ADDIS ABABA UNIVERSITY
NATURAL AND COMPUTATIONAL SCIENCE
SCHOOL OF INFORMATION SCIENCE

GREEN INFORMATION TECHNOLOGY (IT) ADOPTION IN ETHIOPIAN TELECOM INDUSTRY: THE CASE OF ADDIS ABABA ZONAL ADMINISTRATIONS

AWET BRHANE TSEGAY

September 2020
ADDIS ABABA, ETHIOPIA

Addis Ababa University
Natural and Computational Science
School of information science

Green Information Technology (IT) Adoption in Ethiopian Telecom Industry: The Case of Addis Ababa Zonal Administrations

Thesis Submitted to the School of Information Science Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Science in Information Science (Information Systems)

By
Awet Brhane Tsegay

Advisor
Workshet Lamenew (Ph.D.)

September 2020
Addis Ababa, Ethiopia

Addis Ababa University
Natural and Computational Science
School of information science

Green Information Technology (IT) Adoption in Ethiopian Telecom Industry: The Case of Addis Ababa Zonal Administrations

Examining Board Approval

Workshet Lamenew (Ph.D.)	_____	_____
Advisor	Signature	Date
Getachew H/Mariam (Ph.D.)	_____	_____
Examiner	Signature	Date
Gashaw Kebede (Ph.D.)	_____	_____
Examiner	Signature	Date

Declaration

I hereby declare that this thesis work entitled "**Green Information Technology (IT) Adoption in Ethiopian Telecom Industry: The case of Addis Ababa Zonal Administrations**" is my original work carried out under the supervision of Workshet Lamenew (Ph.D.). I have duly acknowledged all the sources of information that have been used in the paper. In addition, this thesis has also not been submitted for any scholastic achievement in any university previously.

Awet Brhane Tsegay	_____	_____
Candidate	Signature	Date

As an advisor, this thesis has been presented for examination with my approval of its originality with the required level of accepted standard.

Workshet Lamenew (Ph.D.)	_____	_____
Advisor	Signature	Date

Dedication

This thesis work is dedicated to the loving memory of my late brother Solomon Brhane whose humbling love and inspiration remain unsurpassed even though he passed away suddenly by accident. Solomon was a very caring and passionate young man who was a source of contentment during the challenging years of my academic work. Solomon provided persistent encouragement and support to make me feel generally fruitful in my life, but I regret that he did not live long enough to witness this success. May the glory of God rest his soul and may the good angles always be with him! Amen.

Acknowledgement

First of all, I would like to express my gratitude to the Good Lord for His blessings and guidance allowing me to complete my M.Sc. work in good health throughout the testing academic journey. Pursuing a M.Sc. degree requires the goodwill support of many key individuals. Over the years, so many have provided me inspiration and encouragement that it would be difficult to name them all. It is therefore with profound appreciation that I express my gratitude to those who have contributed their priceless time, money and ideas to help me complete this dissertation.

My special gratitude goes to my advisor Dr. Workshet Lamenew for honoring me by agreeing to supervise my research paper at Addis Ababa University. I am grateful for the intellectual stimulation, scholarly guidance and valuable feedback provided throughout scholastic journey. This research would not have been possible without my supervisor's enthusiastic supervision. It also gives me great pleasure to candidly thank Prof. Chakra Dhar Dash and Dr. Akshaya Kumar Mohanty for their critical comments as well as valuable suggestions. Above all, I am indebted to acknowledge their thoughtful support and constructive recommendations which gave an interesting meaning to the ideas articulated in my research. I owe my heartfelt thanks to my wife, Mrs. Mahder Embaye and my lovely daughter Blen Awet who endured my endless absence from home and dissipation of our family financial resources in order to complete my studies as well as for having to suffer alone throughout this tiresome journey. I would like to say "I love you all" as always. I am still amused by my wife's emotional fortitude and passion which is beyond my imagination. I feel blessed to live my life with someone special like Mahder. I also acknowledge my truly inspirational parents Mr. Brhane Tsegay and Mrs. Tsega Hagos for their prayers, support and encouragement to strive for the highest academic achievements. Their shining example has guided me and it is through their devotion that I am in this position.

I would like to extend my deepest gratitude to my colleagues and friends at Ethiopian Management Institute for their remarkable technical assistance. I am also indebted to Ethio-telecom leadership and stuff for opening their doors and providing me the necessary information in response to my incessant questions making significant contributions to this study context. Finally, I wish gain to submit my humble acceptance that it all miraculously worked out thanks to the most loving, kind and precious God my maker and sustainer.

Abstract

Green information technology (IT) has become one of the widely debated issues around the world, and there has been increasing pressure to adopt green practices that are more environment-friendly. Among the most crucial practices, green IT practices broadly considered as most organizations and individuals use some form of IT to perform their day to day activity. In due course, the effect of climate change has shifted the focus to green technologies worldwide as the result of global warming. Subsequently, multiple studies have attempted to assess awareness towards the concept of green IT in different countries. This paper aims to explore factors affecting green IT adoption in the context of Ethio-telecom as ICT intensive sector in Ethiopia through determining the cognitive beliefs of IT professionals and managers. Many of prior research focused on factors influencing green IT adoption from the organizational point of view, and there is not much literature dedicated to the study of green IT belief and behavior at individual level. Moreover, most studies tend to focus on developed nations, while a lesser number of studies gave consideration to developing nations. Hence, this study proposed an inter-blended framework that incorporates three personality trait factors to the theory of planned behavior so as to investigate factors influencing actual behavior of adopting green IT as the result of initial decisions made at individual level. Furthermore, a two phase sequential explanatory mixed research design was employed and quantitative data was gathered by administering 289 valid questionnaires as well as interviews were conducted sequentially. Exploratory Factor Analysis (EFA) was used for determining unidimensionality of constructs via examining Correlation Matrix, Kaiser-Meyer-Olkin, Bartlett's Test of Sphericity and Factor Loadings with principal components extraction method followed by Confirmatory Factor Analyses (CFA) via convergent and discriminant validity tests to verify the multidimensionality of each constructs' scale items. In addition, Structural Equation Modeling (SEM) was employed to examine the hypothesized relationships and positive relationship of BI with attitude toward green IT, subjective norms toward green IT, perceived behavioral control toward green IT, consideration of future consequences and openness were found, and also, a positive relationship between Behavioral Intention (BI) to adopt green IT and Actual Behavior (AB) to adopt green IT was established; however, Neuroticism (NR) was found with insignificant relationship with BI. In addition, the hypothesized mediation relationships were tested using Baron and Kenney's causal step approach and bootstrapping methods; and BI was found as a mediator for the prior predictors and actual behavior of adopting green IT as well as moderating effect of gender, age and IT experiences were assessed via metric and configural invariance test and the groups revealed with no difference at model level but specified dissimilar at path level so that each path differences were determined. As the result of these findings, conclusions were drawn and a better fit model was proposed along with the recommendations put forwarded as well as limitations, contributions, implication and directions for future research are presented.

Keywords: Openness, Attitude, Subjective Norms, Perceived Behavioral Control, Behavioral Intention, actual behavior to adopt green IT, Consideration of Future Consequences, Openness to New Experiences, Neuroticism

List of Acronyms

AB	Actual Behavior to adopt Green IT
ATT	Attitude toward Green IT
BI	Behavioral Intention to adopt Green IT
CFC	Consideration for Future Consequence
CRGE	Climate Resilient Green Economy
DOI	Diffusion of Innovation Theory
GTP	Growth and Transformation Plan
ICT	Information and Communication Technologies
IS	Information System
IT	Information Technologies
ITU	International Telecom Union
NI	Network Infrastructure
NR	Neuroticism
OE	Openness to new Experience
PBC	Perceived Behavioral Control toward Green IT
SN	Subjective Norm toward Green IT
TAM	Technology Acceptance Model
TAM-2	Technology Acceptance Model-2
TPB	Theory of Planned Behavior
TRA	Theory of Reasonable Action
UTAUT	Unified Theory of Acceptance and Use of Technologies
UTAUT-2	Unified Theory of Acceptance and Use of Technologies-2
WSIS	World Submit on the Information Society

Table of Contents

List of Tables

List of Figures

Chapter 1 : Introduction

1.1 Background of the Study

The dynamic advancements of Information and Communication Technologies (ICT) have accelerated much faster than the anticipated outcomes by creating digital channels that enable millions of people to be digitally interconnected through wide range of computerized technologies that guarantee lively communication and transmission of information covering all corners of the world disregarding the physical distances (Sajja & Padmavathy, 2017). In due course, ICT has become an inherent requisite of the global society due to its enhancements for improved living standards via generating business opportunities as well as transforming from being a tool to improve business process into business enabler in the today's digital era (Li, Wu, Wang, Zhang, Xing, & Yan, 2019). (Ajzen & Fishbein, 1975)

Although, the initial thrust of ICT introductions were for solving more complex problems (Suryawanshi, 2019), its unprecedented advancements posed potential risk to the negative consequences of climate change (Alkali, Abdul-Azeez, Mansor, Chikaji, & Dodo, 2017). In this regard, the emergence green IT concept ascend as a way out to resolve the swelling vulnerability of ICT intensive organizations towards the elevating trend of energy consumptions that is typically placing heavy burden on electric grids along with the deprived eco-friendly practices in using the overall ICT equipment and resources (Mago, 2015, pp. 265-266). Evidences indicated that the massive ICT expansions derived to strengthen the alarming danger of carbon emission footprints perhaps signpost a gridlock trappings to greenhouse gas emissions and accelerate to environmental distortions globally (Noppers, Keizer, Bolderdijk, & Steg, 2014; Ojo, Raman, & Downe, 2019; Suryawanshi, 2019).

Green IT normally refers to the preventions of ICT's role towards the overall environmental crises and its emphasizes lay on the study and practice of computing devices in terms of designing, manufacturing, using and disposing of personal computers and servers along with the associated sub systems such as displays, printers, storage devices, networking and communication systems so as to guarantee no or minimal impact on environment (Molla, 2008; Molla, Abareshi, & Cooper, 2014; Yoon, 2018). As pointed out by Hart (1997), green IT also refers for using clean information technologies in order to diminish the chance to generate polluted ecosystem constituents via improving environmental friendly competencies and most possibly about reducing the impacts of ICT on the environment. Correspondingly, Klimova, Rondeau, Andersson, Porras, Rybin, and Zaslavsky (2016) defined green IT as the study and

practices of how to use computing technologies in an efficient, effective and economic way through considering aggregate impacts of ICT on the environment directly or indirectly. In due course, green IT becomes one of the top research priorities of these days in the information systems field of studies (Hernandez, 2017).

The traditional concept of green IT has been mainly focused on how to reduce energy consumptions of ICT equipment, resources and systems (Lei & Ngai, 2013). However, recent of green IT concepts are extending from energy saving (i.e. Green of IT) into maintaining greenery using IT (i.e. Green by IT) particularly for ICT intensive sectors. In this regard, green of IT signifies to the eco-friendly practices that aim to reduce the direct impacts of ICT on environmental crises in terms of designing, manufacturing, usage and disposal of ICT products (Asongu, 2018; Freeman, 2016; Sajja & Padmavathy, 2017), Accordingly, green by IT refers nearly to the creation of lower-carbon mindset using IT where the core features apt in promoting environmental sensitive culture along with real-time environmental monitoring and early disaster response systems (Ojo et al., 2019; Suryawanshi, 2019; Tamimi & Bensefia, 2018).

The initial thought of go green proposal for ecological responsiveness (Bansal & Roth, 2000) as well as the emerging green IT concepts remain to serve as a solution to the overall environmental challenges as the results of ICT dynamism so that adopting green IT practices remained as one of the essential measures to minimize carbon emission footprints (Caroro & Hernandez, 2018, pp. 1-2). Among the widely discussed eco-friendly practices, green IT practices are considered as vital strategic focus to maintain sustainable environment where ICT intensive firms and their constituencies tend to increase their demand for accessible and sustainable ICT infrastructures so as to acquire service quality in the process of performing their daily activities (Caroro & Hernandez, 2018, p. 3; Gazzola, Del Campo, & Onyango, 2019, p. 2). In this regard, sectors such as manufacturing, construction and telecom are among majorly vulnerable industries in terms of the aggregate energy consumptions typically broadening the carbon emission footprints along with their distinct shares (Sukarman & Putri, 2018, p. 309). In this regard, telecom as one of the major ICT intensive sectors in Ethiopia was selected by considering its relatively high contribution share towards the impact on the ecosystem crises; thus, this study context basically initiated based on two major rationales.

The primary motivational facet was headed towards the growing trend of global energy consumptions that remained to pose an alarming danger into the environmental sustainability concern (Asongu, 2018; Borthakur & Govind, 2017). In this regard, Sajja and Padmavathy

(2017) demonstrated global energy consumptions as almost 15% of the overall energy remained to be consumed by data center networks and 70% by cellular along with the other additional ingesting substances such as cooling and short product life cycle vested to negate the environment directly. Hence, the trend of ICT dynamism and its negative consequences on the environment are not different in the context of Ethiopia (Alem, 2019; Ali, Shifa, Shimeles, & Woldeyes, 2015; Mamo, 2015). The Ethiopian government established the Ministry of Communication and Information Technology (MoCIT) in 2010 and later in 2018 Ministry of Innovation and Technology (MoIT) recognizing the critical role of ICT development for national economic growth so that the government endeavors to promote ICT enlargements by considering the eco-system bearings within Ethiopia's climate resilient green economy strategy (UNDP, 2011). Congruently, the country's climate resilient green economy strategy (UNDP, 2011) presents a vision of low-carbon resilient economy that has been featured strongly in the GTP-II (NPC, 2016) as well as the GTP-II comprises the drive to be a manufacturing hub where the challenges of ICT advancements come to be more serious to maintain sustainable environment(World Bank, 2017).

Likewise, the national ICT policy and strategy of Ethiopia remained coherent with the GTP-II as well as aligned to the WSIS+10 declaration of principles on the implementation of WSIS Outcomes (ITU, 2014) besides GTP-II was principally designed based on the core principles of WSIS+10 outcomes except few discrepancies (Mammo, 2016).World Bank (2017) country partnership report indicated that Ethiopia has been taken an encouraging effort to incorporate climate resilience green economy into its development strategy, however, evidences identified that green IT readiness level remained at low level in different ICT intensive sectors of the country such as Ethio-telecom, Ministry of Communication and Information Technologies (MoCIT) and World Vision Ethiopia due to the low level of awareness; poor societal culture and thoughtfulness towards environmental concerns; lack of leadership commitments, resistance to change; lack of adequate skill and knowledge to embrace green IT practices; lack of comprehensive policy to incorporate energy efficient criteria; and financial burden to afford green IT solutions among the other multi-level factors (Alem, 2019; Mamo, 2015); thus, the rationale of this study was mainly originated from these inconsistencies.

