These results indicated that culture and SES had low reliability, culture was marginally reliable and that the others were reliable measures. Siddiqui (2008) considered eliminating culture due to the lower reliability; however, Siddiqui ultimately kept this construct in the study. Meanwhile SES, with a  $\alpha < 5$ , was considered unreliable and eliminated from the study as a measurement (Siddiqui, 2008).

To validate the instrument, Siddiqui first used multiple linear regression (MLR) followed by ordinal linear regression (OLR). Siddiqui (2008) validated four out of the five instruments tested for validity: attitude toward ICT, PUEC, CSE, and intention to use e-commerce. These four constructs were found to be significant using a test at  $F(5, 1074) = 644.906, p < .0001$ . A regression coefficient of  $R^2 = .751$  for the MLR test showed that 75.1% of the variance occurring in the variable intention to use e-commerce was explained by these constructs. In Siddiqui's (2008) research using the OLR analysis, a positive relation existed between attitude towards ICT, CSE, and PUEC, and a positive relationship to intention to use e-commerce. These constructs showed a significant chi-square statistic of  $p < 0.0001$  at a 95% confidence interval. The culture-measurement, of Siddiqui (2008) was only marginally reliable, and a significant result not achieved for validity. Socio-economic status (SES) was not a reliable measure and not tested for (Siddiqui, 2008).

A discussion of the validation of the individual construct measurement items used for the DPAM study follows, in order of each measurement device. Deep packet inspection constructs organized by associated instruments aligned with specific questions on the survey; motivate the validation details of each associated instrument. The principal investigator gained authorization to reuse each measurement item from either, the seminal author or from the copyright holder. Survey questions matched to the agency or author granting permission for reuse are in Appendix C. Letters of permission for the measurements and their associated authors are found in Appendices H through O and include the permission granted by Siddiqui (2008).

**Computer self-efficacy.** CSE, questions one through eight, is one of the constructs validated by Siddiqui (2008). Seminal validation for this method was by Gefen (2000) and, using a similar measurement method, further validated by R. Thompson et al. (2006). Both studies were key contributors in defining validation of components measuring CSE for questions one through four. Gefen (2000) achieved factor loadings between .77 and .88, while R. Thompson et al. (2006) achieved factor loadings of between .78 and .92 for both Time 1 and Time 2 in a repeated study. The online transaction self-efficacy survey of Kim and Kim (2005) and Kim et al. (2009) was the source for questions five through eight. The loadings achieved for this survey range from .709 to .867. Kim and Kim (2005) and Kim et al. (2009) tested their loadings using diagonal elements, which are the square root of average variance extracted (AVE). Expectation was that loadings would exceed the inter-construct correlations and demonstrate discriminant validity between constructs. Reliability for Kim and Kim

(2005) was higher than .70, and the lowest average variance extracted (AVE) was .502, which was for effort on the CSE instrument.

**Attitude toward ICT.** Survey questions 9 through 24, measuring attitude toward ICT, were adapted from Siddiqui (2008). Research into the background of these questions indicated basis on the survey of Van Slyke et al. (2004), subsequently updated and revalidated by Van Slyke et al. (2010). Rogers' (1995) framework is the theoretical basis for validation; when tested, the construct had factor loadings ranging from .726 to .992. Van Slyke et al. (2004; 2010) also used AVE, such that the square root of AVE should exceed .707. The targeted validity standards were to have factor loading greater than .707 and an AVE exceeding .50, along with the reliability cut-off of .70 (Van Slyke et al., 2004).

**Perceived usefulness of e-commerce.** Questions 25 through 36 measure PUEC were from Siddiqui's (2008) survey, and were adapted from Xu and Cai's (2004), attitudinal study as well as Sagi et al.'s (2004) and Gefen's (2000) work on attitudes toward technology. Xu and Cai's (2004) survey questions (25-29) were originally validated by Childers, Carr, Peck and Carson (2001), whose loading values ranged from .69 to .88 in the initial study. When Xu and Cai (2004) repeated the study, validity was .942 and .957; reliability was .953. Gefen's (2000) seminal work, which applies to questions 30 through 32, experienced loadings of .770 to .880 and alpha values of .81, .89, and .89. Xu and Cai (2004) obtained loadings of .770 and .878, and an alpha value of .846. Xu and Cai (2004) also used the survey of Babin, Darbin, and Griffin (1994), which applies to questions 33 and 34. Finally, the original validation by Sagi et al. (2004) had factor loadings for questions 35 and 36 of .888 and .859, respectively. Sagi et

al. (2004) reported a cumulative Cronbach's alpha value of .7281 from the pilot study. Siddiqui's (2008) survey is based in part on Xu and Cai's (2004) study, which took place in two stages. The first stage yielded an instrument with three factor loadings less than .50, removed for the second stage of testing. Factor loadings for validity improved for Xu and Cai's (2004) revised instrument and used for this current study, ranging from .738 to .957.

**Intention to use e-commerce.** Validated questions 37 through 42 from Siddiqui's (2008) survey measure intention to use e-commerce and were adapted from the survey devised by Van Slyke et al. (2004) along with that of R. Thompson et al. (2006). Questions 37 through 39 are from Van Slyke et al. (2010). This measurement of use intentions experienced a loading .945 with all reliability scales in the test by Van Slyke et al. (2010) exceeding .70. An  $r^2$  of .637 for use intentions indicated that much of the variance in Van Slyke et al.'s (2010) model was by this factor. Siddiqui's (2008) questions 40 through 42, measuring intention to use e-commerce, are based on R. Thompson et al. (2006), who used a two-stage study—as did Xu and Cai (2004)—resulting in reliability factors loadings of .86 through .90. Validity factor loadings for R. Thompson et al. (2006) were .85 to .87. R. Thompson et al. (2006) used an empirical, survey-based study of 189 MIS students to validate an updated version of the instrument originally validated by Compeau and Higgins (1995), who had used a random sampling survey of 2,000 knowledge workers, to validate their instrument.

**Societal trust.** The measurement of societal trust is obtained via questions 43 through 47, based on Sagi et al. (2004), who focused on cultural trust vis à vis national control, and consumer preference, and questions 48 through 51, based on the work of

Gefen (2000), who focused on consumer trust in e-commerce. Validation is in the work of Kim and Kim (2005) and Kim et al. (2009), based on Gefen (2000). For Kim et al. (2009), factor loadings were .757 to .893, with 67.8% of the variance explained by the construct. The reliability for Kim and Kim's (2005) instrument was .70. Sagi et al. (2004) used a principal component analysis and 14 iterations of Varimax rotation using the Kaiser test for normality to establish factor loadings for cultural trust ranging from .684 to .942. Alpha values exceeding .70 were retained (Sagi et al., 2004).

**Internet filtration.** The Internet filtration instrument (i.e. questions 52 through 66) were developed from constructs found in the literature review from the Open Net Initiative (2009b), a think tank affiliated with some of the top universities in the world. The Open Net Initiative investigated web filtration in the UAE, including a separate list of blocked content contained in the report of Etisalat (2009a), the UAE's state-led telecommunications provider. A workshop convened as part of a field study, using faculty, and student focus groups, and conducted in the context of action research to develop an e-commerce marketing lesson plan for the e-business management degree program on validity and reliability. Students from the sampling frame, working in teams, provided a review and feedback on the Internet filtration constructs and on the survey in general. Sakiz (2007) used a student-centered focus group to validate an e-learning instrument. Discussion of the focus group and action research processes, are next, in the section on field-testing. As with all other constructs, by inverting one of the questions and reversing the scores of that item, when computing the average value for the construct, a test for computing reliability via Cronbach's alpha, was included as part of the pilot study and primary data collection.

### **Field Study of Initial Instrument**

The filtration constructs supported the literature were subjected to analysis first by a group of faculty, and later by the university's e-business management students, then again by business faculty at an annual organizational business conference. In consideration of ONI's Internet filtration study (Open Net Initiative, 2009b) and the state-led telecom provider Etisalat's (2009b) own listing of blocked content, a field test was necessary to choose which questions to ask on the survey from the list of 54 Internet filtration constructs. A third group of six faculty experts from the HCT followed a similar procedure to that followed by the students and reviewed the constructs on December 21, 2010 as part of an faculty-based action research workshop modeled after Wallace (2003), and held under the auspices of innovative entrepreneurial education at HCT's annual business conference held at Dubai Women's College.

The first focus group, consisting of HCT faculty, was a field test of using such a group to validate the survey. The meeting occurred November 3, 2009 with HCT permission. The faculty members had an average of eight years of experience in the HCT system (Higher Colleges of Technology, 2011b). Three, Arabic-speaking faculty members, reviewed the survey and commented favorably on the quality of the Arabic translation. Two of those faculty members were originally from Iraq; they were business and IT faculty. The third Arabic speaker was from Iran and an Arabic language instructor. These Arabic-speaking faculty and two others from Bangladesh and Canada, who were IT and educational technology experts respectively, examined the Internet filtration constructs; they indicated that, although survey questions could be devised to elicit a wide range of responses on Internet filtration, they were uncomfortable picking



the questions. The faculty group suggested that a safer course of action might be to approach the students directly. Given the effect of traditional Islamic cultural values, with restrictions on sex, nudity, religion, and the requirement for honesty in all dealings, the principal investigator decided to approach a knowledgeable group of students about what can and cannot be said, or written about openly, in the Emirati culture without getting a faculty member terminated.

As recommended by the first focus group comprised of experienced faculty, the students selected the best Internet filtration constructs. The students were from the e-business management bachelor's degree program, which is among the highest degree qualifications offered at both Fujairah locations of HCT (Fujairah Colleges, 2011). Although the majority of students at Fujairah Women's College are engaged in foundational studies, the students who participated in the action research and worked with the Internet filtration constructs, were two academic years post-foundational in their studies. Subjectively, the particular group chosen has the greatest expertise in e-commerce among the students at Fujairah Women's College (Fujairah Colleges, 2011).

The ability to use a student-centered, shared learning experience as an approach is a method of student-teacher interaction that is favored at HCT (Higher Colleges of Technology, 2011b). Student learning outcome 2c requires that students assess the validity and reliability of market research findings. Instrument development using both faculty and student expertise is valuable given the student's traditional Arab and Islamic cultural roots and the lack of cultural understanding by outsiders (Higher Colleges of Technology, 2011b). Due to the threat of termination and deportation for expatriate employees that a serious breach of etiquette could trigger, the researcher assumes

significant risk in studying the use and perceptions of ICT in the UAE. As recommended by the earlier faculty-based focus group, students selected the best Internet filtration constructs.

Six faculty members evaluated the teaching and learning strategy at the Innovative Entrepreneurship Education, Business Division Conference, at Dubai Women's College (Higher Colleges of Technology, 2011b). The principal investigator facilitated a workshop, and requested the attending faculty to evaluate the action research of the teaching strategy and student outcomes. Feedback provided by the faculty was positive and supported the student learning outcomes for validity and reliability in e-commerce marketing. As part of a separate review, A. El Asad, a native Arabic speaker from Sudan, and a business instructor at HCT for the past 24 years, commented favorably on the Arabic translation of the instrument (A. El Asad, Higher Colleges of Technology, Business Faculty, personal communication, December 17, 2010).

As shown in the literature review, early work specific to Arab culture on technology adoption is limited. According to R. Thompson, Higgins, and Howell (1994), at the time of their research, they reviewed more than 100 articles and could not find a single study conducted in an Arab country (as cited in Siddiqui, 2008). G. Rose and Straub (1998), Al-Khaldi and Wallace (1999), Straub and Loch (2007), and Siddiqui (2008) reported the same problem.

Action research on validity and reliability in the context of a lesson plan was based the work of Sakiz (2007), who validated a self-developed instrument for e-learning using a focus group and pilot study comprised of students (see also Wallace, 2003). The Internet filtration constructs were the substance of the action research, focus group topic;

these constructs were from both Etisalat (2009a) and the Open Net Initiative (2009b). These filtration constructs are in the dissertation proposal Appendix F and Appendix G, respectively. Focus groups are popular with advertising and marketing organizations to understand consumer preferences and identify effective message strategies (Shockley-Zalabak, 2008). The advantage of a focus group approach in action research is the ability to discuss the problem quickly, gather feedback on the Internet filtration constructs, and get reactions to proposed courses of action (Shockley-Zalabak, 2008). It is important to note that faculty, and student field-testing were part of a feasibility study in the case of the faculty, and part of a regularly scheduled e-commerce lesson plan in the case of the students; accordingly, no data were collected.

Silverblatt's (1995) media literacy approach was the basis for the student-centered focus group (Higher Colleges of Technology, 2011b). Four of Silverblatt's *keys to interpreting media messages*, distributed as guides for the students in their two-stage process, helped students assess the qualitative construct factors (Silverblatt, 1995). First, students given the media message, which consisted of a set of instructions and two lists of constructs totaling 54 items, familiarized themselves with the topic and the instructions. Students divided themselves and formed two teams of four students and two teams of six students. Participants selected relevant information and used it to form an appropriate response to present to the principal investigator. Students organized the constructs into groups, based on function, comparison to like media, media communicator, and audience. Finally, to conclude Stage I of the action research focus group, each team provided the investigator with a group of constructs, based on a consensus ranking of top constructs within each theme to use as possible survey questions.

Prior to Stage II of the action learning-based focus group was the application of a heuristic technique by the principal investigator of the study to interpret the results and achieve a best fit/best case set of Internet filtration questions, and add these to the survey. Stage II required, that the focus group apply three questions, from the group-administered questionnaire (Trochim & Donnelly, 2008) to the entire survey, and make a qualitative interpretation of construct validity and appropriateness of the outcomes of Stage I as well as the other already validated construct measurements. The third focus group was a faculty workshop, on innovative entrepreneurship education, and procedurally mirrored the student action research, except faculty performed the process.

A pilot test took place after the principal investigator secured initial IRB approval. The survey was taken by two randomly selected class sections of bachelor's degree students, of  $n = 54$ . Four of the surveys had many skipped questions, and they were not included in the analysis. Surveys of  $n = 50$  were usable to examine the practical effectiveness and reliability of the instrument. Joppe (2000) had defined reliability as :

the extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if the results of a study can be reproduced under a similar methodology , then the research instrument is considered to be reliable . (p. 1)

While the pilot study is actually part of data collection, it is described here as part of instrumentation due to the need to validate and assess reliability for this instrument. The use of pilot studies in research, to establish reliability and uncover unforeseen problems with data collection, is quite common in scale development for technology adoption models. Examples of pilot studies used for this purpose are in several studies on

technology adoption, including I. Brown and Jayakody (2008), Sakiz (2007), Sagi et al. (2009), R. Thompson et al. (2006), and Xu and Cai (2005).

Cronbach's  $\alpha$  was used to measure the total reliability for all of the survey questions, using a separate reliability estimate for each subscale of the questionnaire (Trochim & Donnelly, 2008). Cronbach's  $\alpha$  makes a statement about the effectiveness of an item measuring a single latent variable (Sekaran, 2003). Cronbach's  $\alpha$  is particularly useful in identifying misunderstood questions, frivolously completed surveys, and instances in which respondents are not willing to give an honest answer (Trochim & Donnelly, 2008). To compute the alpha value, the number of items squared multiplied by the average covariance between items divided by the sum of all item variances and item covariances. The standardized alpha, which typically gives a higher value, was computed as the number of items, minus the average inter-item correlation, divided by adding 1 to the number of items, minus 1, and subtracting the average inter-item correlation (Siddiqui, 2008). SPSS/PASW-18 outputs alpha from both computational methods. The more conservative alpha computation method was favored, and reported over the standardized alpha. When conducting the pilot study to establish reliability, a reliability coefficient of .70 or greater was targeted (Agarwal & Selen, 2009; Cronbach, 1951; Nunnally, 1978; Sellitz et al., 1976).

### **Operational Definition of Variables for Initial Instrument**

Motivation of six independent variables and one dependent variable operationalized them for the study. The independent variables of computer self-efficacy attitudes toward ICT, perceived usefulness of e-commerce, intention to use e-commerce, and societal trust, were operationalized for pilot testing through survey questions taken

from six validated survey instruments. These measurements compiled in one survey instrument existed for Siddiqui's (2008) e-commerce adoption study, compared the UAE and Saudi Arabia. The Internet filtration variable—added to these variables, had basis on constructs identified in the study from work conducted by the Open Net Initiative (2009a) and Etisalat's (2009a) own data.

Likert-type items, were used throughout the instrument, and five possible responses were offered: strongly disagree, disagree, not sure, agree, and strongly agree (assigned a value of 1 through 5, respectively). The validity of the constructs thought to define the Internet filtration variable, needed to be determined. Thus, this first pilot study addressed the 66-question instrument's validity using factor analysis. The reliability test was Cronbach's alpha. The inclusion of negatively worded questions enabled split-half reliability estimation. Negatively worded questions were reverse-scored. A negatively phrased answer of strongly agree would be scored as 1.00 instead of the normal scoring value 5.00 for a non-reversed question. For example, question 52 measuring Internet filtration, "Blogging sites should be blocked" is a normal scored item while the negatively worded item 28 measuring PUEC, "I believe I will **not** be able to find a good deal when using the Web for purchase" (Siddiqui, 2008, p. 147), needed to be reverse scored.

**Computer self-efficacy.** The first independent variable ( $X_1$ ) was computer self-efficacy (CSE), represented by a Likert-type ordinal-based scale, and operationally defined by eight survey questions (items one through eight) that measured one's proficiency with computer technology. Items one through four were from R. Thompson et al., (2006), and items five through eight were from Kim and Kim (2005). A

summation of all ratings (i.e. responses), for the eight questions, was calculated and averaged, to yield a single average score for CSE. Item three, “I cannot send and receive e-mail,” was a negatively-worded response question. This was a verification tool for internal consistency and reliability. The score must be inverted for this one item when computing the aggregated total.

**Attitude toward ICT.** The second independent variable ( $X_2$ ), was attitude toward information and communication technology (ATICT). Attitude toward ICT, represented by Likert-type scaled ordinal-level response data, was operationally defined by 14 items (i.e. questions nine through 22) from Van Slyke et al.’s (2010) validated survey instrument, which was a revision of Van Slyke et al. (2004), and two items (i.e. questions 23 and 24) from Sagi et al. (2004), that focused on attitudes toward Internet access. A summation of all ratings for the 16 questions relevant to this construct were calculated and averaged to yield a single average score for ATICT. To assess internal reliability consistency in the instrument, negatively-worded item 18 “I think you cannot trust Web merchants,” aided identification of situations in which respondents answered all of the questions in the same way (Trochim & Donnelly, 2008).

**Perceived usefulness of e-commerce.** Eleven Likert-type scaled interval-level survey response items (i.e. questions 25 through 36) represented perceived usefulness of e-commerce (PUEC) as independent variable ( $X_3$ ). A summated total of the ratings for all 11 questions relevant to this construct was calculated and averaged to yield a single average score for attitudes toward PUEC. Like all of the independent variables prescribed for this study, data collection was for comparative testing purposes using

statistical correlation. Question 28 was an inverted response question, intended as a tool to evaluate testing reliability of the instrument.

**Intention to use e-commerce.** The fourth independent variable ( $X_4$ ), intention to use e-commerce (IUEC), represented by Likert-type scaled ordinal-level response data, operationally defined by questions 37 through 42, where questions 37 through 39 were from Van Slyke et al. (2010), and questions 40 through 42 were from the validated instrument of R. Thompson et al. (2006). This part was the operationalization of the measurement of intention to use e-commerce as an independent variable. An average score was obtained by computing the aggregated score for these six items, and dividing by six. The reversed item for this construct was question 41, phrased as follows.

“Although I will likely use information from the Web quite extensively, I don’t see myself directly using Web purchasing in the future. “

**Societal trust.** Societal trust ( $X_5$ ), abbreviated at ST, represented by nine Likert-type scaled responses—survey items (i.e. questions 43 through 51), where questions 43 through 47, were from Sagi et al. (2004), and questions 48 through 51 were from Gefen (2000). As with the other variable response measurement items, the aggregated total score, averaged based on the number of items, yielded a value that represented the score or value for that particular construct. Survey Question 50, was negatively worded; “I am not living in a high trust society.” The scoring regime for this question, and others that were negatively worded, would need to be inverted, and added to the aggregated construct score.

**Internet filtration.** Internet filtration ( $X_6$ ) was represented operationally by a series of Likert-type scaled, ordinal-level response format questions, that the respondent



answered about his or her feelings about, how necessary he or she thought it was to filter Internet content. The questions pertaining to Internet filtration (IF), were numbered as survey items 52 through 66. Question 57, “Gambling sites should not be blocked,” was a reverse-worded question, and was included here to enable the measurement of Cronbach’s alpha and a split half reliability estimate.

**Intention to use DPI.** The dependent variable (*Y*) was a latent variable that measured the propensity of the targeted group (Emirati nationals) to use DPI technology. Intention to use DPI was measured operationally by the correlations of the set of variables identified in the model shown in Figure 1 (see Chapter 1) that were thought to influence intention to use DPI. Questions about CSE (items one through eight), attitudes towards ICT (questions nine through 24), PUEC (items 25 through 36), intention to use e-commerce (questions 37 through 42), societal trust (items 42 through 51), and feelings about different Internet content filtration (items 51 through 66) were presented to the respondent in a Likert-type, scaled response format to obtain ordinal-level type data. This type of data was suitable for a factor analysis. Factor analysis was used to determine goodness-of-fit of the proposed model for predicting intention to use DPI (Boomsma, 2000; Pham & Jordan, 2007; T. A. Brown, 2006).

### **Pilot Testing of Initial Instrument**

A principal component analysis (PCA), which is not based on the common factor model, makes no distributional assumptions, and is less prone to improper solutions than the maximum likelihood estimator, was used for factor extraction using PASW-18 on 50 cases ( $n = 50$ ) of the 66 items on the DPI Survey. “Principal component analysis aims to account for variances in the observed measures rather than explain the correlations

among them” (T. A. Brown, 2006, p.22). The sample consisted of 14 surveys, which were the reversed question Arabic instrument, 10 surveys that were the reversed question English instrument, 12 surveys that were the control Arabic instrument, and 14 surveys that were the control English instrument.

After running an initial analysis, eigenvalues for each component in the data were obtained. Highly scattered solutions with 10-13 factors and a non-positive definite matrix message was the initial solution. Factors selected for retention had conceptual and empirical relevance, while factors eliminated had non-substantive method effects, such as inconsistencies with some of the reverse and non-reverse worded questions, and for statistical weakness. Poorly defined factors, having two or less item loadings, were eliminated, as were those with numerically small loadings, signifying low communality. Poorly behaved items having high crossloadings and small loadings on all factors were candidates for reduction. Items from three conceptually distinct factors, consistently loaded onto the first factor, after removing poorly behaved factors.

Given the small sample size, large number of items, and data inconsistencies, a four-factor solution that retained all six constructs was specified. Although oblique rotation methods were investigated, and adequate pattern matrices were obtained, varimax, an orthogonal rotation method provided the best solution. For this solution, the Kaiser-Meyer-Olkin measure of sampling adequacy was .776, which is considerably higher than the minimum standard of .50. The conceptually distinct Internet filtration, intention to use e-commerce, and societal trust items all loaded onto factor one and explained 48.473 % of the variance. Perceived usefulness of e-commerce, with a variance of 14.654%, loaded onto the second factor. Computer self-efficacy (CSE), with

a variance of 8.969%, and Attitude toward IT, with variance of 6.128%, loaded separately onto the third and fourth factors respectively. Cumulatively the final analysis model explains 77.847% of the variance. The factor loadings achieved after varimax rotation are in Appendix P. Because the three latent factors that loaded onto the first factor are both conceptually relevant, distinct, and overall variance explained was relatively high, permission was requested from NCU's IRB to seek to replicate the final factor solution with an independent sample.

A secondary, and ideal outcome of the factor analysis of the pilot data, was creation of a valid and reliable instrument, one derived from the 66 items, albeit reduced to 24 items, which was a less cumbersome instrument. The revised subscales for computer self-efficacy, attitude toward IT, perceived usefulness of e-commerce, intention to use e-commerce, societal trust and Internet filtration all had high reliabilities for Cronbach's  $\alpha > 0.757$  (See Appendix P). Four items retained per factor is one more item than required for a scale, and sufficient to motivate each of the six factors. Thus, these scales underwent revision after taking into account the reduction in items from the exploratory factor analysis. The next step was to validate the piloted survey approach that used 24 questions, by replicating the final EFA solution with an independent sample (Agarwal & Selen, 2009).

### **Competing Interpretation of Pilot Testing of Initial Instrument**

There was a competing interpretation of the pilot test results where the six factor model to explain the adoption of deep packet inspection in the UAE was collapsed into a sixteen question, four factors model with four questions per scale. Factor extraction using principal component analysis in PASW-18 was employed on 50 cases ( $n = 50$ ) of

the 66 items on the DPI Survey. The sample consisted of 14 surveys that were the reversed question Arabic instrument, 10 surveys that were the reversed question English instrument, 12 surveys that were the control Arabic instrument, and 14 surveys that were the control English instrument. With two versions of each English survey, one having some reversed questions, and then having to translate them both into Arabic, meant there were significant complexities to the behavior of the instrument.

An initial analysis run to obtain eigenvalues for each component in the data, this data also yielded highly scattered solutions with 10-13 factors, and a non-positive definite matrix message. Factors were selected for having conceptual and empirical relevance (Brown, 2006; Field, 2009). Given the small sample size, large number of items, and data inconsistencies, a four-factor solution was specified. Items defining factors were excluded that exhibited non-substantive method effects, such as inconsistencies with some of the reverse and non-reverse worded questions. Poorly defined factors, with only two or three item loadings, were eliminated, as were those with small loadings, signifying low communality. Poorly behaved items, having high crossloadings, and small loadings on all factors were also candidates for reduction.

Although oblique rotation was investigated, and adequate pattern matrices were obtained, varimax, which is an orthogonal rotation method, provided the best alternate solution. For this solution, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .665. This was lower than the result of the other analysis, and one of the reasons this solution was not accepted. The conceptually distinct constructs of computer self-efficacy (CSE), attitude toward ICT (ATICT), intention to use e-commerce (IUEC), and Internet filtration (IF) all loaded onto separate factors and cumulatively and

explained 56 % of the variance. This was 22%, less variance explained, than the other interpretation. Perceived usefulness of ecommerce (PUEC), and the societal trust (ST) construct, did not load well onto either construct under factor analysis.

The four best performing questions, for each of the four constructs, were proposed for retention and these would have produced a questionnaire of 16 questions total, with four scales of four questions each. As such, the best CSE, ATICT, IUEC, and IF, questions, those which loaded consistently well onto the factors, would have been retained under this competing survey model. One question from the societal trust scale, number 47, from the 66-question survey, “A nation should control the Web content that crosses its borders.” loaded onto Internet filtration, just as it did with the other interpretation. An interpretation of face validity indicated that this question could potentially be correctly placed with Internet filtration (IF).

The questions for societal trust did not test well, for this competing interpretation of the pilot test, as well as in the earlier study by Siddiqui (2008) where the same questions were termed culture. As such, questions on societal trust/culture were candidates to be dropped from the model and subsequent survey. Questions on the perceived usefulness of ecommerce had inconsistent scattered loadings, with several high crossloading coefficients, did not represent a specific construct for the study based on this interpretation of the pilot test results. Appendix Q shows the factor loadings for the four-factor solution, using varimax rotation, and suppression of factors smaller than .543. Using this value suppresses crossloadings that would otherwise show when using the standardized suppression cut-off value of .40 (Field, 2009).

### **Field Study of Revised Instrument**

A focus group consisting of 20, second year Bachelor's degree e-business management students, from the EBMG N250 Operations class, took place on April 12, 2011. The principal investigator was present. The goals of the focus group were to assess two interpretations of data from the pilot study that yielded different competing factor analysis results, and review again the wording of the instrument's question items for translation accuracy between English and Arabic versions of the instrument.

Both factor analysis models, had high observed Cronbach's  $\alpha$  scores, and high factor loadings, across retained questions that were conceptually related. The interpretation that loaded 24 questions, aligning with six constructs from the DPI model, onto four latent factors, and explained 22% more of the variance extracted, was selected, over the factor outcome that loaded four constructs, using 16 questions, onto four latent factors. Admittedly, to achieve the component matrix for the four-factor model, factor loading coefficients, with absolute values of less than .543, required suppression. This was to obtain a cleaner view of factors, and eliminate from view some cross loadings from the report. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was also less efficient for the four-factor solution than with the six-factor solution. Since the purpose of the dissertation study, was hypothesis testing of the six-factor deep packet acceptance model (DPAM), elimination of two factors, resulting from the pilot study, and to proceeding to obtain data on four factors, was not warranted, given evidence of the validity and reliability of an instrument that would carry all six constructs forward into the primary study. The focus group was satisfied with the wording of the instrument's questions that had tested well, including the Arabic translations.

On May 5, 2011, via video conference, the principal investigator was required to meet one-on-one, with HCT's Dr. S. Jones, Director of Abu Dhabi Men's College. Dr. Jones also supervises a separate research directorate at HCT employing Dr. E. Forsberg, Associate Dean of Research. Dr. Forsberg was supervising the research of the principal investigator. This was only in the context of administering the principal investigator's nomination for the Wharton Global Faculty Development Program and grants with the Wharton School at University of Pennsylvania's at the Higher Colleges of Technology, from the William and Phyllis Mack Center for Technological Innovation and the Entrepreneurship and Family Business Research Center at CERT.

In the videoconference between the principal investigator, and Dr. S. Jones, commitments the principal investigator had made April 26th in response to the meeting on April 25 2011, with the Higher Colleges of Technology's, Academic Central Services (ACS) were reviewed. This earlier meeting had taken place with P. Scanlan, Dean of Academic Advancement and Accreditation (AAA), Dr. M. Robby, Supervisor of Quality Improvement, and other members of the Quality Improvement and Institutional Research Committee (QIIRC). The principal investigator, questioned by P. Scanlan and Dr. M. Robby, regarding the reporting of any descriptive statistics, related to percentages of Emirati nationals in agreement, or disagreement with government policy, provided a written commitment to use discretion in the reporting of descriptive statistics. Dr. Jones requested that because the UAE was not a Western liberal democracy, the principal investigator should consider, but would not be required, to remove any the following questions that P. Scanlan's team had been alerted to, by Dr. N. Khan of Abu Dhabi

Women's College. This request was primarily due to the sensitivity of the political context of the following questions.

1. The government should not stop any product that is legal and is paid for on the Internet from coming to the country.
2. A nation should be able to control the web content that crosses its borders.
3. I am not living in a high trust society.
4. Blogging sites should be blocked.
5. Terrorism content should be blocked.
6. Top level Domain for Israel .il should be blocked.

The principal investigator explained support for the research to Dr. Jones, through data from pilot study, and backed up by theory from the literature review, and that the purpose of the research was to attempt to answer hypothesis testing about a technology adoption model for the UAE utilizing DPI. The meeting ended with a discussion of HCT's partnership with Wharton, the success of the principal investigator with the study on deep packet inspection, in securing two Wharton research grants, and a nomination to the Global Faculty Development program, taking place in August 2011, all related to the DPI study. Dr. Jones' made known his satisfaction with the research potential coming out of HCT Fujairah, and that the study could continue. It is important to note that gaining tacit authorization to continue the study from the director of one of the more influential campuses, Abu Dhabi Men's College, and director of a major research directorate within the HCT system, having administrative responsibilities for the Wharton/CERT collaboration, was a most positive outcome.



### **Pilot Testing of Revised Instrument**

With a basis on prior evidence, applicable theory, and data collected from the first pilot test, a 24 question revised version of the original 66 question instrument, was used for a second pilot test evaluating the instrument for use with the six factor DPAM. These indicators were tested again using principal component analysis (PCA). No distributional assumptions were made for the factor extraction using PASW-18 on the same 51 cases ( $n = 51$ ) of the 24 items on the revised DPI Survey. The sample consisted of 51 surveys, and used the Arabic instrument containing some reversed questions.

An initial analysis, run to obtain eigenvalues for each component in the data, produced highly scattered solutions, with 7-8 total factors, in early analyses. Factor extraction was attempted first on 6, and then 5 factors, and finally, using promax rotation on 4 factors, a best fit achieved. The study used three of the reversed worded question items and there were no non-substantive method effects, such as inconsistencies with the reverse and non-reverse worded questions. There were no poorly defined factors. However, Question 18, loaded onto Internet filtration instead of societal trust. Factor loadings for EFA, from the second pilot study, are in Appendix R.

Question 18, “A nation should control the Web content that crosses its borders” a societal trust question, along with all four of the Internet filtration questions, 21-24, loaded onto the first factor. These factor loadings, utilizing a promax rotated structure, ranged between .775 and .861. Questions 8 and 13, had high crossloadings of .562 and .418 respectively, with the first factor, however each had higher loadings, of .685 and .779 onto their primary factors loadings, which were factors two and three respectively. The CSE questions one through four, and ATICT, questions five through eight, loaded

onto Factor 3 with loading values of .603 through .794. Intention to use e-commerce (IUEC) questions, were numbered 13-16, and the societal trust questions, 17, 19 and 20, loaded onto the second factor, and had factor loadings ranging from .643 to .860. There was one strong crossloading value of .418, loading onto factor two, by question 13, which had otherwise loaded with the other PUEC questions, 9-11, onto the fourth factor by loadings ranging from .643 to .905.

The reliability of the four-question CSE scale, assessed using Cronbach's  $\alpha$  was .804. Attitude toward ICT had a Cronbach's  $\alpha$  of .793 and PUEC had a value of .839. Intention to use e-commerce had a scale reliability of .792. Societal trust was a three-item scale and had a Cronbach's  $\alpha$  of .771. Internet filtration was a five-item scale, with a Cronbach's  $\alpha$  of .887. Reliability results for the second pilot test are in Appendix R.

Given the small sample size of  $n = 51$ , and the 24 items survey, a four factor solution retaining all six constructs was specified. Although orthogonal rotation methods were attempted, and adequate pattern matrices obtained, promax rotation, which is an oblique rotation method, provided the best outcome for this solution. For the second pilot test, the Kaiser-Meyer-Olkin measure of sampling adequacy was .663, lower than obtained in the first pilot test, but still exceeding the minimum standard of .50.

The Internet filtration (IF), items with the addition of question 18 originally from societal trust, all loaded onto Factor 1, and explained 21.565 % of the variance. Intention to use e-commerce (IUEC), and societal trust (ST) with a variance of 17.617 %, loaded onto the second factor. Computer self-efficacy (CSE), and attitude toward IT, (ATICT) with a variance of 15.296 %, loaded separately onto the third factor. Perceived usefulness of e-commerce, (PUEC) loaded independently onto the fourth factor at 9.813

% of the variance. Cumulatively, the model explained 64.282 % of the variance. Refer to Appendix R for the factor loadings of Pilot Study 2, using promax rotation.

Because factor validity and reliability estimated from the second pilot study was statistically sound, the study proceeded to testing on a larger sample of the population. Items loaded onto factors in a conceptually relevant fashion, and the overall variance explained by the model was high. The aim was to replicate the factor solution from the second pilot study, within the EFA framework, and ultimately conduct a CFA, on a larger sample of the population.

An ideal secondary outcome of the factor analysis of the pilot data, was that a valid and reliable instrument was emergent from the 66 items, now reduced to 24, creating a less cumbersome instrument. The revised subscales for computer self-efficacy, attitude toward IT, perceived usefulness of e-commerce, intention to use e-commerce, societal trust and Internet filtration all had high reliabilities for Cronbach's  $\alpha > .771$ . As per Agarwal and Selen, (2009); T. A. Brown (2006); and Field (2009), a minimum of three items per factor is required for a scale, and three items were retained for societal trust, while four items were retained per each of CSE, ATICT, PUEC, IUEC, and Internet filtration has five items that defining that factor. Scales underwent revision after taking into account the reduction in items from the exploratory factor analysis. The next step was to validate the piloted survey approach that used 24 questions replicated as an EFA solution within CFA using an independent sample (Agarwal & Selen, 2009).

### **Operational Definition of Variables for Revised Instrument**

Six independent variables and one dependent variable, operationalized through a validated and reliable instrument was the primary outcome from the second pilot test.

The independent variables of CSE, attitudes toward ICT, PEUC, and intention to use e-commerce, were from the survey of Siddiqui (2008). Siddiqui's original culture construct has been renamed societal trust, to reflect the face validity of the questions successfully added to the measurement instrument. All questions for societal trust originated as culture questions from the Siddiqui (2008) survey. Material taken from Siddiqui 2008 had author permission for their adaptation to the study of DPI. The Internet filtration independent variable, was added to the model based on constructs identified earlier in the study based on literature published by the Open Net Initiative (2009a) and Etisalat's (2009a) own data.

There were five possible responses offered for all Likert-type items: strongly disagree, disagree, not sure, agree, and strongly agree (assigned a value of 1 through 5, respectively). The revised pilot study keeps three of the original negatively worded questions to estimate reliability. For a negatively worded question, the scoring was be reversed. For example, the negatively worded item 28 measuring PUEC, needs to be reversed for scoring purposes: "I believe I will **not** be able to find a good deal when using the Web for purchase" (Siddiqui, 2008, p. 147).

**Computer self-efficacy.** The first independent variable ( $X_1$ ) is CSE, represented by Likert-type ordinal-based scaled data, operationally defined by four survey questions (i.e. original questions four, five, six, and seven taken from the 66-question survey) and measure one's proficiency with computer technology. A summation of ratings (i.e. responses) for these four questions, are shown below in Table 1, was calculated and averaged to yield a single average score for CSE.

Table 1

*Questions for Measuring Computer Self-efficacy*

Item	Question
Question 1	I use the Internet for chatting with ease.
Question 2	I can get the information from a website easily for my work.
Question 3	I am confident that I can obtain relevant information through online sources (e.g. online discussion groups, reputation sites, etc) on the web vendors if I am planning to purchase an item online.
Question 4	I prefer the sites that have chat room to see what others say about the product and service.

**Attitude toward ICT.** The second independent variable ( $X_2$ ) is attitude toward ICT, represented by Likert-type scaled ordinal-level response data. Four items (i.e. original questions 15, 16, 20, and 23 taken from the 66-question survey) operationally define variable  $X_2$  and measure one's attitude toward Information and communications technology. A summation of all ratings for the four questions relevant to this construct was calculated and averaged to yield a single average score for attitudes toward ICT (ATICT).

Table 2

*Questions for Measuring Attitude Toward ICT*

Item	Question
Question 5	Learning to use the Web for purchasing products or services is easy for me.
Question 6	I believe that it is easy to get the Web to do what I want it to do.
Question 7	My life is better because of the Internet.
Question 8	The Web should be accessible just like mail and electricity.

**Perceived usefulness of e-commerce.** Four Likert-type scaled interval-level survey response items (i.e. questions original questions 25, 26, 27, and 28 taken from the 66-question survey) represent perceived usefulness of e-commerce (PUEC) as independent variable ( $X_3$ ). A summated total of the ratings for all four questions relevant to this construct were calculated and averaged to yield a single average score for attitudes toward PUEC. Like all of the independent variables prescribed for this study, data collection was for comparative testing purposes using statistical correlation. Question 12 was an inverted response question, and used to test testing reliability of the instrument.

Table 3

*Questions for Measuring Perceived Usefulness of E-commerce*

Item	Question
Question 9	I expect cheaper prices on the web.
Question 10	Using the Web would help me to make a better decision.
Question 11	Using the Web would help me to buy product I really want.
Question 12	I believe I will <b>not</b> be able to find a good deal when using the Web for purchase.

**Intention to use e-commerce.** The fourth independent variable ( $X_4$ ), intention to use e-commerce (IUEC), was represented by Likert-type scaled ordinal-level response data and is operationally defined by questions 13 through 16 (i.e. original questions 37, 38, 41, 42, taken from the 66-question survey). This part was the operationalization of the measurement of intention to use e-commerce as an independent variable. An average score for IUEC was obtained by computing the aggregated score for these four items and dividing by four. Question 15 was an inverted response question, and a reverse scored item. It was in the survey as a tool used to test reliability of the instrument.

Table 4

*Questions for Measuring Intention to Use E-commerce*

Item	Question
Question 13	I would pay to download information if it saves me time.
Question 14	I believe Internet will make my shopping more efficient.
Question 15	Although I will likely use information from the Web quite extensively, I <b>don't</b> see myself directly using Web purchasing in the future.
Question 16	I expect that I will use Web purchasing quite extensively in the future.

**Societal trust.** Societal trust ( $X_5$ ) was represented by three Likert-type scaled response data items, and was operationally defined by questions 17, 19, and 20 (i.e. original questions 43, 50, and 51, taken from the 66-question survey). As with the other variable response measurement items, the aggregated total score was averaged by dividing using on the number of items, to yield a value that represented the score or value for that particular construct. Question number 19 was a negatively worded question, where the scoring needed to be inverted, and added to the aggregated score, before being

divided by three, to yield the average value for this construct. Question 18, *A nation should be able to control the web content that crosses its border*, was originally a societal trust question. Since question 18 loaded onto Internet filtration, instead of societal trust, it was shifted to the Internet filtration construct.

Table 5

*Questions for Measuring Societal Trust*

Item	Question
Question 17	The government should not stop any product that is legal and is paid for on the Internet from coming in to the country.
Question 19	I am <b>not</b> living in a high trust society.
Question 20	My friends are generally trustworthy.

**Internet filtration.** Internet filtration ( $X_6$ ) was represented operationally by five Likert-type scaled, ordinal-level response format questions that the respondent answered about his or her feelings about how necessary they thought it was to filter Internet content. The questions pertaining to Internet filtration were survey items 18, and 21, through 24 (i.e. original questions 47, 52, 61, 65, and 66, taken from the 66-question survey). Question 18, originally assigned to the societal trust construct, loaded onto Internet filtration in pilot testing. In addition to the empirical support, a reconsideration of face validity of the question, performed in the context of a focus group, supported shifting the question to internet filtration. Thus, Question 18, “A nation should be able to control the web content that crosses its border,” was removed from the societal trust construct, and aligned instead with IF. The average for the Internet filtration construct, equaled the aggregated total, of five items, divided by five.



Table 6

*Questions for Measuring Internet Filtration*

Item	Question
Question 18	A nation should be able to control the web content that crosses its borders.
Question 21	Blogging sites should be blocked.
Question 22	Content that insults any recognized religion should be blocked.
Question 23	Terrorism content should be blocked.
Question 24	Top Level Domain for Israel (.il) should be blocked.

**Intention to use DPI.** The dependent variable ( $Y$ ) is a latent variable that measures the propensity of the targeted group (Emirati nationals) to use DPI technology. Intention to use DPI is measured operationally by the correlations of the set of variables identified in the model shown in Figure 1 (see Chapter 1) that are thought to influence intention to use DPI. Questions about CSE (items one through four), attitudes towards ICT (questions five through eight), PUEC (items nine through 12), intention to use e-commerce (items 13 through 16), societal trust (items 17, 19, and 20), and feelings about different Internet content filtration (items 18, 21 through 24) are presented to the respondent in a Likert-type, scaled response format to obtain ordinal-level type data. This type of data is suitable for a factor analysis used to determine the goodness-of-fit of the proposed model to predict any intention to use DPI (Boomsma, 2000; Pham & Jordan, 2007; T. A. Brown, 2006).

**Data Collection, Processing, and Analysis**

The survey was administered to HCT students; data collected was Likert-type, index-scaled, interval-level data. Due to the data analysis method specified, if the

investigator was required to evaluate the data collected as ordinal-level, a lower category in terms of statistical analysis methods, the effect of this requirement would have been negligible. This is because the proposed analysis method used to determine correlation is the maximum likelihood estimator (MLM), which is robust to non-normality, and appropriate for ordinal-level data (T. A. Brown, 2006). Furthermore, to strengthen the analysis, the Satorra-Bentler Scaled  $\chi^2$  test statistic corrected for non-normality in the data (T. A. Brown, 2006). The ordinal-type of data collected was compatible with CFA and used to evaluate the model in the SPSS statistics software platform, which used the LISREL method (T. A. Brown, 2006; Field, 2009; Garson, 2009; Jackson, 2000; Schermelleh-Engel, Moosbrugger, & Müller, 2003; Trochim & Donnelly, 2008).

The recruitment strategy after achieving host institution and IRB approval was to consult with directors, associate directors, deans, and program and divisional chairs at the various colleges and academic divisions to raise awareness of the survey. The survey administered via hyperlink distributed in an email communication sent over the HCT email servers, and website postings was effective in reaching the target audience. This communication contained evidence of HCT's authorization of students' participation in the study, and the link to the survey on Smart-Survey (2011).

The main data collection took place after the first pilot study. The paper version of the survey is in Appendix B. Final primary survey administration took place during a single three-week period June 1, 2011 through June 21, 2011 to minimize maturation threat (Trochim & Donnelly, 2008). When the online survey hyperlink was distributed, students selected to participate via multistage random sampling, were also notified of the limited three-week period to complete the survey. By posting notification via the HCT

outlook email system and the student Web portal, the researcher was partially able to overcome the limitations of time and space in sampling the test population.

The Skip-Logic function, available at extra-cost through Smart-Survey (2011) allowed a language selection feature to be embedded in the online survey, and referred participants to either the English or Arabic versions. The Arabic translation of the survey, included an accurate translation for the Internet filtration constructs, verified by native Arabic speakers. Furthermore, to display Arabic text right to left in the typical style, the correct HTML code was required (SurveyMonkey, 2010). Smart-Survey, a competing format worked well with Arabic script without requiring excessive HTML coding (Smart-Survey, 2011), and was the survey platform used for this study. A paper version of the instrument—a supplementary mode of data collection, was held in reserve as a back-up plan, but never used. The paper survey would have been for cases where, if for some reason the online method was not preferred, and a paper survey would have been more practical. The first preference was to have the students complete the survey adapted for the web. To ensure consistency, after coding by the researcher, another HCT faculty member verified the collected and coded data. The Smart-Survey (2011) results compiled in Excel first, prior to transfer into SPSS, thus, preparing the data for analysis and long-term storage.

To meet the requirement for normally distributed data, the Kolmogorov-Smirnov (*K-S*) and Shapiro-Wilk (*S-W*) tests of univariate normality were proposed to determine if the distribution deviated significantly from a comparable normal distribution. The sample is not significantly different from a normal distribution if the computed value of  $p > .05$ , but it is significantly different if  $p < .05$ . Because the *K-S* and *S-W* tests are quite

sensitive and prior experience with large sample sizes has shown that it can be quite easy to obtain significant results with small deviations from normality, the *K-S* and *S-W* results were be interpreted in conjunction with histograms, scatterplots, and *Q-Q* plots, checked for skew, kurtosis, and outliers. This assisted in drawing visually identifiable inferences (DeCarlo, 1997a; Field, 2009; Kline 2011). Mardia's test and Srivastava's test are suitable for analysis of multivariate normality (DeCarlo 1997b; Enomoto et al., 2010; Mardia, 1974; Mardia & Foster, 1984; Okomoto & Seo, 2008; Srivastava, 1984; Srivastava & Hui, 1987).

The use of MLM, which is robust to non-normality and appropriate for ordinal data analysis, was proposed, and is particularly appropriate if the data cannot be treated as interval and by default is assessed as ordinal (T. A. Brown, 2006). MLM is a goodness-of-fit modeling technique that generates a solution most likely to produce the correlation matrix observed in the data (Zhang, 2009). When the MLM estimator is used, then the Satorra-Bentler Scaled  $\chi^2$  test statistic is desirable as a correction factor for non-normality (T. A. Brown, 2006). However, sample size was critical with MLM, which required at least an  $n \geq 400$ , in order to be a robust statistical measurement. In past studies, the maximum likelihood estimator provided a formal statistical fit with over-identified models that were more robust than the weighted least squares (WLS) method when used with the recommended Satorra-Bentler correction factor to account for non-normality (Schermelleh-Engel et al., 2003).

According to Field (2009), exploratory factor analysis was appropriate to evaluate or construct a questionnaire to measure an underlying variable—in this case, Internet filtration. A principal component analysis is suitable for factors that are not correlated

while maximum likelihood EFA is suitable if correlation of factors is permitted (Brown, 2006; Field, 2009). A further analysis phase used CFA to establish discriminant and convergent validity by comparing correlation results among similarly tested variables. Discriminant validity refers to the degree of difference contained in the measures of different latent variables, while convergent validity, and is the degree of sameness for variables that should have some correlation (Agarwal & Selen, 2009). Evaluation of DPAM included an assessment of both discriminant and convergent validity.

For the EFA analysis, factor loadings above a cut-off value of 0.30 (Holmes-Smith et al., 2009; Hair et al., 1998) and greater than .40, without significant cross loadings was desirable (Widaman, 1993). For CFA, loadings with indicator values  $\geq 0.5$  or a significant  $t$  value of 2.0—or both—would have shown convergent validity (Fornell & Larcker, 1981). Correlation coefficients  $\geq 0.6$  but not greater than 0.9 were desirable to reject the null hypothesis and allow default to the alternate hypothesis for each of the six cases of variable fit within the model. A correlation coefficient greater than 0.9 was indicative of factors that were probably too closely related and likely measuring the same attitudes, thus not showing discriminant validity (T. A. Brown, 2006).

Other researchers have identified situations in which a lower alpha value may be considered. For example,  $\geq 0.6$  may be acceptable in cases where the literature provided theoretical support, and analysis based on modified scales, as in the case of this examination of DPI (Nunnally, 1978). In addition, Cramer (2003) highlighted that, for newer scales such as the Internet filtration scale from this study, alpha values of  $\geq 0.6$  are acceptable. Finally, Bagozzi and Li (1988) advanced a lower threshold on the average

variance extracted of  $\geq 0.5$ ; this lower alpha value was justified in cases where there were fewer items.

### **Methodological Assumptions, Limitations, and Delimitations**

This study had some limitations given that it used a purposive, yet random, multistage sample of a specific segment of the UAE's post-secondary education environment. This sampling frame is more representative of the larger population of Emirati nationals, than if students from only one emirate were sampled; however, due to the large number of expatriates employed in industry, the sampling frame is not representative of the UAE (UAE Federal e-Government Portal, 2006). Since the participants are Emirati nationals, and this phase of the study does not consider expatriate workers employed in a decision-making capacity at firms located in the UAE, for which using DPI might be relevant, the ability to generalize to the UAE at large is limited. This limitation is correctable in a post-dissertation study that collects data from industry practitioners.

This study was not geographically limited within the UAE and had the advantage of potentially sampling populations from all of the emirates. Furthermore, how many participants will actually gain employment in a relevant sector of the economy, and have any influence on decision makers in industries relevant to DPI is an unknown. Finally, as participants were located in the UAE, their opinions of DPI are not generalizable to global opinion. However, because this study used a random sample, generalizability is mathematically extendable beyond this study to other populations in comparison to a non-random sample (Trochim & Donnelly, 2008).

According to Zikmund (2003), the Likert-type interval-level responses as specified by Trochim and Donnelly (2008) only provided ordinal-level data. Through the construction of a summated ratings scale, this yielded an average for all the Likert-type items for that particular variable, obtaining an indexed value. It is acceptable to treat this index value as ordinal-level data that has been elevated, and interpretable as interval-level data, assuming the conditions for normality existed in the data (Zikmund, 2003).

Siddiqui's (2008) survey used previously validated measurement questions. However, for the Arab population, due to the low reliability score achieved by Siddiqui (2008) for the SES variable and the highly variable question format that only yielded nominal through ratio-scaled data, the SES measurement was not used. United Arab Emirate national students are eligible for a free education provided by the government; within the HCT system, all students receive a laptop, Internet access, and a modern technological environment. Considering the level of support provided to students by the state sector, SES was likely to be not as important as it is in studies taking place in less homogeneous countries, such as the United States (Woszczyński et al., 2007). With widespread Internet access, and technology training ubiquitously being provided to all Emiratis through the school system (Higher Colleges of Technology, 2011b), the effect of SES was believed to be diminished.

The societal trust construct contained the measurement apparatus for culture interpreted as societal trust. The connection of Siddiqui's (2008) original culture questions, to societal trust, is based on the face validity of wording of the questions. Statements such as "My friends are generally trustworthy," "The government should not stop any product that is legal and is paid for on the Internet from coming in to the

country,” and “I am not living in a high trust society,” clearly spoke to the issue of trust (Siddiqui, 2008). The theoretical logic was that trust is a component of culture and part of Hofstede’s (2009) high uncertainty avoidance, high power distance situation, leading to the use of ultimate authority to set rules, regulations, laws, and policies—the reinforcing feature of a classic Islamic moral economy (El-Sheikh, 2008). A dichotomy existed on trust, in consideration of views, that the polity censured the arbitrary rule of the leadership (Lewis, 1996). Emiratis make up about 20% of the UAE population (Euromonitor International, 2009) and occupy nearly all of the top leadership positions in the government and key industries (M. Abdullah, Managing Director of Dubai Media City, personal communication, November 17, 2009).