The second motivational facet resided towards the fact that Ethio-telecom is currently struggling to enable its citizens with more flexible telecom services where as the huge ICT expansions tend to upsurge its vulnerability towards carbon emission footprints. As declared by Ethio-telecom (2019), the company has designed a so called bridge strategy for three years from 2019 to 2022

that recognize the importance of preserving ecosystem trepidations to reduce its impact on sustainable environment as well as deliberated a business plan of 2019/2020 budget year to increase total subscribers by 16% to 50.46 million, mobile voice subscribers by 15% to 48.32 million, data and internet users by 29% to 28.7 million, fixed broadband subscribers by 166% to 240K so as bring telecom penetration to 50.5%. Similarly, 73 (seventy three) additional shops are planned to be operational in this specific period of time that advances the total shops to 438 (four hundred thirty eight) along with the additional 75,000 (seventy five thousand) partner distributors and retailers typically considered to be engaged. Consequently, the total number of partners are planned to rise into 267, 000 (two hundred sixty seven thousand) throughout the country in order to realize service accessibility. In due course, the researcher was stirred in this regard since the company required to layout strategic focus so as to institute pioneering ways of resolving the potential environmental risks.

At the outset, conducting this research sets a fundamental theoretical foundation in more inclusive and modeled manner as well as addresses the call for empirical inquiries towards the prominent cognitive beliefs of individuals in order to adopt green IT in a certain ICT intensive sectors (Jayalath, Chathumali, Kothalawala, & Kuruwitaarachchi, 2019; Suryawanshi, 2019).Therefore, exploring factors affecting green IT adoption in the context of Ethio-telecom would to be worthwhile to pretense complete understanding at root level as one of ICT intensive sectors in the country (Mamo, 2015) as well as enhances the company to maintain eco-friendly practices for sustainable environment through endorsing logical means to reduce carbon emission footprints as the result of these massive ICT expansions.

1.2 Statement of the Problem

Over last few decades, people tend to utilize Information and Communication Technology (ICT) as one of the basic life essentials since it plays vital role in their day to day routines; yet, its contributions for ecosystem crises cannot be denied as the result of the pervasive expansions (Malison & Thammakoranonta, 2018). Since the dynamisms of ICT remain to scale-up carbon emission footprints, several developed and developing nations are becoming more concerned to carry out abundant appliances as well as incorporated different eco-friendly values into their business strategy so as to preserve ICT's aggregate contributions to the overall deteriorations of the environment that dwell notable threat to human lives worldwide (Kamaru, 2015; Ojo et al., 2019; Xia, Zhang, Yu, & Tu, 2019). According to NPC (2016)the government of Ethiopia has recognized the critical role of ICT developments to help reduce extreme poverty and promote

shared prosperity by improving the flow of information and service qualities and expanding business competitiveness so as to provide opportunities for economic diversification.

In due course, Ethio-telecom has planned to double uplift telecom penetration throughout the country in 2019/2020 Ethiopian budget year (Ethio-telecom, 2019) whereas environmental challenges become more obvious and urgent as the result of this massive dispersal. Likewise, evidences indicated that the readiness level of green IT and other technologies such as cloud computing implementation in Ethiopia's ICT intensive sectors including Ethio-telecom revealed as either in low status or slowly diffusing trend (Leulseged, 2017; Mamo, 2015)even if Ethiopia's ICT developments rank among the bottom docile in most international indices (World Bank, 2017). As pointed out by Chou and Chou (2012), organizations primarily required to recognize the potential value of green IT in terms of awareness and then translate the value into green IT strategy that inclusively align with high level organizational policies and strategies along with sound measurements criteria to determine the outcomes of green IT initiatives.

Thus, ICT intensive sectors like Ethio-telecom currently pledged to incorporate ecological sustainability issues into their policies along with the declarations of guiding principles. However, Malison and Thammakoranonta (2018) argues that green IT adoption highly depend on personnel sentiment since cognizing cognitive beliefs towards green IT concern where notable evidences presented their agreement towards the essential strides of these root level beliefs so as to appeal logical reasoning and credible means for resolving the damaging effects ICT's dynamism to environmental crises as well as suggested substantial requirements to carry out inclusive understanding in order to place strategic foundation for maintaining sustainable environment particularly in ICT intensive organizations (Choon, Sulaiman, & Mallasi, 2014; Chow & Chen, 2009).In this regard, understanding individuals' cognitive beliefs remained as one of the fundamental rudiments in order to make green IT solutions succeed otherwise it will remain difficult for a certain organization to maintain values and principles of greenery (Dezdar, 2017; Linehan & Fisher, 2018).As a result, two basic research gaps were identified to conduct this study context.

The primary research gap was drifted towards previous green IT explorations where most of the studies focus on energy efficiency; computing resource recycling and e-waste management; green use and disposal of ICT devices; IT product design effectiveness; and green IT readiness but there is limited researches on cognitive beliefs towards green IT (Alziady & Enayah, 2019; Dezdar, 2017; Yoon, 2018). Correspondingly, several previous studies absorbed much effort on

exploring ascendants of green IT adoption from the organizational point of view; however, there is not much literatures dedicated to the study of green IT adoption at individual level and most studies emphasized on the developed nations context; whereas, lesser number of studies has been conducted towards the unique setting of developing nations (Busic-Sontic & Brick, 2018; Choon et al., 2014; Dezdar, 2017; Wu & Ke, 2015).

The second research gap resided towards the significant variability in conceptualization and measurement credentials towards green IT adoption both at individual and organizational level. In this regard, studies towards green IT adoption at organizational level have employed a variety of theoretical frameworks, such as the Technology-Environment-Organization (TOE) framework (Molla, 2008); Institutional Theory (Chen, Watson, Boudreau, & Karahanna, 2011);Norm Activation Theory (NAT) (Lei & Ngai, 2014); Organizational Culture Theory (OCT) (Deng & Ji, 2015); Organizational Motivational Theory (OMT) (Molla & Abareshi, 2011); and Resource-Based Theory (RBT) (Ryoo & Koo, 2013). In due course, several ascendants of green IT adoption at organizational level were identified where environment related factors have received more attention than technology associated dynamics but still no consensus towards the conceptualizations and measurements along with the ongoing scholarly debates on ecological trepidations at firm level (Deng & Ji, 2015).

Nevertheless of the limited number of studies towards green IT adoption at individual level, prior studies have employed diverse theoretical foundations such as Self-Determination Theory (SDT) (Koo & Chung, 2014; Wati & Koo, 2012); Theory of Reasoned Action (TRA) (Mishra, Akman, & Mishra, 2014); Belief-Action-Outcome (BAO) Framework (Gholami, Sulaiman, Ramayah, & Molla, 2013; Molla et al., 2014); Technology Acceptance Model (TAM) (Akman & Mishra, 2015); and Theory of Planned Behavior (TPB) (Ajzen, 1991). At the outset, extending Theory of Planned Behavior (TPB) through the most relevant personality traits remained as robust integrated framework that received wider support for explaining green IT adoption at individual level (Choon et al., 2014; Dezdar, 2017). For instance, Dezdar (2017) and Choon et al. (2014) proposed green IT adoption frameworks by integrating personality trait factors into TPB in order to scrutinize individuals' cognitive beliefs and attitudes towards environmental trepidations in the context of a developing country taking Iraq and Malaysia respectively as well as demonstrated TPB as the most vibrant and logical framework to determine individuals' behavioral psychology.

Correspondingly, prior studies argue that there have been a number of differences between green IT adoption and the adoption of other technologies along with the termed similarity that was initially uttered by Molla (2008) in his first attempt to develop green IT adoption framework. In this regard, there are variety of theoretical frameworks such as Diffusion of Innovation Theory (DOI) (Rogers, 2010), Technology Acceptance Model (TAM) (Davis, 1989); Technology Acceptance Model-2 (TAM-2) (Venkatesh & Davis, 2000); Motivational Model (Igbaria, Parasuraman, & Baroudi, 1996); Social Cognitive Theory (Bandura, 2001); Unified Theory of Acceptance and Usage of Technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003); and Unified Theory of Acceptance and Usage of Technology-2 (UTAUT-2) (Venkatesh, Thong, & Xu, 2012) are widely engaged for stating user behaviors towards accepting emerging information systems and technologies. However, most of these frameworks were applied to determine consumer driven behaviors so as to meet commercial purposes in various information system literatures (Chang, Hajiyev, & Su, 2017; Sharma & Mishra, 2014; Tadesse & Bahiigwa, 2015; Venkatesh & Davis, 2000; Venkatesh et al., 2012). Therefore, the researcher developed a conceptual framework by integrating TPB and personality traits so as to meet the objective of exploring factors affecting green IT adoption in Ethio-telecom taking the case of Addis Ababa zonal administrations.

1.3 Research Questions

Based on the specific objectives, the following research questions were articulated and mapped towards the hypothesized relationships in the proposed research model so as to address the identified research gaps.

1. What are the major factors affecting individuals' cognitive belief towards adopting green IT in the context of Ethio-telecom?
2. Does behavioral intention mediate the relationships among the prior predictors and the actual behaviors towards adopting green IT?
3. To what extent do the moderators affect the relationships among personality traits, behavioral intention and actual behaviors towards adopting green IT?
4. Does the proposed framework appropriately determine individual level green IT adoption in the context of Ethio-telecom?

1.4 Objective of the Study

The general objective of this research was to explore factors affecting individuals' cognitive belief towards green IT adoption in the context of Ethio-telecom. Thus, the general objective would be addressed based on the following specific objectives to:

- Identify factors affecting IT professionals and managers beliefs towards adopting green IT in the context of Ethio-telecom;
- Inspect the mediating effect of behavioral intention on the relationships among the prior predictors and actual behaviors towards adopting green IT;
- Examine the interactive effects of moderators on the relationships among personality traits, behavioral intention and actual behaviors towards adopting green IT;
- Validate the proposed green IT adoption framework for determining individuals' belief towards adopting green IT in the context of Ethio-telecom.

1.5 Significance of the Study

The significance of this study context can be seen in various dimensions. Primarily, various researchers confirmed that green IT adoption frameworks have a number of differences with the other technologies adoptions; although, there are some similarities among them (Alkali et al., 2017; Bose & Luo, 2012; Molla, 2008; Molla & Abareshi, 2011; Samoei & Moturi, 2016). To this end, this study made an original theoretical contribution via integrating personal traits with Theory of Planned Behavior (TPB) (Ajzen, 1991)where evidences shown that such blended arrangements generally considered as substantial framework to inclusively regulate psychological behaviors towards environmental trepidations at root level (Choon et al., 2014; Dezdar, 2017); thus, an integrated conceptual framework was designed to determine individuals' cognitive beliefs towards green IT adoption in context of Ethio-telecom.

In addition, the proposed research model would also have a practical significance to create comprehensive understanding towards the process of adoption through employing rigorous methodological approaches in an inclusive and modeled manner that would typically enhance the researcher to explore the core beliefs, behaviors and attitude in the process of adopting green IT as well as addresses the under-explored research theme in this regard. Hence, this comprehensive conceptualizations of green IT adoption as an emerging concept would greatly contribute to existing call for empirical enquiry and body of knowledge from the perspectives of moral and normative concerns underlying green IT beliefs and behavior at individual level (Dalvi-Esfahani,

Ramayah, & Nilashi, 2017; Dezdar, 2017; Molla et al., 2014). Similarly, this study context would also serve as a substantial conceptual foundation to certain associated societies, groups and organizations in the country as well as could be used as essential theoretical basis to other developing country with similar background.

1.6 Scope of the Study

Green IT takes widespread conceptual scope that comprises the study and practice of designing, manufacturing, using and disposing of IT equipment so as to ensure sustainable environment through guaranteeing no or minimal impact on eco-system (Molla, 2008; Molla et al., 2014; Yoon, 2018).In due course, pervious green IT studies have given more emphasis to energy efficiency; computing resource recycling; e-waste management; green use and disposal of ICT devices; IT product design effectiveness; and green IT readiness whereas the study restricted its scope to green IT beliefs at individual level that is currently lacking empirical inquiries. Hence, this study context mainly focused on the most crucial psychological behaviors and personality traits that influence individuals' beliefs towards adopting green IT practices in Ethio-telecom. Regarding the geographical scope, this study was limited Ethio-telecom context due to the huge ICT expansions comparing with other ICT intensive sectors in the country as well as these drifts would upsurge its vulnerability to carbon emission footprints that impacts the ecosystem concerns. Therefore, this study was limited its geographical scope to Ethio-telecom and more specifically to Addis Ababa zonal administrations due to the higher number of IT professionals and managers than the other districts.

1.7 Limitation of the Study

This study context applied a mixed research approach with sequential explanatory design; where, such type of research design involves a two phase of data collection and analysis procedure. Therefore, it was more time and budget consuming and challenging work since numerous empirical studies in behavioral psychology usually lack to carrying out methodologically rigorous analyses via establishing cause and effect relationship on the prior behavioral dynamics including personality traits in order to comprehensively cognize the initial decision making routine(i.e. the mediating effect of behavioral intention) and the actual behaviors particularly towards environmental trepidations along with the interactive effects examinations considering individual differences in background (i.e. moderating effects of individual differences) (Busic-Sontic & Brick, 2018; Dezdar, 2017; He & Veronesi, 2017).

In addition, the outcomes in terms of cause and effect were interpreted carefully since the fact that the time horizon for this study was cross-sectional that required accommodating the amount of time allotted for this study. However, exploring this study context at several point of time might create an opportunity to observe whether differences exist at multiple points of times. In this regard, a longitudinal study was provided as recommendation for a future research so as to come up with credible and reliable explorations through broadening this emerging concept and comprising other ICT intensive sectors like Ethio-telecom.

1.8 Definition of Key Terms

Adoption: The classic meaning of the term "adoption" found in Rogers (1976), cited by Eveland (1979) that refers to the intent of creating of absolute willingness to utilize new ideas through exerting best course of action available. In this regard, the author uttered key assumptions to systematically reflect this underlying term; though, there are many instances where these assumptions do not hold. Eveland (1979) suggested three predominant assumptions: i) when there is some definable concept or idea, it would take the same meaning to the people's intent practice it, even if the settings are different; ii) initial willingness are assumed to lead for discerning an idea to place possibly resemble to each other; ii) the availabilities of measurement criteria for accepting an idea to the best course of action. Therefore, these assumptions were taken to present the term of adoption in this study context.

Green IT: refers to the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems such as monitors, printers, storage devices, and networking and communications systems efficiently and effectively with minimal or no impact on the environment (Malhotra, Melville, & Watson, 2010)via abiding social and ethical responsibilities.

Personality Traits: As the general name is constructed by two words, referring their meaning distinctly could lead readers to understand the concept in more inclusive way. Personality states to the fixed and controlling tendencies of adjustment of the individual patterns mainly referring to the temperament, self-expression or strength, and sociality as well as traits are the fundamental rudiments primarily basis towards sociability, habit formation, and character (Allport & Allport, 1921); thus, personality traits reflect people's characteristic patterns of thoughts, feelings, and behaviors.

1.9 Organizations of the Thesis

According to Evans, Gruba, and Zobel (2011), organization of a certain study places lines of discussion to establish how thesis work should be arranged in order show the coherence and central ties of the chapters and referred as a conjunction to clarify the details of a thesis workflow. In generally route, a component of the organization of the study is to spotlight the structural bonds the chapters that follow. Specifically, a component of the organization of the study is to briefly establish how each chapter is constructed towards achieving the research objectives (Everekliogluu, 2014; Golding, 2017). In other words, organization of the study usually introduces the main pieces of evidence that the author used to support the study context as well as used as a blueprint or map that tells readers what they should expect to read throughout the entire thesis work. Therefore, this thesis is organized in to five chapters and the details of each chapter are presented as follows.

Chapter One: Introduces the background of the study, problem statement, objectives and research questions so as to inclusively scrutinize the identified gaps the study context through exploring factors affecting green IT adoption in the context of Ethiopian telecom industry at individual level based on the research gaps stated in problem statement session as well as presented the scope and limitation of the study along with definition of important terms. Consequently,

Chapter Two: Provides brief description the review of related theoretical literature and empirical evidences several contexts. In this regard, this chapter comprehensively presented the reviewed literatures towards green IT arena within multidimensional perspectives developing and developed countries particularly the Middle East, Asian and African contexts.

Chapter Three: Demonstrated the detailed the process research methodology used in the study deals with research model and measurement of research variables. Further, the chapter gives an overview of the researchers' philosophical stance along with the research design and sampling technique as well as the data collection and analysis techniques along with issues of reliability, validity and the ethical considerations during the research process.

Chapter Four: Presents both quantitative and qualitative data analysis results, critical evaluation and triangulations, interpretation of results and discussions of study findings. In addition, demonstrates the scientific data analysis process, steps and procedures followed in the research

process in order to come up with valid answers of the initial research questions based on the collected data.

Chapter Five: Extends the summary of major findings revealed in chapter four as well as provides conclusions and recommendations; theoretical and practical contribution along with implication the study and directions for future research.

Chapter 2 : Literature Review

2.1 Introduction

This chapter presents a review of relevant literatures primarily on the conceptual background of green IT study domain; thus, theoretical literature review involved in exploring theories, models and frameworks related to green IT adoption as well as a review of empirical evidences from both developing and developed nation that have been carried out in this study context.

2.2 Theoretical Literature Review

2.1.1 Concepts of Green IT Domain

According to Molla et al. (2014), the concept conventional of green IT has been mainly focused on how to reduce energy consumption in IT equipment and systems. However, recent concept of Green IT is extending from energy saving in the IT sector into eco-friendly activities using IT. Energy saving in the IT sector means protecting the environment by achieving energy efficiency in overall IT product and service lifecycles (Gholami et al., 2013). Eco-friendly activities using IT is defined as facilitating the transition into a lower-carbon society by maximizing efficient use of energy and resources through IT convergence and strengthening responsiveness to climate change by preparing a real-time environmental monitoring and early disaster response system (Klimova et al., 2016). For instance, the effort to reduce power consumption in datacenters called Hippos eating electricity" can be viewed as Green of IT while using IT aimed at minimizing costs of water pollution through early detection and handling of water pollution using sensors can be classified as green by IT (Molla et al., 2014).

Hwang, Tan, and Bien (2018) has included energy saving in the IT sector as a narrow concept of green IT while eco-friendly activities using IT are considered as a broad concept of green IT. Based on these concepts, Hwang et al. (2018) has classified green IT technologies into product and social levels according to scopes of technical applications. Energy saving in the IT sector with narrow concept of green IT includes green IT technologies at product level such as power consumption reductions in the IT sector covering servers, personal computers (PCs), and display units as well as green IT technologies at social level such as the realization of efficiency in datacenters and high energy efficiency in cloud computing and networks. Eco-friendly activities using IT under broad concept of green IT include IT technologies for improving fuel efficiency of cars and reducing power consumption of home appliances such as refrigerators and air

conditioners, electric energy management using sensors, the control of carbon dioxide (CO2) emissions using IT in manufacturers, and facilitation of home working.

2.1.2 Green IT Adoption Theories

2.1.2.1 Social Psychology

According to Bossle, de Barcellos, Vieira, and Sauvee (2016), as long as the underdone power of computer technology continues to improve, making sophisticated applications tend to be economically feasible. As technical barriers disappear, a pivotal factor in harnessing this expanding power becomes the ability to create applications that people are willing to use (Mishra et al., 2014). Hence, practitioners and researchers require a better understanding of why people resist using IT in order to devise practical methods for evaluating technologies, predicting how users will respond to them, and improving user acceptance by altering the nature of technologies and the processes by which they are implemented. Information Systems investigators have suggested intention models from social psychology as a potential theoretical foundation for research on the determinants of user behavior (Campbell, 1963).

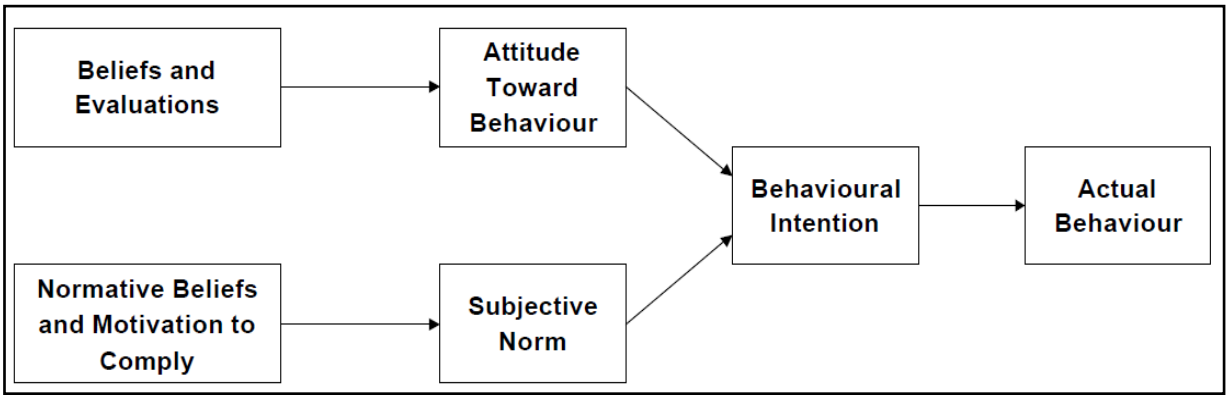
Ajzen and Fishbein (1975) Theory of Reasoned Action (TRA) is an especially widely validated intention model that has proven successful in predicting and explaining behavior across a wide variety of domains. However, due to its limitation on volitional control, Ajzen and Fishbein (1977) extended the Theory of Reasoned Action by including another construct called perceived behavioral control and called Theory of Planned Behavior (TPB). Empirical results indicated that the appropriateness of using these two theories for studying the determinants of IT usage behavior (Choon et al., 2014; Venkatesh & Davis, 2000).

2.1.2.2 Theory of Reasoned Action (TRA)

The theory of reasoned action is a widely studied model from social psychology, which is concerned with the determinants of consciously intended behaviors (Ajzen & Fishbein, 1977). Theory of reasoned action is composed of attitudinal, social influence, and intention variables to predict behavior. Figure 2-1 is a schematic representation of the relationships among constructs in TRA. It is hypothesized by TRA that the individual's Behavioral Intention (BI) to perform a behavior is jointly determined by the individual's Attitude toward performing the Behavior (ATB) and Subjective Norm (SN), which is the overall perception of what relevant others think the individual should or should not do.

The importance of ATB and SN to predict BI will vary by behavioral domain. For behaviors in which attitudinal or personal-based influence stronger (e.g., purchasing something for personal consumption only), ATB will be the dominant predictor of BI, and SN will be of little or no predictive efficacy. While for behaviors in which normative implications are strong (e.g., purchasing something that others will use), SN should be the dominant predictor of BI, and ATB will be of lesser importance Ajzen and Fishbein (1977).

Figure 2-1: Theory of Reasoned Action



Source: Ajzen and Fishbein (1977)

The Theory of Reasoned Action also hypothesizes that BI is the only direct antecedent of actual behavior (AB). BI is expected to predict AB accurately if the three boundary conditions specified by Ajzen and Fishbein (1975) can be hold: (a) the degree to which the measure of intention & the behavioral criterion correspond with respect to their levels of specificity of action, target, context, and time frame; (b) the stability of intentions between time of measurement and performance of the behavior; and (c) the degree to which carrying out the intention is under the volitional control of the individual (i.e., the individual can decide at will to perform or not to perform the behavior).

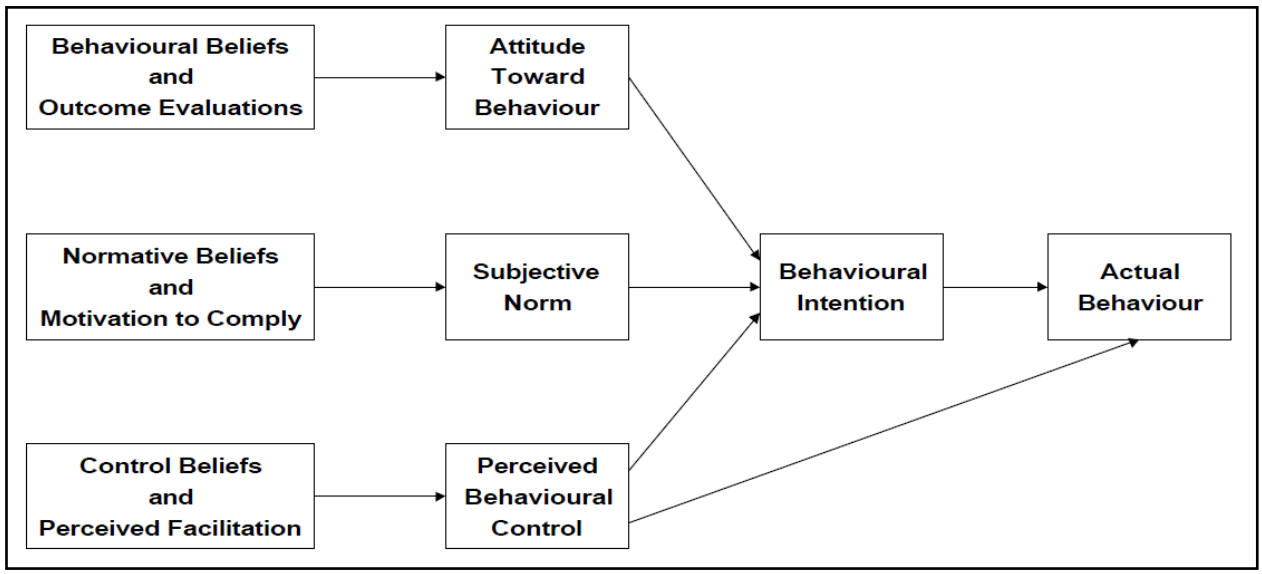
Moreover, TRA is a general model that does not specify the beliefs that are operative for a particular behavior. Researchers using TRA must first identify the beliefs that are salient for subjects regarding the behavior under investigation. (Ajzen & Fishbein, 1975, p. 218) suggest eliciting five to nine salient beliefs using free response interviews with representative members of the subject population. They recommend using "modal" salient beliefs for the population, obtained by taking the beliefs most frequently elicited from a representative sample of the population. The TRA has been successfully applied to a large number of situations to predict the performance of behavior and intentions. For example, TRA predicted turnover (Prestholdt, Lane, & Mathews, 1987) and education (Fredricks & Dossett, 1983). In a meta-analysis of research on

the Theory of Reasoned Action, (Prestholdt et al., 1987) concluded that the predictive utility of the TRA was strong across various contexts.

2.1.2.3 Theory of Planned Behavior

Despite the predictability of the TRA is strong across studies, it becomes problematic if the behavior under study is not under full volitional control. Fredricks and Dossett (1983) pointed out two problems of the theory. First, one must differentiate the difference between behaviors from intention. This could be problematic because a variety of factors in addition to one's intentions determine how the behavior is performed. Second, there is no provision in the model for considering whether the probability of failing to perform is due to one's behavior or due to one's intentions. To deal with these problems, (Ajzen, 1991) extended the Theory of Reasoned Action by including another construct called perceived behavioral control, which predicts behavioral intentions and behavior. The extended model is called the Theory of Planned Behavior (TPB).

Figure 2-2: Theory of Planned Behavior



Source: Ajzen (1991)

As Figure 2.2 shows, TRA and TPB have many similarities. In both models, BI is a key factor in the prediction of actual behavior. Both theories assume that human beings are basically rational and make systematic use of information available to them when making decisions. By considering control-related factors, TRA assumes that the behavior being studied is under total volitional control of the performer (Madden, Ellen, & Ajzen, 1992). However, TPB expands the boundary conditions of TRA to more goal-directed actions.

Attitude toward Behavior is defined as "a person's general feeling of favorableness or unfavourableness for that behavior" (Ajzen & Fishbein, 1977). Subjective Norm (SN) is defined as a person's "perception that most people who are important to him/her think he/she should or should not perform the behavior in question" (Ajzen & Fishbein, 1977). Attitude toward behavior is a function of the product of one's salient beliefs that performing the behavior will lead to certain outcomes, and an evaluation of the outcomes, i.e., rating of the desirability of the outcome. Subjective Norm is a function of the product of one's normative belief, that is, the "person's belief that the salient referent thinks he/she should (or should not) perform the behavior" (Ajzen & Fishbein, 1977), and his/her motivation to comply that referent. Thus, variables that are external to the model are assumed to influence intentions only to the extent that they affect either attitudes or subjective norms.