Bocock (1995) extended Hofstede’s (1997) fourth dimension of cultural structuralism. Bocock’s (1995) view of culture was: “the shared meanings and values...but emphasizes the symbolic dimension and concentrates on what people do more than what the culture is” (p. 154). Shore and Venkatachalam (1996) extended this concept to that of a national culture. Therefore, the magnitude of the score from the societal trust variable was to enable understanding of how trust, an extension of culture, could affect the dependent variable.

Internet filtration is a true construct based on Etisalat’s (2009a) own criteria and those from ONI, an independent third-party research group (Open Net Initiative, 2009b). The ONI is a think tank that reviews Internet filtration for each country researched, through a primary evaluation of government surveillance at the national level. Internet filtration is thus a true construct and should not be construed as an “[artifact] of methodology” (Straub, 1989, p. 150).



Theoretical support in seminal studies held that, intention to use a technology linked to behavior of performing the activity. According to Fishbein and Ajzen's (1975) classical treatise on theory building, "intention with respect to object X has a direct effect on the behavior with respect to object X" (p. 15). Here, Fishbein and Ajzen meant that if an individual performs a behavior, then he or she intended to perform that behavior. In the context of using computer technology such as DPI, if there is a lack of information about actual use, then the construct of intention to use, is a valid predictor of actual use (Ajzen, 2002; Hsu & Chiu, 2004; Sagi et al., 2004). Theoretical support for the independent variable of behavioral intentions toward the usefulness of e-commerce and intention to use DPI was found in Vroom's (2000) expectancy theory, Bandura's (1982) self-efficacy theory, and the diffusion innovation theory, as advanced by theorists such as Clarke (2009); Eisenhart, (1999) and Santos, Doz, and Williamson (2004).

The four technology adoption-related variables of this study—namely, CSE, attitude toward ICT, perceived use of e-commerce, and intention to use e-commerce—were expected to show some possible mutual correlation with each other, perhaps between .50 and .80. If variables have a correlation coefficient of .90 or above, this indicates some redundancy, as the variables may measure the same underlying traits and are not sufficiently discriminating. Factor loadings of at least .50, or a *t* value > 2.0, individually or concurrently, demonstrated convergent validity, for constructs that should show some correlation (Agarwal & Selen, 2009).

According to Trochim and Donnelly (2008), the internal validity of a pattern-matching design is quite strong, particularly when it incorporates many variables. Internal validity is the phenomenon that the observed effects are indeed the result of a

true cause-and-effect relationship and not the result of other extraneous causes (Trochim & Donnelly, 2008). Temporal presence, covariation of cause and effect, and a search for plausible alternative explanations were a part of the evaluation. The results underwent analysis for alternative explanations such as history and maturation threats; however, such threats were minimized by the time exposure of the study to the general university population, being limited at 3 weeks. Testing for regression threat included an assessment of cause-and-effect as part of the analysis, and presented in the results.

External validity is the transferability of conclusions from one study to other persons at other times (Zikmund, 2003). External validity and transferability of the results to the greater Emirati population are, on the surface, poorly supported statistically by the convenience sampling of college students of the purposive study (Trochim & Donnelly, 2008; Van Slyke et al., 2004). However, given the hiring preference agreement between HCT and the Ministry of Labor and Social Services, this strengthened external validity (Higher Colleges of Technology, 2011c; UAE Federal e-Government Portal, 2006). This agreement gives HCT graduates across-the-board priority in workplace hiring in conjunction with a national policy of Emiratisation, specifically in the telecommunications and banking industry. Rival theories of cross-cultural research constitute a second external validity threat (Straub, 1994), that are examined later, in Chapter 5. If prescribing a method outside of CFA for verification, then a multiple analysis of variance (MANOVA)-based correlation tests could have been an ideal method for checking discriminant validity.

### **Ethical Assurances**

The primary investigator obtained Northcentral University, Internal Review Board (IRB) approval prior to any data collection. Before beginning any collection of data, the primary investigator obtained approval for the study from both the IRB at Northcentral University and its counterpart organization, the College Research Committee (CRC), at the Fujairah College's (2011) branch of the Higher Colleges of Technology. Application materials contained a hyperlink to the online survey, provided for IRB and CRC perusal, as well as letters of permission from the host institution to conduct the study, and from the other researchers to use their validated instruments. Subsequently, as fully allowed by applicable law, compliance with the ethical guidelines of Northcentral University, HCT, and the Collaborative Institutional Training Initiative (CITI) as they related to social and behavioral research was fully attempted.

To ensure ethical compliance, the study aimed to respect, and protect the interests of four key stakeholder groups. First, the primary investigator obtained permission to conduct research from the host institutions in the UAE where the study took place. The primary investigator subscribed to the internal review process of the host institution of HCT, headquartered in Abu Dhabi, but with campuses throughout the UAE. The main concerns of the HCT institution were the protection of the students, the organization, and organizational stakeholders. Second, permission was obtained from Dr. H. Siddiqui to re-use substantial portions of the survey instrument compiled; permission has also been obtained from T. Childers; D. Gefen; Y. H. Kim; J. Travers of IGI Global, on behalf of J. Sagi; P. Cartwright of The University of Chicago Press, on behalf of B. Babin; R. Thompson; and C. Van Slyke. Third, the internal criteria of Northcentral University's

IRB requirements for this type of research were adhered to, including obtaining prior approval before beginning the research, and again before proceeding beyond the first pilot study. Finally, the research implemented, upheld the highest ethical standards in research and academic writing, including protecting the participants in accordance with CITI guidelines and adhering to the *Publication Manual of the American Psychological Association, Sixth Edition*.

All of the persons involved in the study received information for contacting the interviewer and representatives of the institutions involved, throughout the course of this study. In addition, participants received an Informed Consent Form, presented in both English and Arabic to read and acknowledge before taking the survey. The Informed Consent Form outlined the purpose of the study, explained that participation is voluntary, and explained the procedures used to gather the data. This disclosure informed participants of the potential risks as well as possible benefits of participating. Under the conditions of participation, where anonymity was required, there was no perceived risk of harm to students who participated, or choose not to participate in the study.

Although participants were provided with informed consent to protect their right to privacy, they were not requested to provide identifying characteristics such as names, signatures, or a handwriting sample. The private nature of a person's own opinion on culture and Internet filtration, as well as the sharing of responses to those other technology adoption constructs, openly, presented a risk that might provoke a sense of exposure and vulnerability.

To complete the survey, an Internet connection and ability to make selections by computer-generated checkmarks were required. Participation in the study was voluntary.

Only information germane to the study was collected as data. With regard to professional ethics and honesty among professional colleagues, the principal investigator invited colleagues to verify the coding of the data from paper or Internet-based surveys to computer spreadsheets. Data from this study has been stored securely in a locked cabinet or stored securely on a password-protected computer.

### **Summary**

With computer crime becoming a major problem in the UAE, as evidenced by the increased incidence of cybercrimes and computer system crashes (Ajbali, 2009), the implementation of DPI technology offers a possible network security solution to the crime problem. Deep packet technology allows governments and institutions to protect their systems through the ability to inspect, filter, and block Internet use (Allot Communications, 2007; Hanff, 2008; Kassner, 2008; Lawson, 2008; Yu, 2007). No previous studies had assessed the tradeoff between the parameters of user privacy and institutional and governmental security needs for the UAE. The proposed study offered a way to test a systems theory model (Cavaleri, 2005) suggested in the literature. The DPAM explained the implementation of DPI in the UAE through the creation of new knowledge directed at the UAE, in support of the DPAM technology adoption model as an outcome of the study.

The theoretical evidence supported the inclusion of attitudes toward ICT and CSE (Bandura, 1982; Compeau & Higgins, 1995; Davis, 1989; Jawahar & Elango, 2001) as well as perceived usefulness of e-commerce and intention to use e-commerce (Davis, 1989; Fawwaz, 2008; Hsu & Chiu, 2004; Jiang, Hus, & Klein, 2000). There was no commonly accepted definition for culture. The influence of culture was conceptualized

as one of cultures components— societal trust—as a construct. However, culture as Siddiqui (2008) interpreted it, is widely used in information systems literature (Bahameed, 2008; Hofstede, 2009). A cultural interpretation of trust as a component of UAE society also had specific support from El-Sheikh (2008), Gher (2002), Kurzman and Naqvi (2010), Lewis (1996) and Wright (1996). For Arab societies Hofstede (2009), viewed trust as a component of uncertainty avoidance. Inclusion of Internet filtration in the model had support from Deibert et al. (2009), Etisalat (2009b), Gher (2002), and the Open Net Initiative (2009a, 2009b). The basis of investigation was six research questions answered by examining six hypotheses, each framed as a testable hypothesis that inquired whether or not the associated DPI construct belonged in the model that explained DPI's adoption or not.

Data collection gathered ordinal data from HCT students as original evidence, through a 66-question Internet-based survey. The survey used questions from a previously validated instrument employed by Siddiqui (2008) for five of the six variables. The questions that defined Internet filtration as a variable were new and not previously validated. However, provisions made through field studies, and subsequent pilot studies, developed reliability and validity of this instrument. Evidence of Internet filtration constructs being relevant to defining Internet filtration as a variable for the UAE was in the literature reviewed (Etisalat, 2009a, 2009b; Open Net Initiative, 2009a, 2009b). An expert focus group investigated these constructs and recommended that properly directed persons from the sampling frame review the construct materials and contribute questions for these constructs. A 24 question validated instrument was a result of the process.

A stratified-random sample that exceeded size  $n = 400$  (Zhang, 2009) was proposed. The HCT students are a group targeted by industry and UAE law for employment in DPI-utilizing sectors (UAE Federal e-Government Portal, 2006). After the second pilot test, an exploratory factor analysis was used to pre-validate the model and establish factor loadings following primary data collection and analysis by CFA in order to develop the most parsimonious outcome (Agarwal & Selen, 2009; Aydinli, Selen, & Sen, 2010; T. A. Brown, 2006). Principal component factor analysis applied first using the SPSS 18/PASW 18 statistics platform, helped to determine model specification (Field, 2009; L. K. Muthén & Muthén, 2004). The results were later verified using maximum likelihood applied through EFA, with no rotation and freely loading of factors as determined by eigenvalues greater than 1.0 (T.A. Brown, 2006). The final analysis was through CFA goodness-of-fit, applying MLM using Mplus 5.0 with the Satorra-Bentler correction factor for non-normality proposed as the primary means of determining if the data fit the model (T. A. Brown, 2006; Garson, 2009).

This study was a quasi-experimental, quantitative method investigation of DPI technology. The method approximated the pattern-matching design described by Trochim (2006), whereby, the theoretical expectation of each of six research questions were tested as a hypothesis against the observed pattern. Quantitative support for the model provided a means of understanding whether certain attitudes and characteristics of the Emirati nationals favor the implementation of DPI. Subsequent research proposed by the principal investigator, will sample industry practitioners in the UAE, and later the GCC countries, thus through triangulation, test DPAM further.

By leveraging incremental changes into the study through the inclusion of the Internet filtration variable to create a DPI-specific instrument, an evolutionary epistemology was developed (Trochim & Donnelly, 2008). This evolution from existing work is a hallmark of what Kuhn (1996) termed “normal science,” potentially building to an eventual tipping point or paradigm shift. In contrast, Lakatos (1970), in an earlier critique of Kuhn, commented that the research philosophy advocated by Kuhn served to promote long-term existence for established paradigms such as Davis’s TAM (1989). With TAM already having substantial support in the scientific community and serving as the *hard core* of the research enterprise, the negative heuristic of attacks on the core would be deflected to the positive heuristic, which is the protective outer-belt of new work surrounding the core theory, in this case DPAM (Lakatos, 1970).



## Chapter 4: Findings

The aim of this quasi-experimental quantitative research was to study intention to use deep packet inspection (DPI) as a strategy for dealing with cybercrime in the United Arab Emirates (UAE). An online questionnaire strategy, facilitated data collection from Emirati National students at the Higher Colleges of Technology (HCT), the UAE's largest university, with a population of  $N \approx 19,370$  students. Graduates of HCT receive a federally mandated hiring preference at key employers such as Etisalat, the state led telecommunications provider, and other IT oriented firms, likely use DPI and shape DPI policy. Six variables proposed for the study were; (a) computer self-efficacy, (b) attitude toward IT, (c) perceived usefulness of e-commerce, (d) intention to use e-commerce, (e) societal trust, and (f) Internet filtration. The research method describing the study of these six variables was in Chapter 3, and included field and pilot testing of the instrument prior to the primary data collection and analysis. There was one hypothesis pair for each variable, and each hypothesis was tested using factor analysis for the associated variable's inclusion, a predictive model of intention to use this technology—the deep packet acceptance model (DPAM).

The structure of Chapter 4 contains two main sections, the first section is a presentation of the results, and the second section is an evaluation of the findings. In the results section, there is a brief description of the data collection procedure, followed by an analysis of the measurement model for construct validity, and reliability of the instrument used to collect data. Then, within the cultural constraints identified through meetings with HCT management that were part of field testing, the results of the descriptive statistics are presented, including an evaluation of normality, skewness, and

kurtosis, present in the data distribution for instrument development. Presented next, are the main results, which is the outcome of the principal component analysis (PCA) which did not conclusively support the model, followed by the exploratory factor analysis (EFA) performed within a regression-based confirmatory factor analysis (CFA) framework, and finally the results of the CFA using MLM performed on the data set. Both of the latter supported DPAM.

Evaluation of findings is the other section of this chapter. This contains the interpretation of the CFA results, in the context of the research questions, answered through hypothesis testing. This analysis resulted in evolutionary changes to the theoretical and conceptual framework of the DPAM based on the CFA outcomes. Comparison is then made of study findings with other salient previously published studies. Chapter 4 concludes with a summarization of the key study outcomes.

## **Results**

The principal investigator via email sent a notification regarding distribution of the survey instrument, to the HCT directors, associate directors, deans, associate deans, program chairs, supervisors, and subsequently to relevant faculty, at the eight randomly selected campuses. The email notice contained links to the website at <http://biga.us>, which served as a gateway to the English and Arabic versions of the survey. The principal investigator constructed the surveys on Smart-Survey's website. The message was of simple construction, and could easily be forwarded to students, as an email or posted on a campus, or academic program Website.

Dissemination of the survey to students at the different campuses was at the discretion the local campus management and faculty. The survey was generally, well

received, evidenced by positive responses communicated to the primary investigator. However, there were objections by some HCT management to some of the questions. These objections to the study surfaced after pilot testing began. Objections by management, handled as part of the field study process, involved an exchange of several emails and two meetings between management, and the principal investigator. The principal investigator made a concession to HCT management, not to report descriptive statistics that would quantify measures of disagreement of study participants with UAE government policy. The Business and IT Program Chair, N. Nunnington, did email the principal investigator that an announcement was made at a system wide meeting to the Divisional Academic Team (DAT) authorizing dissemination of the survey.

Data collection began June 1, 2011, and ended June 21, 2011 using the strategy of a holdout sample for the second pilot study. Five hundred and seventy eight usable responses were collected, which included the holdout sample for the pilot study—the first 51 samples collected by the principal investigator from students, in the BAS (Business, IT, Applied Media, Bachelor's Degree) at Fujairah Women's College students. The remaining 527 samples were random samples collected from across the various HCT campuses. Because of student confidentiality requirements, no data usable in identifying a student, or to pinpoint location were collected. Data collection efforts resulted in a 6% response rate. The principal investigator did not forecast a projected response rate. However, the principal investigator had aimed for a 5% response rate, which would have been sufficient to exceed the number of responses required by the statistical power calculation, of  $n = 239$ , and the requirements of robust MLM at  $n = 400$ .

**Construct validity and reliability.** Construct validity, and reliability for items that comprised each of the six variables in the study, are precursors to individual hypothesis testing, and evaluation of model fit. Because of (a) limited prior use of the Siddiqui (2008) instrument, (b) reduction in the number of questions due to the pilot study results, and (c) addition of Internet filtration measurement items, establishing validity and reliability of survey instrument items, through EFA was prescribed as an intermediate step, before moving into the more restrictive CFA (Agarwal & Selen, 2009; T. A. Brown, 2006). A principal component analysis (PCA) using the Anderson-Rubin factor method, which works well with non-correlated factors and ensures orthogonality of the estimated factors was applied first (Karabatsos, 2003). Then a regression-based maximum likelihood exploratory factor analysis (EFA), which assumed possible correlation of the factors even if they were orthogonal was used to assess component validity of the six constructs (Karabatsos, 2003). Both exploratory procedures were investigated prior, to moving into the robust maximum likelihood method, confirmatory factor analysis (CFA) framework, which is in accordance with the recommendations of Agarwal and Selen (2009).

Based on prior statistical evidence, proposed theoretical relationships uncovered during the literature review, and several focus groups, a six-factor model was specified. Factor loadings determined using PCA were greater than .50, with 9 of 24 factors being greater than .60, and of those, 2 factors greater than .70. The first four constructs, CSE, ATICT, PUEC, and IUEC all loaded onto the same factor and were differentiated by their cross loadings onto other factors. As with the second pilot study, Question 18, originally a societal trust question, loaded onto Internet filtration. The PCA results using the

Anderson-Rubens factor score—an ideal method for assessing uncorrelated factors (Field, 2009), is in Table 7.

Table 7

*Factor Loadings of Primary Data using Principal Component Analysis*

	Component of Constructs					
	F1	F2	F3	F4	F5	F6
CSE1	<b>.585</b>	-.165	-.364	.367	-.080	.330
CSE2	<b>.597</b>	-.270	<b>-.404</b>	.307	-.034	.124
CSE3	<b>.573</b>	-.293	-.394	.342	-.039	.210
CSE4	<b>.553</b>	-.192	<b>-.462</b>	.275	-.163	.357
ATICT1	<b>.621</b>	.015	-.020	.082	-.139	<b>-.494</b>
ATICT2	<b>.611</b>	-.096	-.229	-.017	-.108	<b>-.475</b>
ATICT3	<b>.686</b>	.001	-.176	.012	.148	-.343
ATICT4	<b>.611</b>	.029	-.178	.011	.061	<b>-.505</b>
PUEC1	<b>.521</b>	-.397	.127	-.389	.362	.031
PUEC2	<b>.582</b>	-.259	.207	-.212	.330	.048
PUEC3	<b>.556</b>	-.276	.045	<b>-.473</b>	.368	.233
PUEC4	<b>.503</b>	-.304	.149	<b>-.470</b>	.353	.195
IUEC1	<b>.539</b>	.321	.202	-.205	<b>-.453</b>	.063
IUEC2	<b>.608</b>	.312	.302	-.198	<b>-.403</b>	.076
IUEC3	<b>.539</b>	.280	.369	-.175	<b>-.452</b>	.123
IUEC4	<b>.540</b>	.309	.369	-.070	<b>-.413</b>	.183
ST1	.299	.047	<b>.582</b>	<b>.459</b>	.195	.004
ST2	.245	.024	<b>.635</b>	<b>.489</b>	.298	-.021
ST3	.240	-.012	<b>.577</b>	<b>.533</b>	.248	.045
IF1	.198	<b>.671</b>	-.121	-.025	.256	.070
IF2	.072	<b>.628</b>	-.192	-.074	.179	.127
IF3	.157	<b>.652</b>	-.118	.078	.373	-.035
IF4	.226	<b>.721</b>	-.184	.014	.203	-.005
IF5	.107	<b>.788</b>	-.290	-.020	.256	.138

*Note.* Factor Loadings > .4 are in boldface, extraction method: PCA, 6 factors extracted.

Next, a regression-based EFA, where correlations between factor scores were acceptable, performed on the data using maximum likelihood, with varimax rotation. Factor extraction, determined by eigenvalues greater than 1.0, yielded a six-factor solution (Karabatsos, 2003). All factor loading values were greater than .50, with 23 of 24 factors being greater than .60, and of those, 13 factors greater than .70, three were greater than .80, including the highest loading of .907. The measurement model contained only one crossloading indicator, and that was between CSE 2 on Factor 3 at .695, and ATICT on Factor 5, at .306. Standardized factor loadings of .50 or greater, operationally defined salient factor loading, while a standardized value of .30 or greater, operationally defined a salient, double or crossloading factor (T. A. Brown, 2006).

The Internet filtration (IF) questions loaded onto Factor 1. The factor loadings ranged from .611 to .907. Intention to use E-commerce, loaded onto Factor 2, and loadings ranged from .716 to .797; CSE loaded onto Factor 3, and loadings ranged from .695 to .828; PUEC loaded onto Factor 4, and loading ranged from .586 to .859; ATICT loaded onto Factor 5, and loadings ranged from .603 to .661. Societal trust questions loaded onto Factor 6, with factor loadings of .676 to .872. Constructs did not show strong crossloadings with other factors—indicative of well-defined constructs (T. A. Brown, 2006; Widaman, 1993). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .822, for the EFA performed on the 443 samples of primary data. This was the highest KMO value obtained by the study, and indicative of distinct and reliable factors (Hutcheson & Sofroniou, 1999; Sidanius, n. d.). The statistically significant  $p < .05$ , regression-based maximum likelihood EFA factor loadings are in Table 8.

Table 8

*Factor Loadings of Primary Data using Maximum Likelihood EFA*

	Component of Constructs					
	F1	F2	F3	F4	F5	F6
CSE1	.020	.101	<b>.786</b>	.083	.133	.072
CSE2	-.048	.006	<b>.695</b>	.133	.306	.010
CSE3	-.079	.002	<b>.740</b>	.125	.232	.043
CSE4	-.001	.116	<b>.828</b>	.074	.100	-.087
ATICT1	.000	.254	.154	.075	<b>.647</b>	.103
ATICT2	-.022	.142	.235	.126	<b>.659</b>	-.071
ATICT3	.160	.104	.263	.263	<b>.603</b>	.081
ATICT4	.126	.102	.163	.150	<b>.661</b>	.030
PUEC1	-.155	.031	.073	<b>.741</b>	.216	.061
PUEC2	-.062	.124	.127	<b>.586</b>	.217	.196
PUEC3	.014	.096	.151	<b>.859</b>	.065	-.040
PUEC4	-.071	.110	.064	<b>.780</b>	.072	.015
IUEC1	.126	<b>.716</b>	.065	.076	.177	-.020
IUEC2	.114	<b>.792</b>	.053	.130	.188	.077
IUEC3	.062	<b>.797</b>	.030	.091	.105	.104
IUEC4	.103	<b>.764</b>	.084	.059	.067	.174
ST1	.016	.149	.021	.050	.049	<b>.676</b>
ST2	-.028	.056	.041	.041	.003	<b>.772</b>
ST3	-.002	.057	-.042	.063	.040	<b>.872</b>
IF1	<b>.654</b>	.116	-.021	.002	.042	.020
IF2	<b>.611</b>	.068	-.029	-.052	-.036	-.049
IF3	<b>.644</b>	.001	-.047	-.032	.097	.102
IF4	<b>.706</b>	.135	.002	-.081	.129	-.013
IF5	<b>.907</b>	.044	.032	-.073	-.046	-.091

*Note.* Factor Loadings > .585 are in boldface, extraction method: Maximum Likelihood, 6 factors extracted, 5 iterations required.

The construct reliability for the latent factors, assessed using Cronbach's alpha, showed that reliabilities were all over .80. Cronbach's  $\alpha$  values for social research are considered reliable if they are .70 or greater (Agarwal & Selen, 2009; Cronbach, 1951;

Field, 2009; Nunnally, 1978; Sellitz et al., 1976). Construct reliability outcomes, obtained using Cronbach's  $\alpha$  for the DPI study, are in Table 9.

Table 9

*Reliability Statistics for Instruments*

Constructs	Questions	Number of Questions	Cronbach's $\alpha$
Computer Self-efficacy (CSE)	1 – 4	4	.872
Attitude Toward Information and Communications Technology (ATICT)	5 – 8	4	.813
Perceived Usefulness of E-commerce (PUEC)	8 – 12	4	.859
Intention to Use E-commerce (IUEC)	13 – 16	4	.875
Societal Trust (ST)	17, 19, 20	3	.829
Internet Filtration (IF)	18, 21 – 24	5	.832

**Descriptive statistics.** This section includes a discussion of the structural characteristics of the data set. The analysis considered qualitative factors present in data, missing data, means, standard deviation, skew, kurtosis, outliers, and how this affected the assessment of normality. A total of  $n = 527$ , random-stratified by geographic location samples were collected. A missing data strategy was required for incomplete cases. Some data appeared to have responses missing at random. Missing listwise, a method that ignored cases, that had any missing responses, was selected, yielding 443 case responses for analysis.



The 84 deleted cases, were uniformly distributed over the six variables; this equated to a maximum reduction of 4.6% of cases, per variable. As discussed by Hair et al. (2010), missing more than 10% of data responses are typically not problematic, unless data loss is concentrated at one part of the distributional curve, such as the tail, and if required sample size  $n$  is affected. When missing less than 10%, deleting cases listwise is a valid missing data strategy (Hair et al., 2010).

The descriptive statistics for mean and standard deviation averaged for the questionnaire items that define each of the six constructs are in Appendix S. The results show a higher than scale-average score achieved on all constructs. The lowest average score was IUEC at 3.409 on a scale of 1 to 5, and highest was CSE at 4.092. Standard deviations for CSE, ATICT, PUEC, and IUEC were greater than .9 and less than 1.1, very close to the normal distribution's standard deviation of 1.0. The standard deviation of the remaining two constructs, ST and IF were greater, with societal trust deviating by 1.157, and Internet filtration being highest at 1.247.

Analysis of histograms, Q-Q plots, and boxplots revealed slightly, to substantially negative-skewed, distributions, and slight to substantial representations of both platykurtic and leptokurtic, distributions. More distributions exhibited a peaked rather than flat shape. The principal investigator visually interpreted the outliers heuristically, from individual item boxplots, and assessed the 25 highest and 25 lowest extreme values for each item. Outlier retention was supported because outliers represented unusual yet possible results, rather than illogical or untenable data.

Responses for all question items exhibited negative skew—a right shift to higher overall average scale values. The normality assessment of Gaskin et al. (2010) accepted

skewness between -1 and 1 as being within an acceptable range. Extreme distance from zero, and skewness not close to meeting a normal distribution was displayed by negative skewness beyond -1, shown on items CSE 1 and 3, ATICT 2, and IF items 4 and 5.

Standard error for kurtosis was .231 yielding a critical value of  $|.462|$  (Price, 2000). The responses for 10 out of 24 questions, exhibited a tighter than average, leptokurtic distribution. Leptokurtosis was greatest for CULT 2, at  $-.927$  and IF 2 at  $-.884$ , where kurtosis values approached 1.0. Six questions were platykurtic. Three items, CSE 1, ATICT 3, and IF 4, departed substantially from normality and were strongly platykurtic with positive kurtosis values greater than 1.0, while PUEC item 2 was  $.882$ . These data had a heavy-tailed, wide data distributions signified by a kurtosis value greater than positive 1.0. Items IUEC 4, IF 3, and IF 4 exhibited a mild bimodal tendency. The shape, kurtosis and skew analysis was supported by, histogram, and Q-Q plot interpretation in line with the recommendations of DeCarlo, (1997); Field, (2009); Kline, (2011) and Price (2000). These distributional interpretations are in Appendix S.

**Analysis of normality.** While the maximum likelihood estimator is robust for non-normality (T. A. Brown, 2006), a normal distribution of data collected is an important criteria for factor analysis. Tests of univariate and multivariate normality were conducted prior to moving into hypothesis testing. The univariate Kolmogorov-Smirnov (*K-S*) and Shapiro-Wilk (*S-W*) tests for normality on the six variables in the DPAM model are presented in Table 10, and neither of the variables were normally distributed, by *K-S* or *S-W* measures. While, a visual estimation of boxplots indicated that some constructs were roughly normal, the calculated distribution was not normal, because of the observed significance of  $p < .05$  on all variable measures.

Table 10

*Test for Univariate Normality*

Constructs	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Computer Self-efficacy (CSE)	.251	443	***	.808	443	***
Attitude Toward Information and Communications Technology (ATICT)	.260	443	***	.834	443	***
Perceived Usefulness of E-commerce (PUEC)	.267	443	***	.857	443	***
Intention to Use E-commerce (IUEC)	.259	443	***	.881	443	***
Societal Trust (ST)	.232	443	***	.890	443	***
Internet Filtration (IF)	.271	443	***	.784	443	***

*Note.* a. Lilliefors Significance Correction, \*\*\* = p-value less than .001

In addition to univariate tests, the data were examined for multivariate normality. When the 24 variables were analyzed collectively, approximately 62.5% exceed the significance standard of  $p < .05$ . The data exhibited significant deviations from a multivariate normal distribution. The multivariate skewness of the data was significantly different from that of a multivariate normal distribution ( $\chi^2(24) = 178.58, p < 0.001$ , according to Srivastava's test). The same occurred with multivariate kurtosis, according to Mardia's test ( $b_2p = 18.66, p < 0.001$ ). Normality testing thus confirmed that, contrary to the results of the visual inspection, data was not fitting a univariate or multivariate normality distribution.

## Evaluation of Findings

This section includes a discussion of hypothesis testing, and the results from the research method—the maximum likelihood estimator, which is robust for non-normal data distributions. The evaluation of factor loadings obtained by robust maximum likelihood CFA used to establish discriminant validity are given, as are the implied correlations from the latent DPI constructs tested, followed by the calculated goodness-of-fit indices. Finally, the principal investigator conducted an interpretation of each individual hypothesis, motivated in light of the research findings.

**Testing of hypotheses.** Based on prior evidence and theory, the confirmatory factor analysis (CFA) performed using Mplus 5.0, on the same data previously analyzed for the EFA produced estimates of factor loadings, factor correlations, and an estimation of model fit. The indicators were subscales of an instrument developed specifically for this study. Questions having validity and reliability, previously substantiated for use with Arab culture through an independent pilot study, were taken from the Siddiqui's (2008) study on e-commerce adoption, comparing UAE and Saudi Arabia. These instruments, augmented with an Internet filtration scale, developed through a series of field and pilot studies, conducted as part of this research, became the instrument used for the primary study. The aggregated instrument underwent validity and reliability testing as a part of this research also. The confirmatory factor analysis results using the maximum likelihood (MLM) estimator, with the Satorra-Bentler scaled  $\chi^2$  correction factor—robust for non-normality for sample sizes larger than 400 (Zhang, 2009), are shown in Table 11. In testing a sample size of 527, reduced to 443 using listwise deletion accounted for missing values.

Table 11

*Factor Loadings for Confirmatory Factor Analysis*

Item	Estimate	Std. Error	Est./Std. Error	P-Value
<i>CSE</i>				
CSE1	0.790	0.026	30.22	<0.001
CSE2	0.774	0.029	26.586	<0.001
CSE3	0.800	0.021	38.617	<0.001
CSE4	0.807	0.024	33.096	<0.001
<i>ATICT</i>				
ATICT1	0.672	0.032	20.791	<0.001
ATICT2	0.705	0.03	23.728	<0.001
ATICT3	0.748	0.037	20.087	<0.001
ATICT4	0.703	0.033	21.607	<0.001
<i>PUEC</i>				
PUEC1	0.782	0.027	29.161	<0.001
PUEC2	0.657	0.036	18.349	<0.001
PUEC3	0.842	0.022	38.891	<0.001
PUEC4	0.799	0.025	31.673	<0.001
<i>IUEC</i>				
IUEC1	0.746	0.027	28.024	<0.001
IUEC2	0.841	0.021	40.308	<0.001
IUEC3	0.812	0.026	31.482	<0.001
IUEC4	0.783	0.026	29.852	<0.001
<i>ST</i>				
ST1	0.696	0.036	19.428	<0.001
ST2	0.789	0.031	25.588	<0.001
ST3	0.859	0.032	27.202	<0.001
<i>IF</i>				
IF1	0.666	0.039	17.29	<0.001
IF2	0.621	0.036	17.333	<0.001
IF3	0.647	0.035	18.462	<0.001
IF4	0.736	0.031	23.649	<0.001
IF5	0.885	0.02	44.562	<0.001

All the items had relatively high factor loadings on their corresponding construct (ranging from 0.621 through 0.885). This is consistent with the position postulated by the theoretical evidence, that the six factors that comprise the deep packet acceptance

model (DPAM) are reliable indicators of intention to use deep packet inspection technology. Moreover, all factor loadings, using freely estimated unstandardized parameters, were significantly different from zero ( $p < 0.001$  in all cases). Analysis of the results, suggests that the proposed model structure has discriminant validity between the DPI constructs and is a good fit of the data. Table 12 presents the implied correlation coefficients among the latent constructs of the proposed DPAM model.

Table 12

*Correlation Coefficients amongst Latent Constructs*

	CSE	ATICT	PUEC	IUEC	ST	IF
CSE	1	0.537*	0.304*	0.191*	0.030	-0.028
ATICT		1	0.420*	0.415*	0.117*	0.118*
PUEC			1	0.251*	0.122*	-0.137*
IUEC				1	0.212*	.199*
ST					1	-0.048
IF						1

Note. (\*)  $p < 0.05$

The constructs generally exhibited positive and significant correlations (ranging from 0.117 to 0.537), without displaying deleterious multicollinearity, marked by correlations approaching  $r = 0.90$  (T.A. Brown, 2006). Computer self-efficacy (CSE), ATICT, PUEC, IUEC all exhibited a positive correlation with each other. The most highly correlated constructs were CSE and ATICT at  $r = 0.537$ . The correlations between some pairs of variables (specifically, CSE and ST, CSE and IF, IF and ST) were not significantly different from zero. Finally, there was a significant, albeit small, negative correlation ( $r = -0.137$ ) between PUEC and IF.

**Goodness-of-fit for research model.** The goodness-of-fit statistics computed using Mplus 5.0 produced the *Evaluation of Fit of the DPAM Conceptual Construct*

*Model*, shown in Table 13. Multiple indices covering absolute fit, parsimony correction and comparative fit were used, as well the Tucker-Lewis index (TLI), also known as the non-normed fit index (NNFI), which evaluates the model the against a nested baseline model and includes a model complexity correction factor. Interpretations of each measure's threshold values were reported toward meeting criteria for an acceptable-fit (consistent with the recommendations of Garson, 2009; Pham & Jordan, 2009; Schermelleh-Engel et al., 2003; Ramayah et al., 2009). These indices, reported by Mplus 5.0, are popular in applied research, and perform favorably in Monte Carlo Research (Boomsma, 2000; Pham & Jordan, 2007; T. A. Brown, 2006).

Table 13

*Evaluation of Fit of the DPAM Conceptual Construct Model*

Goodness-of-fit Index	Threshold value	Results obtained
$\chi^2/df$	3.000	2.602
TLI	0.950*	0.905
CFI	0.950*	0.918
RMSEA	0.080	0.060

*Note.* From Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria Versus New Alternatives, *Structural Equation Modeling: A Multidisciplinary Journal* by L. T. Hu and P. M. Bentler 1999, p. 27. \*Values for TLI and CFI within the range of 0.90-0.95 may be indicative of acceptable model fit, from *Confirmatory Factor Analysis for Applied Research* by T. A. Brown, 2006, p. 87. Copyright 2008 by *The Guilford Press*, and *Principles and Practice of Structural Equation Modeling*, 3 rd ed., by R. B. Kline, 2010, p. 204-208. Copyright 2011 by *The Guilford Press*.

The goodness-of-fit values obtained were as follows; Normed Chi-Square ( $\chi^2/df$ ) was 2.602, Comparative fit index (CFI) = 0.918, Tucker-Lewis Index (TLI) = 0.905, and Root mean square error of approximation (RMSEA) = 0.060. As such, normed  $\chi^2/df$ , as

well as RMSEA, were ideally below their respective recommended values, and thus indicative of a good fit (Hu and Bentler, 1999). The CFI and TLI were below Hu and Bentler's (1999) and Yu's (2002) recommended threshold of .95 and do not indicate a good fit. However, CFI and TLI measures are not below .90, Bentler's (1990) earlier threshold for rejection. (Bentler, 1990; Brown, 2006). Indices obtained describing the goodness-of-fit, compared to threshold values are in Table 13.

Cabrera-Nguyen (2010) stated that authors wishing to use lower cut-off values provide dissenting rationale with citations. According to T. A. Brown 2006, measures of CFI and TFI in the range of .90-.95 are marginal, and appropriately considered in tandem with the results of other indices. Marsh, Hau, and Wen (2004) stated that Hu and Bentler (1999) possibly committed a Type I error by incorrectly rejecting an acceptable model, and noted a paradox in their method, that produced a decreasing probability of rejection of a misspecified model, as  $n$  increased. Therefore, given a satisfactory RMSEA, and a satisfactory  $\chi^2/df$ , rejection on the basis, of a marginal outcome for TLI or CFI, is potentially tantamount to committing a Type II error—acceptance of the null hypothesis and rejection of a satisfactory model, which as the alternative hypothesis, was a true hypothesis (Zikmund, 2004).

Barrett (2007); Kline, (2010); and Siva, Fan, Witta, and Willse (2006), also questioned a strict interpretation Hu and Bentler's (1999) recommendations of acceptable indices, as a de-facto hypothesis test, rather than an estimation of model-fit. Given the presence of indicators in favor of a good model fit, especially RMSEA, overall model fit, while perhaps not good, is acceptable. Thus, these fit indices support the previous results, which suggest that the model is an acceptable fit of the collected data.



**Research question 1.** Research question 1 was—to what extent, if any, does computer self-efficacy relate to intention to use deep packet inspection in the UAE? Survey participants answered questions 1 through 4 in Appendix R, about computer self-efficacy (CSE). The CFA, maximum likelihood parameter estimations, using Mplus 5.0, supported rejection of the null hypothesis, and implicit default acceptance, of the alternative hypothesis, propelled by an acceptable goodness-of-fit of CSE, within the deep packet acceptance model (DPAM). The combination of internal consistency, with an average Cronbach's  $\alpha$  of .872, over four CSE items, high factor loadings ranged from .774 to .807 of significance ( $p < 0.001$ ); high correlation with ATICT ( $r = 0.537$ ), moderate correlation with PUEC ( $r = 0.304$ ), and IUEC ( $r = 0.191$ ), of significance ( $p < 0.05$ ); a range of marginal to good fitting CFA model parameter estimates, and low standard error, implied a significantly positive relation between CSE, and intention to use DPI in the UAE.

**Research question 2.** Research question 2 was—to what extent, if any, do attitudes toward ICT relate to intention to use deep packet inspection in the UAE? Survey participants answered questions 5 through 8 in Appendix R, about attitude toward information and communication technology (ATICT). The CFA, maximum likelihood parameter estimations, using Mplus 5.0, supported rejection of the null hypothesis, and implicit default acceptance, of the alternative hypothesis, propelled by an acceptable goodness-of-fit of ATICT, within the deep packet acceptance model (DPAM). The combination of internal consistency, of an average Cronbach's  $\alpha$  of .813, over four ATICT items; high factor loadings ranged from .672 to .748 of significance ( $p < 0.001$ ); high correlation with CSE ( $r = 0.537$ ), PUEC ( $r = 0.4.20$ ), and IUEC ( $r = 0.415$ ),

moderate correlation with ST ( $r = 0.117$ ), and IF ( $r = 0.118$ ) of significance ( $p < 0.05$ ); a range of marginal to good fitting CFA model parameter estimates, and low standard error, implied a significantly positive relation between ATICT, and intention to use deep packet inspection in the UAE.

**Research question 3.** Research question 3 was—to what extent, if any, does the perceived usefulness of e-commerce relate to the intention to use deep packet inspection in the UAE? Survey participants answered questions 9 through 12 in Appendix R, about perceived usefulness of e-commerce (PUEC). The CFA, maximum likelihood parameter estimations, using Mplus 5.0, supported rejection of the null hypothesis, and implicit default acceptance, of the alternative hypothesis, propelled by an acceptable goodness-of-fit of PUEC, within the deep packet acceptance model (DPAM). The combination of internal consistency, of an average Cronbach's  $\alpha$  of .859, for the four PUEC items; high factor loadings ranged from .657 to .842 of significance ( $p < 0.001$ ); high correlation with ATICT ( $r = 0.420$ ), moderate positive correlation with CSE ( $r = 0.304$ ), IUEC ( $r = 0.251$ ), and ST ( $r = 0.122$ ), a moderate negative correlation with IF ( $r = -0.137$ ) of significance ( $p < 0.05$ ); a range of marginal to good fitting CFA model parameter estimates, and low standard error, implied a significantly positive relation between PUEC, and intention to use deep packet inspection in the UAE.

**Research question 4.** Research question 4 was—to what extent, if any, does intention to use e-commerce relate to intention to use deep packet inspection in the UAE? Survey participants answered questions 13 through 16 in Appendix R, about intention to use e-commerce (IUEC). The CFA, maximum likelihood parameter estimations, using Mplus 5.0, supported rejection of the null hypothesis, and implicit default acceptance, of

the alternative hypothesis, propelled by an acceptable goodness-of-fit of IUEC, within the deep packet acceptance model (DPAM). The combination of internal consistency, of an average Cronbach's  $\alpha$  of .875, for the four IUEC items; high factor loadings ranged from .746 to .841, of significance ( $p < 0.001$ ); high correlation with ATICT ( $r = 0.415$ ), and moderate positive correlation with CSE ( $r = 0.191$ ), PUEC ( $r = 0.251$ ), ST ( $r = 0.212$ ), and IF ( $r = 0.199$ ) of significance ( $p < 0.05$ ); a range of marginal to good fitting CFA model parameter estimates, and low standard error, implied a significantly positive relation between IUEC, and intention to use deep packet inspection in the UAE.

**Research question 5.** Research question 5 was—to what extent, if any, does societal trust relate to intention to use deep packet inspection in the UAE? Survey participants answered questions 17, 19 and 20 in Appendix R, about culture manifested as trust. The CFA, maximum likelihood parameter estimations, using Mplus 5.0, supported rejection of the null hypothesis, and implicit default acceptance, of the alternative hypothesis, propelled by an acceptable goodness-of-fit of societal trust, within the deep packet acceptance model (DPAM). The combination of internal consistency, with an average Cronbach's  $\alpha$  of .829, for the three societal trust items; high factor loadings ranged from .696 to .859 of significance ( $p < 0.001$ ); moderate positive correlation with ATICT ( $r = 0.117$ ), PUEC ( $r = 0.122$ ), and IUEC ( $r = 0.212$ ) of significance ( $p < 0.05$ ); a range of marginal to good fitting CFA model parameter estimates, and low standard error, implied a significantly positive relation between ST, and intention to use deep packet inspection in the UAE.

**Research question 6.** Research question 6 was—to what extent, if any, do attitudes toward Internet filtration relate to intention to use deep packet inspection in the

UAE? Survey participants answered questions 18, and 21 through 24 in Appendix R, about Internet Filtration (IF). The CFA, maximum likelihood parameter estimations, using Mplus 5.0, supported rejection of the null hypothesis, and implicit default acceptance, of the alternative hypothesis, propelled by an acceptable goodness-of-fit of IF, within the deep packet acceptance model (DPAM). The combination of internal consistency, of an average Cronbach's  $\alpha$  of .832 for the five IF items; high factor loadings ranged from .621 to .885 of significance ( $p < 0.001$ ); moderate positive correlation with ATICT ( $r = 0.118$ ), and IUEC ( $r = 0.137$ ), moderate negative correlation PUEC ( $r = 0.199$ ) of significance ( $p < 0.05$ ); a range of marginal to good fitting CFA model parameter estimates, and low standard error, implied a significantly positive relation between Internet filtration, and intention to use DPI in the UAE.

### **Summary**

Six unique factors were extracted from the dataset of  $n = 527$ . Data used in analysis was reduced to  $n = 443$  using listwise deletion as the missing data strategy. Average Cronbach's  $\alpha$  by construct was greater than .80. Analysis resulting from a CFA using MLM performed on the data, established discriminant validity of the DPI constructs evidenced by relatively high factor loadings of 0.621 to 0.885 onto their corresponding construct and supporting the construct validity established earlier in the literature review. All factor loadings, using freely estimated unstandardized parameters, were significantly different from zero ( $p < 0.001$ ).

These measures of acceptable fit were marginal in the case of TLI and CFI but good with respect to  $\chi^2/df$  and RMSEA. This was in spite of the absence of a normal distribution of data, established by univariate ( $K-S$  and  $S-W$ ) and multivariate (Mardia's

and Srivastava's) tests for normality in the data. Test values indicating non-normality contradicted indications obtained by a subjective physical assessment of skewness, kurtosis, and outliers. The MLM CFA method, robust under conditions of non-normality given the sample size of  $n = 443$  exceeded the threshold of  $n = 400$ , employed and in consideration of the use of the Satorra-Bentler  $\chi^2$  correction factor. Requirements for achieving statistical power were met by exceeding  $n = 239$ .

The PASW-18 and MPLUS 5.0 measurement sub-model, indicated rejection of the null hypothesis, in favor of default acceptance of the alternate hypothesis for all six research questions. There was a relationship favoring inclusion of each DPI construct (i.e., CSE, ATICT, PUEC, IUEC, ST, and IF) as independent variables, and the dependent variable intention to use deep packet inspection into DPAM (see Figure 2).

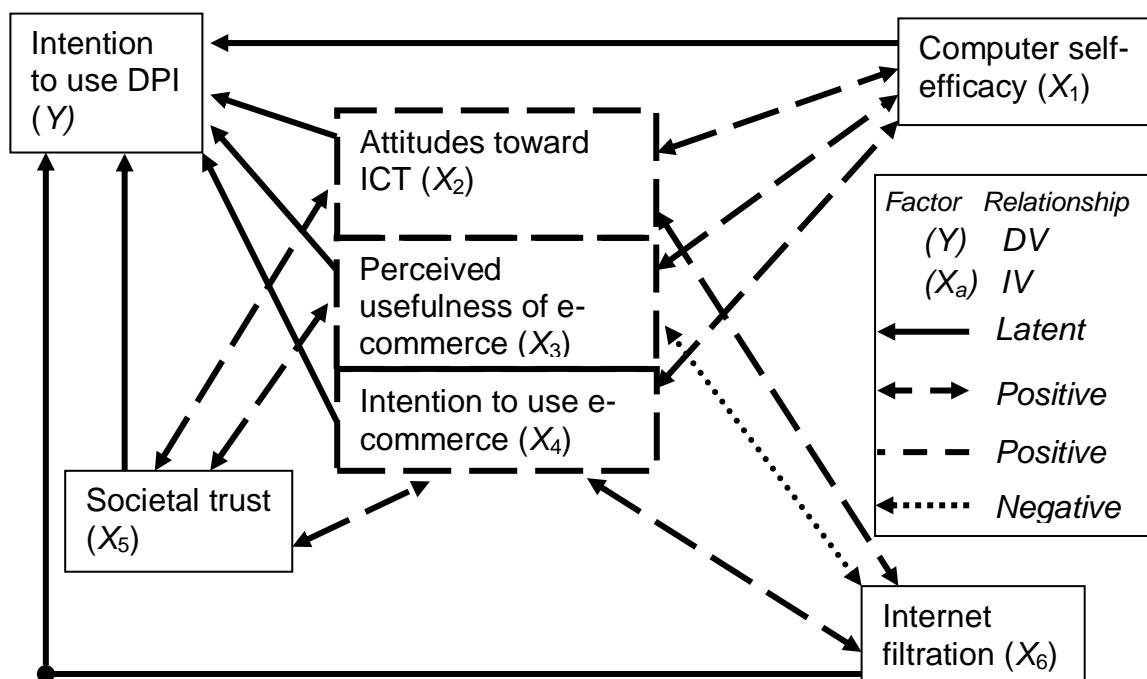


Figure 2. Deep packet acceptance model (DPAM).

Mapping of variables based on CFA research outcomes, of factor loadings, correlation coefficients, and goodness-of-fit thought to influence the acceptance of deep packet inspection in the United Arab Emirates.

## Chapter 5: Implications, Recommendations, and Conclusions

Technology adoption has been widely researched from numerous perspectives, such as Roger's (1995) diffusion of innovations (DOI), and Davis's (1989) Technology Acceptance Model (TAM). Davis's TAM, in particular, has undergone considerable validation and extension by others, most notably to explain adoption and acceptance of e-commerce (e.g., Ghobakhloo et al., 2010; Lederer et al., 2000; Ramayah et al., 2010; Tan & Chung, 2005); Thompson 2010). The study of technology adoption in the United Arab Emirates, particularly the adoption of network security technology, deep packet inspection (DPI)—useful in fighting cybercrime, is a minimally researched topic.

Cybercrime continues to be a major obstacle for the region threatening national security of the state, vis à vis Stuxnet, an infrastructure crippling form of malware (Benson, 2010), e-commerce transactions, ("Group Buying Websites," 2011) and violation of cultural norms (Chapman, 2009). The situation of the *Arab Spring* ("Arab Spring Undermines," 2011; "The Arab Awakening," 2011), with uprisings taking place throughout the Arab world provided increased legitimacy for the study as DPI is effective in blocking social media, blogs, and other electronic discourse, critical of regimes.

A model was proposed—DPAM, to explain acceptance of deep packet inspection in the UAE, and a measurement instrument underwent revision, and testing, to meet reliability and validity standards. Although, a dominant conclusion, for DPI technology adoption for the UAE, was not fully articulated, the data is very useful. Results included a range of marginal and good fitted data to the model. While data did not follow a normal distribution, the CFA method MLM was robust to non-normality. A discussion of the implications, recommendations, and conclusions of this research follows.

## **Implications**

The purpose of this quasi-experimental quantitative study was to examine the relationship between computer self-efficacy, attitude toward ICT, perceived usefulness of ecommerce, intention to use ecommerce, societal trust, and Internet filtration, on the acceptance and adoption of deep packet inspection technology. Deep packet inspection has been deployed in the UAE at the state level (Open Net Initiative, 2009b) and to a lesser extent at the enterprise level (Matwyshyn, 2010), enhancing firewalls, and threat detection capabilities, and was proposed in this study, as an essential technology in the fight against cybercrime. A systems-based, theoretical framework was proposed to explain the deployment of DPI in the UAE. If the UAE's network security stakeholders understand more about factors affecting this technology's acceptance and use, they can be more proactive in developing effective deep packet inspection implementations and network security policy.

**Implications of research question 1.** Research question 1 was—to what extent, if any, does computer self-efficacy relate to intention to use deep packet inspection in the UAE? Survey participants answered questions 1 through 4 in Appendix R, about computer self-efficacy (CSE). The maximum likelihood CFA parameter estimations using Mplus 5.0 supported rejection of the null hypothesis, and implicit default acceptance, of the alternative hypothesis, propelled by an acceptable goodness-of-fit of CSE within the deep packet acceptance model (DPAM).

The high factor loadings on the four questions ranged from .774 to .807, and established significant convergent validity for the items representing the CSE construct, ( $p < 0.001$ ). An average Cronbach's  $\alpha$  of .872 for the four CSE items demonstrated

internal consistency. Computer self-efficacy had a high correlation with ATICT ( $r = 0.537$ ), a moderate correlation with PUEC ( $r = 0.304$ ), and IUEC ( $r = 0.191$ ) of significance ( $p < 0.05$ ), and an insignificant alignment with ST and IF.

These findings align with Siddiqui who using OLR analysis, found attitude towards ICT, CSE, and PUEC, positively related to intention to use e-commerce. Tan and Chung's (2005) testing of Moon and Kim's (2001) extended TAM, and suggested that CSE, as did Compeau and Higgins (1995)— was an important determinant of actual use of a technology. Ball (2008) also demonstrated that CSE was a significant predictor of the use of emerging educational technology.

However, Hayashi et al. (2004) found that CSE accounted for much less of the variance in perceived usefulness (10%), satisfaction (attitude) (14%), than found in the DPI study, and there was some opposition for intention to continue using technology (-1%). Ghobakhloo et al. (2010) reviewed the empirical evidence and qualitatively postulated the IMTAS model targeted at SME's, which related CSE to both ease of use, and perceived usefulness, to shape attitudes toward technology. Al-Busaidi and Al-Shihi (2010) from neighboring Oman singled out CSE, ATICT, as well as factors implicit to the technologies usefulness, which supported the DPAM outcome for CSE. For the Middle East, they cited the importance of organizational factors (Al-Busaidi & Al-Shihi, 2010).