The main difference between these two theories is that the TPB has added Perceived Behavioral Control (PBC) as the determinant of Behavioral Intention, as well as control beliefs that affect the perceived behavioral control. Though it may be difficult to assess actual control before behavior, TPB asserts that it is possible to measure PBC "people's perception of the ease or difficulty in performing the behavior of interest" (Ajzen, 1991). PBC is a function of control beliefs and perceived facilitation. Control belief is the perception of the presence or absence of requisite resources and opportunities needed to carry out the behavior. Perceived facilitation is one's assessment of the importance of those resources to the achievement of the outcomes (Ajzen & Madden, 1986).

Perceived behavioral control is included as an exogenous variable that has both a direct effect on actual behavior and an indirect effect on actual behavior through intentions. The indirect effect is based on the assumption that PBC has motivational implications for behavioral intentions. When people believe that they have little control over performing the behavior because of a lack of requisite resources and opportunities, then their intentions to perform the behavior may be low even if they have favorable attitudes and/or subjective norms concerning performance of the behavior. According to several empirical evidence, people's behavior is strongly influenced by the confidence they have in their ability to perform the behavior and the structural link from PBC to BI reflects the motivational influence of control on actual behavior through intentions (Ajzen, 2011; Madden et al., 1992; Moghavvemi, Salleh, Sulaiman, & Abessi, 2015).

The direct path from PBC to AB is assumed to reflect the actual control an individual has over performing the behavior. Ajzen and Madden (1986) offers the following rationale for this direct path. First, if intention is held constant, the effort needed to perform the behavior is likely to increase with PBC. For example, if two people have equally strong intentions to learn to ride a bike, and if both try to do so, the person who is confident that he or she can master this activity is more likely to ride the bike than a person who doubts his or her ability. Second, PBC often serves as a substitute for actual control, and insofar as perceived control is a realistic estimate of actual control, PBC should help to predict AB.

The relative importance of BI predictors varies with the behavioral domain within TRA. In some applications, it may be found that only ATB has a significant impact on BI; in others, ATB and PBC will be significant; in still others, ATB, SN, and PBC will contribute to the prediction of BI (Ajzen & Madden, 1986). Similarly, the ability of PBC and BI to predict AB also will vary across behaviors and situations. Both BI and PBC can make significant contributions to the prediction of goal-directed actions. In any given application, however, one predictor may be more important than the other, and only one of the two may be significant. In due course, the TPB has been successfully applied to various situations in predicting the performance of behavior and intentions, such as predicting user intentions to use a new software (Mathieson, 1991) and perform breast self-examination (Milewski, Young, & Madden, 1991) found that TPB has a better predictive power of behavior than TRA.

2.3 Empirical Literature Review

Goyal, Arya, and Nagpal (2015) demonstrated that ICT intensive enterprises should develop policies and strategies with inclusive ecosystem concerns that clearly define its purpose through encompassing comprehensive action plans. In supplement, Sugih, Nugroho, and Hartanto (2017) agreed the significant role of ICT dynamism and underline that policy makers should reconsider green IT practices in designing, implementing, using and evaluating ICT initiatives so as to reduce carbon emission footprints and ensure sustainable environment. Accordingly, Ainin, Naqshbandi, and Dezdar (2016) studied factors that affect the adoption intensity of green IT practices and their subsequent influence on the firm's performance in the context of developing country by taking case of Iranian IT managers and disclosed positive relationship of green IT practices with institutional pressure, personality trait factors (i.e. consideration for future consequences, openness to new experience), and organizational performance. In this regard, the authors suggested for organizations to develop well thought recruitment policy that enhance for

employing managers who demonstrate openness in their character since this would reassure environment-friendly practices that cause no problems to economic performance and are likely to yield valuable environmental performances.

Likewise, Ojo et al. (2019) investigated green computing practices in Malaysian context taking a sample of IT professionals in ISO 14001 certified IT companies to determine the effects of individual, social and organizational factors as well as the mediating effect of green IT beliefs along with the association between green IT attitudes and behavioral change in terms of green computing practices based on the Belief-Action-Outcome (BAO) framework. In due course, the result supported the direct effects of green IT knowledge, social influence and green management culture on green IT attitude. In this regard, the authors concluded that green IT knowledge, green management culture, and social influence have positive effects towards shaping IT professionals' attitudes and their engagement in environmentally friendly behavior as well as established two driving forces from a practical perspective.

Primarily, the importance of compelling specific measures in fostering green IT knowledge and culture at organizational level; though, cohesive management usually tend to be fueled. Secondly, the connotation of realizing greenery beliefs, attitudes, and behavior in terms of adopting green IT practices at the individual level endured to be profound foundation in building societal driven greenery norms; thus, these driving forces indicate the essentials of organizations' intervention in improving employees' knowledge towards green IT practices that should go beyond the provision of trainings to figure out proactive environmental behaviors and ensure factual climate resilience attitudes at grass root level.

Alziady and Enayah (2019) also studied the effect of institutional pressure on the intention of managers of small enterprises in Thi-Qar province located at southern Iraq to continue green IT usage through developing a conceptual framework that includes three factors: coercive pressure, normative influence, and mimicry to access their effect on green IT adoption and continuance usage of green IT. The result indicated that the three factors explained 37% of the variance on adoption and 79% on intentions to continuing usage green IT; although, ICT can be used as a tool to create green awareness among IT users, business and the entire society, it showed large variance in behavioral intention factors for determine green IT usage that remained unexplained and the authors suggested for further exploration via incorporating potential unmeasured variables for future researchers in the context of developing countries.

Hernandez (2017) explored green IT practices in three higher education institutions in the Philippines by establishing a conceptual framework that incorporates the use of paperless and digital archiving systems, resource efficient IT equipment, responsible electronic waste disposal, recycling and reuse as well as initiated awareness programs to educate the employees about green IT and sustainability issues. The result showed that these practices are in its early stage due to considerable economic and socio-cultural differences between developing and developed nations that affect the rate of green IT adoption. Moreover, the study identified some links to the reason why the higher education institutions adopt green IT and attitude, the formal structure of IT unit and managerial support were considered as rudimentary foundations. Though, the study addressed the limitations in terms of explore the internal and external factors that affect the rate of adoption such as regulatory issues for developing policies and guidelines as well as monitoring and evaluation aspects for green IT adoption, the author mentioned the importance exploring context based factors at individual level to emerge new insights regarding green IT adoption in designing organization specific framework.

Freeman (2016) assessed the current state of adoption and practice of green computing among tertiary institutions in Ghana through incorporating the role of favorable academic environment and humanity, energy conservation, disposal, and recycling of electronic devices for those who use computers for day to day activities. Given the importance of green computing awareness, knowledge, practice and adoption, the author recommended academic institutions and government agencies should take the first step in educating the public, regarding the underlying principles of green computing. The general impression from this evidence is that, computer users in the selected schools generally have either low level of green computing awareness, habits and practices or none at all. Furthermore, the institutions have made very little effort to accept these practices in their schools and as a result of the fact that the awareness of green IT in most institutions specified as low particularly at individual level.

Woldu (2016) outlines a framework for measuring sustainable green IT practices from an information systems and technology perspective within South African tertiary institutions and revealed how green IT practices significantly supported in sustaining the environment from organizational point of view; nevertheless, the study did not acme green IT practices at individual level which is currently considered as under-researched area in field of computing particularly in developing nations context where the author emphasized on the environmental policies for creating a sustainable environment for South Africa. In addition, the framework was grounded in investigating the acquisition, utilization and effectiveness for technological

breakthroughs that will lead to a cleaner environment. The result of the study explained the role of the universities as center of environmental science in reducing ecological impact of ICT dynamism through focusing on bottom-line issues such as economic values, environmental issues, and social benefits. In addition, the author recommended broader explorations that require the involvement diverse characteristics of ICT users in order to inclusively understand the actual behaviors towards green IT practices. Similarly, Thomson and van Belle (2015) investigated the antecedents for the adoption of green IT in South African higher education institutions by employing the drivers and readiness factors influencing green IT adoption as well as the role of institutional, organizational and value network factors. Thus, the authors confirmed green IT drivers as significant antecedents in the process adoption where the drivers were profoundly classified into economic, ethical, response and regulatory drivers based on Molla (2008) green IT adoption model as well as the overall adoption of green IT was indicated as relatively low.

Consequently, Samoei and Moturi (2016) studied green ICT on sustainable environment and how effective green ICT management can be realized in Kenyan institutions of higher learning. The findings indicated that green IT practices remained still on the negative side towards sustainable environment where institutions of higher learning in Kenya did not have proper management schema to deploy energy efficient equipment. In this regard, the challenges related to green IT management include low awareness, uncertainty in return on investment, constrained collaboration and scarcity of financial resources in institutions of higher learning.

Successively, Alkali et al. (2017) proposed an integrated framework grounding form theoretical assumptions of TRA, TAM, and GITAM models for determining individual behavior towards adopting of green IT in the context of Nigerian university as best place for promoting sustainable environment via taking the sample of IT users from the total communities. Thus, the authors recommended an empirical validation of the proposed Integrated Model of Green Information Technology Adoption (IMGITA) to improve the understanding cognitive belief towards green IT adoption at individual level since the fact that they confirmed the adoption of green IT in organizations has been partly considered by researchers however its adoption among individuals has largely been overlooked generally in African, particularly in Nigerian context.

Alem (2019) developed a framework for green ICT use and disposal of ICT devices considering the case of World Vision Ethiopia (WVE) as well as identified factors affecting green usage and disposal of ICT devices. To come up with the final framework, the author initially identified the influencing factors and then used them as design input as well as approached the proposal in four

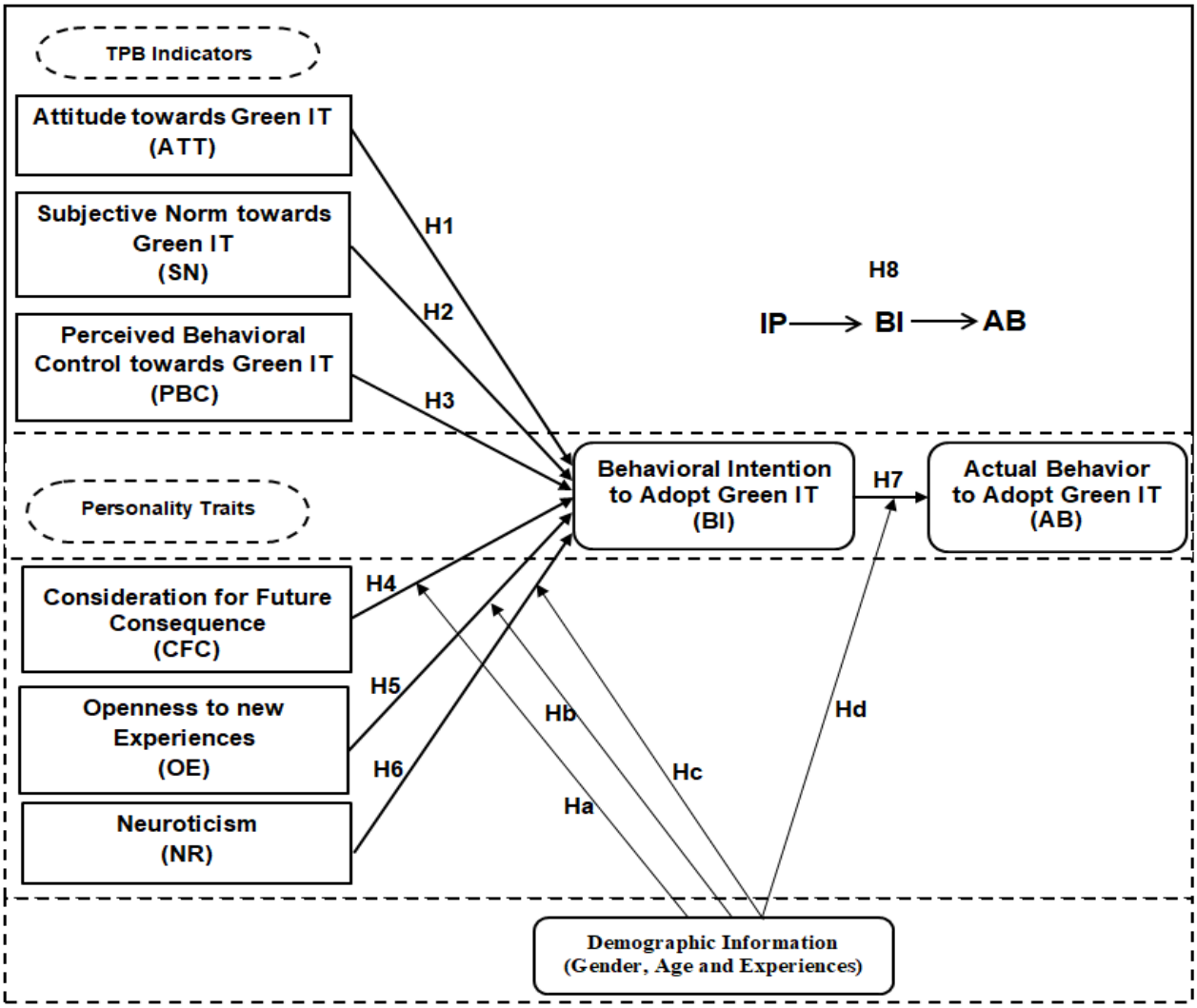
imperatives such as strategic, tactical, operational imperatives and continues improvement. Finally, came up with a notable framework that was evaluated with 98% satisfaction level to address green use and disposal of ICT devices in WVE context. However, the author recommends for further confirmations so as to validate the impact of the proposed framework in related organizations as well as suggested for further investigation towards green readiness both at organizational and individual that fits specific contexts.

Correspondingly, Mamo (2015) also accessed green computing readiness of government organizations in Addis Ababa through adopting Molla, Cooper, and Pittayachawan (2009) green readiness framework taking Ethio-telecom and the former Ministry of Communication and Information Technologies (MoCIT) as case study. To this end, the author confirmed that the total of 64% of variance in the five factors (i.e. attitude, policy, practice, technology and governance) to explain green readiness so that 36% of g-readiness level remained unexplained. In due course, the evidences from both authors indicated that the level of awareness towards green IT practices were found as either low level or slowly diffusing trend as well as justified the cause due to the low level eco-friendly culture, skill and knowledge; lack of leadership commitment and organizations' thoughtfulness in embracing green IT practices, lack of comprehensive policy to incorporate energy efficient criteria during procurement, the financial burden to afford green IT solutions, and resistance to change among the major hindrances in this regard.