Cassidy and Eachus (2006) related CSE and intention to use, through several studies. Glennie (2010) also supported the relation of CSE, to ATICT, PUEC, and IUEC, through study of intention to use a Website. Independent variables of perceived usefulness, perceived ease of use, and computer self-efficacy supported the DPAM,



while an association with trust and subjective norms for the Glennie model, which aligns most closely with DPAM's societal trust construct, deviates from the DPAM findings.

**Implications of research question 2.** Research question 2 was—to what extent, if any, do attitudes toward ICT relate to intention to use deep packet inspection in the UAE? Survey participants answered questions 5 through 8 in Appendix R, about attitude toward information and communication technology (ATICT). The maximum likelihood CFA parameter estimations using Mplus 5.0 supported rejection of the null hypothesis, and implicit default acceptance, of the alternative hypothesis, propelled by an acceptable goodness-of-fit of ATICT with the deep packet acceptance model (DPAM).

The high factor loadings on the four questions ranged from .672 to .748, and established significant convergent validity for the items representing the ATICT construct, ( $p < 0.001$ ). An average Cronbach's  $\alpha$  of .813 for the four ATICT items, demonstrates internal consistency. Attitude toward ICT had a high correlation with CSE ( $r = 0.537$ ), PUEC ( $r = 0.420$ ), and IUEC ( $r = 0.415$ ), and a moderate correlation with ST ( $r = 0.117$ ), and IF ( $r = 0.118$ ) of significance ( $p < 0.05$ ).

These findings agree with Siddiqui who using OLR analysis, found attitude towards ICT, CSE, and PUEC, positively related to intention to use e-commerce. However, they differ slightly from Tan and Chung (2005) who showed that perceived usefulness had a stronger effect on attitude toward using than did perceived ease of use, which more closely aligned with CSE conceptually. Sam et al. (2005), who studied young Islamic students in Malaysia, suggested that through their mandatory software use for a class, and later using it in new and unanticipated ways, that the unique technology-immersed, educational environment may negatively affect the students. Jegede (2007),

who researched technology adoption in Nigeria, found the attitude component of technology adoption led to experience and consequently self-efficacy. Self-efficacy moderated by behavioral factors, led to intention to use, and subsequently led to perceived ease of use, which in turn supported perceived usefulness. Then, with further use of a technology, the user became free from defensive attitudes against ICT.

Ghobakhloo et al. (2010) postulated that for SME's the IMTAS model supported perceived ease of use and perceived usefulness as the determinants of attitude toward usage. Al-Busaidi and Al-Shihi (2010) from neighboring Oman connected CSE, ATICT, as well as factors implicit to the technologies usefulness, while also mentioning for the Middle East they cited the importance of organizational factors. Van Slyke et al. (2010), validated a strong relationship between societal trust and intention to use e-commerce mediated by beliefs (attitudes). Glennie's (2010) intention to use a Web site, independent variables of trust , subjective norms perceived usefulness , perceived ease of use , computer self-efficacy , aligns very closely with the ATICT findings for DPAM as does Xu and Cai's (2004) findings on attitude and intention.

**Implications of research question 3.** Research question 3 was—to what extent, if any, does the perceived usefulness of e-commerce relate to the intention to use deep packet inspection in the UAE? Survey participants answered questions 9 through 12 in Appendix R, about perceived usefulness of e-commerce (PUEC). The maximum likelihood CFA parameter estimations using Mplus 5.0 supported rejection of the null hypothesis, and implicit default acceptance, of the alternative hypothesis, propelled by an acceptable goodness-of-fit of PUEC with the deep packet acceptance model (DPAM).

The combination of high factor loadings on the four questions ranged from .657

to .842, and established significant convergent validity for the items representing the PUEC construct, ( $p < 0.001$ ). An average Cronbach's  $\alpha$  of .859 for the four PUEC items demonstrated internal consistency. Perceived usefulness of e-commerce had a high correlation with ATICT ( $r = 0.420$ ), a moderate positive correlation with CSE ( $r = 0.304$ ), IUEC ( $r = 0.251$ ) and ST ( $r = 0.122$ ), and a moderate negative correlation with IF ( $r = -0.137$ ) of significance ( $p < 0.05$ ).

Moon and Kim (2001) found that perceived usefulness had significant effect on Internet adoption when used for work-related purposes. These findings are consistent with Brown and Jayakody (2008) who found for South Africa, that intentions to use online retail, and related attitudes, were influenced by perceived usefulness, whilst perceived usefulness was influenced by trust and information quality, which may be seen as correlating with the ST and IF variables of this study. Perceived usefulness had a central role in the IMTAS model posited by Ghobakhloo et al. (2010). Al-Busaidi and Al-Shihi (2010) from neighboring Oman, where, besides the existence of the already mentioned CSE, ATICT, relationship, that study also supported factors implicit to the technologies usefulness, and also for the Middle East they cited the importance of organizational factors.

The results of Kim and Kim (2005) show that self-efficacy affects trust, which was tested in this study, as being closely aligned with culture, in turn influencing intention to use e-commerce. Furthermore Glennie's (2010) intention to use a Website study where the independent variables were trust subjective norms, perceived usefulness, perceived ease of use, and computer self-efficacy, matches up well. The negative relationship with IF, found in DPAM is not explained adequately by any of the studies,

however, it is a new construct in technology adoption. Glennie's (2010) computer apprehension construct, a construct dismissed in that study exhibited a negative correlation also. These findings agree with Siddiqui who using OLR analysis, found attitude towards ICT, CSE, and PUEC, positively related to intention to use e-commerce.

**Implications of research question 4.** Research question 4 was—to what extent, if any, does intention to use e-commerce relate to intention to use deep packet inspection in the UAE? Survey participants answered questions 13 through 16 in Appendix R, about intention to use e-commerce (IUEC). The maximum likelihood CFA parameter estimations using Mplus 5.0 supported rejection of the null hypothesis, and implicit default acceptance, of the alternative hypothesis, propelled by an acceptable goodness-of-fit of IUEC with the deep packet acceptance model (DPAM).

The combination of high factor loadings on the four questions ranged from .746 to .841, and established significant convergent validity for the items representing the IUEC construct, ( $p < 0.001$ ). An average Cronbach's  $\alpha$  of .875 for the four IUEC items demonstrates satisfactory internal consistency. Intention to use e-commerce had a high correlation with ATICT ( $r = 0.415$ ), and moderate positive correlation with CSE ( $r = 0.191$ ), PUEC ( $r = 0.251$ ), ST ( $r = 0.212$ ), and IF ( $r = 0.199$ ) of significance ( $p < 0.05$ ).

Siddiqui found that 75% of the variance in intention to use e-commerce was explained by ATICT, CSE, and PUEC for the UAE and Saudi Arabia. Ghobakhloo et al. (2010) posited that behavioral intention motivated technology usage. The results of Kim and Kim 2005 show that self-efficacy affects trust, tested in this study as ST, in turn influencing intention to use e-commerce. Van Slyke et al. (2010) and Van Slyke et al. (2004) validated a strong relationship between culture and intention to use e-commerce,

and mediated by beliefs (attitudes) in the later studies. Gefen (2000) and Van Slyke et al. (2003) connected privacy, trust, and familiarity, which closely aligned with DPAM's — societal trust connection with intention use.

Cassidy and Eachus (2006) connected CSE and intention to use, while the study of Glennie (2010) connected CSE with intention to use a Website. Using independent variables of trust, subjective norms, perceived usefulness, perceived ease of use, computer self-efficacy, matches well with the findings of DPAM. Furthermore, Xu and Cai's (2004) work on attitude and intention supports DPAM.

**Implications of research question 5.** Research question 5 was—to what extent, if any, does societal trust relate to intention to use deep packet inspection in the UAE? Survey participants answered questions 17, 19 and 20 in Appendix R, about culture, primarily as manifested in Emirati society—as trust. The maximum likelihood CFA parameter estimations using Mplus 5.0 supported rejection of the null hypothesis, and implicit default acceptance, of the alternative hypothesis, propelled by an acceptable goodness-of-fit of ST with the deep packet acceptance model (DPAM).

The combination of high factor loadings on the three questions ranged from .696 to .859, and established significant convergent validity for the three items representing the societal trust construct, ( $p < 0.001$ ). An average Cronbach's  $\alpha$  of .875 for the three ST items demonstrated internal consistency. Societal trust had a moderate positive correlation with ATICT ( $r = 0.117$ ), PUEC ( $r = 0.122$ ), and IUEC ( $r = 0.212$ ) of significance ( $p < 0.05$ ).

Tan and Chung 2005 uncovered a strong relationship between image and social norms with perceived usefulness. Sagi et al. (2004) found a statistically supported

connection between societal trust and attitudes toward e-commerce as well as national control and privacy rights. A drawback of making comparisons with the Sagi study is the U.S. and U.K. research locations, being culturally diverse from the UAE.

The results of Kim and Kim 2005 show that self-efficacy affects trust, a construct tested in this study as societal trust, which is in turn influencing intention to use e-commerce. Van Slyke et al. (2010) and Van Slyke et al. (2004) validated a strong relationship between culture and intention to use e-commerce, and in the later study, found both constructs moderated by beliefs (attitudes). Glennie (2010) also modeled relationships between intention to use a Website, where independent variables were trust, subjective norms, perceived usefulness, perceived ease of use, computer self-efficacy.

While Hofstede (2009) is frequently cited connecting culture via trust, to information systems in literature, information systems researchers are reluctant to apply a strict definition to culture (Bahameed, 2008). Gefen (2000) and Van Slyke et al. (2003) connected privacy, trust, and familiarity, which are in close alignment with the societal trust construct as did later studies by Beatty et al. (2011) and Yousafzai et al. (2007). The cultural context of trust in dyadic, one-to-many or many-many relationships is meaningful when viewed through the lens of cultural theory, and the social capital perspective (Verweij, 2005). Cultural theory and the social capital perspective relies on societal trust as a sociocultural construct, central to understanding community relationships, both horizontally between members, and vertically with the government (Al Ali, 2008; Salem and Jarrar, 2010; Verweij, 2005).

Measurement of societal trust took place abstractly through embedded levels of trust, revealed in responses to the survey instrument for this study developing the DPAM.

Salem and Jarrar (2010) recognized societal trust, as it affects social aspects of technology acceptance, as an evolving social construct, of policy implementation in the UAE, by potential driving down the social transaction costs for government. Al-Ali (2008) considered cultural theory and social capital but from the UAE perspective toward Emiratisation.

**Implications of research question 6.** Research question 6 was—to what extent, if any, do attitudes toward Internet filtration relate to intention to use deep packet inspection in the UAE? Survey participants answered questions 18, and 21 through 24 in Appendix R, about Internet Filtration (IF). The maximum likelihood CFA parameter estimations using Mplus 5.0 supported rejection of the null hypothesis, and implicit default acceptance, of the alternative hypothesis, propelled by an acceptable goodness-of-fit of IF with the deep packet acceptance model (DPAM).

The combination of high factor loadings on the three questions ranged from .621 to .885, and established significant convergent validity for the five items representing the IF construct, ( $p < 0.001$ ). Internal consistency was satisfied by an average Cronbach's  $\alpha$  of .832 for the five IF items. Internet filtration had a moderate positive correlation with ATICT ( $r = 0.118$ ), and IUEC ( $r = 0.137$ ), a moderate negative correlation PUEC ( $r = 0.199$ ) of significance ( $p < 0.05$ ).

Woon and Pee (2004) substantiated Internet abuse as a major factor at  $p > .05$  significance. Abadie (2009) warned about a digital *Kasserine Pass* facing the U.S. Army, due to a lack of preparedness or digital warfare at the tactical level. Birrer (2009) advocated the necessity of employing latent Dirichlet allocation (LDA) listening devices, a DPI technology to fight metamorphic malware. Via an extended video lecture, Blei

(2009) explained the configuration of an LDA algorithm to identify malware in electronic archives. For Artan (2008), network intrusion detection and prevention systems (NIDPSs) are a very important part of the defense against cyber-crime, and the primary focus was on increasing the throughput speed of the DPI devices.

From the international relations perspective, hostility toward Israel and support for terrorism, are on the decline, as a basis for ideology for political platforms in the Islamic world according to Kurzman and Naqvi (2010). In a foreshadowing of the events of the Arab Spring (“Arab Spring Undermines,” 2011; “The Arab Awakening,” 2011), Haider (2008) explored qualitatively how the Internet once a research tool, can now launch careers by providing an outlet to perform music, conduct business online, and connect people through blogs and social networking sites. Haider illustrated the contribution the Internet makes to a democracy and contrasted that with countries that have a more autocratic form of government, where the internet is also controlled, undermining the very principles of democracy. Sagi et al. (2004) statistically supported the conclusion that national control and privacy rights were significant factors, and the study had taken place in the U.S. and U.K.

While there were marginal model-fit outcomes for TLI and CFI measures, RMSEA, and  $\chi^2/df$  results indicated a good model fit, and this was coupled with meaningful factor loadings and correlation coefficients amongst latent variables. The PASW-18 and MPLUS 5.0 measurement sub-model indicated a rejection of the null hypothesis in favor of default acceptance of the alternate hypothesis, for all six research questions. There was a positive relationship between each of the six independent variables (i.e., CSE, ATICT, PUEC, IUEC, ST, and IF) and the dependent variable



intention to use deep packet inspection.

**Limitations.** This research has limitations that future work can address. It is the first study to use the proposed model. Further validation studies are required as external validity may be limited to Emirati nationals attending the Higher Colleges of Technology. Any evaluation of the implications of this study on DPI adoption in the UAE should take into consideration limitations of the study.

The study clearly addresses modeling intention to use DPI in the UAE; however, the model contains no variables that can explicitly measure DPI's acceptance. Therefore, as worded, the six hypotheses were tested indirectly through the assessing fit of latent factors to the model and not directly. Thus, this correlational study examined if constructs fit a proposed model, and the research design not constructed to infer causality. At best, this study could only establish a correlation between the independent variables and intention to use DPI. Therefore, there was no way to assess the relationship of the other constructs with intention to use DPI except by association and goodness-of-model-fit. The correlation matrix and goodness-of-fit indices are included to that effect.

The latent relationships between the six constructs and intention to use DPI, were however, postulated through theoretical grounding, established through the literature review. With the research strategy of this DPI study, data correlations among the constructs measured (e.g., to see whether CSE is correlated with ST), lend credibility to the theoretical argument, that these constructs have an effect intention to use DPI.

Internal validity was limited by the quasi-experimental design and the stratified random sampling regime used to draw participants from the HCT, the largest university, in the UAE. The Emirati National college students' who participated, were 65% female,

as a percentage of the total population; although actual response rate by gender was not collected, and full anonymity was guaranteed for the participants, the design led to a possible gender bias. While graduates of HCT, are favored by law for employment in key industries likely to use DPI, industry practitioners and decision makers already working in the field were not sampled, contributing additional bias and limitations on the interpretation and generalizability of the results.

The self-reported measures of the on-line survey were subjective, rather than objective, which may have contributed to internal validity bias. For example, Brezgina et al. (2008) concluded that people are wary of data collection. As such, suspicion on the part of the respondent about the motivation of the study can lead to skipped questions and answers not representative a persons' true feelings.

The culture that the study took place in is a limitation of the study. Translation from English to Arabic can be a limitation. A literal translation often fails to capture some of the nuances and contextual meanings, only known to a native speaker of Arabic. Since many of the question items dealt with technology factors such as Internet and blogs, proper words choice was essential to convey accurate meaning in a culture built on a network of social relationships. In one case of a measurement item, two questions had the same translation into Arabic although their English meanings were different. Pilot Study 1 questions; 49, *People of my community trust each other*, and 50, *I am not living in a high trust society*, presented translation problems when one question was to be reversed, and there was no differentiation between questions. In English, *community* has a local connotation, while *society* is a broader term. These connotations are examples of language constructs that have cultural hindrances in Arabic-English translation and do

not translate well across Arabic and English cultures (Bahameed, 2008). In the UAE, community and society, have virtually the same meaning, which is not surprising since 78% of the population of 5 million, are not Emirati nationals, rather they are expatriates.

The HCT management halted dissemination of the survey on concerns about six of the questions dealing with trust and Internet filtration. Management expressed apprehension that there could be a student backlash if students inferred particular questions as asking them to criticize or disagree with government policy. Management at HCT initially supported the research was then retrospectively reluctant to allow further dissemination of the sensitive items. A temporary halt of further dissemination of the survey took place after research approval and study initiated. However, implementation of the survey then proceeded after two meetings with HCT management and principal investigator secured requisite approvals. The principal investigator met with HCT's Academic Advancement and Accreditation Dean, and the institutional quality assurance team, on 26 April, 2011, followed by a video-conference meeting on 5 May, 2011, with the Director of Abu Dhabi Men's College, also supervisor of the research directorate administering the principal investigator's grants from the Wharton School.

In the first meeting, the principal investigator was requested to provide a commitment that descriptive statistics reflecting negatively on the reputation of the school would not be reported. The second meeting amounted to advisement to consider the situation of the Arab Spring uprising shaking the Arab world and that the UAE was an autocratic state, and not a Western style liberal democracy ("Arab Spring Undermines," 2011; "The Arab Awakening," 2011).

**Significance of findings.** Culture was not a reliable construct in Siddiqui's (2008) study. However, societal trust components of culture were a reliable measurement for this study on DPI adoption. The questions from the Siddiqui (2008) survey used for the first pilot study, drew original construct questions from both, Sagi et al., (2004) and Gefen (2000), see Appendix C. The highest performing questions of these culture questions in the pilot study, in terms of validity, reliability, and factor loading patterns in the sub-model, were those that related to societal trust. As described by Thompson (2011), in a study of Jamaican public sector IT workers, national culture is an important influence on adoption and intention to use technology, and this was substantiated in both earlier (Ein-Dor, Segev, & Orgad, 1993; Shore & Venkatachalam, 1996) and later studies (Chen, Chen, & Kazman, 2007; Straub & Loch, 2007; and Van Slyke et al., 2010).

For the second pilot study and succeeding primary data collection, only Question 18, "A Nation should be able to control the web content that crosses its borders," and Question 17, "The government should not stop any product that is legal and paid for on the Internet from coming into the country," were valid. These questions brought forward into this survey were from those originally provided by Sagi et al. (2004). One significant implication is that the statistical evidence suggested that Question 18, "A Nation should be able to control the web content that crosses its borders," which originally aligned with the societal trust construct, was actually salient with Internet filtration.

Two out of four questions originally provided to the Siddiqui (2008) instrument by Gefen (2000) were advanced to the primary study, and while they were termed as

culture questions in Siddiqui's (2008) study, they appear to reflect trust. Original Questions 49, "People of my community trust each other," and 50, "I am not living in a high trust society," the second of which was a reversed question, and included for reliability purposes, were problematic. These two questions were not unique on the first pilot study, once translated into Arabic for the non-reversed version of the survey.

For the second pilot study, and was later verified by primary data collection, after dropping original Question 48 and 49, only questions 50 and 51, from Gefen (2000) were carried forward into the second pilot study, and the primary study, where they appeared as questions 19 and 20. Question 48 was, "A high degree of trust exists in my family," and did not meet validity standards. Ultimately, questions 19 and 20, along with question 17, would comprise the societal trust measurement in later evolutions of the study.

A significant outcome of this study was the development of a UAE specific measurement instrument for Internet filtration. An existing or readily adaptable instrument was not located in the literature, suitable to measure Internet filtration for the UAE. A custom instrument was developed through field study, pilot tested, and deployed through a primary study. The instrument consists of the following questions: Question 18, "A Nation should be able to control the web content that crosses its borders;" Question 21, "Blogging sites should be blocked," Question 22, "Content that insults any recognized religion should be blocked;" Question 23, "Terrorism content should be blocked," Question 24, "Top Level Domain for Israel (.il) should be blocked."

The measurement instrument developed for this study, also included four questions each, for four technology related variables, thought to influence intention to use deep packet inspection technology. These questions were from Siddiqui (2008) who

had sourced them from prior investigations. These questions, along with those on societal trust and Internet filtration, acquired revalidation as new instrument and reduction of 66 questions from Pilot Study 1 to an instrument utilizing 24 questions.

Computer self-efficacy questions carried over to the final instrument used for primary data collection were on the survey originally provided by Siddiqui, (2008). These questions were from Thompson et al. (2006), for Question 1; and Kim et al. (2009), was the source for Questions 2, 3, and 4. Questions 5, 6, and 7 originally used by Siddiqui for Attitudes toward ICT, were from Van Slyke et al. (2010). Question 8 was from Sagi et al. (2004). For Perceived usefulness of E-commerce, Siddiqui (2008) sourced questions 9-12, from Childers et al. (2001). For Intention to use ICT, Questions 13 and 14, were originally sourced from Van Slyke et al. (2010); while Questions 15 and 16, were originally sourced from Thompson et al. (2006).

Ultimately, this research created a UAE specific instrument, with possible future uses in network security policy-development. Emirati Nationals, some who are graduates of the Higher Colleges of Technology, will gain employment in decision-making capacities at UAE organizations. The importance of having effective organizational policies at the government and firm level—researched for the UAE, by Salem and Jarrar (2010) in the area of technology acceptance, and by Al-Ali (2008) in the area of Emiratisation, demonstrate the salience of the DPAM study.

### **Recommendations**

While this study was successful to build understanding of this important cybercrime phenomenon in the UAE, further refinement of the proposed model and replication of the study in the UAE, and other countries of the region, should take place.

Further validation is beyond the scope of the research for the dissertation and represents a subsequent study. New and unproven paradigms, even those facing critique regarding low statistical power, or other methodological deficiencies gain credibility when the results of several studies can be triangulated (A. M. Grant, Associate Professor, The Wharton School, August 8, 2011). Second, the business model concept should be explored, to identify factors that define firms that employ a superior model, firms that experiment with new models, and firms that make sound business choices within the confines of their existing model (Zott & Amit, 2008; Zott et al., 2011). Third, it would be useful to examine whether the alliance learning process for firms dealing in DPI has any positive, adverse, or declining effects in the cyber-crime problem (Kale & Singh, 2007). Finally, there is the importance of recognizing the limitations imposed by culture.

Organizational policy and culture encouraged action research through faculty workshops, conferences, and experimentation with reflective and novel activity-based, student-focused teaching strategies, and allowed this activity to proceed outside the scope of CRC review (Fujairah Colleges, 2011). Toward developing an appropriate strategy to enable empirical testing of the practitioner community, snowball sampling, social networking, and e-business mailing lists, are ideal methods to explore, for gathering data from this difficult to reach population. Multiple case studies of salient firms, is another recommended mode of enquiry that provides existential proof (Siggelkow, 2007).

Elaborating on the recommendation that for future research, the culture being studied should be accounted for as a limitation of the study. The organizational culture at HCT was a limiting factor that first delayed, and nearly de-railed the study. The primary investigator applied formally, as required, for permission to conduct research, through

the CRC, and there was no official response after more than two weeks. The principal investigator reapplied to the Associate Director, of Fujairah Colleges and received the go-ahead to commence research. The approving Fujairah College management requested that the principal investigator contact all of the assistant directors at the various HCT campuses, regarding distribution of the survey to students. After doing that, and receiving an initially positive response, a system-wide email sent to supervisors, deans, and faculty about the study, served to notify them and requested their support in distribution of the survey.

After launching the survey, critique surfaced from the research directorate at Abu Dhabi Women's college, and although that particular college's students were not targeted for the survey, their local management had been given an opportunity to review the research methodology and insert themselves into the organizational review process. The critique was voiced to HCT upper management and raised concern within HCT about the organization's obligation to address sensitivity toward the societal trust and Internet filtration questions, and the principal investigator was instructed by HCT management, via email, to stop promoting the survey—although never explicitly directed to close the survey. The principal investigator was then required to meet with HCT management twice, with different directorates, allaying fears, of sedition on the part of the primary investigator, in light of the revolution of the Arab Spring revolution (“The Arab Awakening”, 2010).

Further research on network security technologies, including DPI should be encouraged for the UAE specifically, and the Arab world in general, from both the perspectives of the six nations comprising the Gulf Cooperation Council countries, as



well as the entire Middle East, and North Africa Region. Engaging the DPI practitioner community in further studies is essential in building external validity. D. Saral has recommended further analysis of data using regression to determine if multicollinearity could account for a simpler model with less variable constructs (D. Saral, DBA and e-MBA Programs Director, Webster University, personal communication, November 25, 2011). However, the argument that organizations in the UAE, fear giving the impression that they are supporting sedition, highlights the difficulty in engaging the DPI practitioner community in further DPI studies, which are necessary if validity for DPAM is any further. This situation of reaching respondents effectively, applies not only to the UAE, but also to the entire region, so an effective strategy to illicit responses such as snowball sampling, while guaranteeing privacy is necessary, may be necessary.

There are strong arguments for persuasion, using case study research (Siggelkow, 2007). Cases can be ideal way to motivate a research question. In the case of DPAM, the argument is that the DPI constructs lead to acceptance or intention to use DPI. Typically, one would expect a firm to be secretive about the security regimes employed. However, if the researcher could negotiate their way into an organization—a given firm may be willing to anonymously share their network security strategy. Thus, the research would have the appeal of being grounded in a real-life situation and can lead to a more refined conceptualization of the existing theory. On the other hand, a single counterexample can sometimes suffice to falsify a theory (Siggelkow, 2007).

There are two, salient relational systems-theory paradigms that provide an understanding of the interactions of actors, and exchange partners, affected by deep packet inspection in the UAE—the business model concept and transaction cost analysis.

The business model approach and transaction-cost analysis can both play a role in developing an entrepreneurial DPI strategy and can lead to value creation and competitive advantage. Firms involved with DPI should develop a business revenue model focusing on efficiency-and novelty-centered, boundary spanning transactions (Zott & Amit, 2007). Transaction-cost analysis is the match of governance structures with proposed transactions as an economizing measure based on transaction frequency and investment characteristics (Williamson, 1979).

Study of the business model concept is a bounded reality of the phenomena of silos of interest, depending on researcher's respective areas of study. Emerging themes among business model scholars that relate to using DPI to fight cybercrime are; a) e-business and use of information technology in organizations, strategic issues such as value creation, competitive advantage and firm performance, and c) innovation and technology management (Zott, Amit, & Massa, 2011). Under Williamson's transaction-cost analysis model, DPI hardware and services transactions would be characterized as either (a) mixed (more specific), or (b) idiosyncratic (highly specialized and unique) investments.

The occasional DPI purchase, would utilize the trilateral governance model, also known as neoclassical contracting. The trilateral governance model used third party assistance in the form of an independent expert arbitrator to evaluate vendor performance. Principals to transactions have a vested stake to sustaining the relation due to the specialized investment by vendor and customer in the DPI package specific for a given firm, and the opportunity costs of switching to a successor supplier (Williamson, 1979).

Relational contracting is good fit for recurring DPI hardware and service transactions for both the mixed and idiosyncratic investment characteristic. A bilateral governance model fits the mixed application. The bilateral governance model is an obligational contracting mode. The autonomy of parties is maintained, and both parties have incentives through separate profit streams, to sustain the relationship, rather than permit it to unravel. The bilateral model would be favored as the DPI industry matures (Williamson, 1979).

The unified governance model, implying an internal organizational, vertical integration, by the party with superior adaptive properties, is a fit for idiosyncratic applications. The unified governance model removes the DPI transaction from the market and subjects it to an authority relationship of administration (Williamson, 1979). The UAE could move to this model through the state-led telecommunications provider Etisalat, if the organic DPI technological capabilities were developed to a sufficiently high qualitative level.

The argument, that firms' critical resources leading to a competitive advantage spanned firm boundaries, and relationship-based, was later made by Dyer and Singh (1998). The view is that competitive advantage for DPI industry firms, is embedded in; (a) relation-specific assets, (b) knowledge sharing routines, (c) complementary resources and capabilities, and (d) effective governance. From a strategic interpretation, the relational prescription may differ from the resource-based or industry structure view for DPI industry firms. Chances for success with the relationship-based, competitive advantage model, increases with greater partnership experience, and creation of a dedicated alliance function. Firms with this functional attribute had higher stock market

gains of 1.35% to 0.18%, and greater long term success of 63% to 50%, than firms not employing this specialized function (Kale, Dyer, & Singh, 2002; Kale & Singh, 2007).

Deep packet inspection inputs can be highly customized by suppliers, and relation specific investments, and deployment of unique combinations of resources, can lead to a productivity gain in the value chain. This implies that relational rents and competitive advantage can accrue for DPI firms that develop idiosyncratic interfirm linkages.

Synergistic competitive advantages that can result are (a) relation-specific assets; (b) substantial learning and knowledge exchange; (c) unique product and service offerings, resulting from combining scarce but complementary resources and capabilities; and (d) lower transaction cost due to more effective governance (Dyer & Singh, 1998).

To achieve the relation-specific assets, DPI firms should focus on site specificity physical asset specificity, and human asset specificity. The subprocesses facilitating rent value for relation-specific assets are duration of the safeguards against opportunism, and interfirm collaboration volume. Subprocesses for success, in knowledge sharing, are the ability to read and respond to needs of the partner, and inclusion of incentives that encourage transparency and discourages free-riding. Subprocesses for successful implementation of the DPI partners' complementary resources, and capabilities, are the ability to identify and evaluate areas of possible benefit, and then develop the organization's strategic resource complementarity. Successful governance subprocesses for competitive advantage are use of self-enforcement rather than third-party enforcement, and a preference for informal over formal governance mechanisms (Dyer & Singh, 1998). According to Kale et al. (2007), DPI firms should be seeking and maintaining relationships that are salient to the organizations desire to reduce costs.

## Conclusions

The DPI research to develop the DPAM model contributes substantively to study of an important phenomenon—cybercrime in the UAE. This investigation rests upon a foundation of high-quality prior research. The theoretical claim, of DPAM being a viable technology acceptance model, for the network security technology of deep packet inspection, has ambiguity about the dependent variable—intention to use DPI. Deep packet inspection as a latent construct in this study could benefit from direct measurement in future studies. However, for this study, DPAM is rigorously derived, plausible, and flows logically from its basis in the DPI adoption phenomenon, thus meeting the requirements high-quality research in network security strategy (Oxley, Rivkin, & Ryall, 2010).

The six constructs measured for inclusion in the model, allowed empirical investigation of the implications. The empirical data analyzed using accepted statistical methods and the transparent presentation of rich sample information and results are signs of a high-quality research study. The participants and sampling methodology was well organized and clearly described. Descriptive statistics fairly addressed the issue of univariate and multivariate normality, and these results explained in a clear fashion.

Reliable data conforms to the constructs, and the units of analysis are consistent with the five point Likert-type scale. Each construct had a similar number of measurement items per construct. Four constructs had four questions; one construct had three questions, and one construct defined by five questions. Alternative theories, albeit related, received consideration, such as TAM, TPB, DOI, and TRA. An overriding concern expressed for the choice of methods, created valid deductions translatable to firm

strategy at the SME level (Oxley et al., 2010). Significance for convergent reliability of construct operationalizations that should be theoretically similar is  $p < .0001$ . Significant correlation ( $p < .05$ ) existed between some factors, with no multicollinearity of factor correlations approaching .85, indicative of poor discriminant validity (Brown, 2006).

As the UAE society engages more-and-more with e-commerce, executives, decision-makers, security system architects, and users at firms potentially at risk from cybercrime should take heed of this study. The level of specialization, in network security strategy is increased, along the theoretical-empirical divide, by a high-quality study targeted at a specific technology—DPI, for a specific region—the UAE, that has a serious cybercrime problem. The outcome is a theoretical model supported by a large-sample empirical analysis. Issues relating to adoption of DPI such as CSE, ATICT, PUEC, ST, and Internet filtration have crucial ramifications for understanding the evolution of norms and policies countering cybercrime affecting the UAE (Oxley et al., 2010). An effective DPI policy will be instrumental in reducing UAE organizational and government's transactions costs (Salem & Jarrar, (2010).

Research by Thompson (2010) has exemplified that National culture is an important influence on adoption and intention to use technology (Chen, Chen, & Kazman, 2007; Gallivan & Sprite, 2005; Lippert & Volkmar, 2007; and Rouibah & Hamdy, 2009). While it is very important to understand this phenomenon in the UAE is culturally connected, and the data will be very useful, further research and discussion to replicate the research in other Arab countries, would further empiricism in network security for the Arab world. The final validation is beyond the scope of this dissertation and represents a subsequent study.

## References

- Aalbers, M. (2009). Geographies of the financial crisis. *Area*, *41*, 34–42.  
doi:10.1111/j.1475-4762.2008.00877.x
- Abadie, B. (2009). *Www.kasserinepass.com: Determining the U.S. Army's readiness for tactical operations in cyberspace* (Master's thesis). Retrieved from <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA501685&Location=U2&doc=GetTRDoc.pdf>
- Aboelmaged, M., G. (2010). Predicting e-procurement adoption in a developing country: An empirical integration of technology acceptance model and theory of planned behavior. *Industrial Management & Data Systems*, *110*(3), 392–414.  
doi:10.1108/02635571011030042
- Acel, A. D., & Sounderpandian, J. (2002). *Complete business statistics: International edition* (5th ed.). New York, NY: McGraw-Hill.
- Agarwal, R., & Selen, W. (2009). Dynamic capability building in service value networks for achieving service innovation. *Decision Sciences*, *40*, 431–450.  
doi:10.1111/j.1540-5915.2009.00236.x
- Ajbali, M. (2009, November 15). Hackers aim to steal passwords and credit card numbers: Saudi and UAE at high risk to cybercrime: Report. *Al Arabiya News Channel, Dubai*. Retrieved from <http://www.alarabiya.net/articles/2009/11/15/91411.html>
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice Hall.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. doi:10.1016/0749-5978(91)90020-T
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, *32*, 665–683.  
doi:10.1111/j.1559-1816.2002.tb00236.x
- Albright, J. J., & Park, H. M. (2009). *Confirmatory factor analysis using AMOS, LISREL, MPlus, and SAS/STAT CALIS* [Working Paper]. Bloomington, IN: The University Information Technology Services (UITS) Center for Statistical and Mathematical Computing, Indiana University. Retrieved from <http://www.indiana.edu/~statmath/stat/all/cfa/cfa.pdf>

- Al-Ali, J. (2008). *Structural barriers to Emiratisation: Analysis and policy recommendations* (Doctoral Dissertation, Victoria University, Australia). Retrieved from [http://vuir.vu.edu.au/15483/1/al\\_ali.pdf](http://vuir.vu.edu.au/15483/1/al_ali.pdf)
- Al-Busaidi, K. A., & Al-Shihi, H. (2010). Instructors' acceptance of learning management systems: A theoretical framework (Article ID 862128). *Communications of the IBIMA 2010*. Retrieved from <http://www.ibimapublishing.com/journals/CIBIMA/2010/862128/862128.html>
- Al-Gahtani, S. (2003). Computer technology adoption in Saudi Arabia: Correlates of perceived innovation attributes. *Information Technology for Development, 10*(1), 57–69. doi:10.1002/itdj.1590100106
- Alkarobi, T. (2007). *Firewalls*, [PowerPoint slides]. Retrieved from <http://ocw.kfupm.edu.sa/user062/CSE55101/firewall.pdf>
- Al-Khaldi, M., & Wallace, R. (1999). The influence of attitude on personal computer utilization among knowledge workers: The case of Saudi Arabia. *Information and Management, 36*(4), 185–204. doi:10.1016/S0378-7206(99)00017-8
- Allot Communications. (2007). *Digging deeper into deep packet inspection (DPI)*. [White Paper]. Retrieved from [http://www.getadvanced.net/learning/whitepapers/networkmanagement/Deep%20Packet%20Inspection\\_White\\_Paper.pdf](http://www.getadvanced.net/learning/whitepapers/networkmanagement/Deep%20Packet%20Inspection_White_Paper.pdf)
- Anckar, B. (2003). Drivers and inhibitors to e-commerce adoption: Exploring the rationality of consumer behavior in the electronic marketplace. *Proceedings of ECIS 2003*, Naples, Italy. Retrieved from <http://aisel.aisnet.org/ecis2003/>
- Anderson, N. (2007, July 27). Deep packet inspection meets Net neutrality, CALEA. *ARS Technica*. Retrieved from <http://arstechnica.com/articles/culture/deep-packet-inspection-meets-net-neutrality.ars>
- Anderson, N. (2008, May 12). Deep packet inspection under assault over privacy concerns. *ARS Technica*. Retrieved from <http://arstechnica.com/old/content/2008/05/deep-packet-inspection-under-assault-from-canadian-critics.ars>
- Arab Advisors Group. (2008, February 4). B2C e-commerce volume exceeded US \$4.87 billion in Kuwait, Lebanon, Saudi Arabia and UAE in 2007. *Arab Advisors Group*. Retrieved from <http://www.arabadvisors.com/Pressers/presser-040208.htm-0>
- Arab Spring Undermines Support for Economic Liberalization Policies in the Middle East (2011, July 26). *Arabic Knowledge@Wharton*. Retrieved from [http://knowledge.wharton.upenn.edu/arabic/article.cfm?articleId=2695&language\\_id=1](http://knowledge.wharton.upenn.edu/arabic/article.cfm?articleId=2695&language_id=1)



- Artan, N. S. (2007). *High-speed network intrusion detection and prevention* (Doctoral dissertation). Available from Dissertations & Theses: Full Text database. (Publication No. AAT 3311229)
- Associated Press. (2010). UAE, Saudi Arabia to block BlackBerry on security fears. *MSNBC*. Retrieved from [http://www.msnbc.msn.com/id/38508180/ns/technology\\_and\\_science-wireless](http://www.msnbc.msn.com/id/38508180/ns/technology_and_science-wireless)
- Aydinli, A., Selen, W., & Sen, T. (2010, February). *An artificial neural network model for interface preference*. Paper presented at the Research Symposium in Business and Economics, American University of Sharjah, UAE. Retrieved from [http://www.aus.edu/conferences/symp\\_sbm/mis.php](http://www.aus.edu/conferences/symp_sbm/mis.php)
- Babin, B. J., Darben, W. R., & Griffin, M. (1994). Work and/or fun: Measuring hedonic and utilitarian shopping value. *Journal of Consumer Research*, 20, 644–656. doi:10.1086/209376
- Bagozzi, R. P., & Li, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, 16(1), 74–94. doi:10.1007/BF02723327
- Bahameed, A. S. (2008). Hindrances in Arabic-English Intercultural Translation. *Translation Journal*, 12(1), retrieved from <http://translationjournal.net/journal/43culture.htm>
- Baker, L. (2005). Search engine marketing: Behavioral targeting and contextual advertising. *Search Engine Journal*. Retrieved from <http://www.searchenginejournal.com/behavioral-targeting-and-contextual-advertising/836/>
- Ball, D. M. (2008). *An empirical investigation of the contribution of computer self-efficacy, computer anxiety, and instructors' experience with the use of technology to their intention to use emerging educational technology in traditional classrooms* (Doctoral dissertation). Available from ProQuest Dissertations and Theses Database. (UMI No. 3297720).
- Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, 37, 122–147. doi:10.1037//0003-066X.37.2.122
- Barrett, P. (2007), Structural Equation Modelling: Adjudging Model Fit, *Personality and Individual Differences*, 42 (5), 815-24. doi:10.1016/j.paid.2006.09.018
- Bauer, S. J. (2008). *Congestion on the Internet: Operator responses, economic analysis, and improving the network architecture* (Doctoral thesis, Massachusetts Institute of Technology). Retrieved from <http://hdl.handle.net/1721.1/44406>

- Beatty, P., Reay, I., Dick, S., and Miller, J. 2011. Consumer Trust in E-Commerce Web Sites: A Meta-Study. *ACM Computing Surveys*, 43(3), 14:0-14:45. doi:10.1145/1922649.1922651
- Benson, P. (2010, November 18). Computer virus Stuxnet a 'game changer,' DHS official tells Senate. *CNN*. Retrieved from <http://edition.cnn.com/2010/TECH/web/11/17/stuxnet.virus/>
- Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107(2), 238-246. doi:10.1037/0033-2909.107.2.238
- Bernard, H. R. (2002). *Research methods in anthropology: Qualitative and quantitative methods* (3rd ed.). Walnut Creek, CA: AltaMira Press.
- Bhargav-Spantzel, A. (2007). *Protocols and systems for privacy preserving protection of digital identity* (Doctoral dissertation). Retrieved from Dissertations & Theses: Full Text database. (Publication No. AAT 3307439)
- Bhoopathy, D. R. (2009, August 29). *Port of Fujairah second largest bunkering port in the world*. Retrieved from <http://www.marinebuzz.com/2008/08/29/port-of-fujairah-second-largest-bunkering-port-of-the-world/>
- Birrer, B. D., Raines, R. A., Baldwin, R. O., Oxley, M. E., & Rogers, S. K. (2009). Using qualia and hierarchical models in malware detection. *Journal of Information Assurance and Security*, 4, 247–255. doi:10.1109/CICYBS.2009.4925095
- Blei, D. (Producer), (2009, November 2). *Topic Models* [Video Lecture]. Computer Science Department, Princeton University. Retrieved from [http://videlectures.net/mlss09uk\\_blei\\_tm/](http://videlectures.net/mlss09uk_blei_tm/)
- Bocock, R. (1995). *The cultural formation of modern society*. Oxford, UK: Oxford Press.
- Boomsma, A. (2000). Reporting analyses of covariance structures. *Structural Equation Modeling*, 7, 461–483. doi:10.1207/S15328007SEM0703\_6
- Bozionelos, N. (2004). Socio-economic background and computer use: The role of computer anxiety and computer experience in their relationship. *International Journal of Human-Computer Studies*, 61, 725–746. doi:10.1016/j.ijhcs.2004.07.001
- Bradberry, T., & Greaves, J. (2002). *Emotional Intelligence Appraisal* [Emotional intelligence appraisal technical manual]. Retrieved from <http://www.talentsmart.com>

- Brezgina, I., Debouchaud, M., & Frehse, J. (2008). *Is E-personalisation a danger for the customer's privacy?* (Bachelor's thesis, Jönköping International Business School, Sweden). Retrieved from [http://www.diva-portal.org/diva/getDocument?urn\\_nbn\\_se\\_hj\\_diva-1342-1\\_\\_fulltext.pdf](http://www.diva-portal.org/diva/getDocument?urn_nbn_se_hj_diva-1342-1__fulltext.pdf)
- Briscoe, B. (2009). *Freedom with accountability for causing congestion in a connectionless internetwork* (Doctoral dissertation, University of London). Retrieved from [http://www.bobbriscoe.net/projects/refb/refb\\_dis\\_frontmatter\\_pt1.pdf](http://www.bobbriscoe.net/projects/refb/refb_dis_frontmatter_pt1.pdf)
- Brown, E. (2000). Themes in education: Action research. *Northeast and Islands Regional Educational Laboratory at Brown University*. Retrieved from [http://www.alliance.brown.edu/pubs/themes\\_ed/act\\_research.pdf](http://www.alliance.brown.edu/pubs/themes_ed/act_research.pdf)
- Brown, I., & Jayakody, R. (2008). B2C e-commerce success: A test and validation of a revised conceptual model. *Electronic Journal Information Systems Evaluation* 11, 167–184. Retrieved from <http://www.ejise.com/main.html>
- Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York, NY: The Guilford Press.
- Bucchi, P. M. (2007). *An exploration of the resource theory in the Internet environment* (Doctoral dissertation). Retrieved from [http://learners.ncu.edu/writingprogram/dissertation\\_center.aspx?menu\\_id=175](http://learners.ncu.edu/writingprogram/dissertation_center.aspx?menu_id=175)
- Burns, T., & Stalker, G. M. (1961). *The management of innovation*. London, UK: Tavistock.
- Burrell, G., & Morgan, G. (1979). *Sociological paradigms and organizational analysis*. London, UK: Heinemann Educational Books.
- Buros Institute of Mental Measurements. (2009). *Tests reviewed in the mental measurements yearbook series*. Retrieved from <http://www.unl.edu/buros/bimm/html/00testscomplete.html>
- Cabrera-Nguyen, P. (2010). Author guidelines for reporting scale development and validation results in the Journal of the Society for Social Work and Research. *Journal of the Society for Social Work and Research*, 1(2), 99–103. doi:10.5243/jsswr.2010.8
- Campbell, R., Martin C. R., & Fabos, B. (2006). *Media and culture: An introduction to mass communication* (5th ed.). Boston, MA: Bedford/St. Martins.

- Cassidy, S., & Eachus, P. (2002). Developing the computer user self-efficacy (CUSE) scale: Investigating the relationship between computer self-efficacy, gender and experience with computers. *Journal of Educational Computing Research*, 26, 169–189. doi:10.2190/JGJR-0KVL-HRF7-GCNV
- Cavaleri, S. A. (2005). Systems thinking for knowledge. *World Futures: The Journal of General Evolution*, 61, 378–396. Retrieved from <http://www.tandf.co.uk/journals/titles/02604027.asp>
- CenturyLink. (2011). Make every connection a strong one. *CenturyLink formerly CenturyTel/Embarq*. Retrieved from <http://www.embarq.com/>
- CDT: Center for Democracy & Technology. (2008). *Keeping the Internet open innovative and free*. Retrieved from <http://www.cdt.org/>
- Chan, T. F., Golub, G. H., & LeVeque, R. J. (1983). Algorithms for computing the sample variance: Analysis and recommendations. *American Statistician*, 37, 242–247. doi:10.2307/2683386
- Chapman, G. (2009, August 13). Web freedom choked censorship imposed. *The Gazette* (Montreal, Quebec), p. B2. Retrieved from the ProQuest database.
- Chen, C. (2007). *Consumer trust in an e-retailer: An integrative model directed toward customer retention* (Doctoral dissertation). Available from Dissertations & Theses: Full Text database. (UMI No. AAT 3274224)
- Chen, O., Chen, H., & Kazman, R. (2007). Investigating antecedents of technology acceptance of initial eCRM users beyond generation X and the role of selfconstrual. *Electronic Commerce Research*, 7(3), 315-339. doi:10.1007/s10660-007-9009-2
- Chen, Z., & Ji, C. (2005). Spatial-temporal modeling of malware propagation in networks. *IEEE Transactions on Neural Networks*, 16, 1291–1301. doi:10.1109/TNN.2005.853425
- Chiang, B. (2007). *A feasibility study: Secure public key infrastructure with quantum key distributions in grid computing* (Doctoral dissertation). Available from Dissertations & Theses: Full Text database. (UMI No. AAT 3243522)
- Childers, T. L., Carr C. L., Peck J., & Carson, S. (2001). Hedonic and utilitarian motivations for online retail shopping behaviour. *Journal of Retailing*, 77, 511–535. doi:10.1016/S0022-4359(01)00056-2
- Chu, L. (2003). The effects of web page design instruction on computer self-efficacy of preservice teachers and correlates. *Journal of Educational Computing Research*, 28, 127–142. doi:10.2190/K79G-2PYY-VVU6-X988

- Chuttur, M. Y. (2009). Overview of the Technology Acceptance Model: Origins, Developments and Future Directions, Indiana University, USA . *Sprouts: Working Papers on Information Systems*, 9(37). <http://sprouts.aisnet.org/9-37>
- CIA. (2010). *CIA world factbook: United Arab Emirates*. Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/geos/ae.html>
- Clarke, R. (2009). A primer in diffusion of innovation theory. Retrieved from <http://www.rogerclarke.com/SOS/InnDiff.html>
- CloudShield director to speak on guru panel at ISS World MEA. (2009). Retrieved from <http://www.lewiswire.com/us/lewiswire/CloudShield/CloudShield-Director-to-Speak-on-Guru-Panel-at-ISS-World-MEA/n/3574>
- Cohen, J. (1992). Quantitative methods in psychology: A power primer. *American Psychological Association, Psychological Bulletin*, 112, 155–159. doi:10.1037/0033-2909.112.1.155
- Compeau, R., & Higgins, A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, 19, 189–212. doi:10.2307/249688
- Comrey, A. L., & Lee, H. B. (1992). *First course in factor analysis* (2nd ed.). Hillsdale, NJ: Erlbaum.
- Coyne, K. P., & Witter, J. (2002). What makes your stock price go up and down? *The McKinsey Quarterly*, 2, 28-39. Retrieved from [http://www.mckinseyquarterly.com/What\\_makes\\_your\\_stock\\_price\\_go\\_up\\_and\\_down\\_1167](http://www.mckinseyquarterly.com/What_makes_your_stock_price_go_up_and_down_1167)
- Cramer, D. (2003). *Advanced quantitative data analysis*. New York, NY: Open University Press.
- Creswell, J. W. (2008). *Research design: Qualitative, quantitative, and mixed method approaches* (3rd ed.). Thousand Oaks, CA: Sage.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297–334. doi:10.1007/BF02310555
- Cyber warfare could be on horizon as threats increase. (2010, November 20). *AME Info*. Retrieved from <http://www.ameinfo.com/245932.html>
- Davis, F. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13, 319–339. doi:10.2307/249008
- Davis, F., Bagozzi, R., & Warshaw, P. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35, 982–1003. doi:10.1287/mnsc.35.8.982

- Davis, F., Bagozzi, R., & Warshaw, P. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology, 22*, 1109–1130. doi:10.1111/j.1559-1816.1992.tb00945.x
- DeCarlo, L. T. (1997a). On the meaning and use of kurtosis. *Psychological Methods, 2*, 292–307. doi:10.1037//1082-989X.2.3.292
- DeCarlo, L. T. (1997b). Univariate and multivariate tests of skew and kurtosis, a list of the 5 cases with the largest Mahalanobis distances, a plot of the squared distances, critical values for a single multivariate outlier. [SPSS Macro] Retrieved from <http://www.columbia.edu/~ld208/normtest.sps>
- DeCoster, J. (1998). *Overview of factor analysis*. Retrieved from <http://www.stat-help.com/notes.html>
- DeCoster, J. (2009). *Interpreting CFA models*. Retrieved from <http://www.stat-help.com/notes.html>
- Deibert, R., Palfrey, J. G., Rohozinski, R., & Zittrain, J. L. (2008). *Access denied: The practice and policy of global Internet filtering*. Cambridge, MA: MIT Press. Retrieved from <http://opennet.net/accessdenied>
- DeYoung, C., & Spence, I. (2004). Profiling information technology users: En route to dynamic personalization. *Computer in Human Behavior, 20*, 55–65. doi:10.1016/S0747-5632(03)00045-1
- Dickinson, J. (2005). The new anti-virus formula: How to use multilayered security to defeat viruses. *Messaging Press Publications, 11*. Retrieved from <http://borax.polux-hosting.com/madchat/vxdev/library/The%20New%20Anti-Virus%20Formula%20-%20How%20to%20Use%20Multilayered%20Security%20to%20Defeat%20Viruses.pdf>
- Dor, P. E., Myers, M., & Raman, K. S. (2008). Information technology industry development and the knowledge economy: A four country study. In Y. Kurihara, S. Takaya, H. Harui, H. Kamae, Y. Kurihara, S. Takaya, ... H. Kamae (Eds.), *Information technology and economic development* (pp. 174–200). Hershey, PA: Information Science Reference/IGI Global. Retrieved from EBSCOhost.
- Downey, J. (2006). Measuring general computer self-efficacy: The surprising comparison of three instruments in predicting performance, attitude, and usage. *IEEE, Proceedings of the 39th Hawaii International Conference on System Sciences, 3*, 1–10. doi:10.1109/HICSS.2006.268
- Dubai men's college enhances IT curriculum with region's first Nortel security lab. (2005, September 22). *AME Info*. Retrieved from <http://www.ameinfo.com/68276.html>