2.4 Proposed Conceptual Framework

According to Ajzen (2011), theory of planned behavior provides continues to be a very influential theory for dealing with the complexities of human social behavior and incorporates some of the central concepts in the social and behavior sciences since its origin in 1970's. Ajzen and Fishbein (1977) defined the philosophical concepts in a way that permits prediction and understanding of particular behaviors in specified contexts. Theory of planned behavior was basically founded to tackle the original theory of reasoned action limitations in dealing with behaviors over which people typically indicated an incomplete volitional control. The TPB framework suggests that in addition to attitudinal and normative influence, a third element, perceived behavioral control (PBC), also influences behavioral intentions and actual behavior.

Figure 6-1: Research framework



Source: Adopted from Theory of Planned Behavior (Ajzen, 2011) through incorporating Personality Traits and Moderators

Thus it can be summarized that TPB extends TRA to account for conditions in which individuals do not have full control over their behavior. The main variables in this model are namely attitude about the consequences of performing the behavior multiplied by his or her evaluation of these consequences, Subjective Norm as individuals perception that most people who are important to him or her think he should or should not perform the behavior in question and Perceived Behavioral Control as an individual's perceived ease or difficulty of performing the particular behavior (Ajzen & Fishbein, 1977). Ajzen (2011) found that external variables to TPB Model are potential antecedents to the formation of social cognitions and have effects on behavior and intention. In his respective aggregates, behavioral beliefs produce a favorable or unfavorable attitude toward the behavior, normative beliefs result in perceived social pressure or subjective

norm; and control beliefs give rise to PBC. To this end, Theory of Planned Behavior has been considered as one of those frameworks, which has been applied to environmental issues since it offers a theoretical base for the consideration of behavioral attributes in technology adoption (Akman & Mishra, 2014).

The review of literature indicates that explaining human behavior in all its complexity is a difficult task. It can be approached at many levels, from concern with physiological processes at one extreme to concentration on social institutions at the other. Social and personality psychologists have tended to focus on an intermediate level thus the fully functioning individual processing of available information mediates the effects of biological and environmental factors on behavior. Concepts referring to behavioral dispositions, such as social attitude and personality trait, have played an important role in these attempts to predict and explain human behavior (Ajzen, 1991, 2011; Campbell, 1963).

Although, some studies included testing the effect of environmental friendly practices (Han et al., 2010), and exploring individuals' environmental behavior in an organization (Gholami et al., 2013), latest studies have been confirmed that studies on environmental friendly practices regarding individuals' green IT preferences and attitudes are currently rare as well as not many behavioral studies focusing on the intention to use and actual use has been employed personality traits which played an important role to predict and explain human behavior particularly in developing country context (Choon et al., 2014; Dezdar, 2017). To this end, investigation of individuals' green IT behavior is important since these emerging technologies have been identified to have a detrimental influence on the environmental footprint of organizations, which also provides significant information to evaluate the effects of individuals' behavior through systematically extending TPB with the suppositions of personality traits.

Hence, this study included three of the personality traits namely: Consideration for Future Consequence (CFC), Openness to new Experience (OE) and Neuroticism (NR) as factors that influence individual behavior due to their evident effect on the behavioral intention and actual behavior to adopt green IT (Dalvi-Esfahani et al., 2017; Dezdar, 2017; Gholami et al., 2013). In addition the proposed framework incorporated the examination of individual demographic backgrounds' moderating effect on the personality traits to achieve more comprehensive and inclusive understanding of individuals' behavior towards green IT adoption. To the best of authors' knowledge, the extended framework has not been used and tested elsewhere, thus adds to the current literature.

Therefore, the hypothesis development section describes the research model, which includes the five variables from TPB, namely, Attitude toward Green IT (ATT), Subjective Norm toward Green IT (SN), Perceived Behavioral Control toward Green IT (PBC), Behavioral Intention to Adopt Green IT (BI) and Actual Behavior (AB) to Adopt Green IT and other three personality traits as well as the moderating variables on the hypothesized relationship.

There are variety of theoretical frameworks such as Diffusion of Innovation Theory (DOI) (Rogers, 2010), Technology Acceptance Model (TAM) (Davis, 1989); Technology Acceptance Model-2 (TAM-2) (Venkatesh & Davis, 2000); Motivational Model (Igbaria et al., 1996); Social Cognitive Theory (Bandura, 2001); Unified Theory of Acceptance and Usage of Technology (UTAUT) (Venkatesh et al., 2003); and Unified Theory of Acceptance and Usage of Technology-2 (UTAUT-2) (Venkatesh et al., 2012) are widely engaged for stating user behaviors towards accepting emerging information systems and technologies. However, most of these frameworks were applied to determine consumer driven behaviors so as to meet commercial purposes in various information system literatures (Chang et al., 2017; Sharma & Mishra, 2014; Tadesse & Bahiigwa, 2015; Venkatesh & Davis, 2000; Venkatesh et al., 2012). Therefore, the researcher developed a conceptual framework by integrating TPB and personality traits so as to meet the objective of exploring factors affecting green IT adoption.

2.5 Hypotheses Developments

Hypothesis development definition, attitude can be assumed as beliefs about the consequences of performing the behavior multiplied by individuals evaluation of these consequences which included either positive or negative definition, attitude can be assumed as beliefs about the consequences of performing the behavior multiplied by individuals evaluation of these consequences which included either positive or negative definition, attitude can be assumed as beliefs about the consequences of performing the behavior multiplied by individuals evaluation of these consequences which included either positive or negative

2.5.1 Hypotheses of the Main Variables

According to Ajzen and Fishbein (1977) definition, attitude can be assumed as beliefs about the consequences of performing the behavior multiplied by individuals evaluation of these consequences which included either positive or negative belief of an individual to perform a specific behavior. In the context of green IT, it measures the extent to which an individual is aware and interested about green IT (Molla et al., 2014). An individual with a more positive

attitude towards innovative technology is more likely to adopt such technologies and practices (Choon et al., 2014). Hence, the following hypothesis is proposed:

H1: Attitude (ATT) towards green IT has a direct positive effect on the Behavioral Intention (BI) to adopt green IT

Ajzen and Fishbein (1977) advocated subjective norm as the person's perception that most people who are important to him or her think he/she should or should not perform the behavior in question. Empirical evidences have validated the effect of social norm on behavioral intention based on TRA and TPB model (Ajzen, 2011; Rueda, Moriano, & Liñán, 2015; Sheeran, Trafimow, & Armitage, 2003). Accordingly, Sadaf, Newby, and Ertmer (2016) subjective norm were found an essential construct due to the expectation of tech savvy students and the positive support of their mentor teachers. In this regard, an individual who perceive greater social pressure to practice green IT have more positive intention towards it. Thus the following hypothesis is proposed:

H2: Subjective Norm (SN) towards green IT has a direct positive effect on the Behavioral Intention (BI) to adopt green IT

Perceived behavioral control is defined as an individuals' perceived ease or difficulty of performing the particular behavior (Ajzen, 2011). Similarly, individual's perception that he or she possessed the necessary skills, resources or opportunities to successfully perform the activity. Suppose, individuals are provided essential and sufficient level of actual control over the behavior, they are most likely to realize their intention once opportunities are created in this regard (Choon et al., 2014; Dezdar, 2017; Sadaf et al., 2016). Based on the above arguments, the perceived individual control of events influences individuals' behavioral intention to adopt green IT thus the following hypothesis is proposed:

H3: Perceived Behavioral Control (PBC) towards green IT has a direct positive effect on the Behavioral Intention to adopt green IT.

The consideration of personal traits to inclusively understand the behavioral intention of individuals has been grasped notable interest in behavioral studies due to their immediate association to the individual beliefs in this regard. Consideration of Future Consequences (CFC) is one of the major traits where the idea reflects to the extent which people considers the potential distant outcomes of their current behaviors and the extent to which they are influenced by these potential outcomes (Strathman, Gleicher, Boninger, & Edwards, 1994, pp. 740-745).

The authors provided an evidence of the influence of CFC on behaviors and attitudes and showed that individuals with greater interest in the immediate consequences of environment are most likely low to future consequences. An assumption made base on the consideration of future consequences scale – there are differences in individual's decision making process on how they consider future outcomes in deciding their present behavior; and the differences are clear and reliable. A high degree of importance being placed on the CFC will lead to a higher CFC, while risking future negative consequences in order to meet short term goals indicates a low CFC. The higher the CFC, the more likely the individual would adopt green IT (Gholami et al., 2013; Strathman et al., 1994). Thus, the following hypothesis is proposed:

H4: Consideration for Future Consequences (CFC) towards green IT has a direct positive effect on the Behavioral Intention to adopt green IT

Openness to new Experience has been defined as a broad dimension of personality manifested in a rich fantasy life, aesthetic sensitivity, awareness of inner feelings, need for variety in actions, intellectual curiosity, and liberal value systems (McCrae & Costa Jr, 1985). In other words, individuals who are appreciative of novel ideas and new experiences, desire to explore and understand things that are unfamiliar to them, and adopting unconventional ways to solve problems and the potential for improving on the past are categorized with high Openness to Experience. According to Costa Jr, McCrae, Zonderman, Barbano, Lebowitz, and Larson (1986) highly open people are those with the characteristic of intellectual curiosity, creativity, flexible thinking, and culture. In contrast, individuals who are low on Openness to new Experience are more conservative, reluctant to change and find familiar ways of doing things to reduce uncertainty (Griffin & Hesketh, 2004). They usually demonstrate lower levels of divergent thinking and this consistent with what McCrae and Costa Jr (1985) revealed whereby Openness to new Experience is associated with divergent thinking and creativity. In this regard, individuals are different in term of the level of Openness to Experience to the adopt of green IT due to the different background and life experiences (Gholami et al., 2013). Thus, the following hypothesis is proposed:

H5: Openness to new Experience (ON) towards green IT has a direct positive effect on the Behavioral Intention (BI) to adopt green IT

According to He and Veronesi (2017), neuroticism defined as the differences in emotions while individuals experience stressors as well as refers to individuals express negative emotions that is anxiety, nervousness, and depression. Neurotic people tend to be anxious, self-conscious and paranoid (Lane & Manner, 2011). Highly neurotic people tend to be fearful, sad, embarrassed,

distrustful, and have difficulty managing stress (Costa Jr et al., 1986). Empirical research suggests that neuroticism is negatively associated with several constructive elements of work behavior, including Smartphone ownership (Lane & Manner, 2011). Neurotic personalities are most likely to view technological advances in their work as threatening and stressful, and to have generally negative thought processes when considering technological advances for example the case of mobile commerce acceptance (Zhou & Lu, 2011). Similarly, Ehrenberg, Juckes, White, and Walsh (2008) reported that individuals' with higher degree on neuroticism are more likely to use SMS (and IM) messages and suggested that these communication mediums may allow neurotic communicators more time to review message content thus individuals with low neurotic self-esteem used IM more. In addition, people higher in neuroticism reported stronger mobile phone addictive tendencies, and those lower in self-esteem and more disagreeable reported stronger IM addictive tendencies. Thus, the following hypothesis is proposed:

H6: Neuroticism (NR) towards green IT has a direct positive effect on the Behavioral Intention (BI) to adopt green IT

Previous researches indicated that Behavioral Intentions (BI) to adopt green IT a have positive influence on actual behavior (Sadaf et al., 2016). According to Ajzen (1991), intention is the immediate antecedent of behavior. As such, the following hypothesis is proposed:

H7: Behavioral Intention (BI) to adopt green IT has a direct positive effect on the Actual Behavioral (AB) to adopt green IT

2.5.2 Hypotheses of the Mediating Variable

Behavioral Intention (BI) has been defined by Davis, Bagozzi, and Warshaw (1989) as the level to which an individual has developed conscious plans to perform or not perform some specified future behavior. Behavioral intention being a mediating variable in this study depended on TPB and explained as the likelihood that an individual will utilize systems when it is made available to him/her. Individual's behavioral intention to utilize plays a crucial role in the actual use of new technology (Davis et al., 1989) and suggests individuals' behavioral intention shapes their actual behavior towards an emerging technology. Thus, in the context of this study, intention to adopt green IT assumed to have a positive effect on actual adoption behavior as well as mediates the relationship among the independent predictors and the actual behavior to adopt green IT. Therefore, the study hypothesis is proposed:

H8: Behavioral intention to adopt green IT has the mediating effect on the relationship among the independent predictors and the Actual Behavior (AB) to adopt green IT.

2.5.3 Hypotheses of the Moderating Variables

The moderating hypotheses are the set of hypotheses that were tested for moderators. The extended research model considers the influence of three moderators which are: gender, age, and experience. Accordingly, the current study will examine the impact of those moderators which are specified as demographic information including age, gender and experience on the relationships of the independent predictors and behavioral intention (BI) as well as BI and actual behavior (AB) to adopt green IT. According to the Venkatesh et al. (2003) socio-demographic variables such as age, gender, and experience are significant issues towards understanding how individuals make initial decisions to adopt and use contemporary technologies. This implies that the importance of considering the demographic characteristics individuals' towards PT→BI→AB relationships so as to determine the actual cognitive beliefs of individuals in relation to pro-environmental IT practices. In due course, empirical evidences have identified that environmentally responsible people are predominantly female (Abeliotis, Koniari, & Sardianou, 2010), young (Rowlands, Scott, & Parker, 2003), well experienced (Molla et al., 2014).Therefore, we consider the moderating role of gender, age, and experience.

2.5.3.1 Moderating Effect of Gender (H1a-H4a)

The relationship between gender and behavioral intention to adopt green IT has produced mixed results. For example, Cai, Fan, and Du (2017) reported that there is inconsistency towards gender effect to predict green attitude. According to Dagher, Itani, and Kassar (2015), the moderating effect of gender was found to be significant and affect both environmental concern and attitude towards green purchasing behavior. Similarly, Sreen, Purbey, and Sadarangani (2018) specified stronger influence male gender for green purchase. However, some pervious gender studies have found that females are more susceptible to social conformity and influenced by social interactions for making their greener belief (Chen, 2013). In this regard, the following hypotheses (H1a-H4a) were formulated.

H1a: The association between CFC to BI is stronger for Female than Male group;

H2a: The association between OE to BI is stronger for Female than Male group;

H3a: The association between NR to BI is stronger for Female than Male group;

H4a: The association between BI to AB is stronger for Female than Male group;

2.5.3.2 Moderating Effect of Age (H1b-H4b)

A number of researchers have explored the relationship between age and attitudes and behavior toward ecosystem concerns. Some have reported significant association between age and environmental beliefs, attitudes and behavior (Raineri & Paillé, 2016; Shirokova, Osiyevskyy, & Bogatyreva, 2016). For example, older age is associated with frugality and a conservative lifestyle as well as awareness of environmental issues is higher and more stable on older people (aged 40-60 years) than younger people those (aged 20-35 years) along with unstable concerns, Hence; evidences indicated that green IT engagements continue to increase when age of individuals increase (Dagher et al., 2015; Jain & Kaur, 2006). Based on the above discussion the following hypotheses (H1b-H4b) were formulated:

H1b: The association between CFC to BI is stronger for younger than older age group;
H2b: The association between OE to BI is stronger for younger than older age group;
H3b: The association between NR to BI is stronger for younger than older age group;
H4b: The association between BI to AB is stronger for younger than older age group;

2.5.3.3 Moderating Effect of IT Experiences (H1c-H4c)

A large number of studies have investigated the influence of experiences on environmental consciousness. However, the findings are inconclusive. Although some found a negative association between experience and environmental attitude and behavior, most of the studies (Raineri & Paillé, 2016; Shirokova et al., 2016) found significant positive relationships between experience and pro-environmental action. Based on the available empirical evidence, the following hypothesis is posited:

H1c: The association between CFC to BI is stronger for IT experienced than less experienced groups;
H2c: The association between OE to BI is stronger for IT experienced than less experienced group;
H3c: The association between NR to BI is stronger for IT experienced than less experienced group;
H4c: The association between BI to AB is stronger for IT experienced than less experienced group

Chapter 3 : Research Methodology

3.1 Introduction

Research methods are the practical techniques used to carry out research and such projects are set up in order to explain a phenomenon or to test a theory (Walliman, 2011, p. 29). Research methodology consists of the assumptions, postulates, rules, and methods in which a researcher uses as the blue print or roadmap to render their work open to analysis, critiques, replication, repetition and/or adaptation as well as involves specific techniques that are adopted in research process to collect, assemble and evaluate data (Bryman, 2012; Creswell, 2014) besides it defines those tools that are used to gather relevant information in a specific research study. Thus, this methodology section provides a brief description of the philosophical foundation, approaches and design, sampling strategy as well as specific data collection techniques and analysis procedures.

3.2 Research Philosophy and Paradigm

A scientific research requires a philosophical foundation for its inquiry that basically provides scientific paradigm where the central assumptions dictates a particular field of study influence to what should be studied, how research should be done and how results should be interpreted as well as determines how to make sense of the world around to support preconceptions concerning the basic set of beliefs that guide researcher's action(Bryman, 2012, p. 630).The philosophical beliefs towards the development of knowledge and the nature of that knowledge as well as the researcher's paradigm assumed for a particular study typically comprises essential assumptions that place basic ground on how the world can be perceived (Leavy, 2017, pp. 194-195). Hence, these assumptions will underpin the research strategies and methods where a researcher decides as part of the methodology.

According Creswell (2014), there are two broadly conceived paradigms: ontological and epistemological that basically deal to the overall orientation about the world and the nature of research that a researcher holds. Ontological paradigms are concerned with the nature of social entities and the central point of orientation here is the question of whether social entities can be studied objectively taking a reality external to social actors usually referred as objectivism, or whether they can be considered social constructions built up from the perceptions and actions of social actors which state to the position of constructionist. Epistemological paradigm is related to the possibility of knowing the world and concerns the question of what is regarded as acceptable

knowledge. A particularly central issue in this context is the question of whether the social world can be studied according to the same principles and procedures.

Based on the ontological and epistemological paradigms, pragmatism research paradigm will be followed since it primary opens the door to multiple methods, worldviews, different assumptions and flexible procedures of data collection and analysis as well as offers the chance to produce a properly integrated methodology for the behavioral studies by acknowledging the value of both quantitative and qualitative research methods (Barnham, 2015; Creswel, 2009; Creswell, 2014)besides considering its relevance for this study context that ultimately proposed to imply theoretical lens for exploring the core beliefs and attitudes towards adopting an emerging technology at individual level.

3.3 Research Design and Approaches

According to Mitchell and Jolley (2012) research approaches refers to strategies and procedure that consists of the steps of broad assumptions to basic design and detail methods of data collection, analysis and interpretation as well as deals with structuring the problem logically but not logistically to ensure that the evidence obtained enables the researcher to answer the research questions in more credible manner where methods refer to the work plan details what has to be done to complete the project as well as flow from the primary design that mainly supports the researcher to link with the philosophical foundation and methodological assumptions. Creswell (2014) articulated mixed method research as a collection of both qualitative and quantitative data through scientific procedure for collecting, analyzing and mixing or integrating at some stage of the research process in response to research questions or hypotheses. In this regard, mixed research approach was employed since it leaves a room multidimensional ways making critical evaluation through inclusively understanding the study context.

In addition, there are several typologies for classifying mixed research approach in various fields of studies; though, recent evidences identified three basic mixed approach designs: convergent parallel mixed method design, sequential explanatory mixed design and sequential exploratory mixed design particularly in behavioral science field of study(Creswell, 2014; Lawrence, 2014).

According to Creswell (2014) the sequential explanatory design in mixed approach appeals to obtain strong quantitative survey background relatively to qualitative approaches as well as involves two-phase project in which the researcher collects quantitative data in the first phase, analyzes the results, and then uses the results to build the second phase of the qualitative

investigations. In this regard, the quantitative results typically indicate the types of participants to be purposefully selected for the qualitative phase as well as the kinds of questions that will be asked of the participants. Subsequently, recent evidences indicated that sequential explanatory mixed design involves the logical procedure of gathering quantitative data primarily followed by qualitative where the qualitative findings typically used to contextualize and enrich the findings the quantitative data in two consecutive phases in order generate well-established conclusions and recommendation or contribute to the body of knowledge(Bowen, Rose, & Pilkington, 2017). In this regards, the overall intent of sequential explanatory mixed design is to purposively investigate the context so as triangulate prior quantitative results in more detail way. Therefore, sequential explanatory mixed design was employed to determine the initial theoretical foundation through systematically exploring the research gap this study context by involving survey data collection in the first phase and analyzing the data then following up with qualitative data to triangulate the survey responses.

3.4 Instrument Development and Pilot Study

According Song, Son, and Oh (2015) argument, there is limited or no scientific principles guarantee an optimal or ideal questionnaire design and usually seen as much of art than it is a science. In this regard, the authors advocated that creativity, skill, and experience of a researcher play a major role in the end design. As suggested by Singh (2017) there are three common questionnaire development procedures namely: conceptualization of questionnaires; format, data capturing and analytical approach; validity and reliability of questionnaire so as to create collective postulation in developing credible and legitimate questionnaire through undertaking a common development process that have a potential value in avoiding major mistakes.

As suggested by Singh (2017), researchers must be concerned towards the content validity that refers to the extent to which the items on a test are fairly representative of the entire domain the test seeks to measure particularly at the design stage by considering main strides throughout the overall development process such as carefully planning variables that should be manipulated, observed and recorded; identifying any plausible rival statements that remained unadjusted in the initial design; and redesigning to eliminate threat for measurement accuracy. Typically, questionnaires usually involve towards the number of question statements that the respondent has to answer in a set of format so that a distinction is made between open-ended and closed-ended questions. According to Harlacher (2016), an open-ended which refer to the unstructured questions that asks the respondent to formulate his own answer, whereas a closed-ended as

structured and semi-structured question that the respondent picks an answer from a given number of options.

In this regard, the development process will be grounded on standard questionnaires utilized by previous empirical studies as well as the customization process was done based on Singh's suggestions for development procedures considering their applicability in this study context. As, scale development is all about determining how many response options aim to provide trustworthy information, the predominant measurement scale that is the five point Likert scale with anchors from strongly agree to strongly disagree was selected considering as one of the most widely used itemized scales in behavioral science research while rating scales towards respondents level of agreements between four to seven remained painstaking options whereas, scales above seven usually create burden of demarking authentic taxonomies as well as lead to less reliable results (Harlacher, 2016; Sahin, 2018).

Subsequently, Bowen et al. (2017)emphasized the importance of reliability and validity where reliability are used to examine internal consistency typically accessed using Cronbach's alpha coefficient and validity to accuracy of measurements. Thus, the issue of reliability and validity was examined in pilot study initially conducted to evaluate the study design prior to performance of scale items. In this study context validity were applied to both the design and the methods to scrutinize whether the specified measures truly represent the phenomenon proposed to measure considering construct validity usually claim for accuracy of measures procedures that were detailed in the next psychometric measurement procedures section-II due to the its solid claims in quantitative data analyses. In addition, coding and language translations were completed to aid the identification of items; thus scale items were given separate identification number in the questionnaire development process which facilitated in setting statement categorizations; thus, final reorganizations was done by incorporating valid feedbacks from domain experts.

3.5 Sampling Design

According to Taherdoost (2016b) sampling is usually intended to gain information about a population by a scientific choice of representative cases and scientific selection methods within the sampling frame and unit of analysis. Rahi (2017)illustrated sampling design as the process of selecting segment of the population for investigation while population is reflected as entire study target or items that a researcher wishes to understand. In other words, Gottlieb (2018)considered sampling design as a process of selecting a sample of items from a data set in order to measure the characteristics, features and structures of the target group that systematically represent the

entire study population; hence, the details of the sampling design are demonstrated in the following sub-sessions.

3.5.1 Sampling Strategy and Procedure

Sampling strategy and procedure in a mixed research approach determines the specific sampling tactics to be employed for each of the research approaches as well as procedures of combining the quantitative and qualitative approaches to address research questions initially posed. Thus, sampling strategies in mixed approach involve specific procedures, selection of frames and units of analysis for a research study through both probability sampling which helps to increase internal and external validity as well as non-probability sampling to increase transferability(Creswell, 2014). Probability sampling is typically used to select representative units/features from the larger collection of cases or the target population as well as non-probability sampling to determine cases/targets associated to the purpose of the study; thus, target population for a survey refers to the entire set of units for which the survey data are to be used to make inferences and defines those units for which the findings of the survey are meant to generalize (Leavy, 2017; Rahi, 2017). In this regard, the target population of this study context included all staffs in Ethio-telecom to determine the sampling frame and unit of analysis.

According to Guest, Namey, Taylor, Eley, and McKenna (2017) interviews provide insights on the current position of participants so as to acquire diverse opinions and feedback on multiple aspects as well as an appropriate techniques qualitative investigation when there is a need to collect an in-depth information towards respondents' personal opinions, feelings, thoughts, experiences and world view. In this regard, purposive sampling technique was used to collect qualitative data using key informant interview where this technique empowers to measure the reaction of individuals and usually provide immediate ideas and broadening particular concepts(Rosenthal, 2016).

3.5.2 Sampling Frame and Unit of Analysis

Sampling frame refers to the complete list of all the units in a population to provide a base for the selection of the sample where unit of analysis indicates to the entity that frames what is being analyzed in a study as well as involve towards the level of analysis such as individuals, groups, social organizations and social artifacts(Lawrence, 2014; Taherdoost, 2016a). In other words, sampling frame identifies the sampling units in a population and their locations where sampling

frame can consist of a listing of sampling units or it may be based on a map of the population area within which sampling units can be observed(West, 2016; Wilson, 2016).

In addition, the unit of analysis can be considered as a person or object from which a researcher collects data and answers the question of "what" and "who" are being studied in a certain study that might include individuals, groups of individuals, organizations of individuals, countries, technologies and objects based on the purpose of the research (Dolma, 2010; Kumar, 2018; Sedgwick, 2014). Hence, identifying the unit of analysis may seem like an easily perceived step, but it is oftentimes overlooked particularly in behavioral oriented studies. In this regard, individual were considered as the unit of analysis and the sampling frame was involved two strata: IT Professionals and Managers as well as purposive sampling techniques were also employed to determine the sample frames of the study areas based on specific purposes associated with answering a research study's questions.

3.5.3 Sampling Size Determination

Taherdoost (2016a) stated sample size determination as the act of choosing the number of observations or replicates to include in a statistical sample and the sample size is an important feature of any empirical study in which the goal is to make inferences about a population from a sample. According to Gottlieb (2018) the usual practice of applying sample size in social science studies commonly determined based on the cost, time, or convenience of collecting the data, and the need for it to offer sufficient statistical power. A concern for generalization for generalizability and repeatability, identification of sample size is essential in quantitative research where the population size remained to be a vital factor in sample size determination that usually tends to affect the amount of error (Balkin, 2014).

In this regard, evidences argue by exploring the fallacy and misconception of quantitative studies itemization as less prone to bias and subjectivity where researchers make decisions about some of the error that exists in the study remained subjective decisions due to the mere selection of an alpha level (Balkin, 2014; Rahi, 2017; West, 2016). In this study context, the target population comprised the total numbers of employees in Ethio-telecom to decide the actual sample size of quantitative survey as well as to make informed and meaningful analysis and conclusions. Accordingly, simple random sampling was employed to select a representative number of units from the specific subgroups (strata) of a population proportionally where every item in the population would have an even chance and likelihood of being selected in the sample. As illustrated in Table 3-1 the total target population was determined through the mixtures of IT

professionals: Network and Information System as well as supervisors (managers) based on the preliminarily survey conducted.

Table 3-1: Target Population of the Study

Cluster	Location	IT Professionals			Supervisors (Managers)	Total Population
		Network Infrastructure	Information System	Total		
Addis Ababa Zone	EAAZ	177	4	181	36	217
	WAAZ	158	5	163	27	190
	SAAZ	181	5	186	26	212
	NAAZ	147	4	151	26	177
	CAAZ	162	9	171	19	190
	SWAAZ	174	3	177	23	200
Head Quarter	Main HQ	5	35	40	34	74
	Microwave	403	-	403	94	497
	Arada-HQ	18	-	18	9	27
	Leghar-HQ	69	307	376	68	444
	Old Airport-HQ	203	-	203	44	247
	Piassa-HQ	78	-	78	18	96
	Sidistkilo-HQ	166	-	166	46	212
	Total	1941	372	2313	470	2783

Note: IT professionals refers to Network and Information System Experts; Managers to Immediate Supervisors list of employees in Ethio-telecom by 2020

Source: Ethio-telecom HR Management Report (2020)

Since the total target population was determined through identifying the IT professionals: network and Information System experts as well as individuals at supervision or manager when the total target population was known, the representative sample size was computed by using the (Yamane, 1967) formula and cited by (Israel, 1992). The author suggested steps that Yamane (1967) provided to calculate sample sizes.