- Dumper, M., & Stanley, B. E. (2007). *Cities of the Middle East and North Africa: A historical encyclopaedia*. Santa Barbara, CA: ABC-CLIO.
- Du Telecom (2006, April 21). Du lists on Dubai financial market. *Who we are»Du*. Retrieved from <http://www.du.ae/en/about/media-centre/newsdetails/du-Lists-on-Dubai-Financial-Market>
- Du Telecom (2011). *Who we are»Du*. Retrieved from <http://www.du.ae/en/about/who-we-are>
- Dutton, H., Rogers, M., & Jun, H. (1987). Diffusion and social impacts of personal computers. *Communication Research, 14*, 219–250. doi:10.1177/009365087014002005
- Dwivedi, Y. K., Choudrie, J., & Brinkman, W. (2006). Development of a survey instrument to examine consumer adoption of broadband. *Industrial Management & Data Systems, 106*, 700–718. doi:10.1108/02635570610666458
- Dwivedi, Y. K., Williams, M. D., & Lal, B. (2008). Open IT-based innovation: Moving towards cooperative IT transfer and knowledge diffusion. *IFIP International Federation for Information Processing, 287*, 3–32. doi:10.1007/978-0-387-87503-3\_1
- Dyer, J. H., & Singh H. (1998). The relational view: Cooperative strategy and sources of interorganization competitive advantage. *Academy of Management Review, 23*(4), 660-679. doi:10.2307/259056
- Eachus, P., & Cassidy, S. (2006). Development of the Web users self-efficacy scale (WUSE). *Issues in Informing Science and Information Technology, 3*, 199–209. Retrieved from <http://informingscience.org/homepage.php>
- Eastin, M. (2002). Diffusion of e-commerce: An analysis of adoption of four e-commerce activities. *Telematics and Informatics, 19*, 251–267. doi:10.1016/S0736-5853(01)00005-3
- E-Case 2009. (2009). *The 2009 international conference on e-commerce, e-administration, e-society, and e-education, Singapore*. Retrieved from <http://www.e-case.org/2009/cfp.html>
- Ein-Dor, P., Segev, E., & Orgad, M. (1993). The effect of national culture on IS: Implications for international information systems. *Journal of Global Information Management, 4*, 33–44. Available from ProQuest database.
- Eisenhart, K. M. (1999). Strategy as strategic decision making. *Sloan Management Review, 40*(3), 65–72. Available from <http://sloanreview.mit.edu/the-magazine/articles/1999/spring/4036/strategy-as-strategic-decision-making/>

- El-Sheikh, S. (2008). The moral economy of classical Islam: A fiqhonomic model. *The Muslim World*, 98(1), 114–144. doi:10.1111/j.1478-1913.2008.00213.x
- Enomoto, R., Okamoto, N. and Seo, T. (2010). On the distribution of test statistic using Srivastava's skewness and kurtosis. *Journal of Statistical Planning and Inference*. doi:10.1016/j.jspi.2010.03.003
- Epic.org. (2009). *Deep packet inspection and privacy*. Retrieved from <http://epic.org/privacy/dpi/>
- Erdfelder, E., Faul, F., & Buchner, A. (1998). *G\*Power* [Computer software]. Retrieved from <http://www.psych.uni-duesseldorf.de/aap/projects/gpower/>
- Erdfelder, E., Faul, F., & Buchner, A. (2009). *G\*Power 3* [Computer software]. Retrieved from <http://www.psych.uni-duesseldorf.de/abteilungen/aap/gpower3/>
- Etisalat. (2009a). *Blocked content*. Retrieved from <http://www.etisalat.ae/assets/document/blockcontent.pdf>
- Etisalat. (2009b). *Etisalat announces 3rd quarter results*. Retrieved from [http://www.etisalat.ae/index.jsp?lang=en&type=content&currentid=10c8e15c0b56a010VgnVCM1000000a0a0a0a\\_\\_\\_&contentid=a71d34daea50d110VgnVCM1000000c24a8c0RCRD&parentid=fa58800d1f52a010VgnVCM1000000a0a0a0a\\_](http://www.etisalat.ae/index.jsp?lang=en&type=content&currentid=10c8e15c0b56a010VgnVCM1000000a0a0a0a___&contentid=a71d34daea50d110VgnVCM1000000c24a8c0RCRD&parentid=fa58800d1f52a010VgnVCM1000000a0a0a0a_)
- Euromonitor International. (2009). *Market research United Arab Emirates*. Retrieved from Euromonitor Global Market Information database.
- Eysenck, M. (2004). *Psychology: An international perspective*. New York, NY: Psychology Press. doi:10.1002/jclp.10252
- Fairlie, R., & London, R. (2006). *Latina girls: Voices of adolescent strength in the U.S.* Retrieved from [http://www.cjtc.ucsc.edu/docs/London\\_and\\_Fairlie\\_Latinas.pdf](http://www.cjtc.ucsc.edu/docs/London_and_Fairlie_Latinas.pdf)
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39, 175–191. doi:10.3758/BF03193146
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G\*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41, 1149–1160. doi:10.3758/BRM.41.4.1149
- Fawwaz, L. (2008). *A single site case study to examine the efficacy of the accreditation process and standards on post-secondary distance learning programs in the United Arab Emirates* (Doctoral dissertation). Available from Dissertations & Theses: Full Text database. (Publication No. AAT 3315177)



- Fidelis Security Systems. (2011). *See it. Study it. Stop it.* [White Paper]. Retrieved from <http://www.fidelissecurity.com/files/files/whitepapers/FidelisWP-MindtheGap.pdf>
- Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). London, England: Sage Publications.
- Fishbein, M., & Ajzen, I. (1975). *In belief, attitude, intention, and behavior: An introduction to theory and research*. Boston, MA: Wesley. Retrieved from <http://www.people.umass.edu/aizen/f&a1975.html>
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18, 39–50. doi:10.2307/3151312
- Freidman, G. (2008, January 14). The strait of Hormuz incident and U.S. strategy: Geopolitical intelligence report. *STRATFOR Global Intelligence*. Retrieved from <http://www.stratfor.com>
- Fujairah Colleges. (2011). *Welcome to HCT–Fujairah*. Retrieved from <http://fjw.hct.ac.ae/index.html>
- Gallivan, M., & Sprite, M. (2005). Information technology and culture: Identifying fragmentary and holistic perspectives of culture. *Information and Organization*, 15(4), 295–338. doi:10.1016/j.infoandorg.2005.02.005
- Garson, D. G. (2009). *Structural equation modeling: Statnotes*. Retrieved from <http://faculty.chass.ncsu.edu/garson/PA765/structur.htm>
- Gaskin, J., Lyytinen, K., Thummadi, V., Schutz, D., Yoo, Y., Weiss, A., and Berente, N. (2010). *Sequencing design DNA: A set of methodological artifacts for sequencing socio-technical design routines*. ICIS 2010 Proceedings, Paper 202. doi:10.5465/AMBPP.2010.54501354
- Gefen, D. (2000). E-commerce: The role of familiarity and trust. *The International Journal of Management Science*, 28, 725–737. doi:10.1016/S0305-0483(00)00021-9
- Gefen, D. (2002, Summer). Reflections on the dimensions of trust and trustworthiness among online consumers. *SIGMIS Database*, 33, 38–53. doi:10.1145/569905.569910
- Gefen, D., & Straub, D. (2000). The relative importance of perceived ease of use in IS adoption: A study of e-commerce adoption. *Journal of the Association for Information Systems*, 1(8), 1–30. Retrieved from <http://aisel.aisnet.org/jais/>

- Gefen, D., & Straub, D. (2003, Winter). Managing user trust in B2C e-services. *e-Service Journal*, 2, 7–24. doi:10.1353/esj.2003.0011
- Gefen, D., Karahanna, E., & Straub, D. (2003, March). Trust and TAM in online shopping: An integrated model. *MIS Quarterly*, 27, 51–90. doi:10.1109/TEM.2003.817277
- Gefen, D., Rao, V. S., & Tractinsky, N. (2003). The conceptualization of trust, risk, and their relationship in electronic commerce: The need for clarifications. *Proceedings of the 36th Hawaii International Conference on System Sciences*, 1–10. doi:10.1109/HICSS.2003.1174442
- Getting the message: Decoding issues in the BlackBerry backlash. (2010, October 19). *Arabic Knowledge@Wharton*. Retrieved from [http://knowledge.wharton.upenn.edu/arabic/article.cfm?articleId=2550&language\\_id=1](http://knowledge.wharton.upenn.edu/arabic/article.cfm?articleId=2550&language_id=1)
- Gher, L. A. (2002). Patterns in communication: Prospects and concerns. In Y. R. Kamalipour (Ed.), *Global communications* (pp. 247–263). Belmont, CA: Wadsworth-Thomson Learning.
- Ghobakhloo, M., Zulkifli, N. B., & Aziz, F. A. (2010). The interactive model of user information technology acceptance and satisfaction in small and medium-sized enterprises. *European Journal of Economics, Finance, and Administrative Sciences*, 19. Retrieved from <http://www.eurojournals.com>
- Giles, J. (2009, August 21). Worldwide battle rages for control of the Internet. *NewScientist*. Retrieved from <http://www.newscientist.com/article/mg20327224.100-worldwide-battle-rages-for-control-of-the-internet.html>
- Glennie, N. T., (2010). *Examining trust factor relationships in the online business-to-consumer environment* (Doctoral dissertation). Retrieved from [http://learners.ncu.edu/library/ncu\\_diss/logon.asp?dissertation\\_id=587](http://learners.ncu.edu/library/ncu_diss/logon.asp?dissertation_id=587)
- Golafshani, N. (2003, December). Understanding reliability and validity in qualitative research. *The Qualitative Report*, 8, 597–607. Retrieved from <http://www.nova.edu/ssss/QR/QR8-4/golafshani.pdf>
- Greenberg, P. (2009). *CRM at the speed of light: Social CRM 2.0 strategies, tools, and techniques for engaging your customers* (4th ed.). New York, NY: McGraw Hill.
- Gross, G. (2008, July 17). Lawmakers call on NebuAd to change privacy notification. *PC WORLD.COM*. Retrieved from [http://news.yahoo.com/s/pcworld/20080717/tc\\_pcworld/148555;\\_ylt=Ar7HGik6xQ.S39xj2pCPtu4OSLMF](http://news.yahoo.com/s/pcworld/20080717/tc_pcworld/148555;_ylt=Ar7HGik6xQ.S39xj2pCPtu4OSLMF)

- Group Buying Websites Battle for Middle East Shoppers with Online Bargains (2011, August, 1). *Arabic Knowledge@Wharton*. Retrieved from [http://knowledge.wharton.upenn.edu/arabic/article.cfm?articleId=2700&language\\_id=1](http://knowledge.wharton.upenn.edu/arabic/article.cfm?articleId=2700&language_id=1)
- Gulf Cooperation Council. (2010). *The cooperation council for the Arab states of the gulf secretariat general: Foundations and objectives*. Retrieved from <http://www.gccsg.org/eng/index.php?action=Sec-Show&ID=52&W2SID=22406>
- Guo, B., Aveyard, P., Fielding, A., & Sutton, S. (2008). Brief reports: Testing the convergent and discriminant validity of the decisional balance scale of the transtheoretical model using the multi-trait multi-method approach. *Psychology of Addictive Behaviors*, 22(2), 288–294. doi: 10.1037/0893-164X.22.2.288
- Guo, S. (2007). *Analysis of and techniques for privacy preserving data mining* (Doctoral dissertation). Available from Dissertations & Theses: Full Text database. (Publication No. AAT 3296789)
- Hahn, R., & Wallsten S. (2009). An economic perspective on a U.S. national broadband plan: Comments filed with the Federal Communications Commission in the matter of a national broadband plan for our future. *Policy and Internet*, 1(1), 1–23. doi:10.2202/1944-2866.1023
- Haider, A. (2008). Contribution of Internet to a democratic society. School of Computer and Information Science, University of South Australia, Mawson Lakes, SA, Australia.
- Hair, J. F., Anderson, R., Tatham, R., & Black, W. (1998). *Multivariate data analysis* (5th ed.). Englewood Cliffs, NJ: Prentice Hall.
- Hair, J. F., Black, W. C., Basin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
- Hanff, A. (2008). A critical evaluation of the 2006/2007 trials of Phorm Inc. Technology by BT PLC. *No Deep Packet Inspection*. Retrieved from [https://nodpi.org/documents/phorm\\_paper.pdf](https://nodpi.org/documents/phorm_paper.pdf)
- Hanff, A. (2009, December, 31). *No deep packet inspection – A Review 2009* [Web log post]. Retrieved from <https://nodpi.org/2009/12/>
- Harris, R., & Davison, D. (2002). Anxiety and involvement: Cultural dimensions of attitudes toward computers in developing societies. In F. B. Tan (Ed.), *Global Perspective of Information Technology Management* (pp. 234–259). Hershey, PA: IRM Press. doi:10.4018/978-1-93177-711-7

- Hasan, B. H. (2006). Effectiveness of computer training: The role of multilevel computer self-efficacy. *Journal of Organizational and End User Computing*, 18(1), 50–68. doi:10.4018/joeuc.2006010103
- Hassani, S. (2006). Locating digital divides at home, work, and everywhere else. *POETICS: Journal of Empirical Research on Culture, the Media, and the Arts*, 34(4-5), 250–272. doi:10.1016/j.poetic.2006.05.007
- Hayashi, A., Chen, C., Ryan, T., & Wu, J. (2004, June). The role of social presence and moderating role of computer self efficacy in predicting the continuance usage of e-learning systems. *Journal of Information Systems Education*, 15, 139–154. Retrieved from EBSCOhost database.
- Hayles, N. K. (1999). *How we became posthuman: Virtual bodies in cybernetics, literature, and informatics*. Chicago, IL: University of Chicago Press.
- Hazley, G. (2009, August). Middle East embraces Twitter. *O'Dwyer's PR Report*, 23, 11. Available from <http://www.lexisnexis.com.proxy1.ncu.edu/hottopics/lnacademic/>
- Hemery, B., Mahier, J., Pasquet, M., & Rosenberger, C. (2008). *Face authentication for banking*. Proceedings of the First International Conference on Advances in Computer-Human Interaction, 1, 137–142. doi:10.1109/ACHI.2008.17
- Higher Colleges of Technology. (2009). *HCT strategic plan summary*. Retrieved from [http://www.hct.ac.ae/PDFs/HCTStrategicPlanSummary2008\\_2012.pdf?p=App](http://www.hct.ac.ae/PDFs/HCTStrategicPlanSummary2008_2012.pdf?p=App)
- Higher Colleges of Technology. (2011a). *Enrollments by college academic year 2010–2011*. Retrieved from <http://www.hct.ac.ae/factbook/reports/enrollments/HCT-Factbook-Enrollments-By-College.pdf>
- Higher Colleges of Technology. (2011b). *HCT*. Retrieved from <https://www.hct.ac.ae/>
- Higher Colleges of Technology. (2011c). *HCT and du celebrate 150 graduates in new training programs*. Retrieved from <http://www.hct.ac.ae/news.aspx/ViewDetails.aspx?newsid=649>
- Hilotin, J. B. (2008). Web filters: Selective freeway for firms. *Gulfnews.com*. Retrieved from <http://gulfnews.com/news/gulf/uae/general/web-filters-selective-freeway-for-firms-1.447516>
- Hilotin, J. B. (2010, December 30). Businessman loses Dh10,000 through phone “recharge.” *Gulfnews.com*. Retrieved from <http://gulfnews.com/business/telecoms/businessman-loses-dh10-000-through-phone-recharge-1.738202>

- Hofstede, G. (1980). *Culture's consequences: International differences in work related values*. London, England: Sage Publications.
- Hofstede, G. (1997). *Cultures and organizations: Software of the mind*. New York, NY: McGraw Hill.
- Hofstede, G. (2009). *Itim international, Geert Hofstede cultural dimensions*. Retrieved from [http://www.geert-hofstede.com/hofstede\\_arab\\_world.shtml](http://www.geert-hofstede.com/hofstede_arab_world.shtml)
- Holmes-Smith, P., Cunningham, E., & Coote, L. (2009). *An Applied Introduction to Structural Equation Modelling* (2nd ed.). London, England: Sage.
- Houser, J. (2007). How many are enough? Statistical power analysis and sample size estimation in clinical research. *Journal of Clinical Research Best Practices: Can You Handle the Truth*, 3(3), 1–5. Retrieved from [http://firstclinical.com/journal/2007/0703\\_Power.pdf](http://firstclinical.com/journal/2007/0703_Power.pdf)
- Hsu, M., & Chiu, C. (2004). Internet self-efficacy and electronic service acceptance. *Decision Support Systems*, 38, 369–381. doi:10.1016/j.dss.2003.08.001
- Huawei Technologies Co., Ltd. (2010). *Intelligent bandwidth management solution brochure*. Retrieved from <http://www.huawei.com/products/datacomm/catalog.do?id=3595>
- Hu, L.T. and Bentler, P. M. (1999), Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria Versus New Alternatives, *Structural Equation Modeling: A Multidisciplinary Journal*, 6 (1), 1-55. doi:10.1080/10705519909540118
- Hutcheson, G., & Sofroniou, N. (1999). *The multivariate social scientist: Introductory statistics using generalized linear models*. Thousand Oaks, CA: Sage Publications
- Hwang, A. (2008). Antecedents of online trust and acceptance of e-commerce: A survey of consumer perceptions. (Doctoral dissertation). Available from Dissertations & Theses: Full Text database. (Publication No. AAT 3315223)
- Jaafar, J., Kolodinsky, P., McCarthy, S., & Schroder, V. (2004). The impact of cultural norms and values on the moral judgment of Malay and American adolescents: A brief report. *Ongoing Themes in Psychology and Culture*. Retrieved from [http://ebooks.iaccp.org/ongoing\\_themes/chapters/jaafar/jaafar.php?file=jaafar&output=screen](http://ebooks.iaccp.org/ongoing_themes/chapters/jaafar/jaafar.php?file=jaafar&output=screen)
- Jackson, G. B. (2000). *Assessing the methodology of the study*. Retrieved from <http://www.gwu.edu/~litrev/a06.html>

- Jawahar, M., & Elango, B. (2001). The effects of attitudes, goal setting and self-efficacy on end user performance. *Journal of End User Computing*, 13(2), 40–45. Retrieved from <http://www.igi-global.com/Bookstore/Article.aspx?TitleId=3737>
- Jegede, P. O. (2007, September). *Computer attitude as correlates of computer self-efficacy among South Western Nigerian higher education teachers*. Paper presented at ICT-Learn 2007, Sixth International Internet Education Conference, Cairo, Egypt. 271–282. Retrieved from <http://www.docstoc.com/docs/26019366/COMPUTER-ATTITUDE-AS-CORRELATES-OF-COMPUTER-SELF-EFFICACY-AMONG->
- Jiang, J., Hus, M. K., Klein, G., & Lin, B. (2000). E-commerce use behavior model: An empirical study. *Human Systems Management*, 19, 265–277. Retrieved from <http://www.iospress.nl/loadtop/load.php?isbn=01672533>
- Jones, B. (2008). *Deep packet inspection and your privacy online*. Retrieved from <http://torrentfreak.com/deep-packet-inspection-080629/>
- Kale, P., Dyer, J. H., & Singh, H. (2002). Alliance capability, stock market response, and long-term alliance success: The role of the alliance function. *Strategic Management Journal*, 23, 747-767, doi:10.1002/smj.248
- Kale, P., & Singh, H. (1999). Alliance capability and success: A knowledge-based approach. *Academy of Management Proceedings & Membership Directory*, 8, O1. doi:10.5465/APBPP.1999.27594854
- Kale, P., & Singh, H. (2007). Building firm capabilities through learning: The role of the alliance learning process in alliance capability and firm level success. *Strategic Management Journal*, 28, 981-1000. doi:10.1002/smj.616
- Kamalipour, Y. R. (2002). *Global communications*. Belmont, CA: Wadsworth-Thomson Learning.
- Karabatsos, G. (2003). *Course notes EPSY 546: Educational measurement*, Retrieved from University of Chicago, Applied Measurement & Statistics, College of Education Website: <http://www.uic.edu/classes/epsy/epsy546/Lecture%204%20--%20notes%20on%20PRINCIPAL%20COMPONENTS%20ANALYSIS%20AND%20FACTOR%20ANALYSIS1.pdf>
- Karmel, T. S., & Jain, M. (1987). Comparison of purposive and random sampling schemes for estimating capital expenditure. *Journal of the American Statistical Association*, 82, 52–57. doi:10.2307/2289124
- Kassner, J. (2008). *Deep packet inspection: What you should know*. Retrieved from <http://resources.zdnet.co.uk/articles/features/0,1000002000,39454822,00.htm>

- Kast, F., & Rosenzweig, J. (1973). *Contingency views of organization and management*. Chicago, IL: Science Research Associates.
- Kim, Y. H., & Kim, D. J. (2005). A study of online transaction self- efficacy, consumer trust, and uncertainty reduction in electronic commerce transaction . *IEEE, Proceedings of the 38th Hawaii Conference on System Sciences*, 7(1), 170–181. Retrieved from <http://ieeexplore.ieee.org/servlet/opac?punumber=9518>
- Kim, Y. H., Kim, D. J., & Hwang, Y. (2009). Exploring online transaction self-efficacy in trust-building in B2C electronic commerce. *Journal of Organizational and End User Computing*, 21, 37–59. doi:10.4018/joeuc.2009010102
- King, C. V. (2008). *Online privacy and security of Internet digital certificates: A study of the awareness, perceptions, and understanding of Internet users* (Doctoral dissertation). Available from Dissertations & Theses: Full Text database. (Publication No. AAT 3320814)
- Kline, R. B. (2011). *Principles and Practice of Structural Equation Modeling* (3rd ed.). New York, NY: The Guilford Press.
- Kohlberg, L. (1973). The claim to moral adequacy of a highest stage of moral judgment. *Journal of Philosophy*, 70, 630–646. doi:10.2307/2025030
- Kuhn, T. S. (1996). *The structure of scientific revolutions* (3rd ed.). Chicago, IL: The University of Chicago Press .
- Kurzman, C., & Naqvi, I. (2010). The Islamists are not coming. *Foreign Policy*. Retrieved from [http://www.foreignpolicy.com/articles/2010/01/04/the\\_islamists\\_are\\_not\\_coming](http://www.foreignpolicy.com/articles/2010/01/04/the_islamists_are_not_coming)
- Lakatos, I. (1970). Falsification and the Methodology of Scientific Research Programmes. In I. Lakatos & A. Musgrave (Eds.) *Criticism and the Growth of Knowledge* (Vol. 1965, pp. 91-196). London, England: Cambridge University Press. doi:10.2277/0521096235
- Lawson, P. (2008). Re: Bell Canada/Bell Sympatico use of deep packet inspection: PIPEDA complaint. *Canadian Internet Policy and Public Interest Clinic*. Retrieved from [http://www.cippic.ca/uploads/Bell-DPI-PIPEDAcomplaint\\_09May08.pdf](http://www.cippic.ca/uploads/Bell-DPI-PIPEDAcomplaint_09May08.pdf)
- Lederer, A., Maupin, D., Sena, M., & Zhuang, Y. (1998). The role of ease of use, usefulness, and attitude: In the prediction of World Wide Web usage. *Proceedings of the 1998 ACM SIGCPR Conference on Computer Personnel Research*, 195–204. doi:10.1145/279179.279217

- Lederer, A., Maupin, D., Sena, M., & Zhuang, Y. (2000). The technology acceptance model and the World Wide Web. *Decision Support Systems*, 29, 269–282. doi:10.1016/S0167-9236(00)00076-2
- Lewis, B. (1996). A historical overview: Islam and liberal democracy. *Journal of Democracy*, 7(2), 52–63. doi:10.1353/jod.1996.0030
- Li, H. (2007). *Essays on privacy perceptions and privacy behaviors of online shoppers* (Doctoral dissertation). Available from Dissertations & Theses: Full Text database. (Publication No. AAT 3274620)
- Linstrum, K. S. (2009). Ethical training, moral development, and ethical decision making in master's level counseling students. *Journal of College & Character*, 10(3), 1–18. doi:10.2202/1940-1639.1087
- Lippert, S. K., & Volkmar, J. A. (2007). Cultural effects on technology performance and utilization: A comparison of U.S. and Canadian users. *Journal of Global Information Management*, 15(2), 56-90. doi:10.4018/jgim.2007040103
- Lloyd, A. W. (2008). Increasing global demand for an uncensored Internet: How the U.S. can help defeat online censorship by facilitating private action. *Vanderbilt Journal of Transnational Law*, 41(1), p. 299. Retrieved from <http://law.vanderbilt.edu/publications/journal-of-transnational-law/archives/volume-41-number-1/index.aspx>
- MacMillan, D. (2009, March 16). Google, Yahoo criticized over foreign censorship. *BusinessWeek Online*, 10. Retrieved from EBCSOhost database.
- Malin, C. (2010, April). Bloggers reveal the Middle East's many voices. *O'Dwyers Magazine*, 24(4), 12. Retrieved from <http://www.odwyerpr.com/profiles/O%27Dwyer%27s%20Magazine%20-%20April%202010.pdf>
- Mamahloidi, M. (2006, March 5). *What is the chi-square statistic?* Retrieved from <http://cnx.org/content/m13487/latest/>
- Mardia, K.V. (1974). Applications of some measures of multivariate skewness and kurtosis in testing normality and robustness studies. *Sankhya, Series B*, 36(2), 115–128. Retrieved from <http://www.jstor.org/stable/25051892>
- Mardia, K. V. and Foster, K. (1983). Omnibus tests of multinormality based on skewness and kurtosis. *Communications in Statistics: Theory and Methods*, 12, 207–221. 10.1080/03610928308828452



- Marsh, H.W., Hau, K-T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers of overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling*, 11, 320-341. doi:10.1207/s15328007sem1103\_2
- Martellaro, J. A. (2008). *Using the cell processor as an offload streaming assist for sessionization of network traffic for the application of cross packet inspection* (Master's thesis, Rochester Institute of Technology). Retrieved from <http://www.ce.rit.edu/research/thesis.php>
- Masdar Research. (2009, June). Knowledge economy research on the Middle East. *Masdar Research Journal*, 6(2). Retrieved from <http://ae.zawya.com/researchreports/madar/DKE-I.pdf>
- Matwyshyn, A. M., Slaughter-Defoe, D., & Paya, C. (2010, March 18). Information security: Why cybercriminals are smiling. *Arabic Knowledge@Wharton*. Retrieved from <http://knowledge.wharton.upenn.edu/arabic/article.cfm?articleid=2415>
- McAfee Inc. (2009a). *Large enterprise*. Retrieved from [http://www.mcafee.com/us/enterprise/products/email\\_and\\_web\\_security/web/smartfilter.html](http://www.mcafee.com/us/enterprise/products/email_and_web_security/web/smartfilter.html)
- McAfee Inc. (2009b). *McAfee network user behavior analysis (Securify) monitor*. Retrieved from [http://www.mcafee.com/us/local\\_content/datasheets/ds\\_mcafee\\_network\\_user\\_behavior\\_analysis\\_monitor.pdf](http://www.mcafee.com/us/local_content/datasheets/ds_mcafee_network_user_behavior_analysis_monitor.pdf)
- Meddah, M. M. (2008, April 13). Arab online ad spending to grow to \$142 million by 2011. *Startup Arabia*. Retrieved from <http://www.startuparabia.com/2008/04/arab-online-ad-spending-to-grow-to-142-million-by-2011/>
- Merz, P., Kolter, F., & Priebe, M. (2009). A distributed reputation system for super-peer desktop grids. *International Journal on Advances in Security*, 2(1), 30-41. Retrieved from [http://www.ariajournals.org/security/sec\\_v2\\_n1\\_2009\\_paged.pdf#page=61](http://www.ariajournals.org/security/sec_v2_n1_2009_paged.pdf#page=61)
- Metz, R., & Vanacore, A. (2009). Ebay partially undoes Skype deal, selling majority. *Yahoo.com*. Retrieved [http://news.yahoo.com/s/ap/us\\_ebay\\_skype](http://news.yahoo.com/s/ap/us_ebay_skype)
- Middle East continues to see dramatic rise in infected computers, Trend Micro. (2010, October 18). *AME Info*. Retrieved from <http://www.ameinfo.com/245612.html>
- Miller, A. H. (2007). *Internet censorship in Vietnam* (Unpublished master's thesis). Webster University, St Louis, MO.

- Moon, J. W., and Kim, Y. G. (2001). Extending the TAM for the World-Wide-Web context, *Information and Management* (38), 217–230. doi:10.1016/S0378-7206(00)00061-6
- Morgan, G. (1998). *Images of organization: Executive edition*. San Francisco, CA: Berrett-Koehler Publishers, Sage Publications.
- Mortleman, J. (2009, August 16). *IT security: From cottage industry to organised crime*. Retrieved from <http://www.ameinfo.com/206157.html>
- Muthén, B. O. (2002). Beyond SEM: General latent variable modeling. *Behaviormetrika*. 29(1), 81–117. doi:10.2333/bhmk.29.81
- Muthén, L. K., & Muthén, B. (2004). *Mplus User's Guide*, (3rd ed.). Los Angeles, CA: Author.
- Najami, S. A. (2009, October 18). Cybercrimes are costing companies fortunes . *Gulf News*. Retrieved from <http://gulfnews.com/news/gulf/uae/crime/cyber-crimes-are-costing-companies-fortunes-1.515957>
- Nakashima, E., & Lebling, M. (2008, July 17). Lawmakers probe web tracking: Panel examining ad technology for privacy concerns. *Washington Post*. Retrieved from <http://www.washingtonpost.com/wp-dyn/content/article/2008/07/16/AR2008071602378.html?wpisrc=newsletter>
- NebuAd. (2008). *Transforming the online advertising industry with the first consumer-centric behavioral targeting network*. Retrieved from <http://www.nebuad.com/>
- No, W. G. (2007). *An empirical investigation of Internet privacy: Customer behaviour, companies' privacy policy disclosures, and a gap* (Doctoral dissertation). Available from Dissertations & Theses: Full Text database. (Publication No. AAT NR35149)
- Nunnally, J. (1978). *Psychometric theory*. New York, NY: McGraw-Hill.
- Nye, J. S., Jr. (2007). *Understanding international conflicts: An introduction to theory and history* (6th ed.). New York, NY: Pearson Longman.
- Okamoto, N. & Seo, T. (2008). *On the distribution of multivariate sample skewness. Technical Report* (TR08-01). Retrieved from the Hiroshima Statistical Research Group website: <http://www.math.sci.hiroshima-u.ac.jp/stat/TR/index.shtml>
- Open Net Initiative. (2009a). *Blocked content*. Retrieved from <http://www.etisalat.ae/assets/document/blockcontent.pdf>

- Open Net Initiative. (2009b). *Internet filtering in the United Arab Emirates*. Retrieved from [http://opennet.net/sites/opennet.net/files/ONI\\_UAE\\_2009.pdf](http://opennet.net/sites/opennet.net/files/ONI_UAE_2009.pdf)
- Oxley, J. E., Rivkin, J. W., & Ryall, M. D. (2010). The strategy research initiative: Recognizing and encouraging high-quality research in strategy. *Strategic Organization*, 8(4), 377-386. doi:10.1177/1476127010387821
- P2PNet. (2011). *People to people.net.news*. Retrieved from <http://www.p2pnet.net/>
- Pham, T. L., & Jordan, E. (2009). Information technology resources and business performance: An Australian context. *Asia Pacific Management Review*, 14, 407–426. Retrieved from [http://apmr.management.ncku.edu.tw/issue\\_detail.asp?id=101#](http://apmr.management.ncku.edu.tw/issue_detail.asp?id=101#)
- Phorm Inc. (2008). *Phorm is creating two revolutions, in online advertising and in privacy: Phorm introduces the open internet exchange (OIX) and Webwise*. Retrieved from <http://www.phorm.com/>
- Pletts J. (2010, September, 27). *Watch it—worm on the loose*. Retrieved from <http://www.7days.ae/storydetails.php?id=98241&page=localnews&title=Watch%20it%20-%20worm%20on%20the%20loose>
- Polly, L. M., (2002). *Social exchange and customer service: The relationship between perceived organizational support and leader-member exchange, and customer service* (Doctoral dissertation, Louisiana State University). Retrieved from [http://etd.lsu.edu/docs/available/etd-0122102-140841/unrestricted/Polly\\_dis.pdf](http://etd.lsu.edu/docs/available/etd-0122102-140841/unrestricted/Polly_dis.pdf) (Etd No. 0122102-140841)
- Porter, M. E., & Schwab, K. (2009). The global competitiveness report. *Proceedings of the World Economic Forum, Geneva, Switzerland, 2008*. Retrieved from [http://74.125.155.132/scholar?q=cache:SNb2aXD2IRgJ:scholar.google.com/+Dubai+Global+Financial+Center+2009&hl=en&as\\_sdt=2000](http://74.125.155.132/scholar?q=cache:SNb2aXD2IRgJ:scholar.google.com/+Dubai+Global+Financial+Center+2009&hl=en&as_sdt=2000)
- Porter, T. (2005). The perils of deep packet inspection. *SecurityFocus*. Retrieved from <http://www.securityfocus.com/infocus/1817>
- Price, I. (2000). *Determining if skewness and kurtosis are significantly non-normal*. Retrieved from School of Psychology, University of New England, Armidale, Australia website: [http://www.une.edu.au/WebStat/unit\\_materials/c4\\_descriptive\\_statistics/determine\\_skew\\_kurt.html](http://www.une.edu.au/WebStat/unit_materials/c4_descriptive_statistics/determine_skew_kurt.html)
- Raahemi, B., Hayajneh, A., & Rabinovitch, P. (2007). Peer-to-peer IP traffic classification using decision tree and IP layer attributes. *International Journal of Business Data Communications and Networking*, 3(4), 60–72. doi:10.4018/jbdcn.2007100104

- Ramayah, T., Mohamad, O., Omar, A., & Marimuthu, M. (2009). Technology adoption among small and medium enterprises (SMEs): A research agenda. *World Academy of Science, Engineering and Technology*, 53, 943–946. Retrieved from <http://www.waset.org/journals/waset/v53/v53-153.pdf>
- Reddy, P. P., & Reddy, P. R. (2009). Modeling the spread of malware in computer networks (Master's thesis). Blekinge Institute of Technology, Sweden. (Thesis no.: MCS-2009-13)
- Rogers, E. M. (1995). *Diffusion of innovations*. New York, NY: The Free Press.
- Rose, G., & Straub, D. (1998). Predicting general IT use: Applying TAM to Arabic world. *Journal of Global Information Management*, 6(3), 39–46. Retrieved from <http://www.igi-global.com/Bookstore/TitleDetails.aspx?TitleId=1070&DetailsType=Description>
- Rose, S. K. (2009). *Assessing emotional intelligence among information technology and non-information technology professionals* (Doctoral dissertation). Retrieved from [http://library.ncu.edu/ncu\\_diss/display\\_abstract.aspx?dissertation\\_id=815](http://library.ncu.edu/ncu_diss/display_abstract.aspx?dissertation_id=815)
- Rouibah K., and Hamdy H., (2009) Factors Affecting Information Communication Technologies Usage and Satisfaction: Perspective From Instant Messaging in Kuwait. *Journal of Global Information Management*, 17(2), 1-29. doi:10.4018/jgim.2009040101
- Sabin, B. M. (2006). *A faith-based program evaluation: Moral development of seminary students at the Louisiana State Penitentiary* (Doctoral dissertation). Available from Dissertations & Theses: Full Text database. (Publication No. AAT 3210378)
- Sagi, J., Carayannis, E., Dasgupta, S., & Thomas, G. (2004). ICT and business in the new economy: Globalization and attitudes towards e-commerce. *Journal of Global Information Management*, 12(3), 44–64. Retrieved from <http://www.igi-global.com/Bookstore/Article.aspx?TitleId=3611>
- Sakiz, G. (2007). *Does teacher affective support matter? An investigation of the relationship among perceived teacher affective support, sense of belonging, academic emotions, academic self-efficacy beliefs and academic effort in middle school academic classrooms* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3262063)
- Salem, F. & Jarrar, Y. (2010) Government 2.0? technology, trust and collaboration in the UAE public sector, *Policy & Internet*, 2(1), Article 4. doi:10.2202/1944-2866.1016

- Sam, H. K., Othman, A. E., & Nordin, Z. S. (2005). Computer self-efficacy, computer anxiety, and attitudes toward the Internet: A study among undergraduates in UNIMAS. *Educational Technology & Society*, 8, 205–219. Retrieved from [http://ifets.info/journals/8\\_4/19.pdf](http://ifets.info/journals/8_4/19.pdf)
- Santos, J., Doz, Y., & Williamson, P. (2004). Is your innovation process global? *MIT Sloan Management Review*, 45(4), 31–37. Retrieved from <http://sloanreview.mit.edu/the-magazine/articles/2004/summer/>
- Scarvarda, A., & Gorla, N. (2010, February). *Improving tourism industry through service quality and yield management*. Paper presented at the Research Symposium in Business and Economics, American University of Sharjah, UAE. doi:10.1016/j.jsis.2010.05.001
- Schafer, J., Malinka, K., & Hanacek, P. (2009). Peer-to-peer networks: Security analysis. *International Journal on Advances in Security*, 2(54), 6–7. Retrieved from [http://www.ariajournals.org/security/sec\\_v2\\_n1\\_2009\\_paged.pdf#page=61](http://www.ariajournals.org/security/sec_v2_n1_2009_paged.pdf#page=61)
- Scheer, K. (2005). *A comparison of VoIP and analog perceived call qualities* (Doctoral dissertation). Retrieved from [http://learners.ncu.edu/library/ncu\\_diss/logon.asp?dissertation\\_id=221](http://learners.ncu.edu/library/ncu_diss/logon.asp?dissertation_id=221)
- Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online 2003*, 8(2), 23–74. Retrieved from [http://user.uni-frankfurt.de/~kscherm/schermelleh/mpr\\_Schermelleh.pdf](http://user.uni-frankfurt.de/~kscherm/schermelleh/mpr_Schermelleh.pdf)
- Schreck, A. (2010, August 1). United Arab Emirates, Saudi Arabia to block BlackBerry over security fears. *The Huffington Post*. Retrieved from [http://www.huffingtonpost.com/2010/08/01/uae-saudi-arabia-blackberry-ban\\_n\\_666581.html](http://www.huffingtonpost.com/2010/08/01/uae-saudi-arabia-blackberry-ban_n_666581.html)
- Sekaran, U. (2003). *Research methods of business: A skill building approach* (4th ed.). New York, NY: John Wiley & Sons.
- Sellitz, C., Wrightman, L. S., & Cook, S. W. (1976). *Research methods in social relations*. New York, NY: Holt, Rinehart and Winston.
- Sellke, S. H., Shroff, N. B., & Bagchi, S. (2008). Modeling and automated containment of worms: Dependable and secure computing. *IEEE Transactions*, 5(2), 71–86. doi:10.1109/TDSC.2007.70230
- Senge, P. M., Lichtenstein, B. B., Kaefuer, K., Bradbury, H., & Carroll, J. S. (2007). Collaborating for systemic change. *MIT Sloan Management Review*, 48(2), 45–53. Retrieved from <http://www.solsustainability.org/>

- Sethgarnar. (2010, April 11). Re: Per-machine throttling without knowledge of bandwidth? [Web log post] Retrieved from <http://arstechnica.com/civis/viewtopic.php?f=10&t=1091823>
- Shaikh, H. (2008, February). UAE leads e-commerce penetration among Arab states. *Kaleej Times*. Retrieved from [http://www.khaleejtimes.com/DisplayArticleNew.asp?section=business&xfile=data/business/2008/february/business\\_february610.xml](http://www.khaleejtimes.com/DisplayArticleNew.asp?section=business&xfile=data/business/2008/february/business_february610.xml)
- Shapiro, S. S. and Wilk, M. B. (1965). An analysis of variance test for normality: Complete samples, *Biometrika*, 52, 591–611. doi:10.1093/biomet/52.3-4.591
- Shelley, T., Shulman, S., Lang, E., Beisser, S., & Mutiti, J. (2004). Digital citizenship. *Social Science Computer Review*, 22(2), 1–14. doi:10.1177/0894439303262580
- Shockley-Zalabak, P. (2008). *Fundamentals of organizational communication: Knowledge, sensitivity skills, and value* (7th ed.). Boston, MA: Allyn and Bacon.
- Shore, B., & Venkatachalam, A. (1996). The role of national culture in systems analysis and design. *Journal of Global Information Management*, 3(3), 5–14. doi:10.1016/S0963-8687(96)80021-7
- Siddiqui, H. N. (2008). *Investigation of intention to use e-commerce in the Arab countries: A comparison of self-efficacy, usefulness, culture, gender, and socioeconomic status in Saudi Arabia and the United Arab Emirates* (Doctoral dissertation). Available from Dissertations & Theses: Full Text database. (Publication No. AAT 3315103)
- Sidanius, J. (n. d.). Annotated SPSS Output Principal Components Analysis. *UCLA: Academic Technology Services, Statistical Consulting Group*. Retrieved from [http://www.ats.ucla.edu/stat/SPSS/output/principal\\_components.htm](http://www.ats.ucla.edu/stat/SPSS/output/principal_components.htm)
- Siggelkow, N., (2007). Persuasion with case studies. *Academy of Management Journal*, 50, 20–24. doi:10.5465/AMJ.2007.24160882
- Silverblatt, A. (1995). *Media literacy keys to interpreting media messages*. Westport, CT: Praeger Publishers.
- Singletary, L. A., Akbulut, A. Y., Houston, A. L., (2002). Unanticipated software use by adolescents following mandatory adoption. *Twenty-Third International Conference on Information Systems, USA*, 651–656, Retrieved from <http://aisel.aisnet.org/icis2002/60>
- Sivo, S.A, Fan, X., Witta, E.L., & Willse, J.T. (2006). The Search for “optimal” cutoff properties: Fit index criteria in structural equation modeling. *The Journal of Experimental Education*, 74, 267–288. doi:10.3200/JEXE.74.3.267-288

- Skype blocked in UAE (2009). Du Telecom blocks Skype in UAE! Bypass DU and unblock Skype. Retrieved September 25, 2010 from <http://www.du-skype.info/>
- Smart-Survey [Apparatus and computer software]. (2011). Retrieved from <http://www.surveymonkey.com/>
- Smit, M. (2006). Detecting privacy infractions in e-commerce software applications: A framework and methodology (Unpublished master's thesis, University of Dalhousie, Halifax, Nova Scotia, Canada). Retrieved from <http://torch.cs.dal.ca/~smit/final.pdf>
- Snider, J. R. (2008). *Interpreting the perceptions of self-regulating the Internet by online consumers in Seattle, Washington* (Doctoral dissertation). Retrieved from [http://learners.ncu.edu/library/ncu\\_diss/display\\_abstract.asp?dissertation\\_id=552](http://learners.ncu.edu/library/ncu_diss/display_abstract.asp?dissertation_id=552)
- Sophos Plc. (2010a). *Hotspot Shield proxy/VPN tool*. Retrieved from <http://www.sophos.com/security/analyses/controlled-applications/hotspotshield.html>
- Sophos Plc. (2010b). *Ultrasurf proxy/VPN tool*. Retrieved from <http://www.sophos.com/security/analyses/controlled-applications/ultrasurf.html>
- Specter, A. (2009, July 7). *Attack the cyberwalls! The Internet is the pathway to democracy in places like Iran*. Pittsburgh Post-Gazette, p. B7. Retrieved from [http://gateway.proquest.com/openurl?url\\_ver=Z39.88-2004&res\\_dat=xri:pqd&rft\\_val\\_fmt=info:ofi/fmt:kev:mtx:journal&genre=article&rft\\_dat=xri:pqd:did=1778131921](http://gateway.proquest.com/openurl?url_ver=Z39.88-2004&res_dat=xri:pqd&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&genre=article&rft_dat=xri:pqd:did=1778131921)
- Srivastava, M. S. (1984). A measure of skewness and kurtosis and a graphical method for assessing multivariate normality, *Statistics & Probability Letters*, 2, 263–267. doi:10.1016/0167-7152(84)90062-2
- Srivastava, M. S. and Hui, T. K. (1987). On assessing multivariate normality based on Shapiro-Wilk W statistic, *Statistics & Probability Letters*, 5, 15–18. doi:10.1016/0167-7152(87)90019-8
- Stein, C., & Culkin, J. (2008). *MMP320 multimedia networks*. Retrieved from [http://www.teachingmultimedia.net/pdfs/320\\_handouts/network\\_protocols.pdf](http://www.teachingmultimedia.net/pdfs/320_handouts/network_protocols.pdf)
- Straub, D. W. (1989). Validation instruments in MIS research. *MIS Quarterly*, 13, 147–169. doi:10.2307/248922
- Straub, D. W. (1994). The effect of culture on IT diffusion: Email and FAX in Japan and the U.S. *Information Systems Research*, 5(1), 23–47. doi:10.1287/isre.5.1.23

- Straub, D., Keil, M., & Brenner, W. (1997). Testing the technology acceptance model across cultures: A three-country study. *Information & Management*, 33, 1–11. doi:10.1016/S0378-7206(97)00026-8
- Straub, D. W. & Loch, K., D. (2007). Global programs of research: Maintenance and extensibility. In M. G. Hunter & F. Tan (Eds.), *Strategic use of information for global organizations* (pp. 33–58). Hershey, PA: IGI Global. doi:0.4018/978-1-59904-292-3.ch002
- Suomalainen, J., Pehrsson, A., & Nurminen, J. K. (2009). A secure P2P incentive mechanism for mobile device . *International Journal on Advances in Security*, 2, 42–52. Retrieved from [http://www.iariajournals.org/security/sec\\_v2\\_n1\\_2009\\_paged.pdf#page=61](http://www.iariajournals.org/security/sec_v2_n1_2009_paged.pdf#page=61)
- SurveyMonkey [Apparatus and computer software]. (2011). Retrieved from <http://www.surveymonkey.com/>
- Sutton M. (2010, September 29). *The Stuxnet conspiracy*. Retrieved from <http://www.arabianbusiness.com/the-stuxnet-conspiracy-352109.html>
- Tan, F. B., Chung J, (2005). Validating the extended technology acceptance model: Perceived playfulness in the context of information-searching websites. *16th Australasian Conference on Information Systems*. Sydney, Australia. Retrieved from <http://aisel.aisnet.org/acis2005/111>
- Tehrani, M. N. (2008). Achieving superior results from the mature market through e-marketing planning (Doctoral dissertation). Retrieved from [http://learners.ncu.edu/library/ncu\\_diss/display\\_abstract.asp?dissertation\\_id=354](http://learners.ncu.edu/library/ncu_diss/display_abstract.asp?dissertation_id=354)
- The Arab awakening: Revolution spinning in the wind (2011, July 16-22). *The Economist*, 400, 41-43.
- Thompson, R., Compeau, D., & Higgins, C. (2006). Intentions to use information technologies: An integrative model. *Journal of Organizational and End User Computing*, 18(3), 25–46. Retrieved from <http://www.igi-global.com/Bookstore/Article.aspx?TitleId=3813>
- Thompson, R. L., Higgins, C. A., & Howell, J. M. (1994). Influence of experience on personal computer utilization: Testing a conceptual model. *Journal of Management Information Systems*, 11, 167–187. Retrieved from [http://www.jmis-web.org/articles/v11\\_n1\\_p167/index.html](http://www.jmis-web.org/articles/v11_n1_p167/index.html)
- Thompson, T., II (2010). *Assessing the determinants of information technology adoption in Jamaica's public sector using the technology acceptance model* (Doctoral dissertation). Retrieved from [http://library.ncu.edu/ncu\\_diss/display\\_abstract.aspx?dissertation\\_id=1753](http://library.ncu.edu/ncu_diss/display_abstract.aspx?dissertation_id=1753)



- Thomson, I. (2008). Quantum cryptography effectively “useless”: Bruce Schneier speaks out. Retrieved from <http://www.vnunet.com/vnunet/news/2228487/schneier-quantum-cryptography>
- Tien, F., & Fu, T. (2008). The correlates of the digital divide and their impact on college student learning. *Computer & Education*, 50, 421–436. doi:10.1016/j.compedu.2006.07.005
- Titterington, G. (2010, September 29). Fears grow over state-sponsored cyber attacks. *AME Info*. Retrieved from <http://www.ameinfo.com/243444.html>
- Trinity Ventures (2011). *Portfolio*. Retrieved from <http://www.trinityventures.com/venture-capital-investments/http://www.trinityventures.com/venture-capital-investments/>
- Trist, E. L., & Bamforth, K. W. (1951). Some social and psychological consequences of the longwall method of coal getting. *Human Relations*, 4, 3–38. doi:10.1177/001872675100400101
- Trochim, W. M. K. (2006). Research methods knowledge base. *Web Center for Social Research Methods*. Retrieved from <http://www.socialresearchmethods.net/kb/contents.php>
- Trochim, W. M. K., & Donnelly, J. P. (2008). *The research methods knowledge base* (3rd ed.). Mason, OH: Cengage Learning.
- UAE Federal e-Government Portal. (2006). *Emiratisation*. Retrieved from <http://www.government.ae/gov/en/res/citizen/emp/emiratisation.jsp>
- UAE restricts VoIP to local firms Skype still banned. (2010). *BusinessIntelligence Middle East*. Retrieved from <http://www.bi-me.com/main.php?id=45142&t=1&c=12&cg=2&mset=>
- Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods*, 3, 4–69. doi:10.1177/109442810031002
- Vangala, R. R. & Sasi, S. (2004). Biometric authentication for e-commerce transaction. *Imaging Systems and Techniques, 2004 IEEE International Workshop*, 14, 113–116. doi:10.1109/IST.2004.1397295
- Van Slyke, C., Belanger, F., & Hightower, R. (2005, January). Understanding gender-based differences in consumer e-commerce adoption. *Proceedings of the 2005 Southern Association of Information Systems Conference*, Savannah, GA, 24–29. Retrieved from <http://sais.aisnet.org/>

- Van Slyke, C., Lou, H., Belanger, F., & Sridhar, V. (2004). The influence of culture on consumer-oriented electronic commerce adoption. *Proceedings of the 7th Annual Conference of the Southern Association for Information Systems*, 310–315. Retrieved from <http://sais.aisnet.org/2004/2004proceedings.pdf>
- Van Slyke, C., Lou, H., Belanger, F., & Sridhar, V. (2010). The influence of culture on consumer-oriented electronic commerce adoption. *Journal of Electronic Commerce Research*, 11, 30-40. Retrieved from <http://www.allbusiness.com/government/government-bodies-offices/14104720-1.html>
- Van Slyke, C., Shim, J. T., Johnson, R., & Jiang, J. (2006). Concern for information privacy and online consumer purchasing. *Journal of the Association for Information Systems* 7, 415–444. Retrieved from <http://aisel.aisnet.org/jais/vol7/iss6/>
- Venkatesh, V., & Davis, F. (2000), A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186–204. doi:10.1287/mnsc.46.2.186.11926
- Venkatesh, V., & Morris, M. (2000). Why don't men ever stop to ask for directions? Gender, social influence and their role in technology acceptance and usage behavior. *MIS Quarterly*, 24, 115–139. doi:10.2307/3250981
- Verweij, M. (2005). *Trust (and Social Capital) in Cultural Theory*. Research Collection, School of Social Sciences (Paper 74). Retrieved from Singapore Management University at: [http://ink.library.smu.edu.sg/soss\\_research/74](http://ink.library.smu.edu.sg/soss_research/74)
- Vroom, V. H. (2000). Leadership and the decision making process. *Organizational Dynamics*, 28, 89-94. doi:10.1016/S0090-2616(00)00003-6
- Wallace, M. J. (2003). *Action research for language teachers*. Cambridge, UK: Cambridge University Press.
- Walter, K. A. (2005). Information and communication technology (ICT) for development of small and medium-sized exporters in Latin America: Colombia. In M. Kuwayama, M. Tsuji, & Y. Ueki (Eds.), *Information technology (IT) for development of small and medium-sized exporters in Latin America and East Asia* (pp. 12–13). Retrieved from <http://www.cepal.org/publicaciones/xml/4/26934/SW-49-Colombia.pdf>
- Widaman, K. F. (1993). Common factor analysis versus principal component research analysis: Differential bias in representing model parameters? *Multivariate Article Behavioral Research*, 28, 263–311. doi:10.1207/s15327906mbr2803\_1

- Widaman, K. F., & Thompson, J. S. (2003). On specifying the null model for incremental fit indices in structural equation modeling. *Psychological Methods*, 8, 16–37. doi:10.1037/1082-989X.8.1.16
- Williamson, O. E. (1979). Transaction-cost economics: The governance of contractual relations. *Journal of Law and Economics*, 22, 233-261. doi:10.1086/466942
- Woon, I. M. Y., Pee, L. G. (2004, December). Behavioral factors affecting Internet abuse in the workplace: An Empirical Investigation. *Proceedings of the Third Annual Workshop on HCI Research in MIS (SIGHCI)*, 80-84, Washington, D.C.
- Woszczyński, A., Myers, M., & Moody, J. (2007). Student perceptions of diversity issues in IT. *Journal of Information Systems Education*, 17, 449–458. Retrieved from <http://www.jise.org/Issues/17/V17N4P449-Abs.pdf>
- Wright, R. (1996). Two visions of reformation (Islam and liberal democracy). *Journal of Democracy*, 7(2), 64–75. Retrieved from <http://www.journalofdemocracy.org/articles/toc/tocapr96.html>
- Wu, J., Tsai, R., & Chen, C. (2006). An integrative model to predict the continuance use of electronic learning systems: Hints for teaching. *International Journal on E-Learning*, 5(2), 287–302. Retrieved from <http://www.editlib.org/p/5781>
- Xu, Y., & Cai, S. (2004, June). A conceptual model of customer value in e-commerce. *Proceedings of the 13th European Conference on Information Systems: The European IS Profession in the Global Networking Environment, ECIS 2004*, Turku, Finland. Retrieved from <http://aisel.aisnet.org/ecis2004/>
- Yi, M., & Hwang, Y. (2003). Predicting the use of web-based information system : Self-efficacy, enjoyment, learning goal orientation and the technology acceptance model. *International Journal of Human-Computer Studies*, 59, 431–449. doi:10.1016/S1071-5819(03)00114-9
- Yousafzai, S. Y., Pallister, J. G. and Foxall, G. R. (2005), Strategies for building and communicating trust in electronic banking: A field experiment. *Psychology and Marketing*, 22, 181–201. doi: 10.1002/mar.20054
- Yousafzai, S. Y., Foxall, G. R., and Pallister, J. G. (2007). Technology acceptance: A meta-analysis of the TAM: Part 1, 2. *Journal of Modelling in Management*, 2(3), 251-280. doi: 10.1108/17465660710834462
- Yu, C. Y. (2002). *Evaluating cutoff criteria of model fit indices for latent variable models with binary and continuous outcomes*. (Unpublished Doctoral Dissertation). University of California, Los Angeles. Retrieved from <http://www.statmodel2.com/download/Yudissertation.pdf>

- Yu, F. (2007). *High speed deep packet inspection with hardware support* (Doctoral dissertation, University of California, Berkeley). Retrieved from <http://www.eecs.berkeley.edu/Pubs/TechRpts/2006/EECS-2006-156.pdf>
- Zhang, J. (2009). Multivariate data analysis using SSPS. *Scribd*. Retrieved from <http://www.scribd.com/doc/11485761/Multivariate-Data-Analysis-Using-SPSS>
- Zikmund, W. G. (2003). *Business research methods* (7th ed.). Mason, OH: Thomson Southwestern.
- Zott, C., Amit, R. (2007). Business model design and the performance of entrepreneurial firms, *Organizational Science*. doi:10.1287/orsc.1060.0232
- Zott, C., Amit, R., & Massa, L. (2011). The business model: Recent developments and future research. *Journal of Management*, 37(4), 1019-1042. doi: 10.1177/0149206311406265

## Appendixes

Appendix A  
Sampling Frame

Table 14

*Sampling Frame, Higher Colleges of Technology, 19,370 enrolled students*

College for Random Area Sample	No. of Enrollments	%	Stratification class
Abu Dhabi Men's College	2,610	13.474	A
Abu Dhabi Women's College	2,602	13.433	A
Al Ain Men's College	686	3.542	E
Al Ain Women's College	1,771	9.143	C
Dubai Men's College	1,806	9.324	C
Dubai Women's College	2,113	10.909	B
Fujairah Men's College	394	2.034	F
Fujairah Women's College	1,350	6.970	D
Madinat Zayad Men's College	69	.356	H
Madinat Zayad Women's College	269	1.389	G
Ras Al Khaimah Men's College	555	2.865	F
Ras Al Khaimah Women's College	1,395	7.202	D
Ruwais Men's College	47	.243	H
Ruwais Women's College	259	1.337	G
Sharjah Men's College	894	4.615	E
Sharjah Women's College	2,296	11.853	B

*Note.* Enrolled students from 16 campuses, Adapted from "Enrollments by College Academic Year 2010-2011" by *Higher Colleges of Technology, Factbook 2010-2011*, p.1. Copyright 2011 by the HCT United Arab Emirates.