The formula was used to calculate the sample sizes within the consideration of 95% confidence level as well as $e^2 = 0.0025$is the precision level where *P*=0.05 (5%) assumed as error term to determine the sample size in order represent the study population.

$$n = \frac{N}{1 + Ne^2}$$

Where$N$ are total populations (Ethio-telecom employees) and n is the required sample size from the target employees: IT professionals and Managers as well as e^2 is the precision level to be used 5% (0.0025). In this regard, the desired sample size for each target populations that were calculated as follows:

$$n = \frac{2783}{1 + (2783 * 0.0025)}$$

$$n = \frac{2783}{1 + (6.9575)} \quad \rightarrow \quad \text{IT Professionals \& Supervisors}$$

$$n = \frac{2783}{7.9575} = 350$$

Therefore, the sample size of both IT Professionals and Managers were 350 (three hundred fifty)from the total target population. Accordingly, the sample proportion was calculated through dividing the total population of each zonal and headquarter clusters by the sample interval (7.96) as well as the sampling interval was computed by dividing the target population (2783) by the sample size (350). In this regard, the sample proportions for both IT professionals and supervisors group based are illustrated based on their district strata in Table 3-2 and Table 3-3 respectively below.

Table 3-2: Sample Determination Based the Proportion for IT Professionals

Cluster	Location	IT Professionals	Sample Interval	Sample Proportion
Addis Ababa	EAAZ	181	7.96	23
	WAAZ	163	7.96	20
	SAAZ	186	7.96	23
	NAAZ	151	7.96	19
	CAAZ	171	7.96	22
	SWAAZ	177	7.96	22
Head Quarter	Main HO	40	7.96	5
	Microwave	403	7.96	51
	Arada-HO	18	7.96	2
	Leghar-HO	376	7.96	47
	Old Airport-HO	203	7.96	26
	Piassa-HO	78	7.96	10
	Sidistkilo-HO	166	7.96	21
	Total	2313	7.96	291

Source: IT Professionals' Sampling Proportion Results, 2020

Accordingly, sample proportions of IT professionals were calculated through dividing IT professionals' sample size at each cluster by the sample interval (7.96) as well as the sampling interval was calculated by dividing the total sample of the target population (2313) at Ethio-telecom by the sample size (291). Thus, the sample size proportions IT professionals were calculated towards the location of each cluster as presented in Table 3-2 above.

Table 3-3: Sample Determination Based the Proportion for Managers

Cluster	Location	Supervisors (Managers)	Sample Interval	Sample Proportion
Addis Ababa Zone	EAAZ	36	7.96	5
	WAAZ	27	7.96	3
	SAAZ	26	7.96	3
	NAAZ	26	7.96	3
	CAAZ	19	7.96	2
	SWAAR	23	7.96	3
Head Quarter	Main HQ	34	7.96	4
	Microwave	94	7.96	12
	Arada-HQ	9	7.96	1
	Leghar-HQ	68	7.96	9
	Old Airport-HQ	44	7.96	6
	Piassa-HQ	18	7.96	2
	Sidistkilo-HQ	46	7.96	6
	Total	470	7.96	59

Source: Managers' Sampling Proportion Results, 2020

Similarly, sample proportions of managers or supervisors were calculated through dividing the sample size of managers at each cluster by the sample interval (7.96) as well as the sampling interval was calculated by dividing the total sample of the target population (470) at Ethio-telecom by the sample size (59). Thus, the sample size proportions managers were calculated towards the location of each cluster as presented in Table 3-3 above.

3.6 Type and Source of Data

Ajayi (2017) determined sources of data as primary and secondary where primary sources refers to original and unique data sources that researchers directly use as first-hand source or study object while secondary sources as well as secondary sources of data are one that was created later by someone who did not experience first-hand or participate in the conditions that a

researcher intend to investigate. Hence, primary sources include the first-hand data from surveys, observations, experiments, questionnaires or interviews whereas secondary sources comprise published or unpublished materials such as textbooks, magazine, articles, book reviews, commentaries (Prada-Ramallal, Roque, Herdeiro, Takkouche, & Figueiras, 2018). In this regard, the self-administered questionnaires and key informant interview was considered as primary sources of data as well as the published and unpublished sources such as books articles, journals, proceedings, plans, reports and other government documents (strategic plans, annual reports, policies, proclamations, laws, procedures and guidelines) were deliberated as secondary sources of data in this study context.

3.7 Data Collection Techniques

According to Newby (2014) data collection is the process of gathering and measuring information on targeted variables which then enables one to answer relevant questions and evaluate outcomes. Since, this study adopted mixed approach with sequential explanatory research design; evidences indicated to seek evidences sequentially (i.e. collecting first quantitative data and collecting qualitative data in the second phase) to measure the particular level of belief, perception and behavior of participants (Bryman, 2012; Creswell, 2014; Gray, 2013; Leavy, 2017).

As explained by Creswell (2014) mixed research approach should determine the type of data collection techniques which are typically associated with quantitative and qualitative inquiry. Consequently, mixed usually comprise at least a quantitative and qualitative techniques of data collection to gather information for a certain study context. in a single study. Therefore, data collection techniques that were employed in this study were both survey questionnaires and key informant interviews for quantitative and qualitative data respectively. The rationale for choosing these methods of data collection techniques is described here under in the following sub-sections.

3.1.1 Survey Questionnaire

Roopa and Rani (2012) purely defined questionnaire as research instrument consisting of a series mimeographed questions or other sort of up-headed prompts inquires to be completed by respondents based on their previous experiences, opinions and beliefs to meet the purpose of collecting information from participants. Literatures indicated questionnaires as backbone of any survey based investigations and the success such inquiries typically lie in the designing of a valid

questionnaire (Gnambs & Kaspar, 2015; Song et al., 2015). In this regard, it is essential to be watchful towards the process of instrument development stages such as clarifying foundational concepts, demonstrating question contexts, phrasing and response formats, sequence and layout, pretest and pilot demonstration, revision and reorganizations to design and develop valid and reliable survey instruments; since, standardizing the measurements of each question items enable researchers to collect internally consistent quantitative data in order to determine coherent analyses (Roopa & Rani, 2012; Song et al., 2015). Thus, review of literatures indicate that well-designed survey questionnaires require well-thought conceptual foundations and needs long way exertions so as to plan and develop standardized instrument via the scientific processes articulated above.

In this regard, there are about four different types of survey questionnaires (contingency questions /cascaded format/, matrix questions, close-ended questions and open ended questions) usually applied according to the purpose of a survey (Roopa & Rani, 2012). Consequently, McCusker and Gunaydin (2015) declared several advantages of using survey questionnaires in terms of their assurance for a researcher to reach large number of people, guarantee for better statistical significance with little or at least closes room for subjectivity as well as relatively easy to analyze and provides quantifiable answers for a research topic. Therefore, close and open ended questionnaires were logically developed to collect quantitative data where the close ended (i.e. scale questions) were utilized to determine respondents level of agreements and open ended to achieve comprehensive perceptions of respondents without being constrained by a fixed set of possible responses towards the study context.

3.1.2 Key Informant Interview

According to David and Ching (2014) key informant interviews refer to qualitative in-depth investigations via discussing with people who know what is going on and expected to share more information associated to a certain study context. The purpose of key informant interviews is to collect information from purposively selected individuals including leaders/managers, professionals, or residents who have first hand information or knowledge about the study context (Guest et al., 2017). Although researchers select in-depth interviewing for different purposes, the basic interviewing techniques are similar for these different types of studies. In each case, interviewers try to establish rapport with informants and to develop a detailed understanding of their experiences and perspectives (Taylor, Bogdan, & DeVault, 2016). Furthermore, as suggested by Jamshed (2014), there are number of advantages towards utilizing key informant

interviews such as; making it possible for the researcher to directly intervene in the research process; allowing the researcher to guide participants to talk about specific issues; and allowing the researcher to ask a number of participants the same broad questions on particular theme.

Therefore, to obtain rich information on the research area semi-structured interview was used in this study context for qualitative data collection. Semi-structured interviews involve a mix of open and closed questions and the questions are planned but leaves a room for flexibility (Creswell, 2014; Lawrence, 2014). The reason for choosing this technique of data collection is; first, it provides complete freedom and authority to address any or all of a given number of inquiries in order to add certain interests to the area of investigation or explorations. Similarly, semi structured interviews allow participant to expand the areas of investigation which they feel are important to uncover the framework of meanings.

3.8 Data Analyses Techniques and Procedures

Data analysis procedures encompass the examinations and interpretations of the collected data to address the prior research questions or hypotheses(Savin-Baden & Howell-Major, 2013). As pointed out by Alavi and Hąbek (2016) data analysis in a mixed research approach is related to the processes and procedures of combining both qualitative and quantitative explorations of multidimensional logical techniques for the purposes of breadth and depth of understanding of a certain study context through applying scientific procedures of triangulations and interpretations. In this regard, the following sub session describes the detail descriptive and inferential statistics employed to analyze the quantitative data as well as designates the justification for selecting and using each statistical technique to scrutinize the hypothesized relationships in the proposed conceptual framework.

3.8.1 Preliminary Data Analysis Procedures

As pointed out by Babagana, Mat, and Ibrahim (2019)preliminary data analyses are typically considered as indispensable aids in identifying whichever possible contraventions of core assumptions quantitative data analysis for further multivariate statistics. Several evidences advocate the importance performing preliminary analysis usually executed using descriptive statistics to define the basic features of quantitative data by presenting brief summaries and the measurements done towards a particular study (Denis, 2016; Ho & Yu, 2015; Park, 2015). In this regard, the procedures for data screening and management such as missing data management

and outlier detection procedures as well as the concern of normal distribution measures were illustrated in the following subsections.

3.8.1.1 Data Screening and Management

The first procedure in preliminary analyses commonly associated to data managements: screening and treatment in order to maximize signal and minimize noise through fixing or removing errors that comprise missing data management and outliers' detection. Prykhodko, Prykhodko, Makarova, and Pugachenko (2017)stated outliers as either any cases of responses that significantly divergent from most of the respondents in a particular data set or a kind of observations that dwell outside the overall pattern of a distribution as well as missing data management refers to simply omit missing cases related to main research variables and analyzing the remaining data via detection technique which is the most frequently used routine in handling missing data in most statistical tools.

3.8.1.2 Assessment for Normal Distribution

Univariate analyses also considered as the next to prior preliminary process that involve in measurements of central tendency and dispersion in order to scrutinize the association among variable items particularly to determine the concern of normality in this study context. Denis (2016)explained the assumptions of normal distribution as the probability function of designating how the values of a variable are symmetrically distributed where majority of the observation clusters expected to dwell around the central peak and the probabilities for values deviate from the mean taper off equally in both directions that usually appear as bell curve. In this regard, test of normality were given prior concern due to assumption of the sample means across the independent samples expected to remain normally distributed especial to behavioral science studies related to behaviors, beliefs and attitudes in order to quantify respondents perception towards a certain subject of investigation where pondering these assumptions were considered appropriate rulebooks in this study context.

Tabachnick, Fidell, and Ullman (2007)claimed that the basic techniques of statistical normality tests are the skewness and kurtosis that typically involve towards determining whether the data distribution looks similar to the left and right of the center point and groping the data in terms of heavy-tailed or light-tailed relative to the normal distribution respectively. Since, the violations of normality concern usually incur sufficient threat to perform credible and reliable interpretations of a given research, test of normality were examined to inspect whether there

existed any normality issues along with the data screening and treatment carried out to detect the outliers towards the associations among the main research variables so as to make the data ready for further statistical analyses.

3.8.2 Psychometric Measurement Analyses Procedures

This session presents the measurement scales employed in the questionnaire to test the measurement accuracy towards the hypothesized relationships among the constructs in the proposed research model. Thus, the nest sessions provide detail procedures towards examining the data structures of each construct items to determine the dimensionality of items along with inspecting the concerns of reliability and validity as well as issues of collinearity to prepare the entire data for Structural Equation Modeling (SEM) in order to test the hypothesized relationships among the independent and dependent variables.

3.8.2.1 Measurement Scales Assessments

As elaborated by several evidences, the dimensionality structure of factors items that can be reflected through grouping factor items based on strong correlations typically considered as imperative since it indicates the degree to which the test of items adequately represent the construct (Foster & Maas, 2014; Osborne & Banjanovic, 2016; Samuels, 2017). At the outset, the concept of factor analysis predominantly emerge in behavioral science discipline and become much more common during the past two decades as a multivariate statistical procedure for interpreting self-reporting questionnaires (Williams, Onsman, & Brown, 2010). Evidences indicated that factors analysis has three main purposes among the other routine; primarily, it reduces large number of variables into smaller set of factors and then establishes underlying dimensions between measured variables and latent constructs that allow the formulation and refinement of theory (Hadi, Abdullah, & Sentosa, 2016; Osborne & Banjanovic, 2016; Samuels, 2017). Subsequently, Exploratory Factor Analysis (EFA) is usually considered as one way to determine internal structure via providing evidence of validity so as to prepares the variables to be used for cleaner structural equation modeling(Watson, 2017; Wongpakaran, Wongpakaran, Sirirak, Arunpongpaisal, & Zimet, 2018).

Since, this study context was resided to cognitive belief variables in order to explore factors affecting green IT adoption at individual level where assuming potential correlations were inevitable among measurement items of each construct than to explain their respected construct separately or independently particularly in behavioral science researches (Coan, 1959; Flora &

Flake, 2017; Samuels, 2017). Moreover, oblique and orthogonal are considered as majorly used rotation types where oblique assumes correlation among factor components and orthogonal dons to remain separated from or uncorrelated with one another (Kirkegaard, 2016). Thus, oblique rotation via promax technique were employed along with the rulebooks of principal component analysis that transforms a number of correlated variables into smaller number of uncorrelated variables (Coan, 1959; Dray & Josse, 2015; Ringner, 2008). In this regard, EFA was examined via Kaiser-Meyer-Olkin (KMO) for testing the appropriateness of data towards sample adequacy and Bartlett's Test of Sphericity to ensure whether minimum standard (cut-off)were meet to evaluating indicator loadings where the factor structures specify the inter-correlations among the factor components determined via the pattern matrix valuation along with the minimum criteria for factor loading so as to confirm the unidimensionality of factor components that usually ruin as prerequisite to proceed towards assessing path analyses in the structural equation modeling.