Table 15

*Sampling Frame, by stratification, size class pairings*

College for Random Area Sample	No. of Enrollments	%	Stratification class
Abu Dhabi Men's College	2,610	13.5	A
Abu Dhabi Women's College	2,602	13.5	A
Sharjah Women's College	2,296	12	B
Dubai Women's College	2,113	11	B
Dubai Men's College	1,806	9	C
Al Ain Women's College	1,771	9	C
Ras Al Khaimah Women's College	1,395	7	D
Fujairah Women's College	1,350	7	D
Sharjah Men's College	894	5	E
Al Ain Men's College	686	3.5	E
Ras Al Khaimah Men's College	555	3	F
Fujairah Men's College	394	2	F
Madinat Zayad Women's College	269	1	G
Ruwais Women's College	259	1	G
Madinat Zayad Men's College	69	<1	H
Ruwais Men's College	47	<1	H

*Note.* Sampling frame (continued). One campus from each size pair is randomly selected from each stratification class pair to ensure that one campus of each size class is represented. Adapted from "Enrollments by College Academic Year 2010-2011" by *Higher Colleges of Technology, Factbook 2010-2011*, p.1. Copyright 2011 by the HCT United Arab Emirates.

## Appendix B

### Informed Consent Form and Survey

#### Examining Intention to use Deep Packet Inspection Technology in the United Arab Emirates

##### *Purpose.*

You are invited to participate in a research study. The principal investigator and conductor of this study is Alfred Miller, who is working on a doctorate degree at Northcentral University, Prescott Valley, Arizona. This research is funded in part by a grant from the Wharton Entrepreneurship and Family Business Research Centre at CERT and The Centre of Excellence for Applied Research and Training Term Fund.

The purpose of this study is to identify, analyze, and define the relationship between variables thought to impact intention to use deep packet inspection technology, and test a proposed technology adoption model. Cybercrime is major problem in the UAE particularly for small and medium sized businesses, and deep packet inspection, offers a means to protect these networks and systems from threats.

There is no deception in this study. The principal investigator is interested in your opinions and reflections about your life as it pertains to the Internet, computer use and communications technology.

You were selected as a possible participant because you are a student of the Higher Colleges of Technology, a university whose graduates are given preferential hiring consideration in certain ICT, and banking sectors of employment, within the UAE, which are likely to use deep packet inspection technology.

##### *Background Information.*

Deep Packet Inspection (DPI) is a firewall application that uses a variety of methods to scrutinize or inspect Internet data transmissions, including message content, at OSI levels 3-7, as they traverse the firewall protecting a computer system or network.

##### *Participation Requirements.*

You will be asked to complete 66 questions by checking a box for each question about how you view computers, and things related to the Internet and communications technology. You may choose to answer the English language version or the Arabic translation of the survey. The session will last from 5 to 20 minutes depending on your reading ability and proficiency in completing an online survey.

##### *Research Personnel.*

The following people are involved in this research project and may be contacted at any time:

- Alfred Miller, Principal Investigator conducting this study, contact him directly at 971-050-324-1094 or at Alfred.miller@hct.ac.ae
- Dr. Lawrence Ness, Dissertation Committee Chair, Northcentral University, contact him directly at 1-928-541-7777, or at DrNess@my.ncu.edu
- Dr. Erik Forsberg Associate Dean, Research and Innovation, on behalf of the Director of HCT Research, Innovation and Graduate Studies Directorate at Erik.forsberg@hct.ac.ae, and 971-2-4048419



- Sylvie Beauvais, Associate Director of Wharton Entrepreneurial Programs and the Wharton Global Family Alliance, at Beauvais@wharton.upenn.edu, 1-215-898-1901.

*Potential Risk/Discomfort.*

Although there are no known risks in this study, some of the information is personally sensitive and also includes questions about using and interacting with technology which may be distressing to some people. However, you may withdraw at any time, and you may choose **not** to answer any question that you feel uncomfortable in answering.

*Potential Benefit.*

There are no direct benefits to you for participating in this research. No incentives are offered. The benefits of this study are that respondents may help the researcher to identify strengths and weaknesses in the proposed deep packet acceptance model (DPAM) for the UAE, and subsequently guide leadership and management in the affected industries, to direct change and add value to the economy as a whole, by developing improved network security.

*Anonymity/Confidentiality.*

Confidentiality will be maintained to the fullest extent allowed by applicable law. All information collected in this study will be held at the highest level of confidentiality. There will be no disclosure of names, student numbers, or other information that could identify you as a participant.

*Right to Withdraw.*

You have the right to withdraw from the study at any time without penalty. You may omit questions on any questionnaires if you do not want to answer them. We would be happy to answer any question that may arise about the study. Please direct your questions or comments to:

- Alfred Miller, Principal Investigator conducting this study. Contact him directly at 971-050-324-1094 or at Alfred.miller@hct.ac.ae

*Consent to Participate in the Study*

You will now be asked to check a box attesting that you are 18 years old or older and that you consent to participate in the study.

- Age is 18 years or older, have read the information above, understand the conditions of participation, understand that clicking this response represents an electronic signature, and **agree to participate** in this research study.
- Less than 18 years old, or have not read the above information, or do not understand the conditions of participation, or do not wish to click this response representing an electronic signature, and/or **do not wish to participate** in this research study.

Link to online versions of survey:

Link to Arabic survey here: <http://www.smart-survey.co.uk/v.asp?i=29892rytbd>

Link to English survey here: <http://www.smart-survey.co.uk/v.asp?i=31102zqroc>

Research Instrument (English Version)					
Thank you in advance for participating in this survey. Please respond to all of the questions. Your responses are in confidence, and will be used in an academic study.					
Age _____ You must be 18 years of age or older to participate					
To answer the following questions please circle/check the response that best describes your attitude.					
The answer choices are:					
a. Strongly agree      b. Agree      c. Not sure      d. Disagree      e. Strongly disagree					
1. I can download a text file from the Internet with no difficulty.	SA	A	NS	DA	SDA
2. I can download music from the Internet with no difficulty.	SA	A	NS	DA	SDA
3. I cannot send and receive e-mail.	SA	A	NS	DA	SDA
4. I use the Internet for chatting with ease.	SA	A	NS	DA	SDA
5. I can get the information from a website easily for my work.	SA	A	NS	DA	SDA
6. I am confident that I can obtain relevant information through online sources (e.g. online discussion groups, reputation sites, etc) on the web vendors if I am planning to purchase an item online.	SA	A	NS	DA	SDA
7. I prefer the sites that have chat room to see what others say about the product and service.	SA	A	NS	DA	SDA
8. I am confident that if I would like to purchase an item online, I will purchase exactly the item that I want.	SA	A	NS	DA	SDA
9. I'd rather take a course online than in a classroom.	SA	A	NS	DA	SDA
10. I feel buying on the Internet is or will be more difficult than going to a shop.	SA	A	NS	DA	SDA
11. I think using the Web fits well with the way I like to purchase products or services.	SA	A	NS	DA	SDA
12. Using the Web enhances my effectiveness in purchasing products or services.	SA	A	NS	DA	SDA
13. Purchasing products or services over the Web is a status symbol.	SA	A	NS	DA	SDA
14. People who use the Web to purchase products or services have more prestige than those who do not.	SA	A	NS	DA	SDA
15. Learning to use the Web for purchasing products or services is easy for me.	SA	A	NS	DA	SDA
16. I believe that it is easy to get the Web to do what I want it to do.	SA	A	NS	DA	SDA
17. Overall, I believe that using the Web to purchase products or service will be easy.	SA	A	NS	DA	SDA
18. I think you cannot trust Web merchants.	SA	A	NS	DA	SDA
19. Most formal education will be done on the Internet in my lifetime.	SA	A	NS	DA	SDA

20. My life is better because of the Internet.	SA	A	NS	DA	SDA
21. E-commerce sites discriminate against race, age, and gender.	SA	A	NS	DA	SDA
22. I prefer the use of the Internet for research rather than visit a library.	SA	A	NS	DA	SDA
23. The Web should be accessible just like mail and electricity.	SA	A	NS	DA	SDA
24. The government should subsidize Internet access.	SA	A	NS	DA	SDA
25. I expect cheaper prices on the web.	SA	A	NS	DA	SDA
26. Using the Web would help me to make a better decision.	SA	A	NS	DA	SDA
27. Using the Web would help me to buy product I really want.	SA	A	NS	DA	SDA
28. I believe I will not be able to find a good deal when using the Web for purchase.	SA	A	NS	DA	SDA
29. I learn many new things when working on the Internet.	SA	A	NS	DA	SDA
30. I believe using Internet will improve my performance.	SA	A	NS	DA	SDA
31. I believe I would save money if I use the Web for shopping.	SA	A	NS	DA	SDA
32. Buying on the Internet is less troublesome.	SA	A	NS	DA	SDA
33. Using the Web for shopping is truly a joy.	SA	A	NS	DA	SDA
34. Compared to other things, the time spent on the Web is really a joy.	SA	A	NS	DA	SDA
35. Internet stores will replace “bricks and mortar” stores in my lifetime.	SA	A	NS	DA	SDA
36. I feel more connected to people on the web than in class or in person.	SA	A	NS	DA	SDA
37. I would pay to download information if it saves me time.	SA	A	NS	DA	SDA
38. I believe Internet will make my shopping more efficient.	SA	A	NS	DA	SDA
39. I would like to use the Web for purchasing a product or service.	SA	A	NS	DA	SDA
40. I predict that I will use Web purchasing on regular basis in the future.	SA	A	NS	DA	SDA
41. Although I will likely use information from the Web quite extensively, I don't see myself directly using Web purchasing in the future.	SA	A	NS	DA	SDA
42. I expect that I will use Web purchasing quite extensively in the future.	SA	A	NS	DA	SDA
43. The government should not stop any product that is legal and is paid for on the Internet from coming in to the country.	SA	A	NS	DA	SDA
44. I believe the Internet provides reliable, accurate	SA	A	NS	DA	SDA

information.					
45. I meet very good friends on the Internet.	SA	A	NS	DA	SDA
46. I spend less time with friends now, and more time on the internet.	SA	A	NS	DA	SDA
47. A nation should be able to control the web content that crosses its borders.	SA	A	NS	DA	SDA
48. A high degree of trust exists in my family.	SA	A	NS	DA	SDA
49. People of my community trust each other.	SA	A	NS	DA	SDA
50. I am not living in a high trust society.	SA	A	NS	DA	SDA
51. My friends are generally trustworthy.	SA	A	NS	DA	SDA
52. Blogging sites should be blocked.	SA	A	NS	DA	SDA
53. Internet tools for bypassing blocked content should be blocked.	SA	A	NS	DA	SDA
54. Illegal calling cards for making inexpensive international calls should be blocked.	SA	A	NS	DA	SDA
55. Content for illegal drugs should be blocked.	SA	A	NS	DA	SDA
56. Alternate religious views should be blocked.	SA	A	NS	DA	SDA
57. Gambling sites should not be blocked.	SA	A	NS	DA	SDA
58. Sites for hacking should be blocked.	SA	A	NS	DA	SDA
59. Content containing pornography should be blocked.	SA	A	NS	DA	SDA
60. Human rights abuses in the UAE should be blocked.	SA	A	NS	DA	SDA
61. Content that insults any recognized religion should be blocked.	SA	A	NS	DA	SDA
62. Phishing Internet sites should be blocked.	SA	A	NS	DA	SDA
63. Internet content that downloads spyware should not be blocked.	SA	A	NS	DA	SDA
64. Websites providing unlicensed VoIP should be blocked.	SA	A	NS	DA	SDA
65. Terrorism content should be blocked.	SA	A	NS	DA	SDA
66. Top Level Domain for Israel (.il) should be blocked.	SA	A	NS	DA	SDA

## Research Instrument (Arabic Version)

نموذج العلم والموافقة على محتويات البحث (الدراسة)

اختبار النوايا من أجل استخدام حزمة برامج التفتيش والبحث العميق في دولة الإمارات العربية المتحدة  
**الهدف**

أنت مدعو للمشاركة في دراسة بحثية للباحث الرئيسي والمسئول عن هذه الدراسة هو الفريد ميلر , الذي يعمل للحصول على درجة الدكتوراه من جامعة نورث سنترال , وادي بريسكوت , أريزونا. يتم تمويل هذا البحث جزئياً بمنحة من وارتون انتربريونشيب ومركز أبحاث الأعمال العائلية في (مركز الاستجابة لطوارئ الحاسب الآلي) ومركز التميز للبحوث التطبيقية ومنحة التدريب المحدود.

الغرض من هذه الدراسة هو التعرف وتحليل وتعريف العلاقة بين المتغيرات التي يعتقد بأنها تؤثر على النية في استخدام تكنولوجيا حزمة التفتيش العميق و اختبار نموذج الاختيار أو التبني التكنولوجي . جرائم الشبكة الالكترونية تعد مشكلة رئيسية في الإمارات العربية المتحدة خاصة للمؤسسات الصغيرة والمتوسطة الحجم و حزمة برامج التفتيش العميق تقدم الوسائل اللازمة لحماية الشبكات و الأنظمة من هذه التهديدات .

لا يوجد غش أو تدليس في هذه الدراسة . الباحث الرئيسي يهتم بأرائكم وردود أفعالكم في حياتكم فيما يختص بشبكة الانترنت و استخدام الحاسبات الالكترونية وتكنولوجيا الاتصالات .

لقد تم اختيارك كمشارك محتمل في هذه الدراسة لأنك طالب في كليات التقنية العليا , وهي الجامعة التي يحصل خريجها على معاملة مميزة وأفضلية عند النظر في أمر التعيينات في مناطق مخصصة .  
وقطاع البنوك في الإمارات العربية المتحدة هي القطاعات التي قد تفضل استخدام تكنولوجيا حزمة برامج التفتيش العميق.

### معلومات عن خلفية المشروع

حزمة برامج التفتيش العميق هو نظام حماية يستخدم طرق مختلفة ومتنوعة لتفقد أو تفتيش وفحص المعلومات الخاصة بنقل البيانات عبر الانترنت مما يشتمل على نقل الرسائل على مستوى (ترابط الأنظمة المفتوح) 3-7 حيث يعترض برنامج الحماية الذي يحمي جهاز الحاسب أو الشبكة.

### متطلبات أو احتياجات المشاركة

سيطلب منك أن تستكمل 66 سؤال عن طريق وضع علامة في مربع لكل سؤال عن كيف تعتبر أو ترى الحاسبات الالكترونية, ومواضيع تختص بالانترنت وتكنولوجيا الاتصالات. يمكن أن تختار أن تجيب على النسخة الانجليزية أو الترجمة العربية لهذه الدراسة. الجلسة ستستغرق ما بين 5 إلى 20 دقيقة حسب مدى قدرتك على القراءة وعلى مهارتك في استكمال الدراسات الموجودة على الحاسب .

### موظف البحث

- الفريد ميلر , الباحث الرئيسي المسئول عن هذه الدراسة. يمكن الاتصال به مباشرة  
على رقم 971-050-324-1094  
- أو على بريده الإلكتروني Alfred.miller@hct.ac.ae

\_\_ د. لورانس نيس , رئيس اللجنة الخاصة بالإطروحة أو البحث , جامعة نورت سنترال. يمكن الاتصال به مباشرة  
على رقم 1-928-541-7777  
أو على بريده الإلكتروني DrNess@my.ncu.edu

\_\_ د. ايرك فورسبيرج , العميد (المشارك), فالبحت والاختراع, نيابة عن رئيس قسم البحث والاختراع وبحوث الدكتوراه في كليات التقنية العليا. يمكن الاتصال به على بريده الإلكتروني Erik.forsberg@hct.ac.ae أو على رقم 971-2-404 8419

سيلى بيو فيس, المدير المساعد لبرنامج وارتون انتربرينيول ووارتون جلوبال فاميلى اليانس , يمكن الاتصال على  
1-215-898-1901 , أو البريد الإلكتروني Beauvais@wharton.upenn.edu

#### المخاطر والمضايقات المحتملة

رغم انه لا يوجد مخاطر معروفة بخصوص هذه الدراسة, بعض المعلومات قد تكون ذات حساسية شخصية كما قد تتضمن أسئلة بخصوص استخدام والتعامل مع التكنولوجيا مما قد يسبب بعض القلق والتوتر لبعض الناس. ولكن يمكنك الانسحاب في أي وقت يمكنك أن تختار أن لا تجيب على أي سؤال تشعر بالقلق وعدم الراحة عند الإجابة عليه.

#### الفوائد المحتملة

لا يوجد فوائد مباشرة تجنبها من المشاركة في هذه الدراسة. لا توجد حوافز مقدمة. الفوائد المحققة من هذه الدراسة هو أن المشاركين الذين استجابوا للاستقصاء قد يساعدوا الباحث في التعرف على جوانب القوة والضعف فمؤدج الموافقة المقترح بخصوص حزمة البحث العميق للإمارات العربية المتحدة وبالتالي توجيه وإرشاد القيادة والإدارة في الصناعات التي تأثرت لتوجيه التغيير وإضافة قيمة عن طريق إنشاء وتطوير نظام حماية محسن للشبكات .

#### السرية

سيتم الحفاظ على السرية إلى الحد الأقصى في حدود القوانين المطبقة . كل المعلومات التي ستم جمعها عن طريق هذه الدراسة سيتم الاحتفاظ بها على مستويات السرية. لن يتم الكشف عن الأسماء, أرقام الطلاب, أو أي معلومات قد تؤدي إلى التعرف على هوية المشارك.

#### الحق في الانسحاب

لك الحق في الانسحاب من الدراسة في أي وقت بدون أي عقوبة. يمكن أن تلغي أو تتخطى أي أسئلة في أي استبيان إذا لم ترغب في الإجابة عنه. في حالة وجود أية أسئلة بخصوص هذه الدراسة ستقابل بالترحاب من جانبنا. يرجى منك أن توجه أسئلتك أو تعليقاتك إلى :

الفريد ميلر , الباحث الرئيسي لهذه الدراسة . يمكن الاتصال به مباشرة على :

971-050-324-1094

او على بريده الإلكتروني

Alfred.miller@hct.ac.ae

الموافقة على الاشتراك في هذه الدراسة

سيطلب منك أن تضع علامة في مربع لتؤكد بصفة رسمية انك بلغت 18 من العمر أو اكبر, كما سيتم سؤالك عن الموافقة على الاشتراك في هذه الدراسة.

لقد قرأت المعلومات أعلاه وفهمت

واستوعبت شروط المشاركة. أنا أعى واعلم انه بوضع علامة ( صح ) يمثل توقيع الكتروني و أنا أوافق على المشاركة في هذه الدراسة البحثية ( ) .

- لقد قرأت المعلومات أعلاه

وفهمت واستوعبت شروط المشاركة. أنا أعى واعلم انه بوضع علامة ( خطأ ) يمثل توقيع الكتروني و أنا لا ارجب في المشاركة في هذه الدراسة البحثية ( ) .

يمكن التواصل والربط مع النسخة الإلكترونية من هذه الدراسة على:

<http://www.smart-survey.co.uk/v.asp?i=29892rytbd>

<p>دوات او آليات البحث ( النسخة العربية) شكرا لك مقدما لمشاركتك في هذه الدراسة(البحث) . يرجى اجابة جميع الاسئلة. اجاباتك ستكون سرية وستستخدم في دراسة اكااديمية. العمر----- يجب ان تكون في الثامنة عشر من العمر أو اكبر لتشارك في هذه الدراسة ادوات او آليات البحث ( النسخة العربية) شكرا لك مقدما لمشاركتك في هذه الدراسة(البحث) . يرجى اجابة جميع الاسئلة. اجاباتك ستكون سرية وستستخدم في دراسة اكااديمية. العمر----- يجب ان تكون في الثامنة عشر من العمر أو اكبر لتشارك في هذه الدراسة.</p> <p>للإجابة على الاسئلة التالية برجاء وضع دائرة \ علامة على الاجابة التي تمثل احسن تمثيل سلوكك (.) اختيارات الإجابات هي : أ- موافق بشدة (بقوة) ب - موافق ج - غير متأكد د - غير موافق هـ - غير موافق بشدة (بقوة)</p>	
1- يمكنني تحميل ملف نصي من الانترنت بدون صعوبة	! م ب ! م ! غ مت ! غ م ! غ م ب
2- يمكنني تنزيل موسيقى من الانترنت بدون صعوبة	! م ب ! م ! غ مت ! غ م ! غ م ب
3- لا يمكنني أن أرسل أو أستلم رسالة الكترونية	! م ب ! م ! غ مت ! غ م ! غ م ب
4- أنا استخدم الانترنت للتحدث والردشة بسهولة	! م ب ! م ! غ مت ! غ م ! غ م ب
5- يمكن أن أحصل على معلومات عملي بسهولة من المواقع الإلكترونية ! م ب ! م ! غ مت ! غ م ! غ م ب	! م ب ! م ! غ مت ! غ م ! غ م ب
6- أنا على ثقة بأنه يمكنني الحصول على المعلومات المرتبطة عن طريق الوسائل الإلكترونية ( مثل جماعات النقاش الإلكترونية , المواقع حسنة السمعة... الخ) على مواقع الباعة الإلكترونية إذا ما خططت لشراء مواد الكترونية	! م ب ! م ! غ مت ! غ م ! غ م ب
7- أنا أفضل المواقع التي تحتوى على غرف دردشة لأعرف ما يقوله الآخرون عن المنتج والخدمة	! م ب ! م ! غ مت ! غ م ! غ م ب
8- أنا على ثقة بأنني أستطيع شراء السلعة التي أريدها من الإنترنت	! م ب ! م ! غ مت ! غ م ! غ م ب
9- أنا أفضل الدراسة الكترونيا عن الدراسة في قاعة المحاضرات	! م ب ! م ! غ مت ! غ م ! غ م ب
10- أنا أشعر بأن الشراء عن طريق الإنترنت أصعب من الذهاب إلى السوق	! م ب ! م ! غ مت ! غ م ! غ م ب
11- أنا أعتقد أن استخدام الشبكة يناسب جيدا الأسلوب الذي أحب أن اشتري به المنتجات والخدمات	! م ب ! م ! غ مت ! غ م ! غ م ب
12- استخدام الشبكة يحسن أو يزيد من كفاءة شراء المنتجات والخدمات	! م ب ! م ! غ مت ! غ م ! غ م ب
13- شراء المنتجات أو الخدمات عن طريق الشبكة يعد من مظاهر الثراء	! م ب ! م ! غ مت ! غ م ! غ م ب
14- الناس الذين يستخدمون الشبكة لشراء المنتجات أو الخدمات يعتبر مظهر من مظاهر الجاه أكثر ممن لا يستخدمونها	! م ب ! م ! غ مت ! غ م ! غ م ب
15- تعلم شراء المنتجات أو الخدمات عن طريق الشبكة سهل بالنسبة إليّ	! م ب ! م ! غ مت ! غ م ! غ م ب
16- أنا أعتقد أنه من السهل على الشبكة أن تقوم بأداء المهمات التي أريدها	! م ب ! م ! غ مت ! غ م ! غ م ب

17- عموماً ، أنا أعتقد أن استخدام الشبكة لشراء المنتجات أو الخدمات سيكون سهلاً	! م ب ! م ! غ مت ! غ م ! غ م ب
18- أنا أعتقد أنه لا يمكنك أن تثق بتجار الشبكة	! م ب ! م ! غ مت ! غ م ! غ م ب
19- معظم التعليم الأساسي سيتم عن طريق الانترنت في حياتي	! م ب ! م ! غ مت ! غ م ! غ م ب
20 - حياتي أفضل بسبب وجود الإنترنت	! م ب ! م ! غ مت ! غ م ! غ م ب
21- مواقع التجارة الالكترونية تميز أو تفرق بين الناس على أساس العرق و السن والجنس	! م ب ! م ! غ مت ! غ م ! غ م ب
22- أنا أفضل استخدام الانترنت في البحوث بدلا من زيارة المكتبة.	! م ب ! م ! غ مت ! غ م ! غ م ب
23- يجب أن تكون الشبكة متاحة مثل البريد والكهرباء	! م ب ! م ! غ مت ! غ م ! غ م ب
24- يجب على الحكومة أن تدعم الحصول على الإنترنت	! م ب ! م ! غ مت ! غ م ! غ م ب
25- أتوقع أن أجد أسعار أرخص على الإنترنت	! م ب ! م ! غ مت ! غ م ! غ م ب
26- استخدام الشبكة يساعد في اتخاذ قرارات أفضل .	! م ب ! م ! غ مت ! غ م ! غ م ب
27- استخدام الشبكة قد يساعدني في شراء منتج أنا أحتاجه	! م ب ! م ! غ مت ! غ م ! غ م ب
28- أعتقد أنني لن أجد صفقة جيدة عندما استخدم الشبكة في الشراء	! م ب ! م ! غ مت ! غ م ! غ م ب
29- أنا أتعلم الكثير من الأشياء الجديدة عندما أعمل على الانترنت	! م ب ! م ! غ مت ! غ م ! غ م ب
30- اعتقد أن استخدام الانترنت سيزيد ويحسن من كفاءة أدائي	! م ب ! م ! غ مت ! غ م ! غ م ب
31- أنا أعتقد أنه يمكنني أن أوفر المال عندما استخدم الشبكة للتسوق	! م ب ! م ! غ مت ! غ م ! غ م ب
32- الشراء باستخدام الانترنت أقل إزعاجا	! م ب ! م ! غ مت ! غ م ! غ م ب
33- استخدام الانترنت للشراء ممتع	! م ب ! م ! غ مت ! غ م ! غ م ب
34- مقارنة بالأشياء الأخرى, الوقت الذي أقضيه على الشبكة هو حقا وقت ممتع	! م ب ! م ! غ مت ! غ م ! غ م ب
35- محلات الإنترنت ستحل محل (الطوب والاسمنت) خلال حياتي	! م ب ! م ! غ مت ! غ م ! غ م ب
36- أشعر أنني أكثر اتصالا بالناس على الشبكة من الذين أراهم في الفصل أو أكون على اتصال شخصي بهم	! م ب ! م ! غ مت ! غ م ! غ م ب
37- أنا على استعداد لسداد رسوم تحميل المعلومات من الشبكة إذا كانت توفر لي الوقت	! م ب ! م ! غ مت ! غ م ! غ م ب
38- أعتقد أن الإنترنت سوف يجعل عملية التسوق أكثر كفاءة	! م ب ! م ! غ مت ! غ م ! غ م ب



! م ب ! م ! غ مت ! غ م ! غ م ب	39- أحب استخدام الشبكة لشراء منتج أو خدمة
! م ب ! م ! غ مت ! غ م ! غ م ب	40- أتوقع أن استخدم الشبكة للتسوق بشكل مستمر في المستقبل
! م ب ! م ! غ مت ! غ م ! غ م ب	41- رغم أنني استخدم المعلومات عن طريق الشبكة بتوسع، إلا أنني لا أجد نفسي استخدم الشبكة للشراء المباشر في المستقبل
! م ب ! م ! غ مت ! غ م ! غ م ب	42- أنا أتوقع أن استخدم نظام الشراء عن طريق الشبكة بتوسع في المستقبل
! م ب ! م ! غ مت ! غ م ! غ م ب	43- يجب أن لا توقف الحكومة أي منتج مسموح به قانوناً وتم دفع ثمنه عن طريق الانترنت من القنوم للبلدة.
! م ب ! م ! غ مت ! غ م ! غ م ب	44- أنا أعتقد أن الإنترنت يقدم معلومات دقيقة يمكن الاعتماد عليها
! م ب ! م ! غ مت ! غ م ! غ م ب	45- لقد قابلت أصدقاء جديدين من خلال استخدام الانترنت
! م ب ! م ! غ مت ! غ م ! غ م ب	46- أنا أقضي وقتاً أقل الآن مع الأصدقاء ، ووقت أكثر على الانترنت
! م ب ! م ! غ مت ! غ م ! غ م ب	47- من حق الدولة أن تكون قادرة على التحكم في محتويات الشبكة التي تعبر حدودها
! م ب ! م ! غ مت ! غ م ! غ م ب	48- تتوفر في عائلتي درجة عالية من الثقة
! م ب ! م ! غ مت ! غ م ! غ م ب	49- الناس في مجتمعي يتقنون في بعضهم
! م ب ! م ! غ مت ! غ م ! غ م ب	50- أنا لا أعيش في مجتمع تتوفر فيه الثقة
! م ب ! م ! غ مت ! غ م ! غ م ب	51- أصدقائي يستحقون الثقة
! م ب ! م ! غ مت ! غ م ! غ م ب	52- المدونات يجب أن تسد أو تمنع
! م ب ! م ! غ مت ! غ م ! غ م ب	53- معدات الانترنت التي تستخدم للتغلب على الحصار يجب حظرها ومنعها
! م ب ! م ! غ مت ! غ م ! غ م ب	54- بطاقات الاتصال التلفزيوني الغير قانونية والتي تستخدم لإجراء اتصالات دولية رخيصة يجب منعها
! م ب ! م ! غ مت ! غ م ! غ م ب	55- محتويات العقاقير الغير قانونية ( المخدرات ) يجب حظرها
! م ب ! م ! غ مت ! غ م ! غ م ب	56- الآراء الدينية المخالفة يجب منعها
! م ب ! م ! غ مت ! غ م ! غ م ب	57- لا يجب حظر مواقع القمار ( اللعب بالقمار )
! م ب ! م ! غ مت ! غ م ! غ م ب	58- يجب حظر مواقع الاختراق ( الهكر )
! م ب ! م ! غ مت ! غ م ! غ م ب	59- يجب حظر المواقع الإباحية
! م ب ! م ! غ مت ! غ م ! غ م ب	60- ينبغي حظر انتهاكات حقوق الإنسان في دولة الإمارات العربية المتحدة
! م ب ! م ! غ مت ! غ م ! غ م ب	61- المحتويات التي تسيء إلى أي دين معترف به يجب حظرها
! م ب ! م ! غ مت ! غ م ! غ م ب	62- مواقع التصيد يجب حظرها

63- محتويات الانترنت التي تنزل برامج التجسس لا يجب حظرها.	! م ب ! م ! غ مت ! غ م ! غ م ب
64- يجب حظر المواقع التي تقدم عبر بروتوكول الإنترنت غير المرخصة .	! م ب ! م ! غ مت ! غ م ! غ م ب
65- المحتويات الإرهابية يجب حظرها	! م ب ! م ! غ مت ! غ م ! غ م ب
66- يجب حظر المستوى الأعلى لموقع إسرائيل ( ايل )	! م ب ! م ! غ مت ! غ م ! غ م ب

## Appendix C

## Validation Sources for Survey Questions

Computer Self-efficacy<sup>a</sup>

1. I can download a text file from the Internet with no difficulty	SA	A	NS	DA	SDA
2. I can download music from the Internet with no difficulty	SA	A	NS	DA	SDA
3. I cannot send and receive e-mail (R)	SA	A	NS	DA	SDA
4. I use the Internet for chatting with ease	SA	A	NS	DA	SDA

*Note.*<sup>a</sup> Adapted from “Investigation of intention to use e-commerce in the Arab countries: A comparison of self-efficacy, usefulness, culture, gender, and socioeconomic status in Saudi Arabia and the United Arab Emirates, by H. N. Siddiqui, a dissertation from Nova Southeastern University, United States, Florida, retrieved from Dissertations & Theses: Full Text database, Publication No. AAT 3315103; who adapted it from “Intentions to use information technologies: An integrative model,” by R. Thompson, D. Compeau, and C. Higgins, 2006, *Journal of Organizational and End User Computing*, 18(3), 25-46.

Computer Self-efficacy<sup>b</sup>

5. I can get the information from a website easily for my work	SA	A	NS	DA	SDA
6. I am confident that I can obtain relevant information through online sources (e.g. online discussion groups, reputation sites, etc) on the web vendors if I am planning to purchase an item online	SA	A	NS	DA	SDA
7. I prefer the sites that have chat room to see what others say about the product and service.	SA	A	NS	DA	SDA
8. I am confident that if I would like to purchase an item online, I will purchase exactly the item that I want	SA	A	NS	DA	SDA

*Note.*<sup>b</sup> Adapted from “Investigation of intention to use e-commerce in the Arab countries: A comparison of self-efficacy, usefulness, culture, gender, and socioeconomic status in Saudi Arabia and the United Arab Emirates, by H. N. Siddiqui, a dissertation from Nova Southeastern University, United States, Florida, retrieved from Dissertations & Theses: Full Text database, Publication No. AAT 3315103; who adapted it from “Exploring online transaction self-efficacy in trust-building in B2C electronic commerce,” by Y. H. Kim, D. J. Kim, and Y. Hwang, 2009. *Journal of Organizational and End User Computing*, 21, 37-59.

Attitudes toward ICT<sup>a</sup>

9. I'd rather take a course online than in a classroom	SA	A	NS	DA	SDA
10. I feel buying on the internet is or will be more difficult than going to a shop	SA	A	NS	DA	SDA
11. I think using the Web fits well with the way I like to purchase products or services	SA	A	NS	DA	SDA
12. Using the Web enhances my effectiveness in purchasing products or services	SA	A	NS	DA	SDA
13. Purchasing products or services over the Web is a status symbol	SA	A	NS	DA	SDA
14. People who use the Web to purchase products or services have more prestige than those who do not.	SA	A	NS	DA	SDA
15. Learning to use the Web for purchasing products or services is easy for me	SA	A	NS	DA	SDA
16. I believe that it is easy to get the Web to do what I want it to do	SA	A	NS	DA	SDA
17. Over all, I believe that using the Web to purchase products or service will be easy	SA	A	NS	DA	SDA
18. I think you cannot trust Web merchants (R)	SA	A	NS	DA	SDA
19. Most formal education will be done on the Internet in my lifetime	SA	A	NS	DA	SDA
20. My life is better because of the internet	SA	A	NS	DA	SDA
21. E-commerce sites discriminate against race, age and gender	SA	A	NS	DA	SDA
22. I prefer the use of the Internet for research rather than visit a library.	SA	A	NS	DA	SDA

*Note.*<sup>a</sup> Adapted from "Investigation of intention to use e-commerce in the Arab countries: A comparison of self-efficacy, usefulness, culture, gender, and socioeconomic status in Saudi Arabia and the United Arab Emirates, by H. N. Siddiqui, a dissertation from Nova Southeastern University, United States, Florida, retrieved from Dissertations & Theses: Full Text database, Publication No. AAT 3315103; who adapted it from "The influence of culture on consumer-oriented electronic commerce adoption," by C. Van Slyke, H. Lou, F. Belanger, V. Sridhar, 2010, Journal of Electronic Commerce Research, retrieved from <http://www.allbusiness.com/government/government-bodies-offices/14104720-1.html>

Attitudes toward ICT<sup>b</sup>

23. The Web should be accessible just like mail and electricity.	SA	A	NS	DA	SDA
24. The government should subsidize Internet access.	SA	A	NS	DA	SDA

*Note.*<sup>b</sup> Adapted from “Investigation of intention to use e-commerce in the Arab countries: A comparison of self-efficacy, usefulness, culture, gender, and socioeconomic status in Saudi Arabia and the United Arab Emirates, by H. N. Siddiqui, a dissertation from Nova Southeastern University, United States, Florida, retrieved from Dissertations & Theses: Full Text database, Publication No. AAT 3315103; who adapted it from “ICT and business in the new economy: Globalization and attitudes towards e-commerce,” by J. Sagi, E. Carayannis, S. Dasgupta, and G. Thomas 2004, *Journal of Global Information Management*, 12(3), 44-64.

Perceived Usefulness of E-commerce (PUEC)<sup>a</sup>

25. I expect cheaper prices on the web	SA	A	NS	DA	SDA
26. Using the Web would help me to make a better decision	SA	A	NS	DA	SDA
27. Using the Web would help me to buy product I really want	SA	A	NS	DA	SDA
28. I believe I will not be able to find a good deal when using the Web for purchase (R)	SA	A	NS	DA	SDA
29. I learn many new things when working on the internet	SA	A	NS	DA	SDA

*Note.*<sup>a</sup> Adapted from “Investigation of intention to use e-commerce in the Arab countries: A comparison of self-efficacy, usefulness, culture, gender, and socioeconomic status in Saudi Arabia and the United Arab Emirates,” by H. N. Siddiqui, a dissertation from Nova Southeastern University, United States, Florida, retrieved from Dissertations & Theses: Full Text database, Publication No. AAT 3315103; who adapted it from “A conceptual model of customer value in e-commerce,” by Y. Xu and S. Cai, June, 14-16, 2004, from the proceedings of the 13th European Conference on Information Systems, The European IS Profession in the Global Networking Environment, ECIS 2004, Turku, Finland; Original source is “Hedonic and utilitarian motivations for online retail shopping behaviour.” by T. L. Childers, C.L., Carr, J. Peck and S. Carson S., 2001. *Journal of Retailing*, 77 (4), 511-535.

Perceived Usefulness of E-commerce (PUEC)<sup>b</sup>

30. I believe using Internet will improve my performance	SA	A	NS	DA	SDA
31. I believe I would save money if I use the Web for shopping	SA	A	NS	DA	SDA
32. Buying on the Internet is less troublesome	SA	A	NS	DA	SDA

*Note.*<sup>b</sup> Adapted from “Investigation of intention to use e-commerce in the Arab countries: A comparison of self-efficacy, usefulness, culture, gender, and socioeconomic status in Saudi Arabia and the United Arab Emirates, by H. N. Siddiqui, a dissertation from Nova Southeastern University, United States, Florida, retrieved from Dissertations & Theses: Full Text database, Publication No. AAT 3315103; who adapted it from "The relative importance of perceived ease of use in IS adoption: A study of ecommerce adoption," D. Gefen, and D. Straub, September, 2000, *Journal of the Association for Information Systems* 1(8), 1-30.

Perceived Usefulness of E-commerce (PUEC)<sup>c</sup>

33. Using the Web for shopping is truly a joy	SA	A	NS	DA	SDA
34. Compared to other things, the time spent on the Web is really a joy	SA	A	NS	DA	SDA

*Note.*<sup>c</sup> Adapted from “Investigation of intention to use e-commerce in the Arab countries: A comparison of self-efficacy, usefulness, culture, gender, and socioeconomic status in Saudi Arabia and the United Arab Emirates, by H. N. Siddiqui, a dissertation from Nova Southeastern University, United States, Florida, retrieved from Dissertations & Theses: Full Text database, Publication No. AAT 3315103; who adapted it from “A conceptual model of customer value in e-commerce,” by Y. Xu and S. Cai, June, 14-16, 2004, from the proceedings of the 13th European Conference on Information Systems, The European IS Profession in the Global Networking Environment, ECIS 2004, Turku, Finland; Original source is “Work and/or fun: Measuring hedonic and utilitarian shopping value,” by B. J. Babin, W. R. Darben, and M. Griffin, 1994, Journal of Consumer Research, 20(1), 644-656.

Perceived Usefulness of E-commerce (PUEC)<sup>d</sup>

35. Internet stores will replace “bricks and mortar” stores in my lifetime.	SA	A	NS	DA	SDA
36. I feel more connected to people on the web than in class or in person	SA	A	NS	DA	SDA

*Note.*<sup>d</sup> Adapted from “Investigation of intention to use e-commerce in the Arab countries: A comparison of self-efficacy, usefulness, culture, gender, and socioeconomic status in Saudi Arabia and the United Arab Emirates, by H. N. Siddiqui, a dissertation from Nova Southeastern University, United States, Florida, retrieved from Dissertations & Theses: Full Text database, Publication No. AAT 3315103; who adapted it from “ICT and business in the new economy: Globalization and attitudes towards e-commerce,” by J. Sagi, E. Carayannis, S. Dasgupta, and G. Thomas, 2004, Journal of Global Information Management, 12(3), 44-64.

Intention to use E-commerce<sup>a</sup>

37. I would pay to download information if it saves me time	SA	A	NS	DA	SDA
38. I believe Internet will make my shopping more efficient	SA	A	NS	DA	SDA
39. I would like to use the Web for purchasing a product or service	SA	A	NS	DA	SDA

*Note.*<sup>a</sup> Adapted from “Investigation of intention to use e-commerce in the Arab countries: A comparison of self-efficacy, usefulness, culture, gender, and socioeconomic status in Saudi Arabia and the United Arab Emirates, by H. N. Siddiqui, a dissertation from Nova Southeastern University, United States, Florida, retrieved from Dissertations & Theses: Full Text database, Publication No. AAT 3315103; who adapted it from “The influence of culture on consumer-oriented electronic commerce adoption,” by C. Van Slyke, H. Lou, F. Belanger, V. Sridhar, 2010, Journal of Electronic Commerce Research, retrieved from <http://www.allbusiness.com/government/government-bodies-offices/14104720-1.html>

Intention to use E-commerce<sup>b</sup>

40. I predict that I will use Web purchasing on regular basis in the future.	SA	A	NS	DA	SDA
41. Although I will likely use information from the Web quite extensively, I don't see myself directly using Web purchasing in the future (R)	SA	A	NS	DA	SDA
42. I expect that I will use Web purchasing quite extensively in the future.	SA	A	NS	DA	SDA

*Note.*<sup>b</sup> Adapted from “Investigation of intention to use e-commerce in the Arab countries: A comparison of self-efficacy, usefulness, culture, gender, and socioeconomic status in Saudi Arabia and the United Arab Emirates, by H. N. Siddiqui, a dissertation from Nova Southeastern University, United States, Florida, retrieved from Dissertations & Theses: Full Text database, Publication No. AAT 3315103; who adapted it from “Intentions to use information technologies: An integrative model,” by R. Thompson, D. Compeau, and C. Higgins, 2006, Journal of Organizational and End User Computing, 18(3), 25-46.



Societal trust<sup>a</sup>

43. I believe the Internet provides reliable, accurate information	SA	A	NS	DA	SDA
44. I believe the Internet provides reliable, accurate information	SA	A	NS	DA	SDA
45. I meet very good friends on the Internet	SA	A	NS	DA	SDA
46. I spend less time with friends now, and more time on the internet	SA	A	NS	DA	SDA
47. A nation should be able to control the web content that crosses its borders	SA	A	NS	DA	SDA

*Note*<sup>b</sup>. Adapted from "Investigation of intention to use e-commerce in the Arab countries: A comparison of self-efficacy, usefulness, culture, gender, and socioeconomic status in Saudi Arabia and the United Arab Emirates, by H. N. Siddiqui, a dissertation from Nova Southeastern University, United States, Florida, retrieved from Dissertations & Theses: Full Text database, Publication No. AAT 3315103; who adapted it from "ICT and business in the new economy: Globalization and attitudes towards e-commerce," by J. Sagi, E. Carayannis, S. Dasgupta, and G. Thomas, 2004, Journal of Global Information Management, 12(3), 44-64.

Societal trust<sup>b</sup>

48. A high degree of trust exists in my family	SA	A	NS	DA	SDA
49. People of my community trust each other	SA	A	NS	DA	SDA
50. I am not living in a high trust society (R)	SA	A	NS	DA	SDA
51. My friends are generally trustworthy	SA	A	NS	DA	SDA

*Note*<sup>b</sup>. Adapted from "Investigation of intention to use e-commerce in the Arab countries: A comparison of self-efficacy, usefulness, culture, gender, and socioeconomic status in Saudi Arabia and the United Arab Emirates, by H. N. Siddiqui, a dissertation from Nova Southeastern University, United States, Florida, retrieved from Dissertations & Theses: Full Text database, Publication No. AAT 3315103; who adapted it from, "E-commerce- the role of familiarity and trust," D. Gefen, September, 2000 OMEGA 28(6), 725-737.

Internet Filtration<sup>a</sup>

52. Blogging sites should be blocked	SA	A	NS	DA	SDA
53. Internet tools for bypassing blocked content should be blocked	SA	A	NS	DA	SDA
54. Illegal calling cards for making inexpensive international calls should be blocked	SA	A	NS	DA	SDA
55. Content for illegal drugs should be blocked	SA	A	NS	DA	SDA
56. Alternate religious views should be blocked	SA	A	NS	DA	SDA
57. Gambling sites should be blocked	SA	A	NS	DA	SDA
58. Sites for hacking should be blocked	SA	A	NS	DA	SDA
59. Content containing pornography should be blocked	SA	A	NS	DA	SDA
60. Human rights abuses in the UAE should be blocked	SA	A	NS	DA	SDA
61. Content that insults any recognized religion should be blocked	SA	A	NS	DA	SDA
62. Phishing internet sites should be blocked	SA	A	NS	DA	SDA
63. Internet content that downloads spyware should not be blocked (R)	SA	A	NS	DA	SDA
64. Websites providing unlicensed VoIP should be blocked	SA	A	NS	DA	SDA
65. Terrorism content should be blocked	SA	A	NS	DA	SDA
66. Top Level Domain for Israel (.il) should be blocked	SA	A	NS	DA	SDA

*Note*<sup>a</sup>. Adapted from “Blocked Content” by Etisalat, 2009, retrieved from the Etisalat Website at <http://www.etisalat.ae/assets/document/blockcontent.pdf> and “Internet filtering in the United Arab Emirates,” by the Open Net Initiative, 2009, retrieved from [http://opennet.net/sites/opennet.net/files/ONI\\_UAE\\_2009.pdf](http://opennet.net/sites/opennet.net/files/ONI_UAE_2009.pdf).

## Appendix D

## e-Commerce Surveys

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## Research Instrument (English Version)

Thank you for participating in our survey. You do not need to have purchased anything on the web to offer your opinions. Please respond to all of the questions. Your responses are in confidence, and will be used in an academic study.

1. Age \_\_\_\_\_
2. I am  Male  Female
3. My family income per year (on average) is (please tick)
  - 40,000 SR/ AED or less
  - Between 40000 – 156000
  - More than 156000
4. My level of education is (please tick)
  - Below high School,  High school diploma  Bachelors Degree
  - Master's Degree  Doctorate  please specify .....
5. Number of individuals in the house hold \_\_\_\_\_
6. The total number of cars my family has.
  - 0  1  2  3  4  5  more than 5
7. The total number of servants my family has for house work
  - 0  1  2  3  4  5  more than 5
8. My father is a college graduate  Yes  No
9. My mother has completed high school  Yes  No
10. My father uses computer at work  Yes  No  Not Applicable
11. My father uses computer at home  Yes  No  Not Applicable
12. My mother uses computer at work  Yes  No  Not Applicable
13. My mother uses computer at home  Yes  No  Not Applicable
14. I have purchased something on the Internet  Yes  No
15. The total number of hours I spend per week on the Internet, for any purpose (Please specify)

When answering the following questions please circle the appropriate number

- |                   |                      |             |  |  |  |
|-------------------|----------------------|-------------|--|--|--|
| 1. strongly agree | 2. agree             | 3. not sure |  |  |  |
| 4. Disagree       | 5. strongly disagree |             |  |  |  |
- 
- |     |   |    |   |    |    |     |
|-----|---|----|---|----|----|-----|
| 16. | I feel buying on the internet is or will be more difficult than going to a shop                   | SA | A | NA | DA | SDA |
| 17. | I think using the Web fits well with the way I like to purchase products or services              | SA | A | NA | DA | SDA |
| 18. | Using the Web enhances my effectiveness in purchasing products or services                        | SA | A | NA | DA | SDA |
| 19. | Purchasing products or services over the Web is a status symbol                                   | SA | A | NA | DA | SDA |
| 20. | People who use the Web to purchase products or services have more prestige than those who do not. | SA | A | NA | DA | SDA |
| 21. | Learning to use the Web for purchasing products or services is not easy for me                    | SA | A | NA | DA | SDA |
| 22. | I believe that it is easy to get the Web to do what I want it to do                               | SA | A | NA | DA | SDA |

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23.	Over all, I believe that using the Web to purchase products or service will be easy	SA	A	NA	DA	SDA
24.	I think you can trust Web merchants	SA	A	NA	DA	SDA
25.	Most formal education will be done on the Internet in my lifetime	SA	A	NA	DA	SDA
26.	My life is better because of internet	SA	A	NA	DA	SDA
27.	Ecommerce sites discriminate against race, age and gender	SA	A	NA	DA	SDA
28.	I would like to use Web for purchasing a product or service	SA	A	NA	DA	SDA
29.	The government should not stop any product that is legal and is paid for on the Internet from coming in to the country.	SA	A	NA	DA	SDA
30.	I meet very good friends on the Internet	SA	A	NA	DA	SDA
31.	A high degree of trust exist in my family	SA	A	NA	DA	SDA
32.	People of my community trust each other	SA	A	NA	DA	SDA
33.	I am not living in a high trust society	SA	A	NA	DA	SDA
34.	I spend less time with friends now, and more time on the internet	SA	A	NA	DA	SDA
35.	A nation should be able to control the web content that crosses its borders	SA	A	NA	DA	SDA
36.	My friends are generally trust worthy	SA	A	NA	DA	SDA
37.	I prefer the use of Internet for research rather than visit a library.	SA	A	NA	DA	SDA
38.	Using the Web would help me to make a better decision	SA	A	NA	DA	SDA
39.	Using the Web would help me to buy product I really Want	SA	A	NA	DA	SDA
40.	I believe I will not be able to find a good deal when using the Web for purchase	SA	A	NA	DA	SDA
41.	I learn many new things when working on the internet	SA	A	NA	DA	SDA
42.	I believe using Internet will improve my performance	SA	A	NA	DA	SDA
43.	I believe I would save money if I use Web for shopping	SA	A	NA	DA	SDA
44.	Buying on the Internet is less troublesome	SA	A	NA	DA	SDA
45.	Using the Web for shopping is truly a joy	SA	A	NA	DA	SDA
46.	Compared to other things, the time spent on the Web is really a joy	SA	A	NA	DA	SDA
47.	I believe the Internet provides reliable, accurate information	SA	A	NA	DA	SDA
48.	I would pay to download information if it saves me time	SA	A	NA	DA	SDA
49.	I believe Internet will make my shopping more efficient	SA	A	NA	DA	SDA

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50.	I can download a text file from the Internet with no difficulty	SA	A	NA	DA	SDA
51.	I can download music from the Internet with no difficulty	SA	A	NA	DA	SDA
52.	I can send and receive e-mail	SA	A	NA	DA	SDA
53.	I use Internet for chatting with ease	SA	A	NA	DA	SDA
54.	I can get the information from a website easily for work	SA	A	NA	DA	SDA
55.	I am confident that I can obtain relevant information through online sources (e.g. online discussion groups, reputation sites, etc) on the web vendors if I am planning to purchase an item online	SA	A	NA	DA	SDA
56.	I prefer the sites that have chat room to see what others say about the product and service.	SA	A	NA	DA	SDA
57.	I am confident that if I would like to purchase an item online, I will purchase exactly the item that I want	SA	A	NA	DA	SDA
58.	I do not expect cheaper prices on the web	SA	A	NA	DA	SDA
59.	Internet stores will replace "bricks and mortar" stores in my lifetime.	SA	A	NA	DA	SDA
60.	I feel more connected to people on the web than in class or in person	SA	A	NA	DA	SDA
61.	I'd rather take a course online than in a classroom	SA	A	NA	DA	SDA
62.	Web should be accessible just like mail and electricity.	SA	A	NA	DA	SDA
63.	The government should subsidize Internet access.	SA	A	NA	DA	SDA
64.	I predict that I will use Web purchasing on regular basis in future.	SA	A	NA	DA	SDA
65.	Although I will likely use information from the Web quite extensively, I don't see myself directly using Web purchasing in the future	SA	A	NA	DA	SDA
66.	I expect that I will use Web purchasing quite extensively in the future.	SA	A	NA	DA	SDA

*Thank you very much for taking the time and participating in this study*

### Research Instrument (Arabic Version)

#### بحث عن موقف الدول العربية من التجارة الإلكترونية

نشكركم لمساهمتكم في هذا المسح الميداني . ليس بالضرورية ان تكون ممن اشتروا أي شيء عبر الإنترنت لتقول رأيك . نرجوا منك الإجابة على جميع الأسئلة . مستخدم إجابتك لأغراض البحث العلمي فقط وستعامل بسرية .

- 1- العمر \_\_\_\_\_  
 2- أنا  ذكر  أنثى  
 3- دخل أسرتي السنوي (المتوسط) هو (فضلاً ضع علامة)

40,000 ريال/ درهم أو أقل  
 ما بين 40,000 – 156,000  
 أكثر من 156,000

4- المستوى التعليمي (فضلاً ضع علامة)

- دبلوم عالي  بكالوريوس  ماجستير  دكتوراة  تعليم ثانوي  تعليم أقل من ثانوي

5- مجموع عدد الأشخاص الذين يعيشون في المنزل (فضلاً ضع علامة)

2  3  4  5 أو أكثر من 5

6- مجموع ما تملك أسرتي من السيارات (فضلاً ضع علامة)

0  1  2  3  4  5 أو أكثر من 5

7- عدد العمالة المنزلية لدى أسرتي (فضلاً ضع علامة)

0  1  2  3  4  5 أو أكثر من 5

- 8- والدي خريج جامعي  نعم  لا  
 9- أتعلمت والنني مرحلة التقوية  نعم  لا  
 10- والذي يستخدم الحاسوب في العمل  نعم  لا  لا ينطبق  
 11- والذي يستخدم الحاسوب في المنزل  نعم  لا  لا ينطبق  
 12- والنني تستخدم الحاسوب في العمل  نعم  لا  لا ينطبق  
 13- والنني تستخدم الحاسوب في المنزل  نعم  لا  لا ينطبق  
 14- سبق وإشتريت شيء عبر الإنترنت  نعم  لا

15- إجمالي الساعات التي قضيتها أسبوعياً في الإنترنت، لأى غرض كان (يرجى التحديد) : \_\_\_\_\_  
 عدد إجابتك للأسئلة التالية يرجى رسم علامة (دائرة) حول الإجابة الصحيحة

غير موافق بشدة	غير موافق	لست متأكد	موافق	موافق بشدة
غير موافق بشدة	غير موافق	لست متأكد	موافق	موافق بشدة
غير موافق	غير موافق	لست متأكد	موافق	موافق

16- اشعر بأن الشراء عبر الإنترنت هو أصعب أو سيكون أصعب من الذهاب إلى السوق

17- أعتقد أن استخدام الإنترنت يتناسب والطريقة التي أود أن أشترى بها السلع أو الخدمات

18- استخدام الإنترنت يعزز قدرتي على شراء ما يلمبيني من السلع أو



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الخدمات

موافق بشدة	موافق	متأكد			
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	19- شراء السلع أو الخدمات عبر الإنترنت يدل على المكافحة
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	20- الذين يستخدمون الإنترنت لشراء السلع أو الخدمات أعلى مقاما ممن لا يستخدمونه
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	21- تعلم استخدام الإنترنت لشراء السلع أو الخدمات ليس سهلا بالنسبة لي
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	22- أعتقد أنه من السهل جعل الإنترنت تلبية ما أريد ان أفعل
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	23- إجمالاً، أعتقد أنه سيكون من السهل استخدام الإنترنت لشراء السلع أو الخدمات
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	24- أعتقد أنه بإمكانك الوثوق بتجار الإنترنت
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	25- خلال حياتي، معظم التعليم الرسمي سيتم عبر الإنترنت
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	26- حياتي أفضل بسبب الإنترنت
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	27- مواقع التجارة الإلكترونية تمارس ضد تمييز العرقي،العنصري والجنسي
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	28- أود استخدام الإنترنت لشراء سلعة أو خدمة
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	29- ليس للحكومة الحق في منع أي سلعة (مسموح به قانونياً) دفعت ثمنه عبر الإنترنت من دخوله للمملكة أو الإمارات
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	30- التقيت بأصدقاء جيبين على الإنترنت
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	31- تتوفر درجة عالية من الثقة داخل أسرتي
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	32- الناس في مجتمعي يشقون بعضهم بعضا
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	33- انا لا أعيش في مجتمع تغلب عليه روح الثقة
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	34- الآن أنا أمضي وقت أقل مع الأصدقاء ووقت أطول على الإنترنت
موافق بشدة	موافق	لست متأكد	موافق	موافق بشدة	35- على النول أن تكون قادرة في التحكم لشبكات الإنترنت التي تتجاوز حدودها

موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لمست	غير موافق	غير موافق بشدة

36- اصنفلي عادة من أهل الثقة

37- انا أفضل استخدام الإنترنت في عمل البحوث منه على زيارة المكتبة

38- استخدام الإنترنت سيساعدني في الوصول الى القرار الصائب

39- استخدام الإنترنت سيساعدني في شراء السلعة التي أنا فعلا في حاجة لها

40- أعتقد انه سيكون ليس بمفتوري إيجاد صفقة طيبة عند استخدام الإنترنت في الشراء

41- أنعم كثير من الأشياء الجديدة عند استخدامي الإنترنت

42- أعتقد أن استخدام الإنترنت سيطور من ادائي

43- أعتقد بإمكانني توفير المال لو قمت باستخدام الإنترنت للتسوق

44- الشراء عبر الإنترنت اقل إزعاجا

45- استخدام الإنترنت للتسوق ممتع حقا

46- مقارنة بأشياء أخرى فإن الوقت الذي امضيه على الإنترنت ممتع فعلا

47- أعتقد أن الإنترنت يوفر معلومات دقيقة يعتمد عليها

48- مستعد لنفخ ثمننا لتحميل معلومات المتصلة عبر الإنترنت إذا كان هذا سيوفر لي الزمن

49- أعتقد أن الإنترنت سيجعل تسوقي أكثر كفاءة

50- بإستطاعتي تحميل ملف نصي من الإنترنت دون صعوبة

51- أستطيع تحميل موسيقى من الإنترنت دون صعوبة

52- أستطيع إرسال وإستقبال الرسائل



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موافق بشدة	موافق	لست متأكد	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لست متأكد	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لست متأكد	غير موافق	غير موافق بشدة

53- أستخدم الإنترنت لـ "الردشة" بسهولة

54- أستطيع الحصول على المعلومة للعمل بسهولة من الإنترنت

55- أنا واثق من قدرتي الحصول على المعلومات المطلوبة من مصادر الشبكة ( مثل: مناقشة علي اليوتيوب مع مجموعة مواقع الشهرة، الخ) عن تجار الإنترنت إذا ماويت في شراء سلعة عبر الإنترنت

موافق بشدة	موافق	لست متأكد	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لست متأكد	غير موافق	غير موافق بشدة
موافق بشدة	موافق	لست متأكد	غير موافق	غير موافق بشدة

56- أفضل المواقع التي بها غرف لـ (الردشة) لمعرفة رأي الآخرين في السلع والخدمات

57- أنا واثق بفتي إذا ما رغبت في شراء شيء عبر الإنترنت فأسألي ما أريده تماماً

58- أنا لا توقع اسعاراً أرخص على الإنترنت

59- متاجر الإنترنت ستحل مكان تلك من "المتاجر التقليدية الحالية" خلال ما تبقى من حياتي

60- اشعر بفتي على اتصال أفضل بالانسان عبر الإنترنت عنه في الفصل أو شخصياً

61- أنا أفضل للدراسة عبر الإنترنت عنه في الفصل

62- استخدام الإنترنت يجب ان يصبح تماماً كالبريد والكهرباء

63- يجب على الحكومة دعم استخدام الإنترنت

65- بالرغم من أنني مستعمل معلومات من المحتفل من الويب تماماً على نطاق واسع، أنا لا أرى نفسي أستعمل ويب مباشرة يشتري في المستقبل

66- أتوقع بفتي مستعمل شراء الويب تماماً على نطاق واسع في المستقبل

شكراً جزيلاً لعنظا من وقتك ومشاركتك في هذه الدراسة .

## Appendix E

### Instructions for Focus Group

#### Examining Intention to use Deep Packet Inspection Technology in the United Arab Emirates

You are invited to participate in a focus group examining the relationship between variables thought to impact intention to use deep packet inspection technology (DPI) in the United Arab Emirates. Please see the definition of DPI given below in *Background Information*.

You were selected as a possible participant because you have a demonstrated e-business literacy and either experience or interest in working with the principal investigator Alfred Miller.

We ask that you read this document and ask any questions you may have before agreeing to be in the study. The principal investigator and conductor of this study is Alfred Miller, who is working on a doctorate degree at Northcentral University, Prescott Valley, Arizona. This research is funded in part by a grant from the Wharton Entrepreneurship and Family Business Research Centre at CERT and The Centre of Excellence for Applied Research and Training Term Fund.

#### *Background Information.*

Deep Packet Inspection (DPI) is a firewall application that uses a variety of methods to scrutinize or inspect Internet data transmissions including message content at OSI levels 3-7 as they traverse the firewall protecting a computer system or network.

The purpose of this study is to identify, analyze, and define the relationship between variables thought to impact intention to use deep packet inspection technology and test a proposed technology adoption model. Cybercrime is major problem in the UAE particularly for small and medium sized businesses and deep packet inspection offers a means to protect these networks and systems from threats.

#### *Phase I. Procedure.*

If you agree to be in this study, you will be asked you to participate by splitting into teams of approximately 4-6 students and then view this set of instructions and the media message.

The media message consists of 54 Internet filtration items printed on paper, and a second set of 54 items, which has been cut up into individual pieces.

These items correspond to the research findings on the Etisalat website and a private research group called the Open Net Initiative.

Respond to the 54 Internet filtration items in consideration the following elements of interpreting media messages:

- Function
- Comparison to other media
- Who the media communicator is
- Who is the audience for the message

The meaning of interpret is meant as follows:

The 54 Internet filtration constructs have been presented as a list and cut up into individual pieces of paper.

1. Physically arrange these constructs on the desk that your team is working at.
2. Now in light of the four bullet-pointed elements above, and according to your team's interpretation of the items, assign the 54 items to however many groups of constructs you feel there should be.
3. The process is entirely subjective and based on your team's collective opinion.
4. Keep in mind that this is a subjective process and it is opinion-based and that no answers are necessarily wrong or right. Group the constructs as your team sees fit. It is ok to have many constructs in one group, while another group of constructs may only have one or two items.
5. This exercise is based entirely on your team's collective opinion and what your team thinks is the most logical relationship of constructs.
6. Record your answers on a piece of paper.
7. By consensus, pick a single construct from each group of constructs that most representative of each group or category of constructs, and does not represent an extreme case in your team's opinion.

*Phase II. Procedure.*

Review your teams work from *Phase I*, and the sample of the survey (provided).

Answer the following questions about the survey and your teams work from *Phase I*.

- (1) On their surface, do the items measure the constructs they were developed to measure?

(2) Are there any replications, overlapping items, or need for exclusion, inclusion, or clarification for any item?

(3) Are all items clear and comprehensible for Higher Diploma and Bachelor's degree students at Higher Colleges of Technology to grasp the meaning of each item?

*Risks and Benefits of Being in the Study.*

There are no risks in participating in this study. The benefits of this study are that respondents may help the researcher to identify strengths and weaknesses in the proposed deep packet acceptance model (DPAM) for the United Arab Emirates and subsequently guide leadership and management in the affected industries to direct change and add value by developing strong threat protection policies and procedures.

*Confidentiality.*

Confidentiality will be maintained to the extent allowed by applicable law. All information collected in this study will be held at the highest level of confidentiality. There will be no disclosure of names, student numbers, or other information, that could identify you as a participant.

*Participation in the Study is Voluntary*

Your decision whether or not to participate in this focus group will not affect your current or future relations with Alfred Miller or the Higher Colleges of Technology. You have the right to withdraw from the study at any time without penalty

*Contacts and Questions*

Alfred Miller is the principal investigator conducting this study. Contact him directly at 971-050-324-1094 or at Alfred.miller@hct.ac.ae if you have any concerns or questions about the content of this project.

If you wish to contact someone other than the principal investigator, you may contact Northcentral University, at 1-928-541-7777, the dissertation committee chair, Dr. Lawrence Ness, at DrNess@my.ncu.edu , or Dr. Erik Forsberg Associate Dean, Research and Innovation, on behalf of the Director of HCT Research, Innovation and Graduate Studies Directorate at Erik.forsberg@hct.ac.ae , and at 971-2-4048419, or Sylvie Beauvais, Associate Director of Wharton Entrepreneurial Programs and the Wharton Global Family Alliance, at Beauvais@wharton.upenn.edu , 1-215-898-1901.

*Consent to Participate in the Study (Focus Group).*

- I have read the above information and am willing to participate in the focus group process
  
- I have read the above information and am **not** willing to participate in the focus group process

## Appendix F

## Constructs from the ONI Country Report

1. Blogging sites
2. Sexual health and education
3. Provocative attire such as lingerie
4. Artistic nudity
5. Internet tools for bypassing blocked content
6. Content for learning criminal skills
7. Content for illegal drugs
8. Content containing pornography
9. Content containing nudity
10. Gambling sites
11. Sites for hacking
12. Sites for malicious codes
13. Content offensive to religions
14. Phishing internet sites
15. Internet content that downloads spyware
16. Websites providing unlicensed VoIP
17. Terrorism content
18. Top Level Domain for Israel (.il)

People should be jailed for the following Internet related conduct.

19. Abolishing, destroying or revealing secrets of personal or official information

20. Defamation of Islamic places of worship or tradition
21. Insulting any recognized religion
22. Promoting sinful acts
23. Transcending family values and principles
24. Setting up a Website calling for calling for, facilitating, and promoting ideas in breach of the general order and public decency
25. Illegal calling cards for making inexpensive international calls
26. Women who promote their sex services and publicize their Dubai phone numbers on line
27. Persons offering illegal VoIP services from their apartment
28. Alternative political views
29. Alternative religious views
30. Human rights abuses in the UAE
31. Content critical of the state of the local economy
32. Content critical of the society
33. Unorthodox perspectives on Islam
34. Websites that promote minority faiths
35. Extremist sites
36. Information about blocked media
37. Social networking sites
38. Video and file sharing sites
39. Bookmarking services
40. Cyber-warfare by foreign countries
41. Content offered to users in the Arab and Muslim countries should be different from that offered to users in the West because they have different cultures.

## Appendix G

## Etisalat Blocked Content Categories

**Prohibited Content Categories****1. Internet Content for Bypassing Blocked Content**

This category includes Internet Content that allows or assist Users to access Blocked Content.

**2. Internet Content for Learning Criminal Skills**

This category includes Internet Content that either provides instructions for or identifies methods to promote, encourage or provide the skills to commit illegal or criminal or unethical activities. These include bomb-making, phreaking (breaching phone security or phone service theft), scams and fraud, terrorism, evading law enforcement, stalking, lock picking, selling pirate material such as commercial software, music, videos or others.

**3. Dating Internet Content**

This category includes Internet Content that provides online dating or matchmaking which contradicts with the ethics and morals of the UAE.

Exemptions: *Chatting services, chatting groups, social networking and forums.*

**4. Internet Content for Illegal Drugs**

This category includes Internet Content that provides information on purchasing, manufacturing, promoting and using illegal drugs.

**5. Internet Content containing Pornography and Nudity**

This category includes Internet Content that contains material of a pornographic nature, or relates or depicts acts of homosexuality, nudity and sexual material (including stories, jokes, animations, and video) or Internet Content that promotes sexual activity. It includes Internet Content which promote the distribution of above material (such as Peer-to-Peer websites and links).

**6. Gambling Internet Content**

This category includes Internet Content that is relevant to gambling or such as gambling links, tips, sports picks, lottery results, as well as horse, car or boat racing.

**7. Internet Content for Hacking and Malicious Codes**

This category includes Internet Content that distribute information and tools for hacking (root kits, kiddy scripts, etc.) that help individuals gain unauthorized access to computer systems. Also include Internet Content



that distributes tools or information for producing and distributing malicious codes such as viruses, worms or Trojan horses.

*Exemptions: Information security including ethical hacking.*

**8. Internet Content that are offensive to Religions**

This category includes Internet Content that contains material which expresses hate to religions.

**9. Phishing Internet Content**

This category includes Internet Content where entities or persons falsely represent themselves as a "legitimate" businesses or enterprises for the purpose of deceiving and obtaining from Users, valuable information such as bank account or email account information including details such as usernames, passwords, credit card details or bank account details.

**10. Internet Content that downloads Spyware**

This category includes Internet Content that downloads Spyware which gathers private information of the users without his or her knowledge.

**11. Internet Content providing Unlicensed Voice over Internet Protocol (VoIP) service**

This category includes Internet Content that allows access to services which are prohibited in accordance with the TRA's Voice over Internet Protocol Policy.

**12. Terrorism Internet Content**

This category includes Internet Content of terrorism groups and related Internet Content that support terrorism and publish and distribute materials for terrorism or include material for training and encouraging terrorism or help to serve terrorism groups such as funding, facilitating communication and other direct and indirect services.

**13. Prohibited Top Level Domain (TLD)**

This category includes Internet Content under a Top Level Domain names which offends against, is objectionable to, or is contrary to the public interest, public morality, public order, public and national security, Islam morality or is otherwise prohibited by any applicable UAE law, regulation, procedure, order or requirement.

## Appendix H

Permission from Humaira Siddiqui Ph.D.

## RE: Join my network on LinkedIn

Humaira Siddiqui Ph.D. via LinkedIn [Add to contacts](#)  
To Alfred Miller

**Humaira Siddiqui Ph.D. wrote:**

Hi,  
Sure you can use it, Pleas do mention my name somewhere.

Humaira

On September 25, 2010 11:22 AM, Alfred Miller wrote:

I would like to correspond and request your permission to use part of your survey instrument from your PhD dissertation on mine.

I'm sorry, but I don't know any other way top contact you.

- Alfred Miller in UAE

The screenshot shows a Hotmail email interface. The main content area displays the email text from Humaira Siddiqui Ph.D. and Alfred Miller. The sidebar on the left shows the 'Inbox (41)' and various folders like 'Junk (205)', 'Drafts (55)', 'Sent', 'Deleted (68)', 'Applicants', 'From Alfred (1)', 'GMB A', 'INB528', 'Jobs (1)', 'Orapin', 'Seve', 'Website (27)', and 'New folder'. Below the sidebar are 'Quick views' for 'Flagged (3)', 'Photos (2)', 'Office docs (1)', and 'Shipping updates'. The bottom of the screenshot shows the Windows taskbar with the date and time as 6:26 AM on 9/29/2010.

## Appendix I

Permission from Craig Van Slyke Ph.D.

Re: Requesting permission to please use your attitude toward ICT survey  
Craig VanSlyke [cvanslyk@slu.edu]  
You replied on 9/25/2010 4:29 PM.  
Sent: Saturday, September 25, 2010 4:08 PM  
To: Alfred Miller

Professor Miller,

Thank you for your message. I would be pleased for you to use our instrument and I possess the necessary rights to grant this permission.

Good luck with your research.

On Sat, Sep 25, 2010 at 6:49 AM, Alfred Miller <alfred.miller@hct.ac.ae> wrote:  
Alfred Miller  
Fujairah Women's College  
Box 1626 Fujairah, United Arab Emirates  
25 September, 2010  
+971 9 228 1212  
+971 50 324 1094

Dr. Craig Van Slyke,  
Davis-Shaughnessy Hall, 200  
3674 Lindell Ave.  
St. Louis , MO 63108  
(314) 977-2476

Dear Dr. Craig Van Slyke,

I am Alfred Miller, originally from St Louis, MO, now Business Faculty, of the Higher Colleges of Technology in the UAE and working on a doctorate degree at Northcentral University, Prescott, Arizona. I also have a research affiliation with the Wharton Entrepreneurship and Family Business Research Centre at CERT and The Centre of Excellence for Applied Research and Training.

I humbly request your written permission, to use your attitude toward ICT instrument in my study, which is:

"A Model Examining Factors Related to the Intention to Use Deep Packet Inspection Technology in the United Arab Emirates."

The purpose of this study is to identify, analyze, and define the relationship

between variables thought to impact intention to use deep packet inspection technology and test a proposed technology adoption model. Cybercrime is major problem in the UAE particularly for small and medium sized businesses and deep packet inspection offers a means to protect these networks and systems from threats.

Here are relevant references to your work:

Van Slyke, C. Lou, H. Belanger, F. Sridhar, V. (2004). The influence of culture on consumer-oriented electronic commerce adoption, Proceedings of the 7th Annual Conference of the Southern Association for Information Systems, 310-315.

Van Slyke, C. Lou, H. Belanger, F. Sridhar, V. (2010). The influence of culture on consumer-oriented electronic commerce adoption, Journal of Electronic Commerce Research. Retrieved from <http://www.allbusiness.com/government/government-bodies-offices/14104720-1.html>

Please confirm that you are the copyright owner of the instruments used in the above mentioned works.

The following people are involved in this research project and may be contacted at any time:

- Alfred Miller, Principal Investigator. Contact him directly at 971-050-324-1094 or at [Alfred.miller@hct.ac.ae](mailto:Alfred.miller@hct.ac.ae)
- Dr. Lawrence Ness, Dissertation Committee Chair, Northcentral University, contact him directly at 1-928-541-7777, or at [DrNess@ncu.edu](mailto:DrNess@ncu.edu)
- Dr. Erik Forsberg Associate Dean, Research and Innovation, on behalf of the Director of HCT Research, Innovation, and Graduate Studies Directorate at [Erik.forsberg@hct.ac.ae](mailto:Erik.forsberg@hct.ac.ae), and at 971-2-4048419
- Sylvie Beauvais, Associate Director of Wharton Entrepreneurial Programs and the Wharton Global Family Alliance, at [Beauvais@wharton.upenn.edu](mailto:Beauvais@wharton.upenn.edu), 1-215-898-1901.

I will seek publication of my dissertation when completed through ProQuest by its UMI® Dissertation Publishing business.

A return email from you granting permission is acceptable.

If permission to use your instrument has conditions please inform me so that I may seek to comply.

Sincerely,  
Alfred Miller

--

Craig Van Slyke, Ph.D.  
Associate Dean for Academic Programs  
John Cook School of Business  
Saint Louis University  
314.977.2476 (Voice)  
cvanslyk@slu.edu  
"See your possibilities, not your limitations."

## Appendix J

## Permission from Professor Ronald Thompson

RE: Requesting permission to please use your intention to use e-commerce instrument from survey

Ron Thompson [Ron.Thompson@mba.wfu.edu]

You replied on 9/25/2010 10:38 PM.

Sent: Saturday, September 25, 2010 6:10 PM

To: Alfred Miller

Dear Alfred,

Thank you very much for your interest in our work.

Yes, I am the copyright holder for the measurement instrument used in the paper you cite below.

Yes, you have my permission to use the instrument in your research. My only request is that you cite our paper as the source of the instrument in your dissertation and any publications resulting from your study.

One minor suggestion. We used three indicators to measure many of the constructs in the instrument. That was done in the interests of parsimony, to reduce fatigue on the part of the respondents. However, you may wish to add some indicators, and try for a minimum of four indicators for most constructs. That way, if you find after you collect the data that an indicator displays weak psychometric properties (e.g., it is unreliable), you could remove it and still have three valid indicators for your construct. That will increase your power and provide you with more options for your data analysis.

I wish you the best of luck with your research. It sounds like a very interesting and worthwhile study.

Best regards,

Ron

Ron Thompson  
Professor  
Schools of Business  
Wake Forest University  
Winston-Salem, NC, USA 27109  
ron.thompson@mba.wfu.edu

---

**From:** Alfred Miller [mailto:alfred.miller@hct.ac.ae]

**Sent:** Sat 9/25/2010 8:53 AM

**To:** Ron Thompson

**Subject:** Requesting permission to please use your intention to use e-commerce instrument from survey

Alfred Miller  
 Fujairah Women's College  
 Box 1626, Fujairah, United Arab Emirates  
 +971 9 228 1212  
 +971 50 324 1094  
 Fax:+971 9 228 1313

Professor Ronald L. Thompson  
 3125 Worrell Professional Center  
 Wake Forest University  
 Winston-Salem, NC 27106  
 Phone: 336.758.4998  
 Fax: 336.758.4514

25 September, 2010

Dear Professor Ronald Thompson (Ron),

I am Alfred Miller, originally from St Louis, MO, now Business Faculty, of the Higher Colleges of Technology in the UAE and working on a doctorate degree at Northcentral University, Prescott, Arizona. I also have a research affiliation with the Wharton Entrepreneurship and Family Business Research Centre at CERT and The Centre of Excellence for Applied Research and Training.

I humbly request your written permission, to use your intention to use e-commerce instrument in my study, which is:

"A Model Examining Factors Related to the Intention to use Deep Packet Inspection Technology in the United Arab Emirates."

The purpose of this study is to identify, analyze, and define the relationship between variables thought to impact intention to use deep packet inspection technology and test a proposed technology adoption model. Cybercrime is major problem in the UAE particularly for small and medium sized businesses and deep packet inspection offers a means to protect these networks and systems from threats.

Here is the relevant reference to your work:

Thompson, R. Compeau, D. & Higgins C. (2006). Intentions to use information technologies: An integrative model. *Journal of Organizational and End User Computing*, 18(3), 25-46.

Please confirm that you are the copyright owner of the instrument used in the above mentioned works.

The following people are involved in this research project and may be contacted at any time:

- Alfred Miller, Principal Investigator. Contact him directly at 971-050-324-1094 or at Alfred.miller@hct.ac.ae
- Dr. Lawrence Ness, Dissertation Committee Chair, Northcentral University, contact him directly at 1-928-541-7777, or at DrNess@ncu.edu
- Dr. Erik Forsberg Associate Dean, Research and Innovation, on behalf of the Director of HCT Research, Innovation and Graduate Studies Directorate at Erik.forsberg@hct.ac.ae, and 971-2-4048419
- Sylvie Beauvais, Associate Director of Wharton Entrepreneurial Programs and the Wharton

Global Family Alliance, at  
Beauvais@wharton.upenn.edu, 1-215-898-1901.

I will seek publication of my dissertation when completed, through ProQuest by its UMI®  
Dissertation Publishing.

A return email from you granting permission is acceptable.

If permission to use your instrument has conditions please inform me so that I may seek to  
comply.

Sincerely,  
Alfred Miller



## Appendix K

Permission from Dr. Young Hoon Kim

RE: Requesting permission to please use your trust and Computer self-efficacy instruments from survey

kimyou@rci.rutgers.edu [kimyou@rci.rutgers.edu]

Sent: Sunday, September 26, 2010 1:38 AM

To: Alfred Miller

Attachments: Online transaction self-e~1.docx (64 B)[Open as Web Page]

Oh, I see why you're asking my written permission. Yes, you can use the measurement items for online transaction self-efficacy. Attached is the items.

In regard to the citation, I would like to be cited as follows. The paper accepted in the HICCS in 2005, later it was published in the Journal of Organizational and End User Computing in 2009.

Kim, Y. H., Kim, D. J., & Hwang, Y. (2009). Exploring online transaction self-efficacy in trust-building in B2C electronic commerce. Journal of Organizational and End User Computing, 21, 37-59.

All best,  
Young Hoon Kim

> Dear Prof Young Hoon,  
>  
> Definitely I will be citing your article.  
>  
> Its just that at my school if we use someone else's instrument we must  
> have permission.  
>  
> I, like you did for the study cited below will be using instruments mostly  
> developed by others except for one construct which I am developing.  
> (Internet Filtration)  
>  
> My research indicates that that you supplied the online transaction  
> self-efficacy measurement and I was hoping to gain your permission to use  
> that in my study.  
> It seems like if its your measure I should be attributing to you.  
>  
> I am in the process of contacting other the authors and so far I have two  
> other responses, both favorable.  
>  
> Sincerely,  
> Alfred Miller

---

> From: kimyou@rci.rutgers.edu [kimyou@rci.rutgers.edu]  
> Sent: Saturday, September 25, 2010 7:02 PM  
> To: Alfred Miller  
> Subject: Re: Requesting permission to please use your trust and Computer  
> self-efficacy instruments from survey  
>  
> Dear Mr. Miller,

>  
> Thanks for contacting me with this matter. I thought you could simply cite  
> my article for your paper, but because I have never experienced such a  
> copyright issue, let me have some time to think of. And I will answer you  
> by early next week at latest.  
>  
> In the meantime, I wanted to let you know that the measurement for online  
> transaction self-efficacy is only my contribution. As indicated, the other  
> measurements for constructs (general self-efficacy, disposition to trust,  
> perceived risk, consumer trust, and purchasing intention) were employed  
> from literature.  
>  
> Best,  
> Young Hoon

>> Alfred Miller  
>> Fujairah Women's College  
>> Box 1626 Fujairah, United Arab Emirates  
>> 25 September, 2010  
>> +971 9 228 1212  
>> +971 50 324 1094  
>>  
>> Yoon Hoon Kim  
>> Scott Hall  
>> 43 College Avenue  
>> New Brunswick, NJ 08901  
>>  
>>  
>> Dear Yoon Hoon Kim,  
>>  
>> I am Alfred Miller, originally from St Louis, MO, now Business Faculty,  
>> of  
>> the Higher Colleges of Technology in the UAE and working on a doctorate  
>> degree at Northcentral University, Prescott, Arizona. I also have a  
>> research affiliation with the Wharton Entrepreneurship and Family  
>> Business  
>> Research Centre at CERT and The Centre of Excellence for Applied  
>> Research  
>> and Training.  
>>  
>> I humbly request your written permission, to use your e-commerce trust  
>> and  
>> computer self-efficacy instruments in my study, which is:  
>>  
>> "A Model Examining Factors Related to the Intention to Use Deep Packet  
>> Inspection Technology in the United Arab Emirates."  
>>  
>> The purpose of this study is to identify, analyze, and define the  
>> relationship between variables thought to impact intention to use deep  
>> packet inspection technology and test a proposed technology adoption  
>> model. Cybercrime is major problem in the UAE particularly for small and  
>> medium sized businesses and deep packet inspection offers a means to  
>> protect these networks and systems from threats.  
>>  
>> Here is the relevant reference to your work:  
>>

>> Kim, Y. & Kim, D. (2005). A study of online transaction self-efficacy,  
 >> consumer trust, and uncertainty reduction in electronic commerce  
 >> transaction. IEEE, Proceedings of the 38th Hawaii conference on System  
 >> Sciences, 7(1), 170-181.

>>

>> Please confirm that you are the copyright owner of the instruments used in  
 >> the above mentioned works.

>>

>> The following people are involved in this research project and may be  
 >> contacted at any time:

>> • Alfred Miller, Principal Investigator. Contact him directly at  
 >> 971-050-324-1094 or at Alfred.miller@hct.ac.ae

>> • Dr. Lawrence Ness, Dissertation Committee Chair, Northcentral  
 >> University, contact him directly at 1-928-541-7777, or at DrNess@ncu.edu

>> • Dr. Erik Forsberg Associate Dean, Research and Innovation, on  
 >> behalf of the Director of HCT Research, Innovation, and Graduate Studies  
 >> Directorate at Erik.forsberg@hct.ac.ae, and 971-2-4048419

>> • Sylvie Beauvais, Associate Director of Wharton Entrepreneurial  
 >> Programs and the Wharton Global Family Alliance, at  
 >> Beauvais@wharton.upenn.edu, 1-215-898-1901.

>>

>> I will seek publication of my dissertation when completed, through  
 >> ProQuest by its UMI® Dissertation Publishing.

>>

>> A return email from you granting permission is acceptable.

>>

>> If permission to use your instrument has conditions please inform me so  
 >> that I may seek to comply.

>>

>> Sincerely,

>> Alfred Miller

Re: Requesting permission to please use your trust and Computer self-efficacy  
 instruments from survey

kimyou@rci.rutgers.edu [kimyou@rci.rutgers.edu]

Sent: Saturday, September 25, 2010 7:02 PM

To: Alfred Miller

Dear Mr. Miller,

Thanks for contacting me with this matter. I thought you could simply cite  
 my article for your paper, but because I have never experienced such a  
 copyright issue, let me have some time to think of. And I will answer you  
 by early next week at latest.

In the meantime, I wanted to let you know that the measurement for online  
 transaction self-efficacy is only my contribution. As indicated, the other  
 measurements for constructs (general self-efficacy, disposition to trust,  
 perceived risk, consumer trust, and purchasing intention) were employed  
 from literature.

Best,

Young Hoon

## Appendix L

## Permission from Professor David Gefen

RE: Requesting permission to please use your disposition to trust, consumer trust, e-commerce instruments from survey  
 David Gefen [gefend@drexel.edu]  
 Sent: Sunday, September 26, 2010 8:35 AM  
 To: Alfred Miller

Alfred,

The copyright of a published article is owned by the journal where it is published. I have no objection to anybody reusing the items in my studies providing they cite the source as is customary in academic publications.

Professor Gefen

-----Original Message-----

From: Alfred Miller [mailto:alfred.miller@hct.ac.ae]  
 Sent: Saturday, September 25, 2010 4:16 PM  
 To: gefend@drexel.edu  
 Subject: Requesting permission to please use your disposition to trust, consumer trust, e-commerce instruments from survey

Alfred Miller  
 Fujairah Women's College  
 Box 1626, Fujairah, United Arab Emirates  
 +971 9 228 1212  
 +971 50 324 1094  
 Fax:+971 9 228 1313

Dr. David Gefen  
 Drexel University  
 3141 Chestnut Street  
 Philadelphia, PA 19104  
 Academic Building 333  
 Phone: 215.895.2148

25 September, 2010

Dear Professor David Gefen,

I am Alfred Miller, originally from St Louis, MO, now Business Faculty, of the Higher Colleges of Technology in the UAE and working on a doctorate degree at Northcentral University, Prescott, Arizona. I also have a research affiliation with the Wharton Entrepreneurship and Family Business Research Centre at CERT and The Centre of Excellence for Applied Research and Training.

I humbly request your written permission, to use your disposition to trust , consumer trust and e-commerce instruments, in my study, which is:

"A Model Examining Factors Related to the Intention to use Deep Packet Inspection Technology in the United Arab Emirates."

The purpose of this study is to identify, analyze, and define the relationship between variables thought to impact intention to use deep packet inspection technology and test a proposed technology adoption model. Cybercrime is major problem in the UAE particularly for small and medium sized businesses and deep packet inspection offers a means to protect these networks and systems from threats.

Here is the relevant reference to your work:

Gefen, David and Straub, Detmar W. "The relative importance of perceived ease of use in IS adoption: A study of ecommerce adoption" JOURNAL OF THE ASSOCIATION FOR INFORMATION SYSTEMS 1.8 (Sep 2000):1-30

Gefen, David . "E-commerce- the role of familiarity and trust" OMEGA 28.6 (Sep 2000):725-737

Please confirm that you are the copyright owner of the instrument used in the above mentioned works.

The following people are involved in this research project and may be contacted at any time:

- . Alfred Miller, Principal Investigator. Contact him directly at 971-050-324-1094 or at Alfred.miller@hct.ac.ae
- . Dr. Lawrence Ness, Dissertation Committee Chair, Northcentral University, contact him directly at 1-928-541-7777, or at DrNess@ncu.edu
- . Dr. Erik Forsberg Associate Dean, Research and Innovation, on behalf of the Director of HCT Research, Innovation, and Graduate Studies Directorate at Erik.forsberg@hct.ac.ae, and 971-2-4048419
- . Sylvie Beauvais, Associate Director of Wharton Entrepreneurial Programs and the Wharton Global Family Alliance, at Beauvais@wharton.upenn.edu, 1-215-898-1901.

I will seek publication of my dissertation when completed, through ProQuest by its UMIR Dissertation Publishing.

A return email from you granting permission is acceptable.

If permission to use your instrument has conditions please inform me so that I may seek to comply.

Sincerely,  
Alfred Miller

## Appendix M

Permission from Jan Travers at IGI Global on behalf of John Sagi

RE: Requesting permission to please use your e-commerce instrument  
Jan Travers [jtravers@igi-global.com]  
You replied on 10/1/2010 7:14 PM.  
Sent: Friday, October 01, 2010 5:37 PM  
To: Alfred Miller

Dear Alfred, thanks for your request pertaining to IGI Global copyrighted materials. Could you confirm whether you are requesting permission to reprint the complete journal article in the thesis or only using the processes introduced in the article? I look forward to your clarification.

Thanks,

Jan Travers

(Ms) Jan Travers  
Director of Intellectual Property and Contracts  
IGI Global - Disseminator of Knowledge Since 1988  
701 E Chocolate Avenue  
Hershey Pennsylvania 17033-1240, USA  
Tel: 717.533-8845 x112; Fax: 717.533-8661  
E-mail: jtravers@igi-global.com  
www.igi-global.com

Stay up to date with the latest IGI Global news and research by visiting the NEW IGI Global blogs at [www.igi-global.com/blogs](http://www.igi-global.com/blogs).

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Follow us on Twitter & Facebook!

-----Original Message-----

From: Alfred Miller [mailto:[alfred.miller@hct.ac.ae](mailto:alfred.miller@hct.ac.ae)]  
Sent: Friday, October 01, 2010 6:16 AM  
To: jtravers@igi-global.com  
Subject: Requesting permission to please use your e-commerce instrument

From:  
Alfred Miller  
Fujairah Women's College  
Box 1626, Fujairah, United Arab Emirates  
+971 9 228 1212  
+971 50 324 1094  
Fax:+971 9 228 1313

To:  
Jan Travers  
IGI Global  
Director of Intellectual Property and Contracts

701 E Chocolate Avenue  
 Hershey PA 17033-1240, USA  
 TEL 717.533-8845 x112  
 FAX 717.533-8661

1 October, 2010

Dear Jan Travers,

I am Alfred Miller, originally from St Louis, MO, now Business Faculty, of the Higher Colleges of Technology in the UAE and working on a doctorate degree at Northcentral University, Prescott, Arizona. I also have a research affiliation with the Wharton Entrepreneurship and Family Business Research Centre at CERT and The Centre of Excellence for Applied Research and Training.

I humbly request your written permission, to use your e-commerce instrument focused on national control, privacy cost, property rights and consumer preference in my academic study, which is:

"A Model Examining Factors Related to the Intention to Use Deep Packet Inspection Technology in the United Arab Emirates."

The purpose of this study is to identify, analyze, and define the relationship between variables thought to impact intention to use deep packet inspection technology and test a proposed technology adoption model. Cybercrime is major problem in the UAE particularly for small and medium sized businesses and deep packet inspection offers a means to protect these networks and systems from threats.

Here is the relevant reference to the work you own the copyright on:

Sagi, J. Carayannis, E. Dasgupta, S. & Thomas, G. (2004). ICT and business in the new economy: Globalization and attitudes towards e-commerce. *Journal of Global Information Management*, 12(3), 44-64.

Please confirm that you are the copyright owner of the instrument used in the above mentioned works.

The following people are involved in this research project and may be contacted at any time:

- Alfred Miller, Principal Investigator. Contact him directly at 971-050-324-1094 or at Alfred.miller@hct.ac.ae
- Dr. Lawrence Ness, Dissertation Committee Chair, Northcentral University, contact him directly at 1-928-541-7777, or at DrNess@ncu.edu
- Dr. Erik Forsberg Associate Dean, Research and Innovation, on behalf of the Director of HCT Research, Innovation, and Graduate Studies Directorate at Erik.forsberg@hct.ac.ae, and 971-2-4048419
- Sylvie Beauvais, Associate Director of Wharton Entrepreneurial Programs and the Wharton Global Family Alliance, at Beauvais@wharton.upenn.edu, 1-215-898-1901.

I will seek publication of my dissertation when completed, through ProQuest by its UMI® Dissertation Publishing.

A return email from you granting permission is acceptable.

If permission to use your instrument has conditions please inform me so that I may seek to comply.

Sincerely,  
Alfred Miller



## Appendix N

Permission from Perry Cartwright on behalf of Barry Babin

**University of Chicago Press**

**Permission Grant**

Date:

Grant Number:

Request Date:

Reference Number:

104315

10-07-2010

0049534700

Permissions Department

1427 East 60th Street

Chicago, IL 60637

Phone: 773-702-6096 / Fax: 773-702-9756

ALFRED MILLER

HIGHER COLLEGES OF TECHNOLOGY

BUSINESS FACULTY

BOX 1626, FUJAIRAH WOMEN'S COLLEGE

FUJAIRAH, 1626

UNITED ARAB EMIRATES

October 08, 2010

Dear Requester:

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University of Chicago as publisher. In addition, the acknowledgement must include the identical copyright notice as it appears in our publication.

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6) Author approval is not required.

7) Permission is granted GRATIS.

8) This permission is void if more than 10% of your forthcoming work, exclusive of index and bibliography, is composed of University of Chicago Press material.

0049534700 1502 Babin, JOURNAL CONSUMER RESEARCH . 20:4

(1994) "Work and/or Fun: Measuring Hedonic and

Utilitarian Shopping Value" Table #2 (pp. 651 to

651) .

\$0.00

**Order Total: \$0.00**

**Payments:**

**Balance Due:**

\$0.00

**\$0.00**

**For Use In:**

an academic dissertation by Alfred Miller

**Handling: \$0.00**

\$0.00

**Sub Total: \$0.00**

**Tax:**

Approved By: \_\_\_\_\_, Perry Cartwright, Rights & Permissions

**University of Chicago Press**

**Permission Grant**

Date:

Grant Number:

Request Date:

Reference Number:

104315

10-07-2010

0049534700

Permissions Department

1427 East 60th Street

Chicago, IL 60637

Phone: 773-702-6096 / Fax: 773-702-9756

ALFRED MILLER

HIGHER COLLEGES OF TECHNOLOGY

BUSINESS FACULTY

BOX 1626, FUJAIRAH WOMEN'S COLLEGE

FUJAIRAH, 1626

UNITED ARAB EMIRATES

October 08, 2010

Approved By: \_\_\_\_\_, Perry Cartwright, Rights & Permissions

## Appendix O

## Permission from Terry Childers

Re: Requesting permission to please use your hedonic shopping e-commerce instruments from survey

Childers, Terry [MKT] [tchilder@iastate.edu]

You replied on 10/19/2010 9:11 PM.

Sent: Monday, October 18, 2010 11:35 PM

To: Alfred Miller

Alfred, You have permission to use the scales. Good luck with the dissertation. Terry

Sent from my iPad

On Oct 18, 2010, at 3:01 AM, "Alfred Miller" <alfred.miller@hct.ac.ae> wrote:

> From: Alfred Miller  
 > Sent: Monday, October 18, 2010 9:47 AM  
 > To: tchilders@uky.edu  
 > Subject: Requesting permission to please use your hedonic shopping e-commerce instruments from survey  
 >  
 > Alfred Miller  
 > Fujairah Women's College  
 > Box 1626, Fujairah, United Arab Emirates  
 > +971 9 228 1212  
 > +971 50 324 1094  
 > Fax:+971 9 228 1313  
 >  
 > Dr. Terry L. Childers  
 > Dean's Chair in Marketing  
 > Professor of Marketing  
 > Iowa State University  
 > 3311 Gerdin Business Building  
 > Ames, IA 50011-1350  
 > (515) 294-8117  
 >  
 > 14 October, 2010  
 >  
 > Dear Professor Terry Childers,  
 >  
 > I am Alfred Miller, originally from St Louis, MO, now Business Faculty, of the Higher Colleges of Technology in the UAE and working on a doctorate degree at Northcentral University, Prescott, Arizona. I also have a research affiliation with the Wharton Entrepreneurship and Family Business Research Centre at CERT and The Centre of Excellence for Applied Research and Training.  
 >  
 > I humbly request your written permission, to use your perceived usefulness and ease of use questions found on page 531, as they relate to e-commerce, in my study, which is:  
 >  
 > "A Model Examining Factors Related to the Intention to use Deep Packet Inspection Technology in the United Arab Emirates."  
 >

> The purpose of this study is to identify, analyze, and define the relationship between variables thought to impact intention to use deep packet inspection technology and test a proposed technology adoption model. Cybercrime is major problem in the UAE particularly for small and medium sized businesses and deep packet inspection offers a means to protect these networks and systems from threats.

>

> Here is the relevant reference to your work:

>

> T. L. Childers, C.L., Carr, J. Peck and S. Carson S. , 2001. Journal of Retailing, 77 (4), 511-535.

>

> Please confirm that you are the copyright owner of the instrument used in the above mentioned works.

>

> The following people are involved in this research project and may be contacted at any time:

> • Alfred Miller, Principal Investigator. Contact him directly at 971-050-324-1094 or at Alfred.miller@hct.ac.ae

> • Dr. Lawrence Ness, Dissertation Committee Chair, Northcentral University, contact him directly at 1-928-541-7777, or at DrNess@ncu.edu

> • Dr. Erik Forsberg Associate Dean, Research and Innovation, on behalf of the Director of HCT Research, Innovation and Graduate Studies Directorate at Erik.forsberg@hct.ac.ae, and 971-2-4048419

> • Sylvie Beauvais, Associate Director of Wharton Entrepreneurial Programs and the Wharton Global Family Alliance, at Beauvais@wharton.upenn.edu, 1-215-898-1901.

>

> I will seek publication of my dissertation when completed, through ProQuest by its UMI® Dissertation Publishing.

>

> A return email from you granting permission is acceptable.

>

> If permission to use your instrument has conditions please inform me so that I may seek to comply.

>

> Sincerely,

> Alfred Miller

## Appendix P

## Pilot Study 1 Validity and Reliability

Table 16

*Pilot Study 1, Rotated Component Matrix*

Component	1	2	3	4
4 I use the Internet for chatting with ease			.680	
5 I can get the information from a website easily for my work			.807	
6 I am confident that I can obtain relevant information through online sources (e.g. groups, reputation sites, etc.) on the web vendors if I am planning to purchase an i			.836	
7 I prefer the sites that have chat rooms to see what others say about the product :				
15 Learning to use the Web for purchasing products or services is easy for me			.686	
16 I believe that it is easy to get the Web to do what I want it to do				
20 My life is better because of the Internet			.610	.607
23 The web should be accessible just like mail and electricity				.735
25 I expect cheap prices on the Web				.728
26 Using the Web would help me make a better decision				.828
27 Using the Web would help me buy a product I really want	.479	.871		
28 I believe I will not be able to find an good deal when using the web for purchase	.481	.870		
37 I would pay to download information if it saves me time	.480	.870		
38 I believe Internet will make my shopping more efficient	.481	.870		
41 Although, I will likely use information from the Web quit				
Web purchasing in the future			.791	
42 I expect that I will use Web purchasing quite extensively in the future			.770	
43 The government should not stop any product that is legal and is paid for on the			.890	
into the country				
47 A nation should control the Web content that crosses its borders			.891	
50 I am not living in a high trust society			.778	
51 My friends are generally trustworthy				
52 Blogging sites should be blocked			.928	
61 Content that insults any recognized religion should be blocked			.890	
65 Terrorism content should be blocked			.781	
66 Top level domain for Israel (.il) should be blocked			.927	
			.787	

Note. Factor loadings less than .4 are not shown.

Table 17

*Reliability Statistics for Instrument Development from First Pilot Test*

Constructs	Questions	Number of Questions	Cronbach's $\alpha$
Computer Self-efficacy (CSE)	1 – 4	4	.767
Attitude Toward Information and Communications Technology (ATICT)	5 – 8	4	.757
Perceived Usefulness of E-commerce (PUEC)	8 – 12	4	1.000
Intention to Use E-commerce (IUEC)	13 – 16	4	.905
Societal Trust (ST)	17 – 20	4	.909
Internet Filtration (IF)	21 – 24	4	.938

## Appendix Q

## Pilot Study 1 Alternative Interpretation

Table 18

*Validity Statistics for Competing Interpretation of Pilot Study 1*

Component	1	2	3	4
4 I use the Internet for chatting with ease	.622			
5 I can get the information from a website easily for my work	.801			
6 I am confident that I can obtain relevant information through online sources (e.g. online discussion groups, reputation sites, etc.) on the web vendors if I am planning to purchase an item online	.813			
7 I prefer the sites that have chat rooms to see what others say about the product and service	.640			
15 Learning to use the Web for purchasing products or services is easy for me			.575	
16 I believe that it is easy to get the Web to do what I want it to do			.698	
20 My life is better because of the Internet			.729	
23 The web should be accessible just like mail and electricity			.804	
37 I would pay to download information if it saves me time				.626
38 I believe Internet will make my shopping more efficient				.605
41 Although, I will likely use information from the Web quite extensively, I don't see myself directly using Web purchasing in the future				.847
42 I expect that I will use Web purchasing quite extensively in the future				.668
47 A nation should control the Web content that crosses its borders		.783		
61 Content that insults any recognized religion should be blocked		.795		
65 Terrorism content should be blocked		.730		
66 Top level domain for Israel (.il) should be blocked		.782		

*Note.* Factor loadings less than .53 are not shown.

Table 19

*Reliability Statistics for Competing Interpretation of Pilot Study 1*

Constructs	Questions	Number of Questions	Cronbach's $\alpha$
Computer Self-efficacy (CSE)	1 – 4	4	.767
Attitude Toward Information and Communications Technology (ATICT)	5 – 8	4	.757
Intention to Use E-commerce (IUEC)	8 – 12	4	.788
Internet Filtration (IF)	12 – 16	4	.787



## Appendix R

## Pilot Study 2 Validity and Reliability

Table 20

*Pilot Study 2, Rotated Component Matrix*

Component	1	2	3	4
1 I use the Internet for chatting with ease			.617	
2 I can get the information from a website easily for my work			.603	
3 I am confident that I can obtain relevant information through online sources (e.g. online discussion groups, reputation sites, etc.) on the web vendors if I am planning to purchase an item online			.784	
4 I prefer the sites that have chat rooms to see what others say about the product and service				.794
5 Learning to use the Web for purchasing products or services is easy for me			.630	
6 I believe that it is easy to get the Web to do what I want it to do			.697	
7 My life is better because of the Internet			.674	
8 The web should be accessible just like mail and electricity	.562		.685	
9 I expect cheap prices on the Web				.898
10 Using the Web would help me make a better decision				.643
11 Using the Web would help me buy a product I really want				.905
12 I believe I will not be able to find an good deal when using the web for purchase			.412	.779
13 I would pay to download information if it saves me time	418	.723		
14 I believe Internet will make my shopping more efficient		.690		
15 Although, I will likely use information from the Web quite extensively, I don't see myself directly using Web purchasing in the future		.839		
16 I expect that I will use Web purchasing quite extensively in the future		.783		
17 The government should not stop any product that is legal and is paid for on the Internet from coming into the country		.860		
18 A nation should control the Web content that crosses its borders	.775			
19 I am not living in a high trust society		.690		
20 My friends are generally trustworthy		.643		
21 Blogging sites should be blocked	.778			
22 Content that insults any recognized religion should be blocked	.861			
23 Terrorism content should be blocked	.853			
24 Top level domain for Israel (.il) should be blocked	.809			

*Note. Factor loadings less than .410 are not shown.*

Table 21

*Reliability Statistics for Instrument Development from Second Pilot Test*

Constructs	Questions	Number of Questions	Cronbach's $\alpha$
Computer Self-efficacy (CSE)	1 – 4	4	.804
Attitude Toward Information and Communications Technology (ATICT)	5 – 8	4	.793
Perceived Usefulness of E-commerce (PUEC)	8 – 12	4	.839
Intention to Use E-commerce (IUEC)	13 – 16	4	.792
Societal Trust (ST)	17, 19, 20	3	.771
Internet Filtration (IF)	18, 21 – 24	5	.887

## Appendix S

## Analysis of Descriptive Statistics

Table 22

*Mean and Standard Deviation Descriptive Statistics for Constructs*

Constructs	Questions	Mean	Standard Deviation
Computer Self-efficacy (CSE)	1 – 4	4.092	.915
Attitude Toward Information and Communications Technology (ATICT)	5 – 8	3.939	.974
Perceived Usefulness of E-commerce (PUEC)	8 – 12	3.850	.913
Intention to Use E-Commerce (IUEC)	13 – 16	3.409	1.073
Societal Trust (ST)	17, 19, 20	3.534	1.157
Internet Filtration (IF)	18, 21 – 24	3.899	1.247

Table 23

*Kurtosis, Skew, and Outliers*

Item	<i>n</i>	Kurtosis	Skew	Outliers
CSE1	443	1.536	-1.342	6
CSE2	443	.356	-.961	5
CSE3	443	-.310	-.525	0
CSE4	443	.716	-1.035	7
ATICT1	443	-.475	-.563	4
ATICT2	443	.574	-.860	0
ATICT3	443	1.025	-1.218	6
ATICT4	443	.122	-.704	6
PUEC1	443	.045	-.661	0
PUEC2	443	.882	-.743	4
PUEC3	443	-.001	-.640	0
PUEC4	443	-.341	-.666	4
IUEC1	443	-.625	-.454	0
IUEC2	443	.131	-.756	4
IUEC3	443	-.725	-.399	0
IUEC4	443	-.517	-.432	4
ST1	443	-.613	-.437	4
ST2	443	-.927	-.367	4
ST3	443	-.669	-.475	0
IF1	443	.187	-.984	0
IF2	443	-.884	-.499	0
IF3	443	-.179	-.873	0
IF4	443	1.614	-1.677	6
IF5	443	-.241	-1.041	0

*Note.* Standard error for kurtosis = .231, standard error for skew = .116.

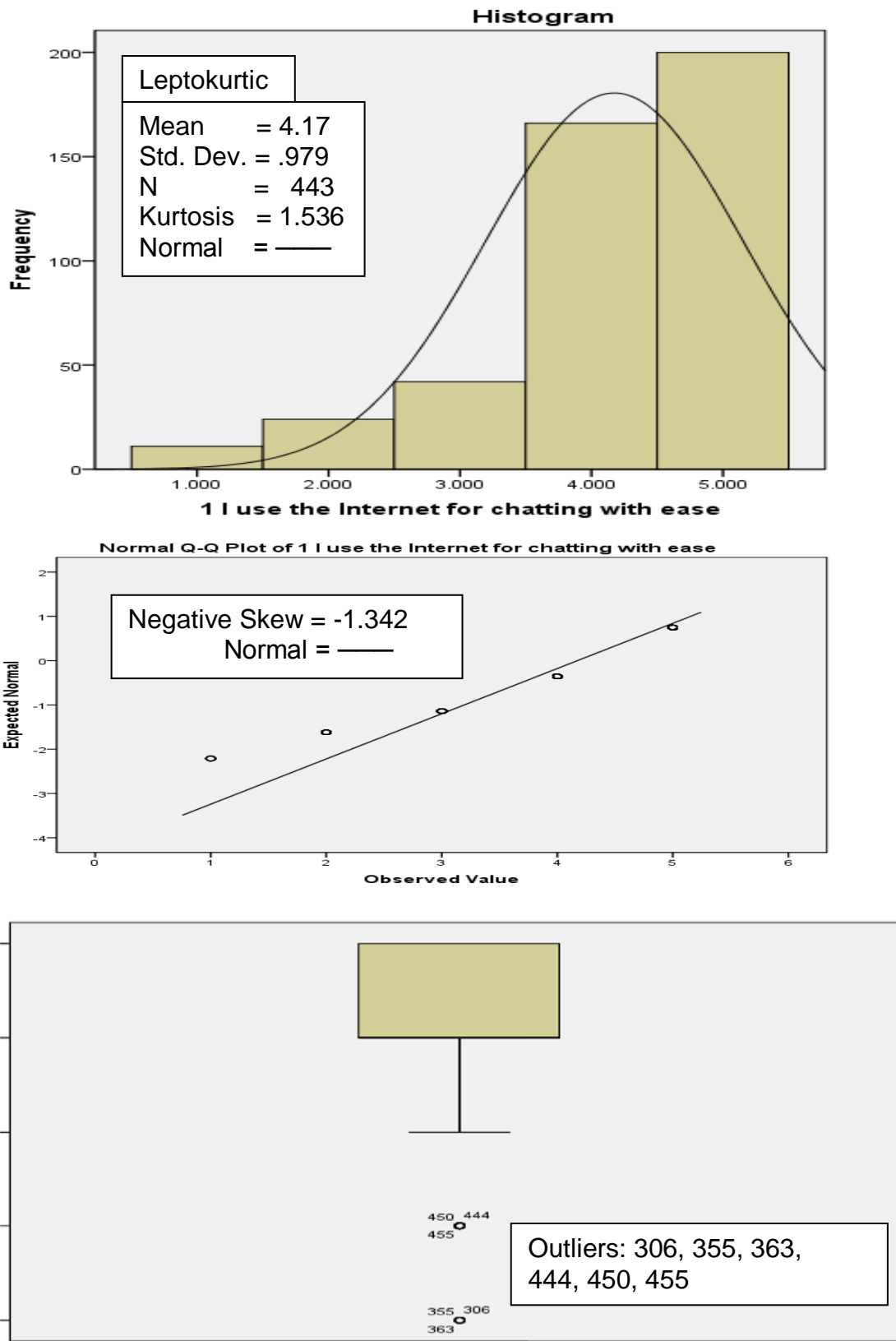
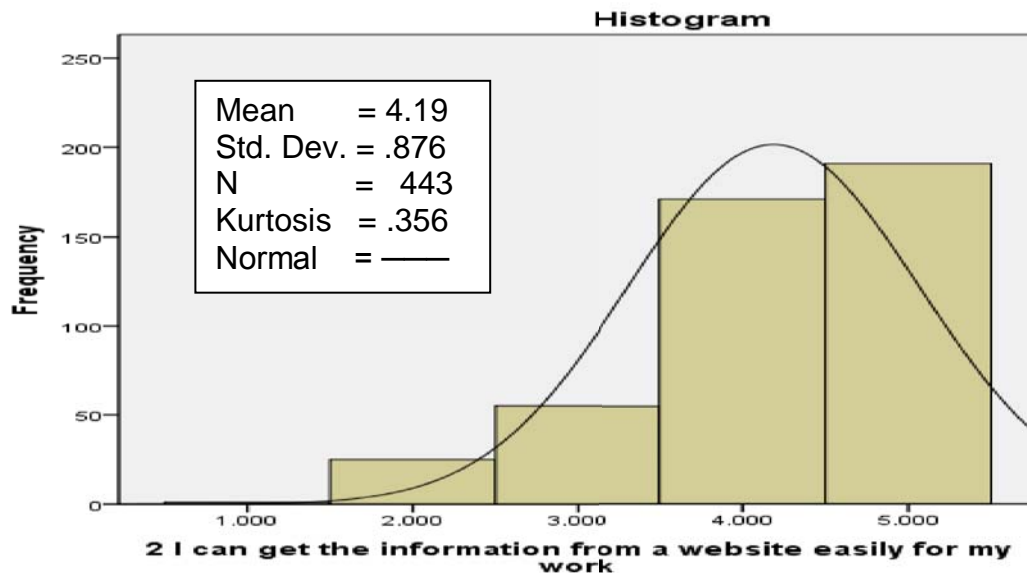


Figure S1. CSE 1, univariate normality assessment distributions.



Normal Q-Q Plot of 2 I can get the information from a website easily for my work

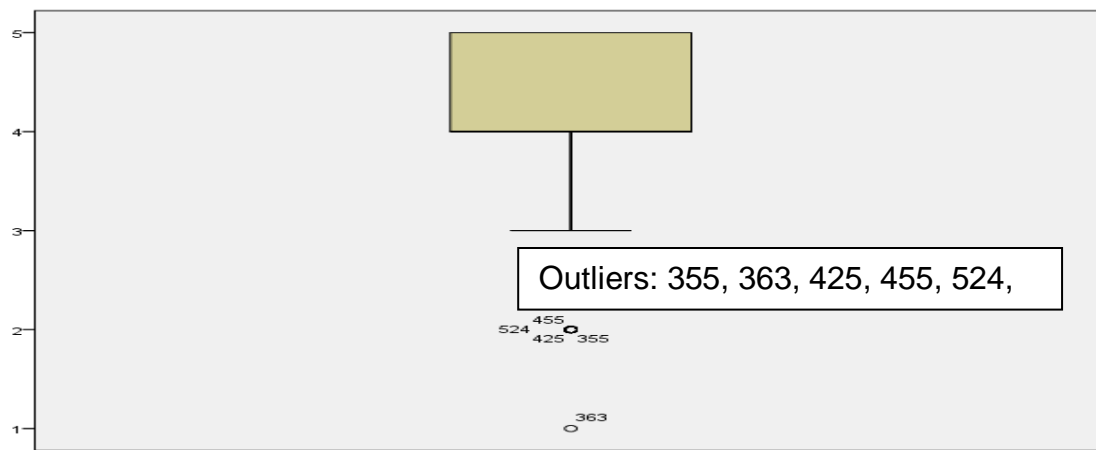
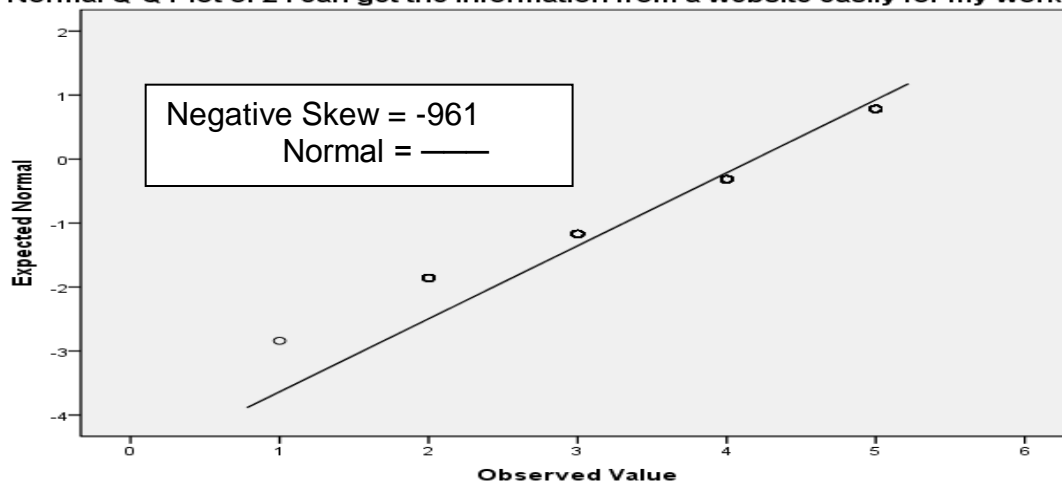
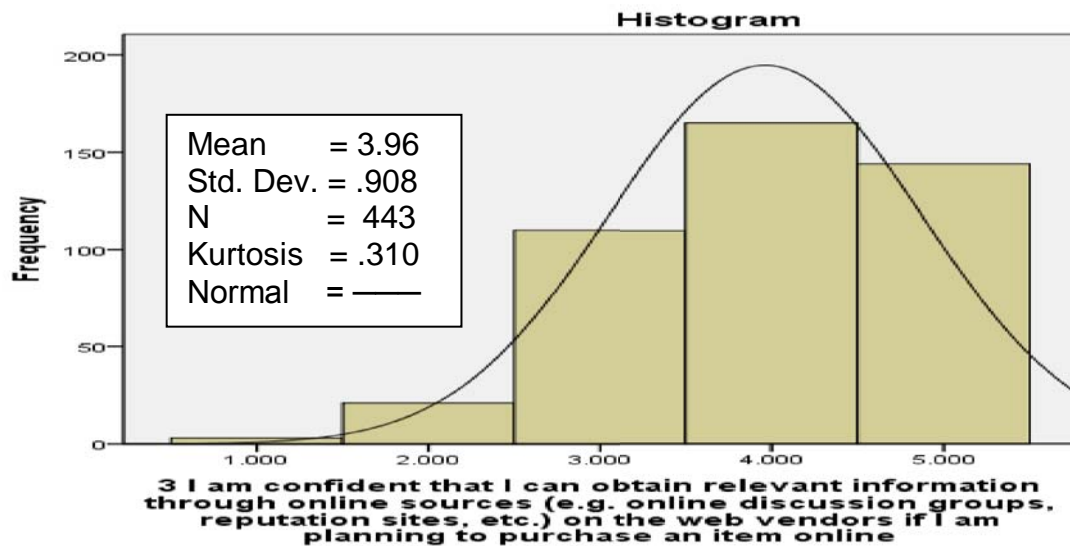


Figure S2. CSE 2, univariate normality assessment distributions.



Normal Q-Q Plot of 3 I am confident that I can obtain relevant information through online sources (e.g. online discussion groups, reputation sites, etc.) on the web vendors if I am planning to purchase an item online

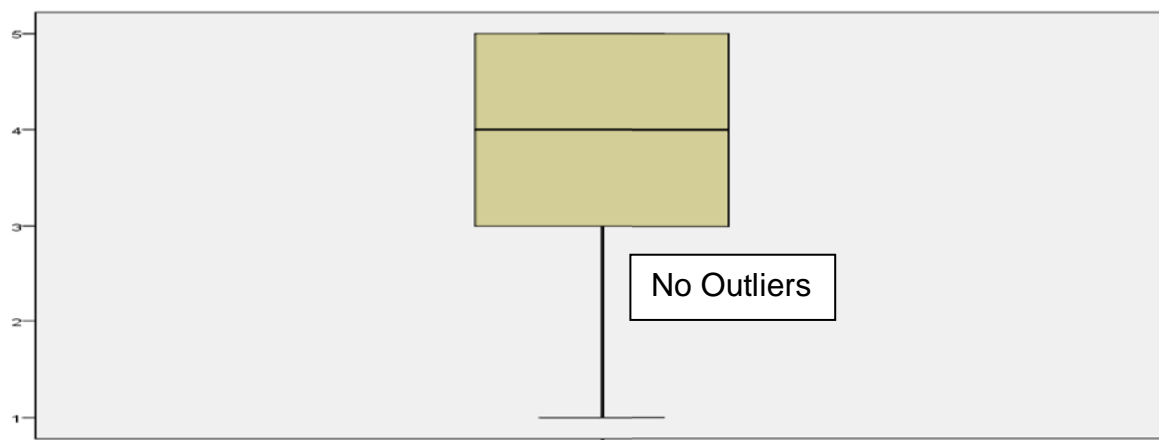
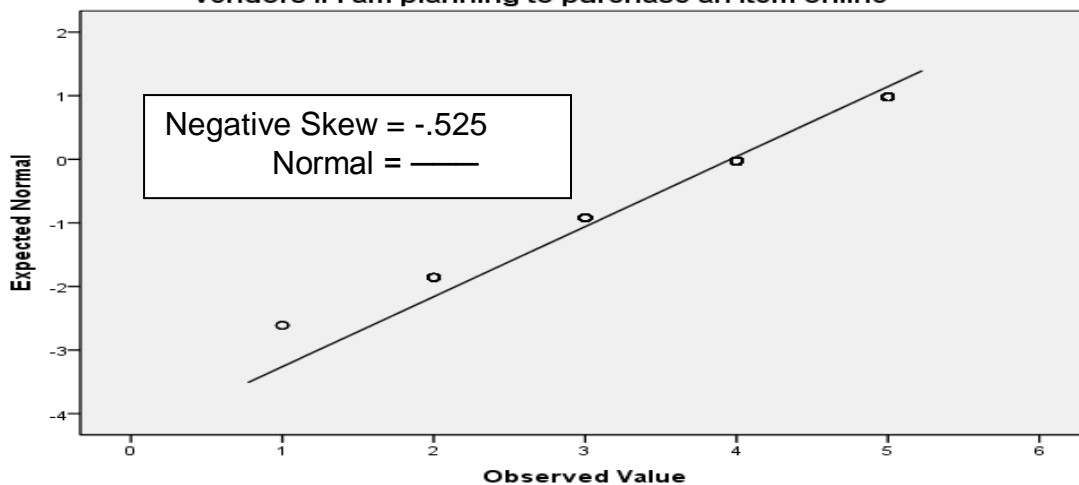
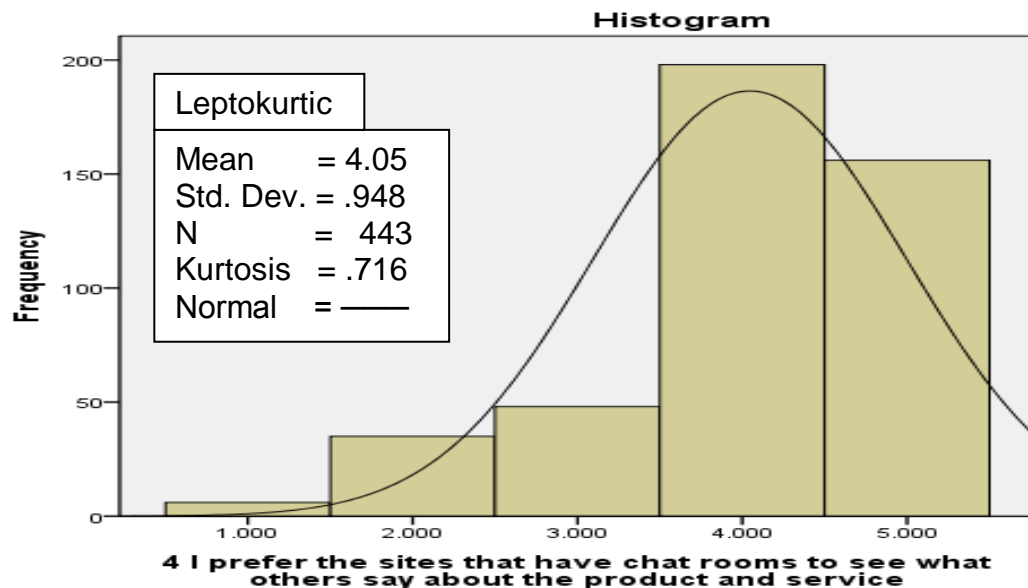


Figure S3. CSE 3, univariate normality assessment distributions.



Normal Q-Q Plot of 4 I prefer the sites that have chat rooms to see what others say about the product and service

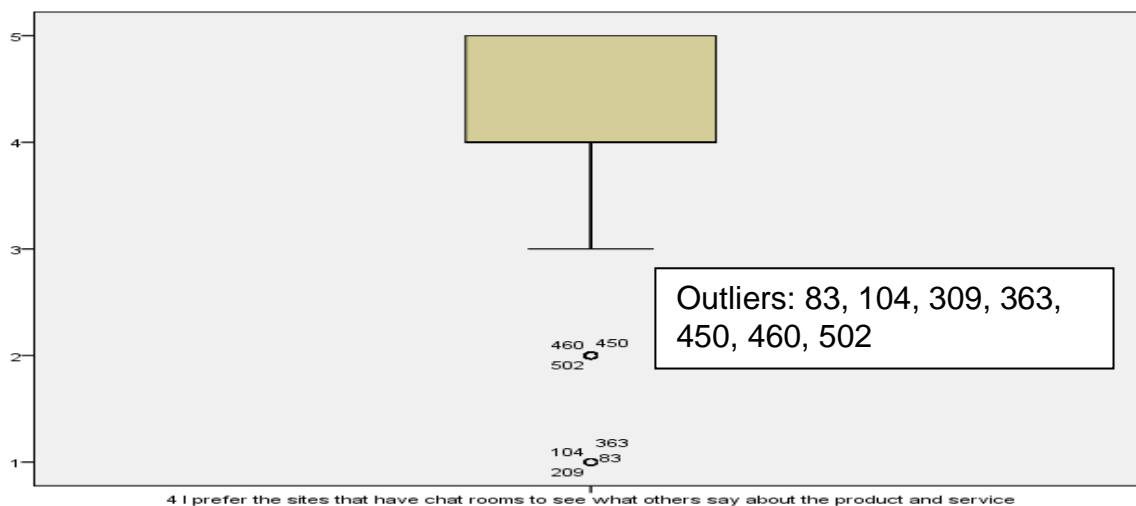
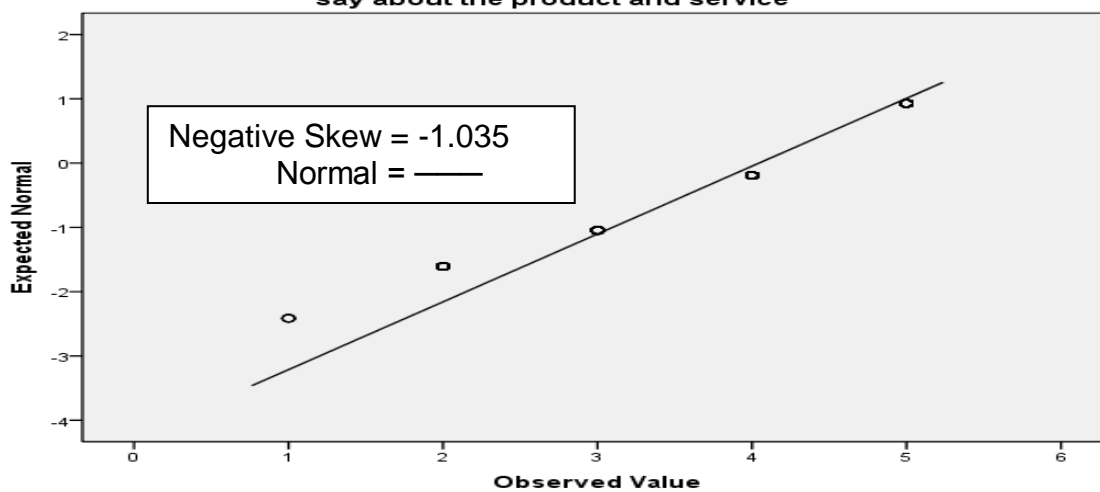


Figure S4. CSE 4, univariate normality assessment distributions.



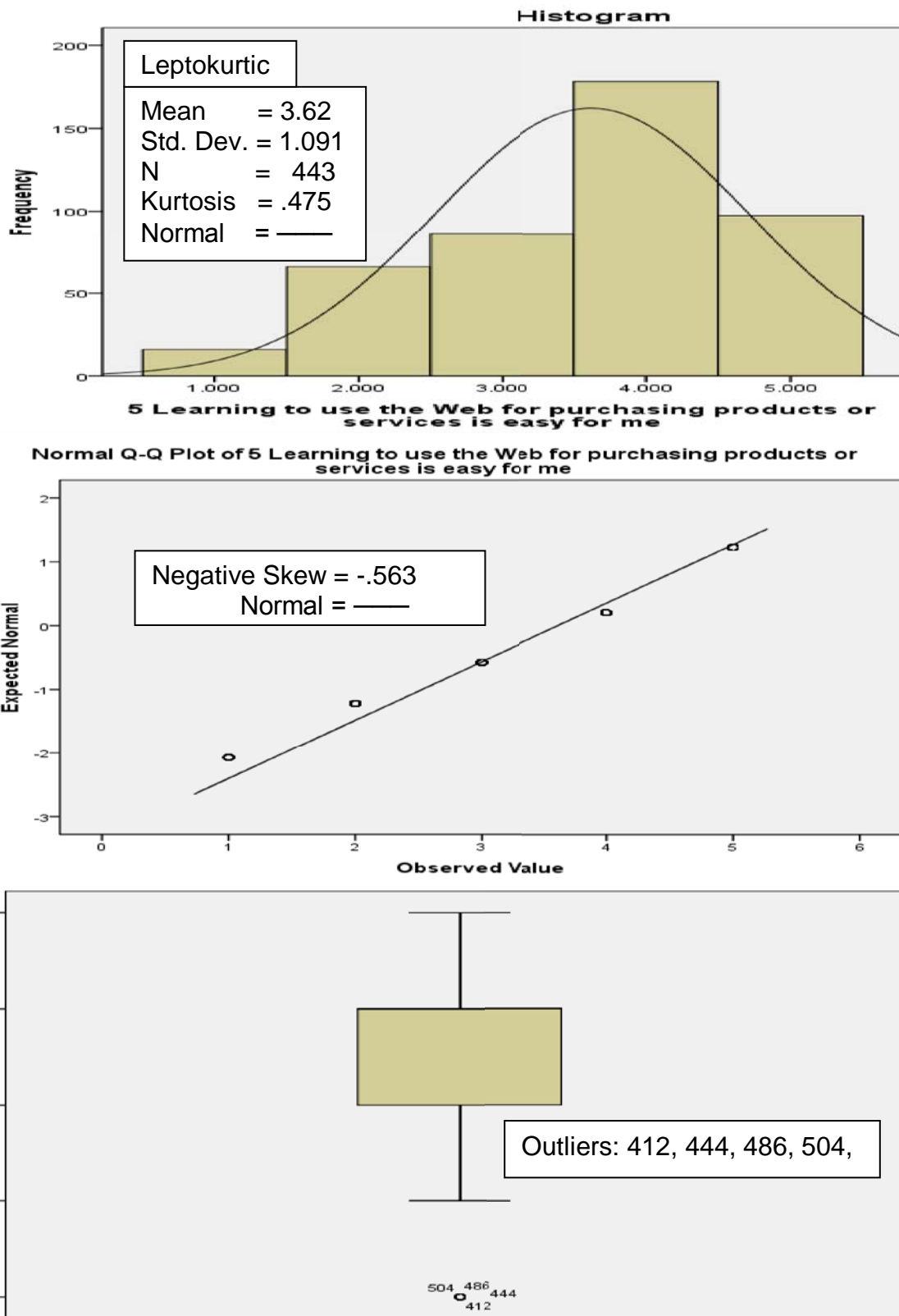


Figure S5. ATICT 1, univariate normality assessment distributions.

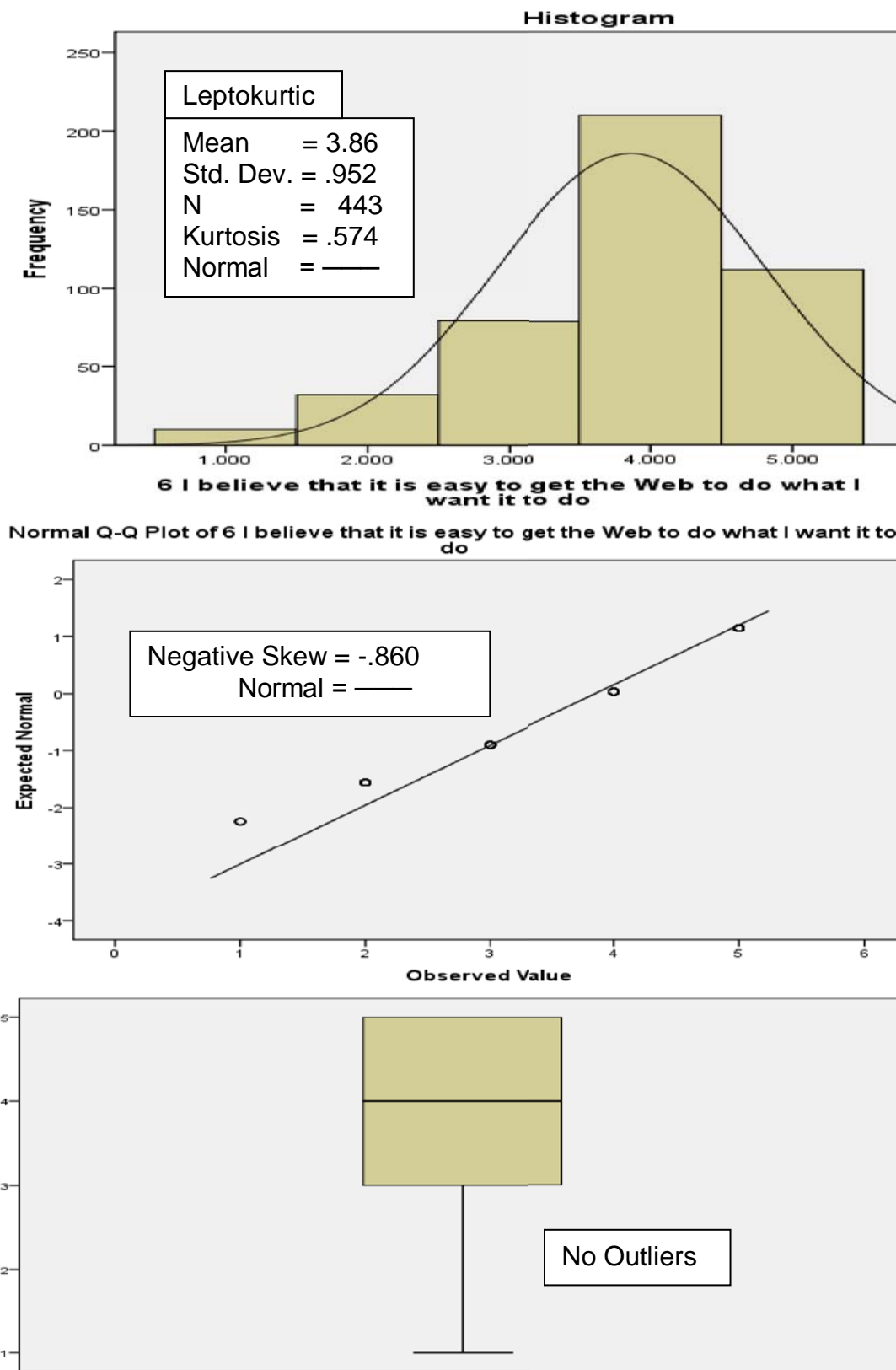


Figure S6. ATICT 2, univariate normality assessment distributions.

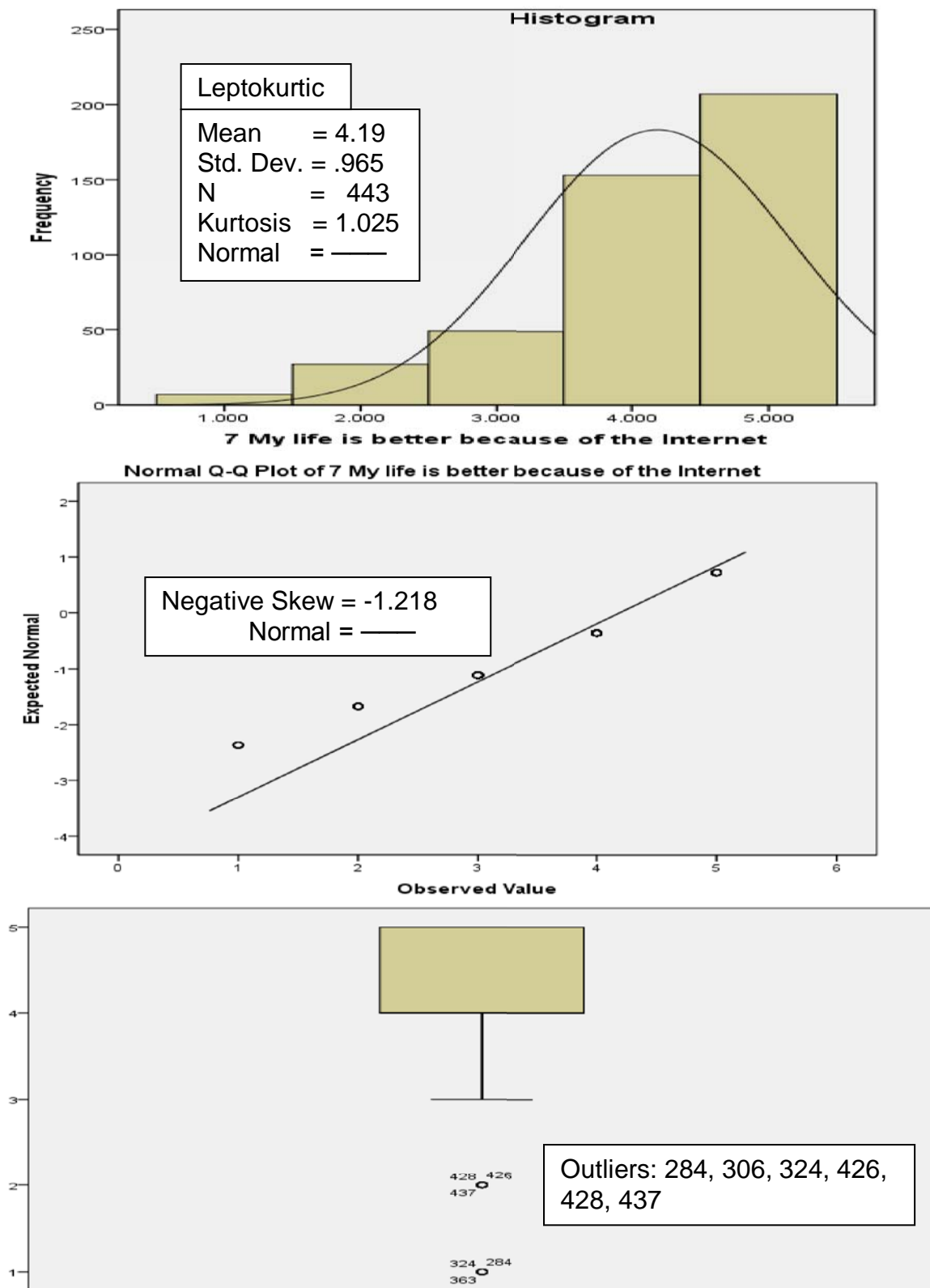
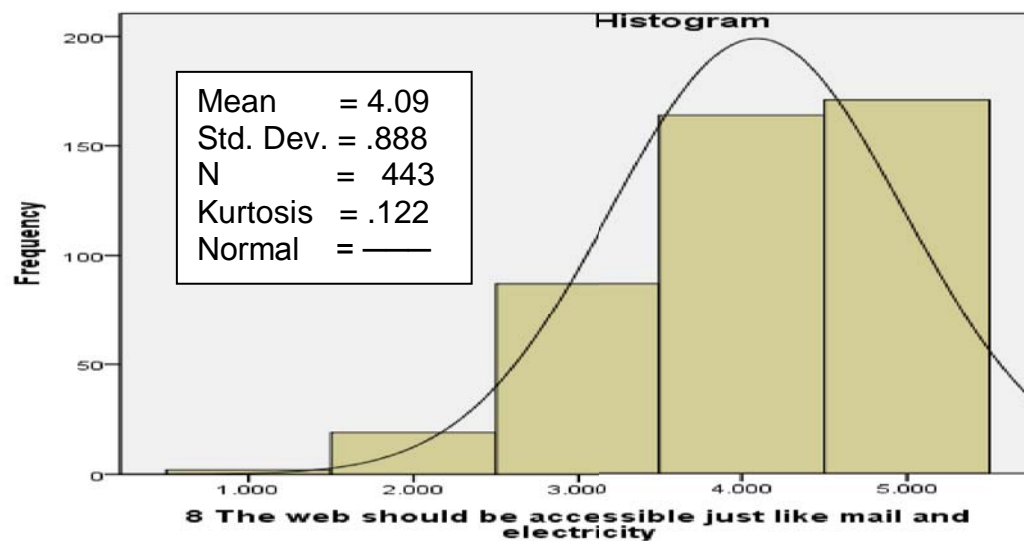


Figure S7. ATICT 3, univariate normality assessment distributions.



Normal Q-Q Plot of 8 The web should be accessible just like mail and electricity

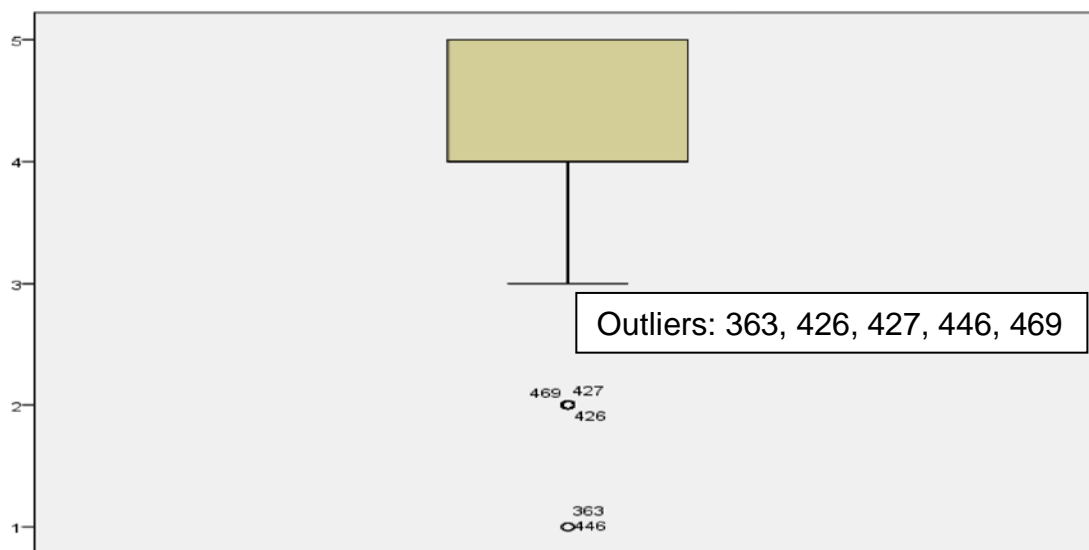
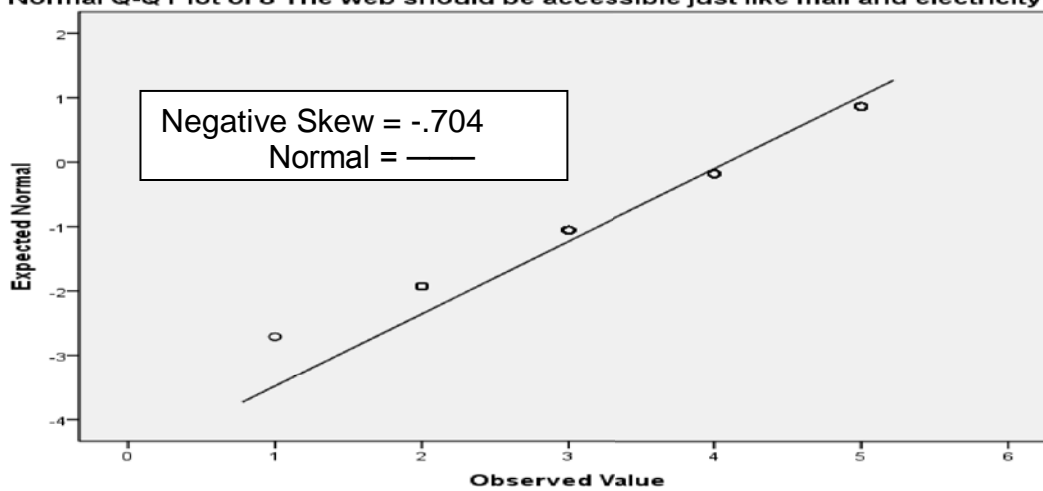


Figure S8. ATICT 4, univariate normality assessment distributions.

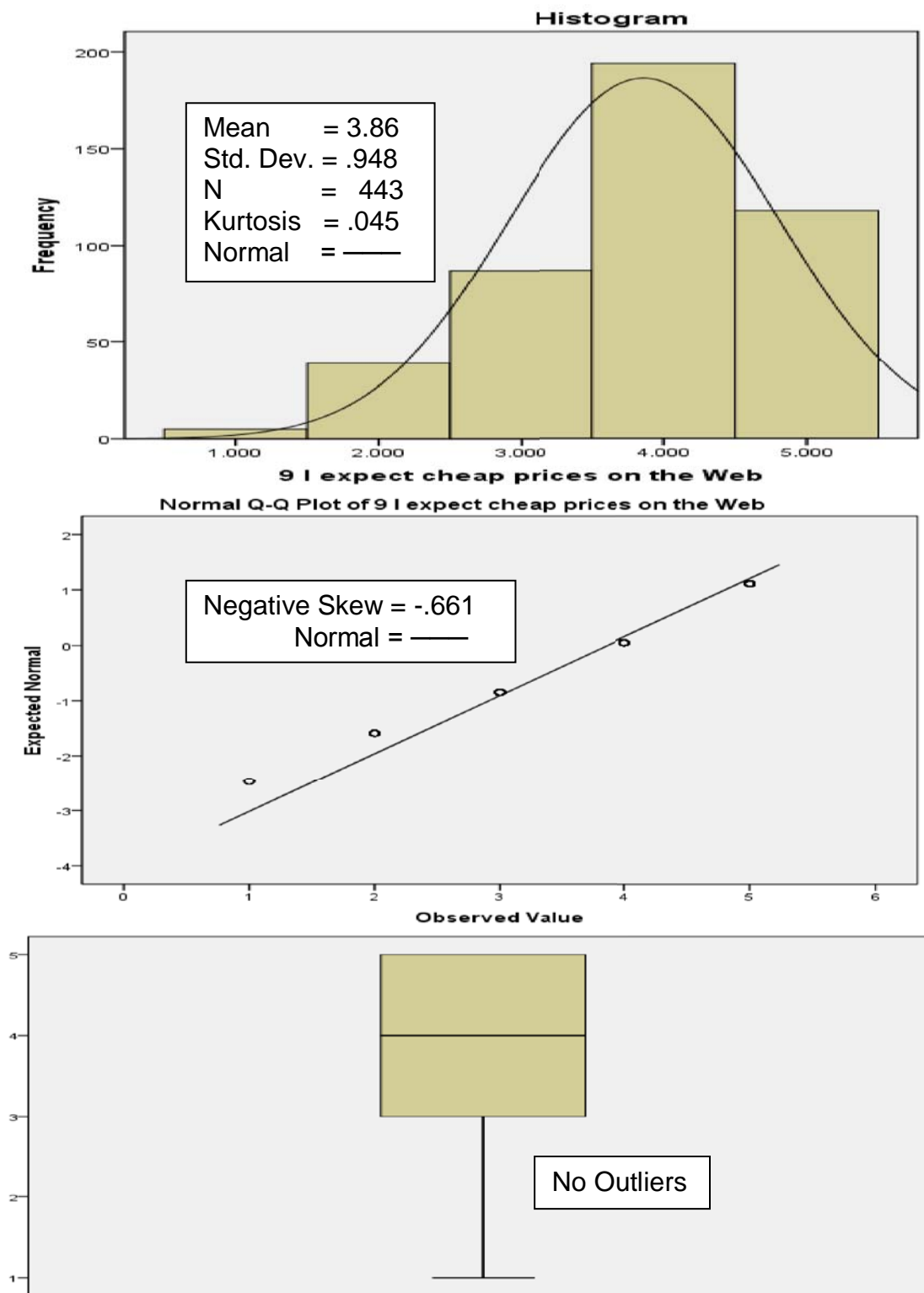


Figure S9. PUEC 1, univariate normality assessment distributions.

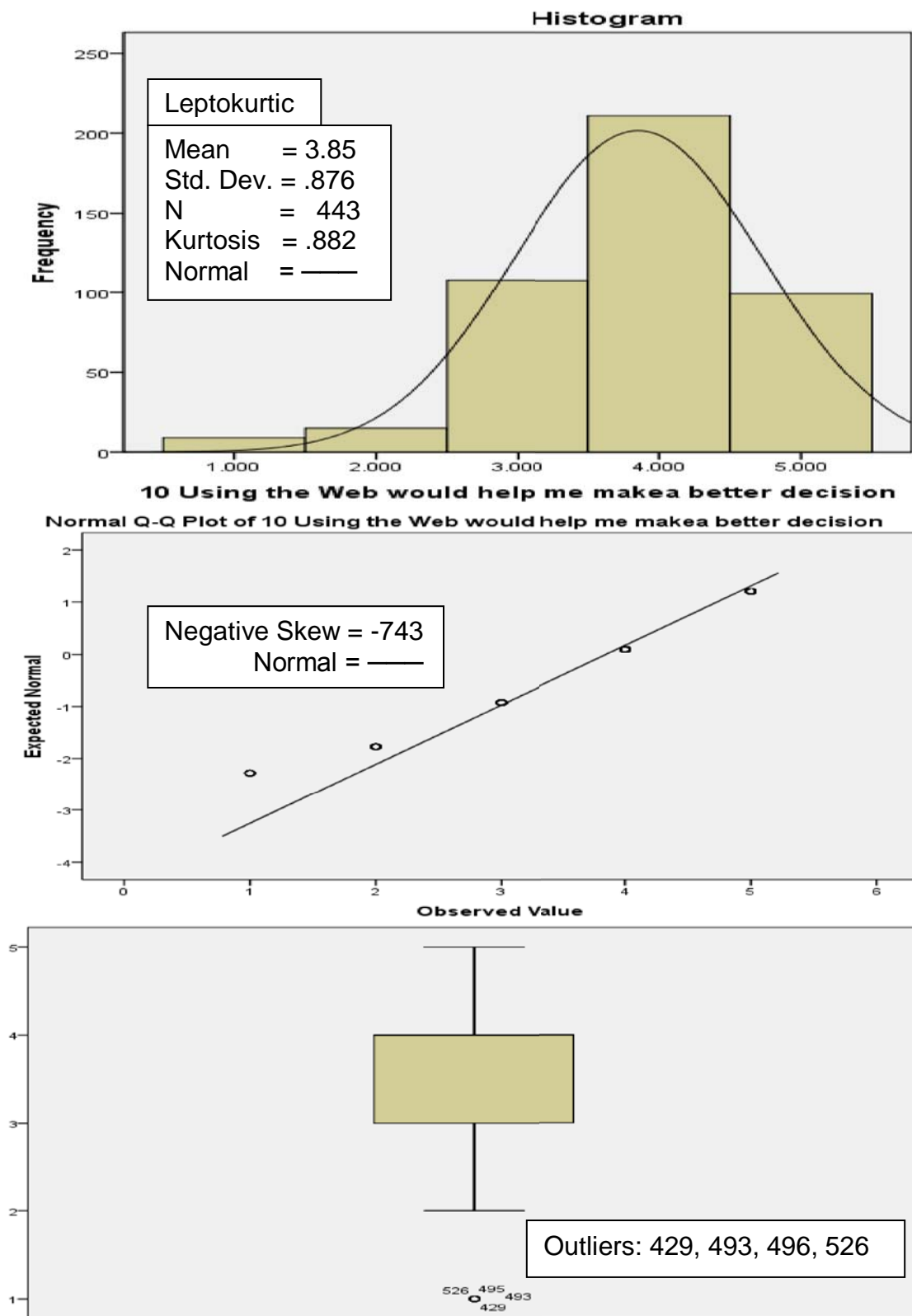


Figure S10. PUEC 2, univariate normality assessment distributions.

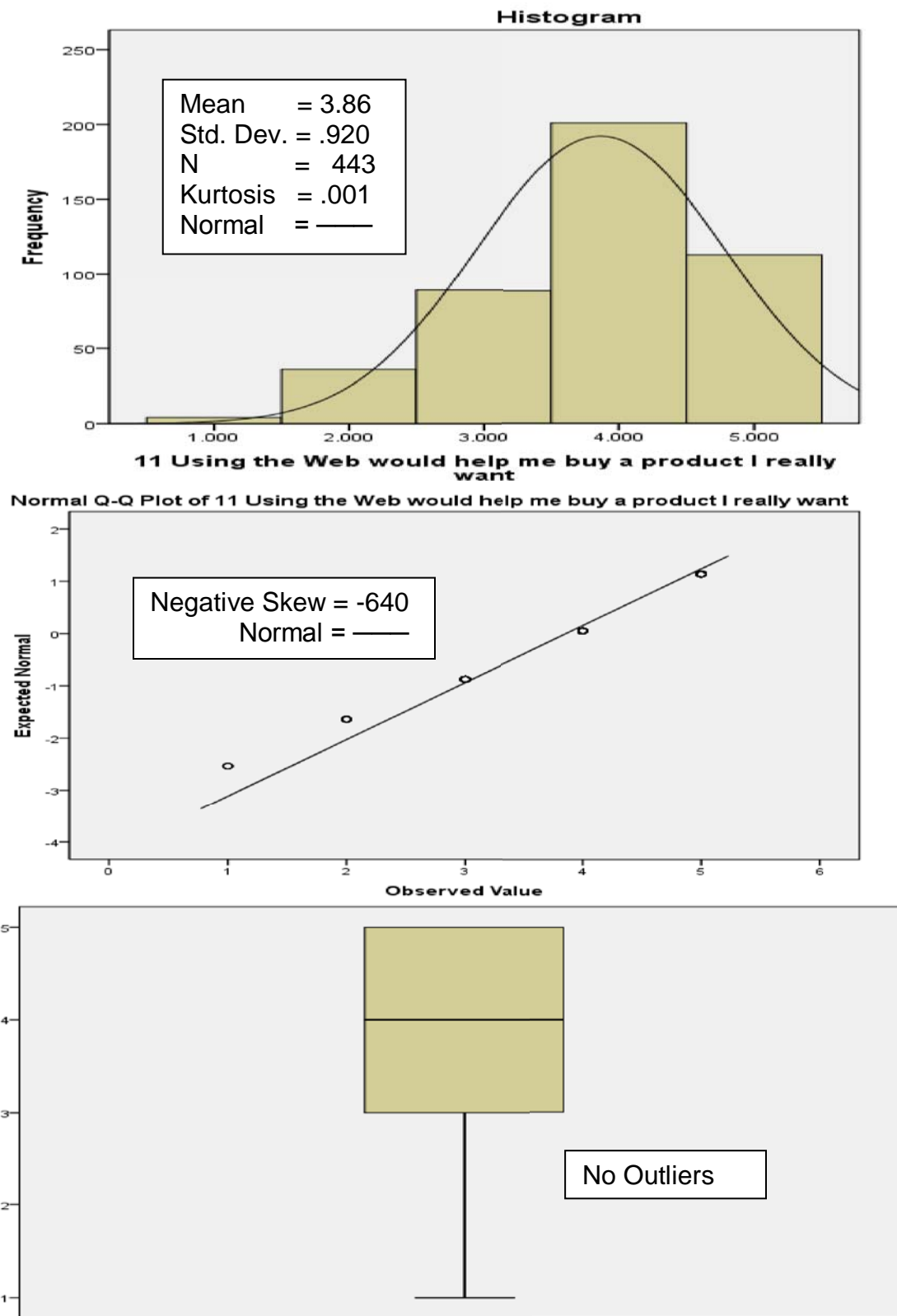


Figure S11. PUEC 3, univariate normality assessment distributions.

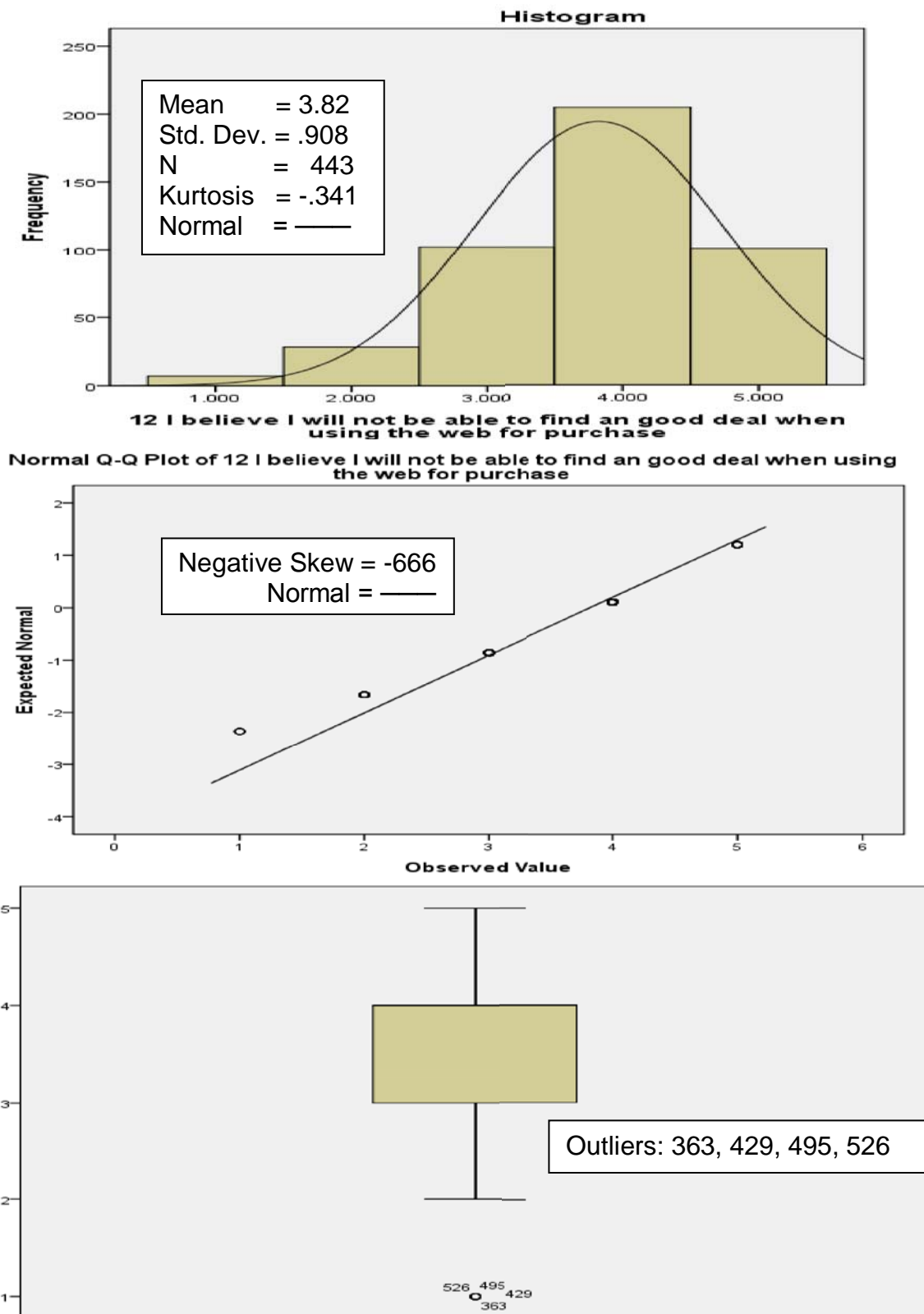


Figure S12. PUEC 4, univariate normality assessment distributions.



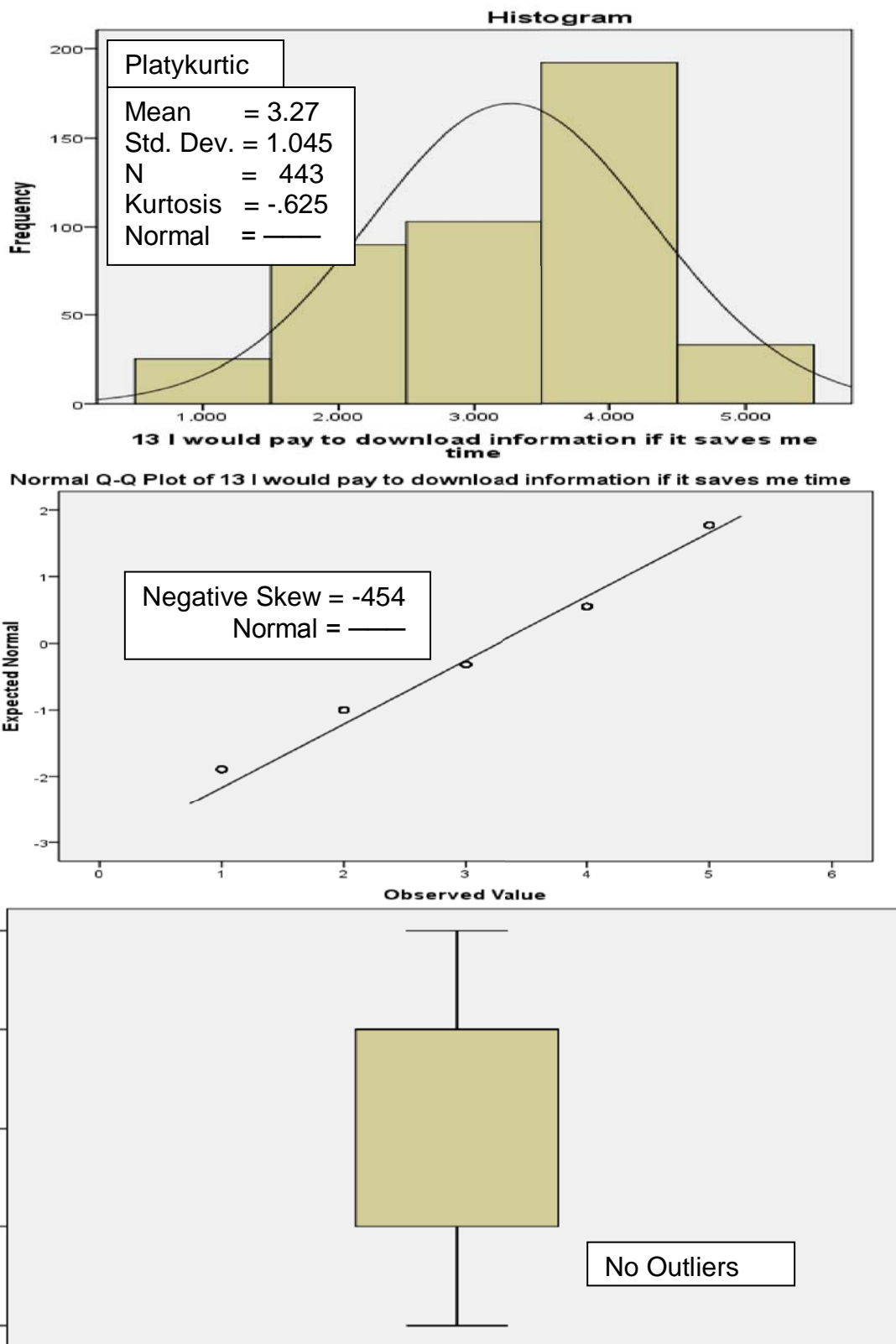


Figure S13. IUEC 1, univariate normality assessment distributions

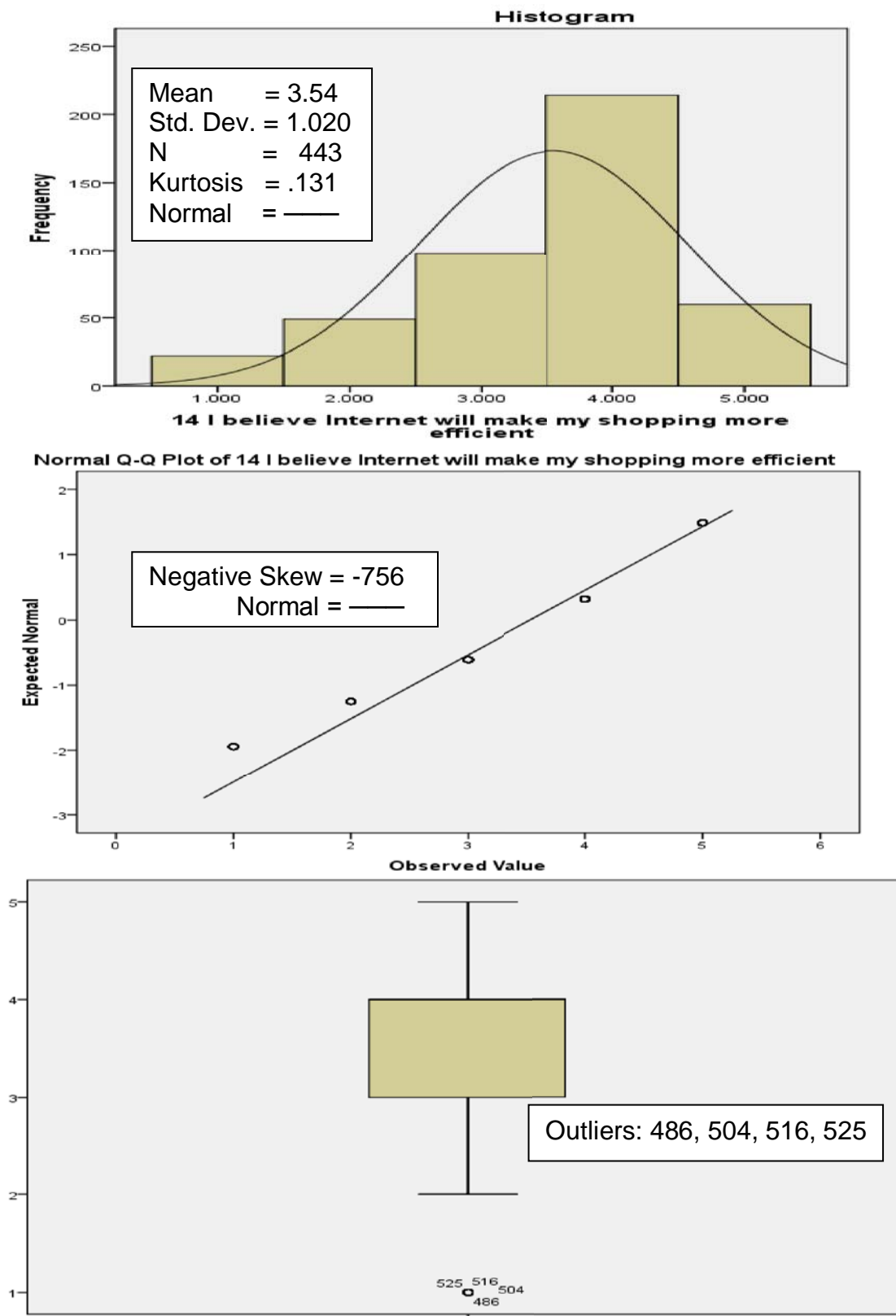


Figure S14. IUEC 2, univariate normality assessment distributions.

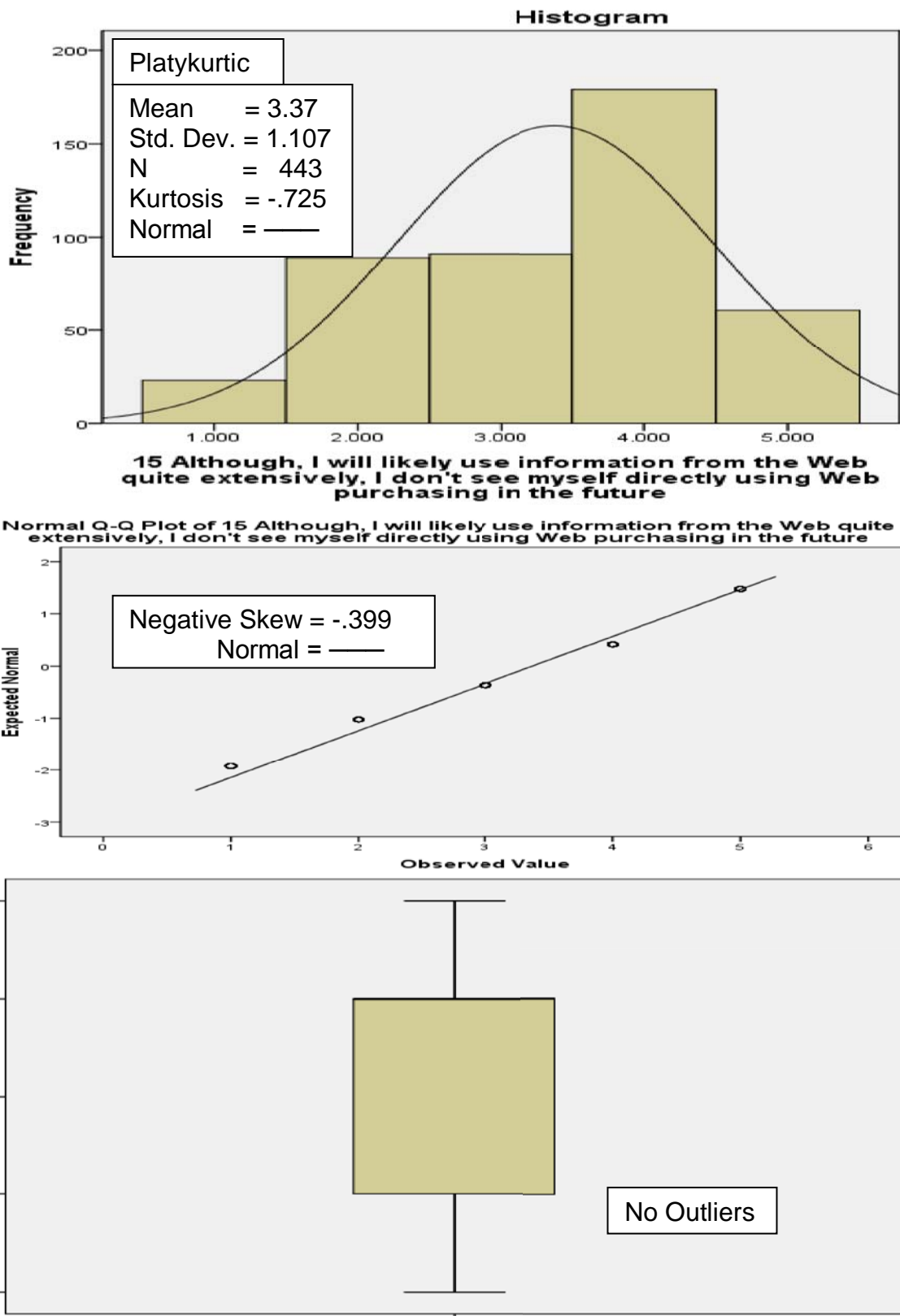
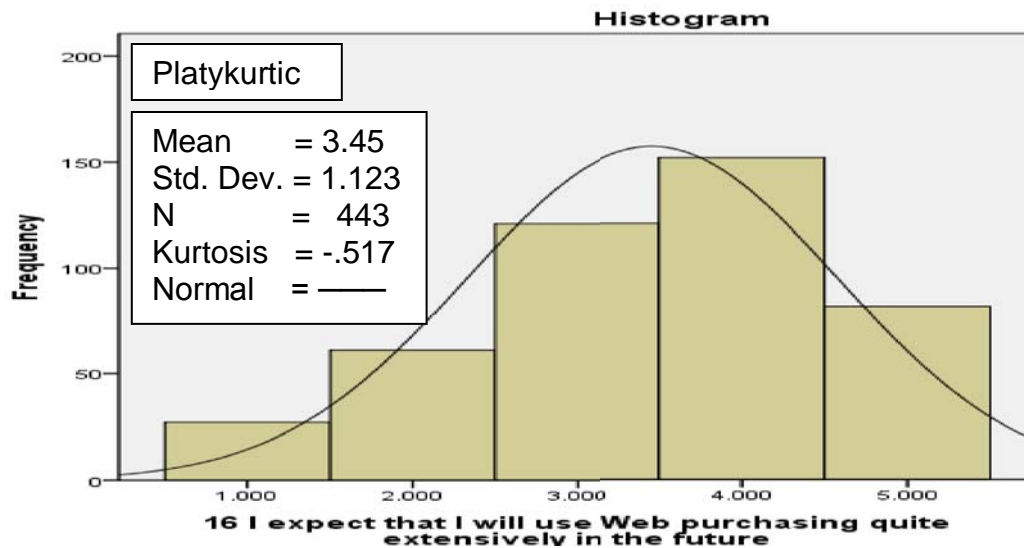


Figure S15. IUEC 3, univariate normality assessment distributions.



Normal Q-Q Plot of 15 Although, I will likely use information from the Web quite extensively, I don't see myself directly using Web purchasing in the future

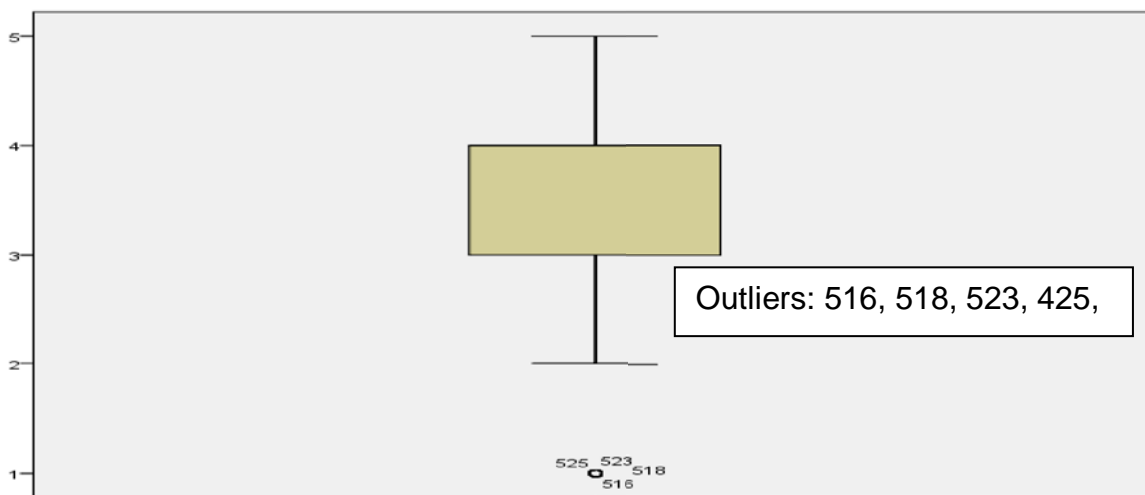
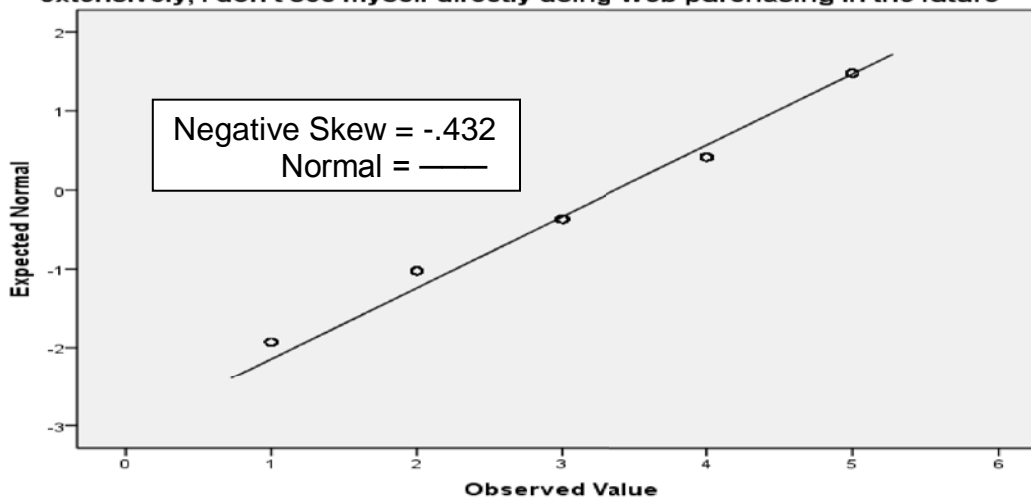
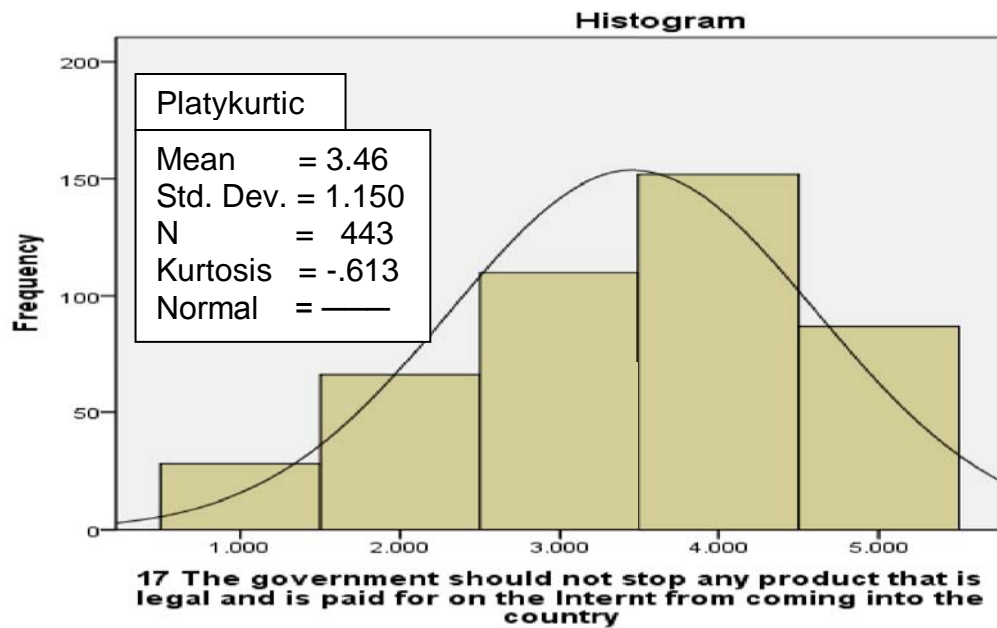


Figure S16. IUEC 4, univariate normality assessment distributions.



Normal Q-Q Plot of 17 The government should not stop any product that is legal and is paid for on the Internet from coming into the country

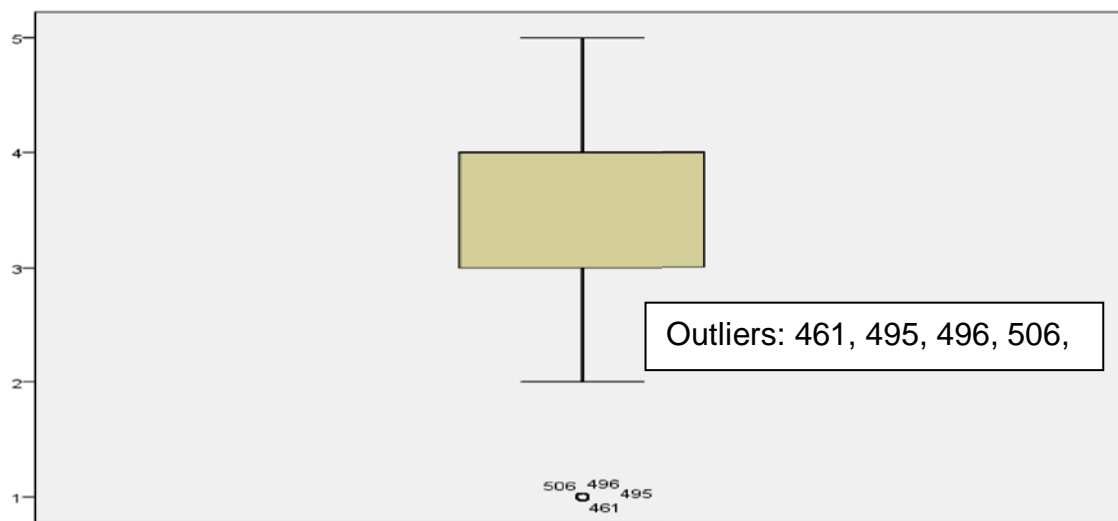
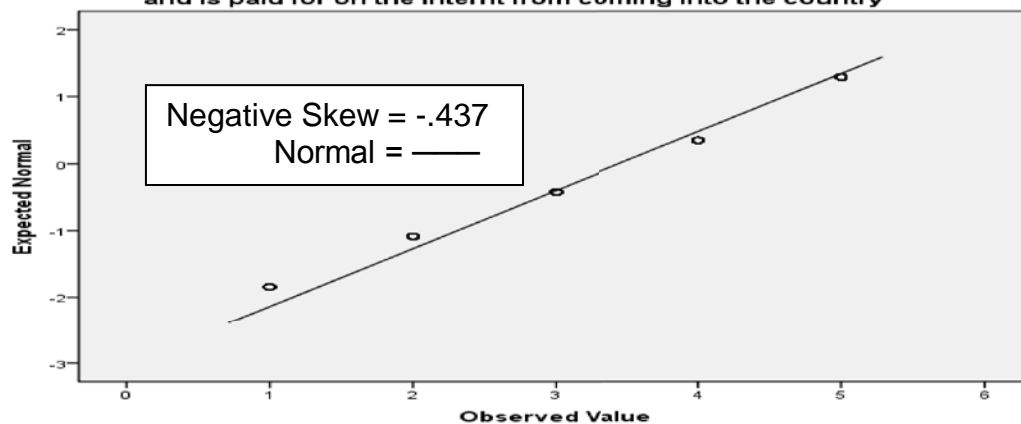


Figure S17. ST 1, univariate normality assessment distributions.

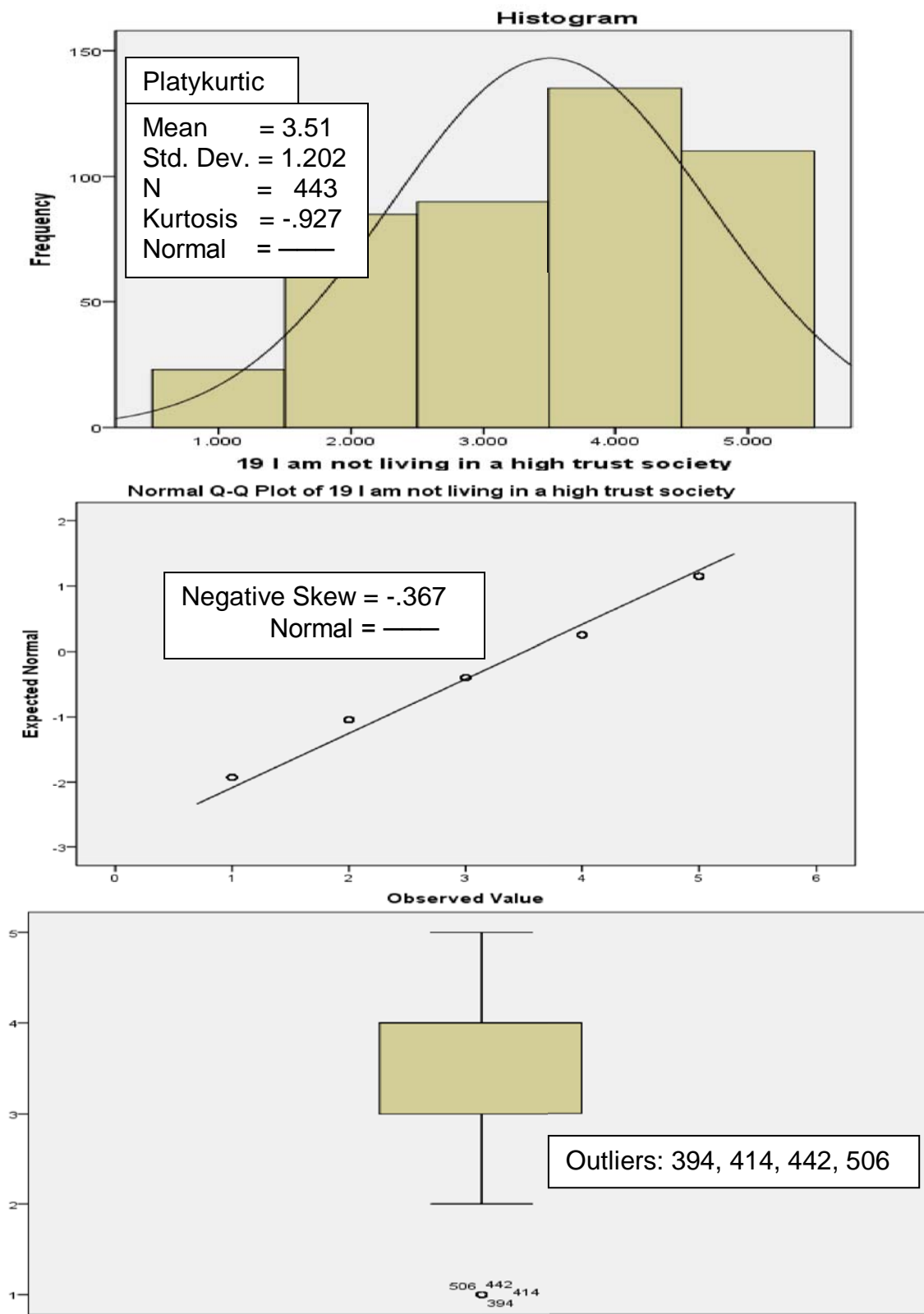


Figure S18. ST 2, univariate normality assessment distributions.

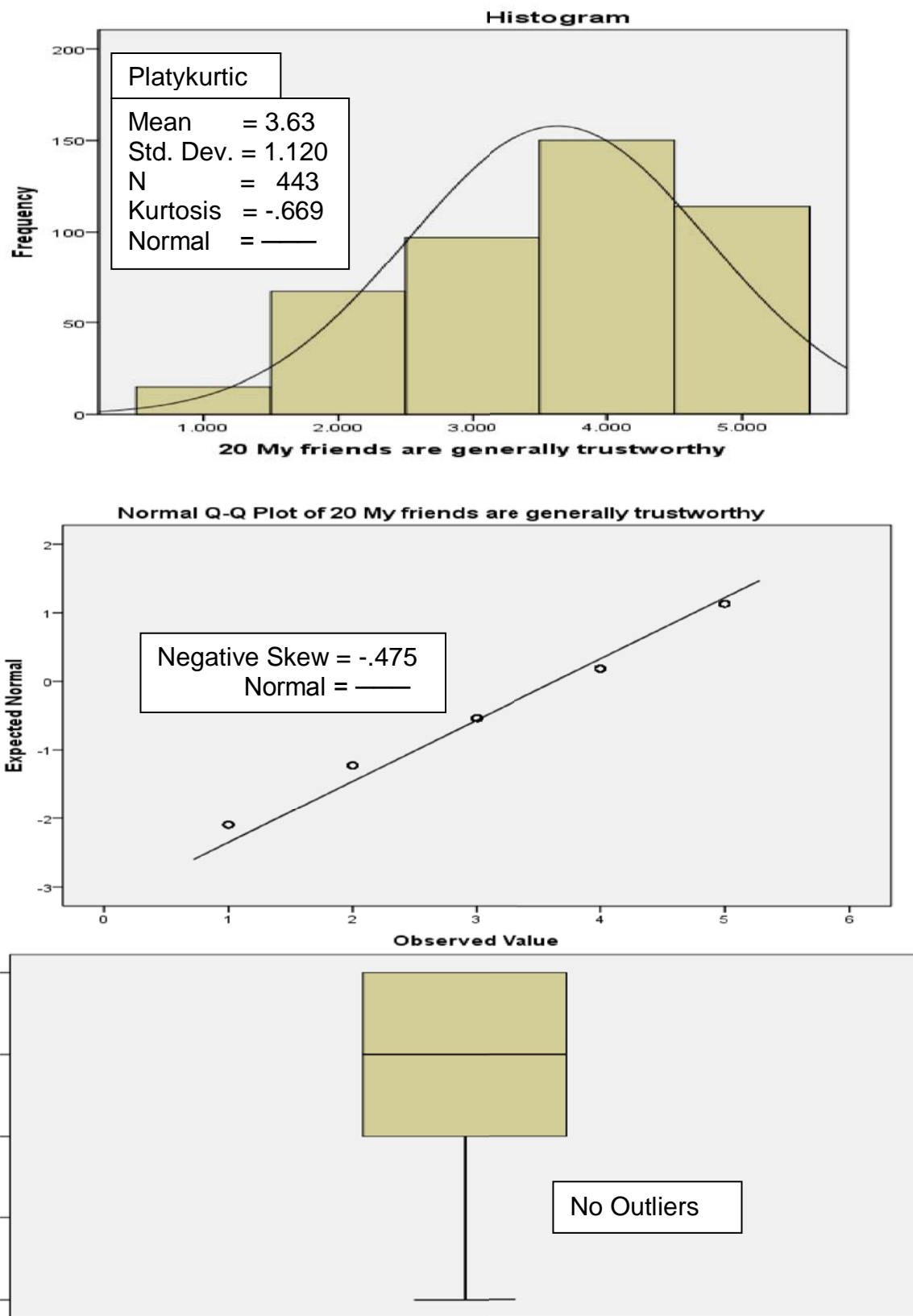


Figure S19. ST 3, univariate normality assessment distributions.

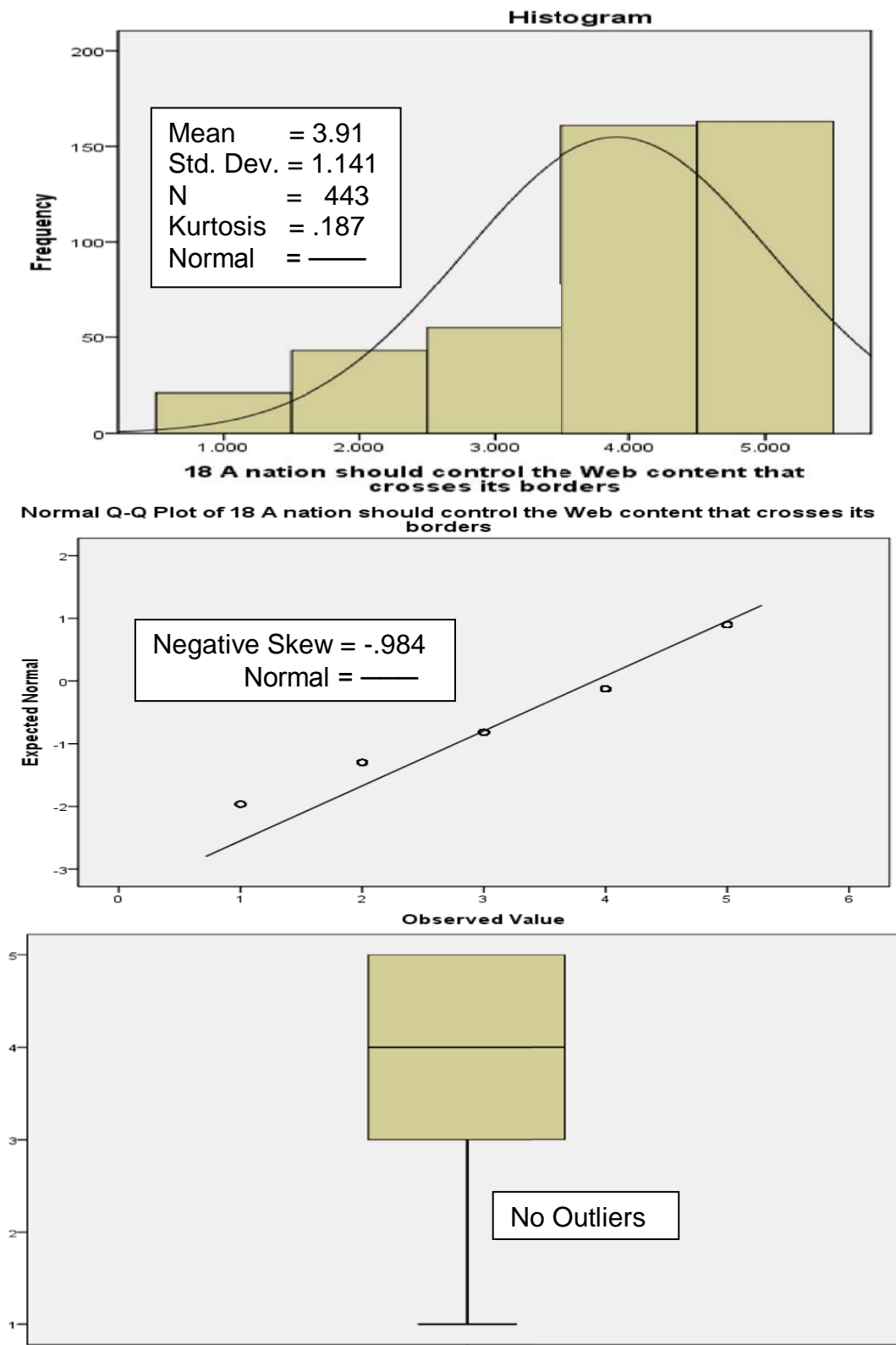


Figure S20. IF 1, univariate normality assessment distributions.



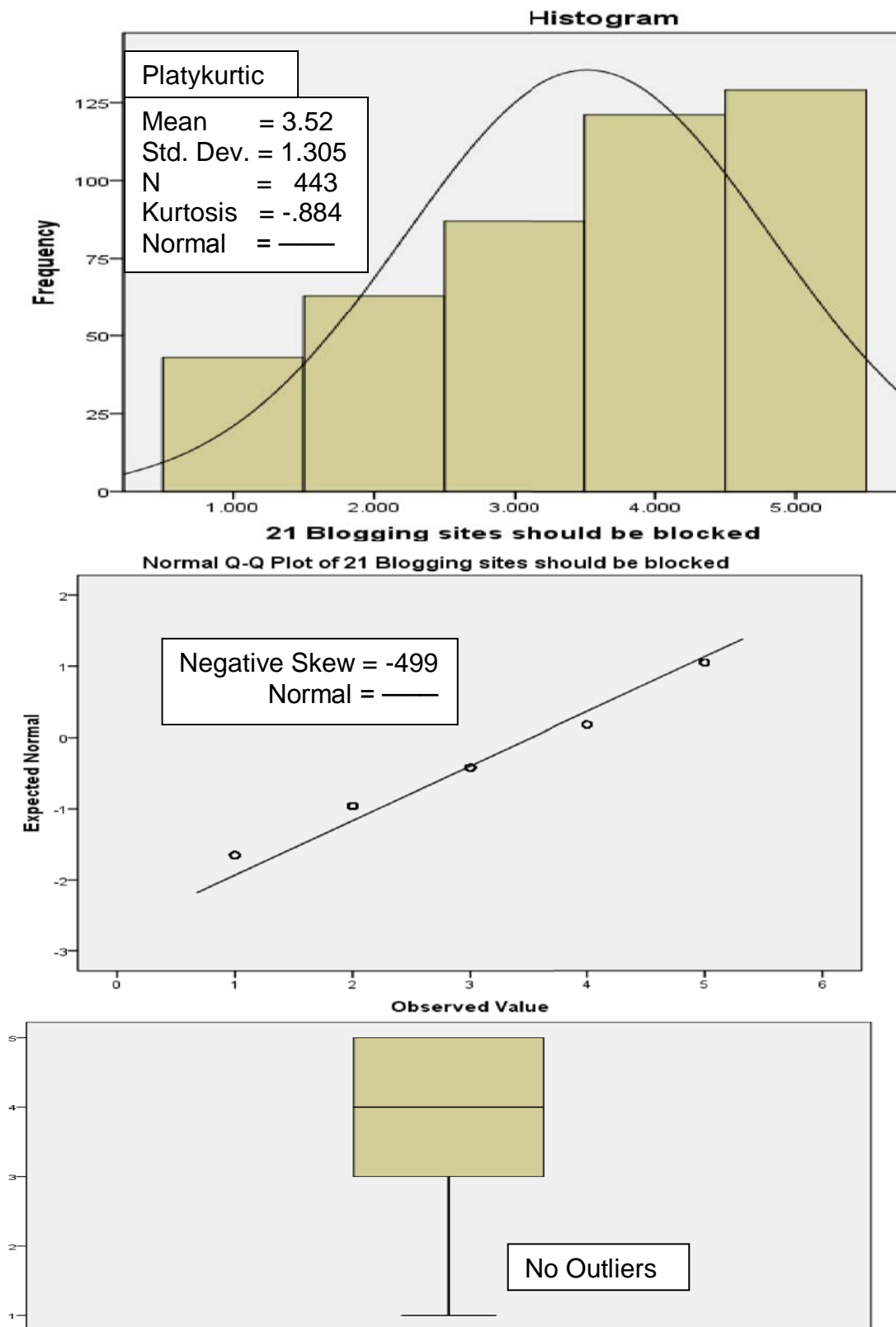


Figure S21. IF 2, univariate normality assessment distributions.

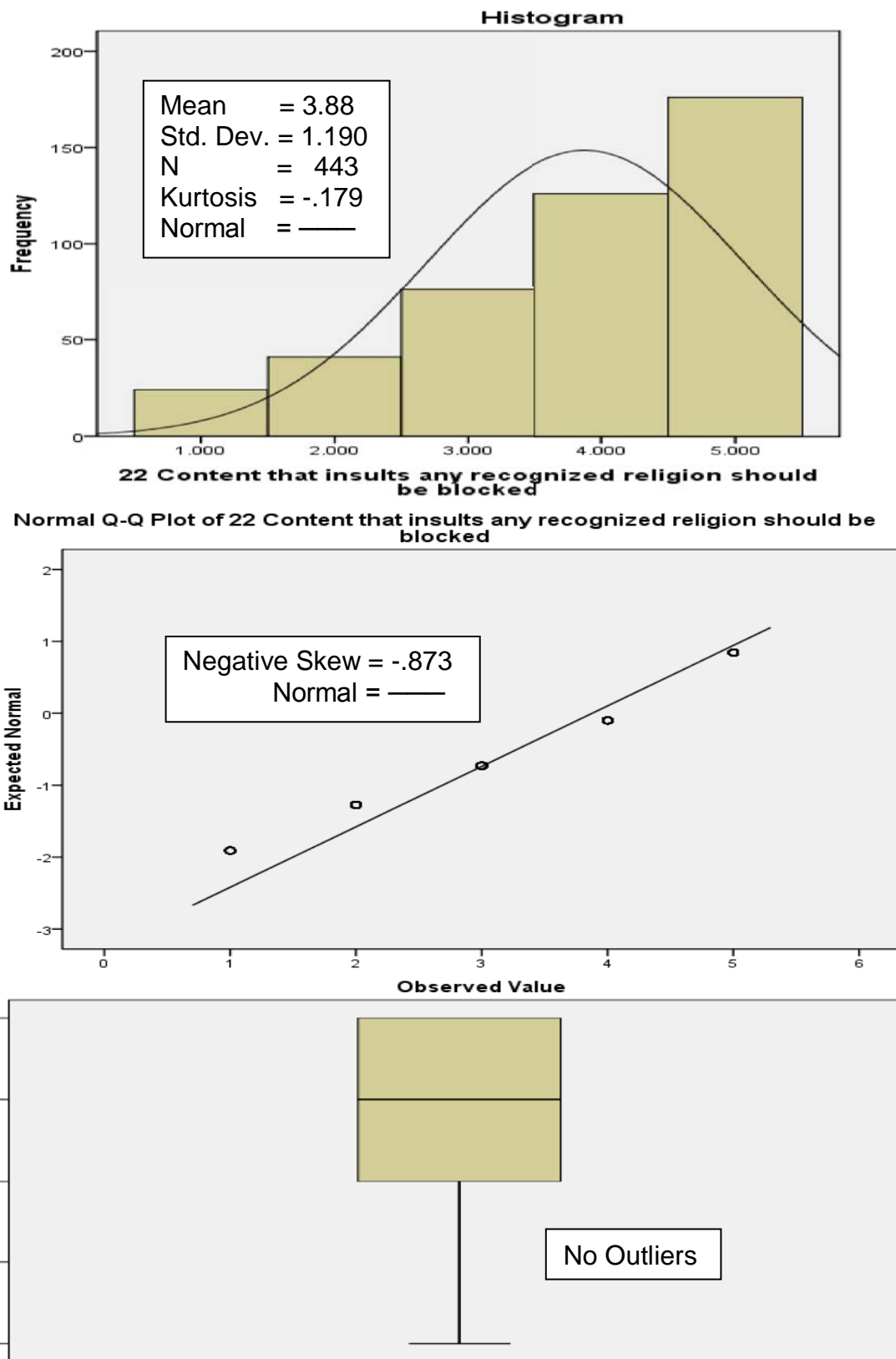


Figure S22. IF 3, univariate normality assessment distributions.

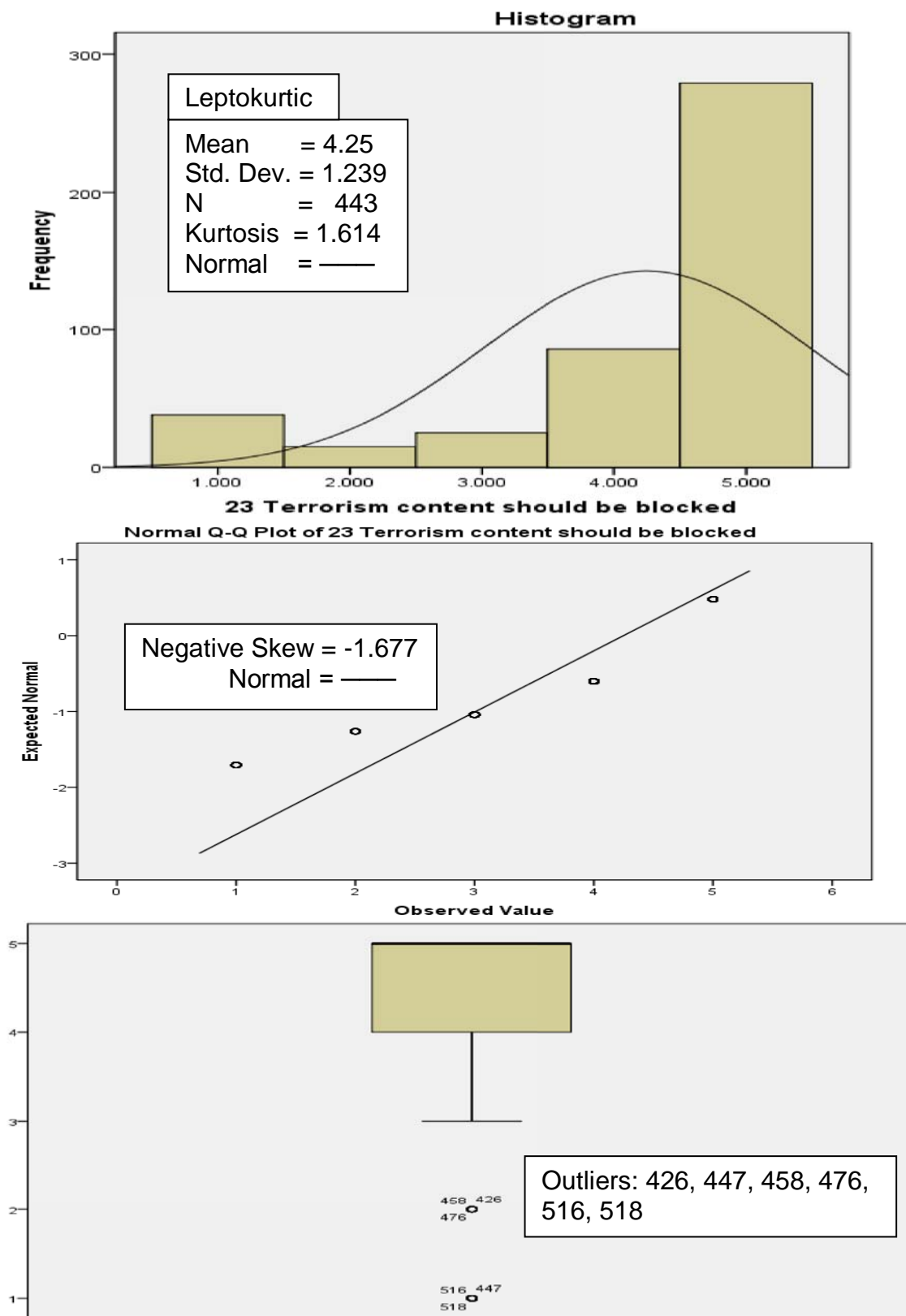


Figure S23. IF 4, univariate normality assessment distributions.

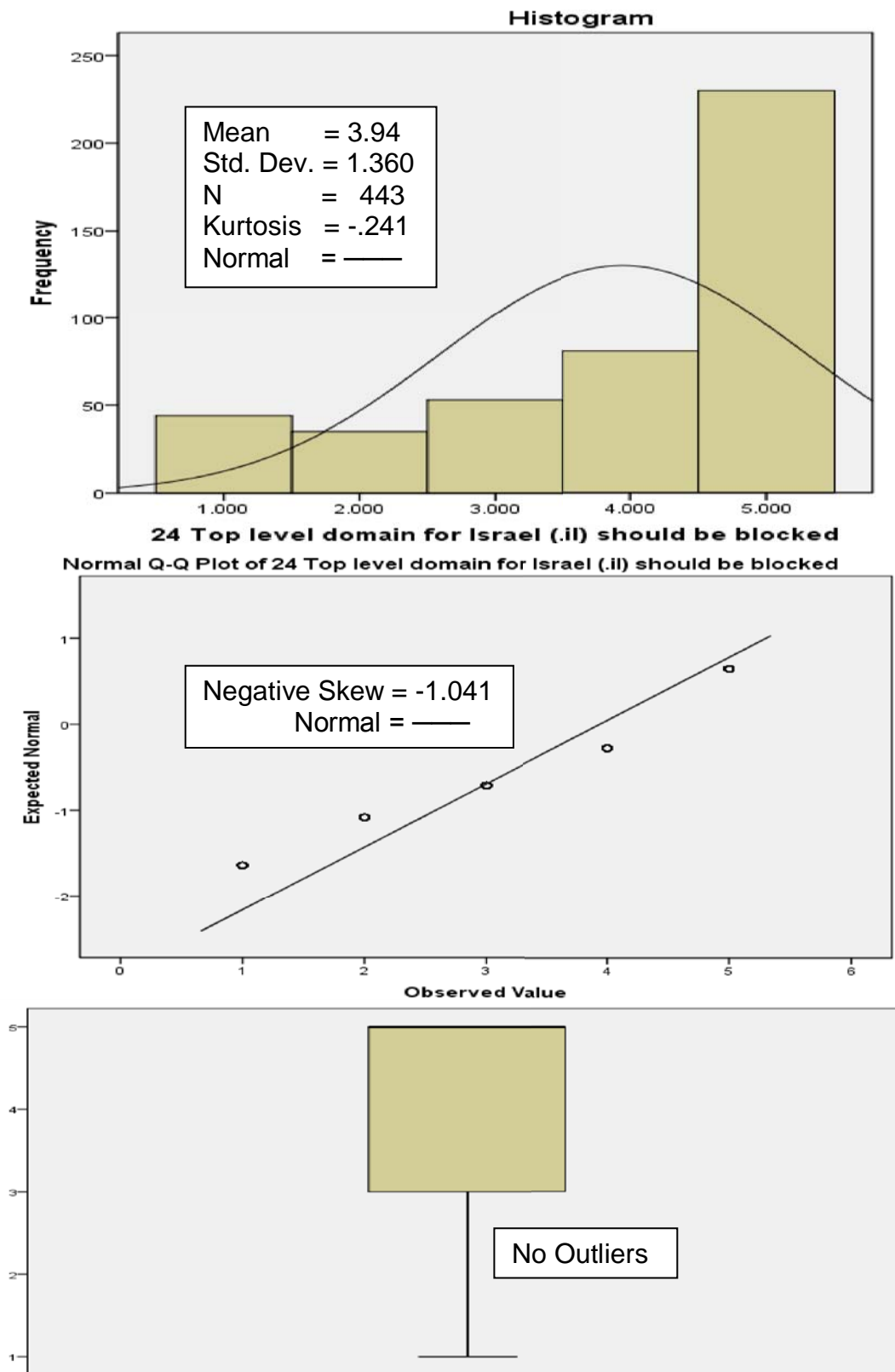


Figure S24. IF 5, univariate normality assessment distributions.