3.8.2.2 Reliability and Validity Valuations

Evidences indicated that groping the concern of validity and reliability issues are essential steps to proceed testing the hypothesized relationship as such assumptions critically affect the results and objective of the research(Hair, Ringle, & Sarstedt, 2013). As pointed out by Song et al. (2015), reliability refers to the degree to which an instrument measures accurately under the same condition of a certain study subject and concerned about consistency of a measures or stability of the score obtained from a certain measure or assessment across a certain study backgrounds so as to evaluate whether it is free from random measurement error. In this regard, the concern of reliability of the scale measurement remained vital step in social science studies that aimed towards how well similar results produce while repeated measurements are made under the same conditions usually called as internal consistency and refers to the degree of item scales tend to measure consistently underlying each construct measurements (Taherdoost, 2016a). The most commonly used pointer for determining internal consistency is Cronbach's coefficient alpha coefficient where values 0.7 or greater are considered acceptable in the social science research (Kriston, Schäfer, Jacob, Härter, & Hölzel, 2013).

As suggested by Singh (2017), the concern of validity is all about guaranteeing results of a study to be meaningful and trustworthy usually established by increasing internal validity (how well inferences of causality could be made from the hypothesized relationship) and external validity (the concern of generalizability that reflects how well the outcome of the study can be expected to apply to other settings) concerns. Among the others trepidations of validity, construct validity

were typically examined in this study context since the main objective is to explore factors affecting individuals' behaviors towards adopting green IT through the lens of extended theory of planned behavior as well as assessing convergent and discriminant validity resided as prime approaches for testing construct validity particularly for underlying theoretical constructs supposed to measure (Hair, Sarstedt, Pieper, & Ringle, 2012a).

In this regard, convergent validity refers to the extent to which measures of a specific construct whether a specific measure converge or share a high proportions of variance in common based on theoretical mold of correlations whereas discriminant validity; also known as divergent validity that undertakes to the extent in which constructs are not unduly related to other similar or accepting distinction of constructs (Hair et al., 2013). Hence, notable number of literatures indicated the concern of convergent validity can be measured through assessing the values of Factor Loading (FL); Composite Reliability (CR), Average Variance Extracted (AVE), and Maximum Shared Squared Variance (MSV) (Raykov, 2011) while factor loading refers to the variance explained by the variable on a particular factor; CR to degree where the construct indicator represent the latent construct; AVE to the overall amount of variance in the indicators accounted for latent construct; MSV to the square of the highest correlation coefficient between latent constructs (Hair et al., 2013; Henseler, Ringle, & Sarstedt, 2014).

At the outset, empirical evidences majorly suggested CR and AVE cut-off level as greater than 0.70 and 0.05 respectively where MSV is expected to remain less than AVE and loading to be greater than 0.70 in order to establish convergent validity (Tarhini, Teo, & Tarhini, 2016; Watson, 2017). In addition, discriminant validity usually determined via calculating the square root of AVE to be compared with its squared correlations with other constructs in the model while the inter-construct correlations itemized as less than the square root of AVE so as to satisfy the minimum requirement to determine multidimensionality of component factors that prerequisite for employing structural equation modeling to determine the hypothesized relationships in the initial research model (Denis, 2016; Henseler et al., 2014; Memon, Ting, Ramayah, Chuah, & Cheah, 2017).

3.8.2.3 Collinearity Assessments Techniques

According to Keith (2019) multicollinearity refers to a phenomenon in which a predictor variable can be linearly predicted from the others with a substantial degree of accuracy towards multiple regression models. In addition, multicollinearity also called collinearity usually occurs when several independent variables correlate at an excessively high level with one another or when

two variables overlap with one another in predictions as well as often become a problem when there are multiple measures of same construct towards regression analysis(Harrell Jr, 2015). In this regard, issues of multicollinearity bizarre for regression usually tend to mislead results by producing strange results such as standardized regression coefficient greater than one along with inflated standard error. As noted by Keith (2019)the collinearity diagnostics can be examined using tolerance and Variance Inflation Factor (VIF) values where tolerance refers to the degree in which each variable is independent of (does not overlap with) the other independent variable as well as Variance Inflation Factor (VIF) represent to the reciprocal of tolerance and signify to the index of amount that the variance of each regression coefficient come to be overestimated towards the variance at each regression.

At the outset, tolerance can range from 0 (zero) to 1 (one) and ranges with approximate to zero indicate no independence from other variables but if tolerance values specified as approximately close to one then dons for complete independence where large values are usually desire. In addition, the values of VIF ranging from 0 to 5 reasonable flags for being safe zone while greater than 5 indicate for excessive multicollinearity concern(Harrell Jr, 2015). Thus, the common rule of thumb for larger values of VIF commonly specified as 10(ten) which means the standard errors come to be three times as large as the uncorrelated variables where this value is probably too high where smaller values of tolerance and larger values of VIF signals the presence of multicollinearity (Denis, 2016; Harrell Jr, 2015; Keith, 2019; Tabachnick et al., 2007). In this regard, the concern of multicollinearity was addressed via examining the values of variance inflation factor and tolerance in this study context.

3.8.3 Structural Equation Modeling (SEM)

Structural equation modeling (SEM) has emerged as a contemporary multivariate statistical analysis technique across disciplines and increasingly grown particularly in the social sciences majorly known as path analysis, covariance structure analysis, simultaneous equation models that has notable differences comparing with the classical methods such as factor analyses or regressions to carry out simultaneous estimations towards set of hypothesized relationships of variables (Kline, 2016; Memon et al., 2017). As pointed out by Kline (2016), one of the major differences between SEM and regressions can be present in terms of structural assumptions that implies testable and implications; thus, the primary goal of regression analysis is mere prediction where several predictors usually done for informational purpose and usually explain variance beyond the inclusion of the others.

In this regard, regression coefficients typically denote to the weights chosen to maximize prediction but no causal content because fitting a regression plane into a multidimensional scatter of Y-values along with the consideration to remain provisionally expected mean of Y/X results where X states a vector of weighted predictors (Bollen & Pearl, 2013; Hooper, Coughlan, & Mullen, 2008). In contrast, SEM commonly bases on multidimensional causal assumptions where various exposures of variables can be included for determining specific causal role and parameters can estimated under these set of assumptions where transporting causal meaning, fusing the data patterns and the causal suppositions can be performed at the same time particularly for studies that have strong theoretical backgrounds (Bollen & Pearl, 2013; Henseler & Sarstedt, 2013).

According to Memon et al. (2017) argument, the potentials of SEM towards adding and investigating latent variables (factors) in measurement model could be evaluated and the links among these latent variables splendidly estimated in more credible manner simultaneously. Similarly, Hair et al. (2013) defined SEM as a multivariate technique, which combines features of multiple regressions, factor analyses and other related procedures such as analysis of covariance structures, causal modeling, covariance structure analysis, covariance structure modeling, latent variable structural modeling, linear structural relations, or moments structure modeling in order to estimate various relationships concurrently in order to generate empirically validate theories and concepts. Thus, evidences addresses complexity of directly observing theoretical constructs in the behavioral sciences studies due to the vital request to maintain a concern of measurement accuracy; thus SEM deals directly with how well the measures reflect the intended constructs. Moreover, researchers remained inquisitive towards the complexity predictions along with the requisite for comprehensive understanding to the multifaceted aspect of a certain phenomenon where predictive models have become more complex. At the outset, SEM techniques allow for more specific testing of complex path models that incorporate sophisticated thought of patterns and relatively more flexible than the classical techniques (Henseler & Sarstedt, 2013; Keith, 2019; Memon et al., 2017).

Furthermore, SEM provides a unique analysis that simultaneously considers questions of both measurement and prediction as well as provides a flexible and powerful means of assessing the quality of measurement and examining predictive relationships among constructs typically for latent variable models (Memon et al., 2017); thus, SEM allows researchers to frame increasingly precise questions about the phenomena they are interested through performing path analyses that offer considerable advantages for estimating and predictive among relationships of latent

constructs generally uncontaminated by measurement error. In this regard, the following subsections detailed the overall criteria of Goodness of Fit Indices (GFI) employed for evaluating both model measurement and path analyses where model measurement valuation procedures to specify how measured variables represent the study context and path analyses to scrutinize the hypothesized relationships in the proposed research model

3.8.3.1 Criteria for Goodness of Fit Measures

According to Kline (2016) Goodness of Fit refer to continuous measures of model data correspondence so as to reject or retain a null hypothesis due to the inevitable limitation in demarcating sampling errors. In this regard, various evidences categorized Goodness of Fit Indices into three classes such as Absolute Fit Indices, Incremental Fit Indices and Parsimony Fit Indices where Absolute Fit Indices include Chi-square (x^2), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index ($AGFI$), Root Mean Square Residual (RMR), and Standardized Root Mean Square Residual ($SRMR$), Close Fit ($PClose$) as well as Incremental Fit Indices encompass Comparative Fit Index (CFI), Normed Fit Index (NFI) (i.e. later improved as Non-Normed Fit Index (NFI) due to its sensitiveness to sample size) also known as Tucker-Lewis Index (TLI).

Moreover, Parsimony Fit Index (PFI) involve in Parsimonious Normed Fit Index ($PNFI$) and Parsimonious Goodness of Fit Index ($PGFI$) in general (Arbuckle & Wothke, 2012; Hooper et al., 2008; Kline, 2016). In this regard, absolute fit indices determine how well a priori model fits the sample data and demonstrate which proposed model has the most superior fit so that these measures provide the most fundamental indication of how well the proposed theory fits the data (McDonald & Ho, 2002) as well as incremental fit indices are group of indices that do not use the chi-square in its raw form but compare the chi-square value to a baseline model(Miles & Shevlin, 2007). However, there are some cases particularly for complex model that designates the estimation process to be dependent on the sample data while better fit indices produced in less rigorous theoretical model for nearly saturated models paradoxically(Crowley & Fan, 1997). To this end, Mulaik, James, Van Alstine, Bennett, Lind, and Stilwell (1989) have developed two parsimony fit indices; the Parsimony Goodness of Fit Index ($PGFI$) based upon the GFI by adjusting for loss of degrees of freedom and the Parsimonious Normed Fit Index ($PNFI$) adjusts for degrees of freedom based on NFIin order to overcome these problems.

As cautioned by Kline (2016)chi square (x^2) test is generally a reasonable measure of fit models particularly for models with relatively small sample size (around 75 to 200 cases); however models with more 400 or more cases usually remains almost always statistically significant while non-significant x^2 considered as serious warning and indications of for missing a single large covariance residual or a pattern of smaller cases in order to diagnose the magnitudes and sources of misfit via detecting the data discrepancies caused for the specified failure. As SEM tends towards simultaneous estimation routine, several writers have suggested to examine the ratio of minimum discrepancy (x^2/df) as a vital measure of fit where likelihood ratio of x^2 refers to the minimum values of discrepancies regularly denoted as $CMIN$ in Analysis of Moment Structures (AMOS) software and df explicates a fractional number used to compute for p-value in order to determine the statistical significance of the entire estimations along with an over-identified model allows to be falsified using x^2 test (Arbuckle & Wothke, 2012; Hoyle, 2012; Keith, 2019). In addition, GFI refers to a measure of fit among the hypothesized model and the observed covariance matrix; adjusted goodness of fit index($AGFI$) corrects the GFI, which is affected by the number of indicators of each latent variable as well as IFIalso known as Bollen's IFIused adjusts the Normed Fit Index for sample size and degrees of freedom due to its insensitiveness to sample size (Arbuckle & Wothke, 2012; Hair et al., 2013).

In this regard, $CFI$and TLI are incremental fit indices that compare the fit of a hypothesized model with that of a baseline model where baseline model usually denotes the independence (null) model, which assumes covariance of zero between the endogenous variables; thus, values of GFI, IFI, TLI& CFI that exceed from 0.90 commonly regarded as acceptable level, although these indexes can exceed 1 when theoretical models reach at saturation level. In contrast, $RMSEA$refers to the absolute fit index used to assess how far the hypothesized model is presented from the perfect model considering p-value for testing the null hypothesis and the population $RMSEA$remains with no greater than 0.08 where lesser values indicate a close fit in which $PClose$ provides test of close fit while$p$ indication a test of exact fit(Arbuckle & Wothke, 2012; Hooper et al., 2008; Keith, 2019). In this regard, the above mentioned criteria of goodness of fit indices were employed for carrying out structural equation modeling towards both measurement model assessments and path analyses (structural model valuations) to determine the hypothesized relationship in the proposed research model.

3.8.3.2 Procedures for Measurement Model Valuations

According to Kline (2016)measurement model normally suggest how measured observed variable known as indicators represent the latent variable usually measured directly where observed variables in reflective measurement models required to be effect indicators due to reflective measurements regularly derived from the sampling model domain. Evidences suggested that reflective measures (when indicators caused by the latent variable) of the same construct should be internally consistent along with the statistical consideration for inter-correlations be duty-bound to moderately high in magnitude as well as correlations between indicators of the same construct should be greater than the cross-factor correlations with indicators that are supposed to measure different factors(Hair et al., 2013; Kline, 2016). In Confirmatory factor Analysis (CFA), there is no requisite to distinguish between endogenous and exogenous constructs while it is necessary during the model measurement stage where covariance is usually represented by two-headed arrows in order to generate a model that best fits the sample data via assessing the goodness of fit measures. In this regard, evidences indicated that modification indices provide information to improve the model fit measures by residing standardized residual covariance to 2.58 and factor loading above 0.70 through discarding the modification indices with very high covariance so as to come with high regression weights (Keith, 2019; Kline, 2016).

3.8.3.3 Procedures for Structural Model Valuations

Confirmatory Factor Analysis (CFA) is the next step after Exploratory Factor Analysis to determine the factor structure of your dataset whereas EFA explores the factor structure (how the variables relate and group based on inter-variable correlations) and CFA confirms the factor structure extracted in the EFA(Kline, 2016). Furthermore, once the measurement model assessment was completed via establishing reliability, convergent validity and discriminant validity valuations along with the model fit measures; thus the next step was to examine the hypothesized relationships of constructs in the proposed model during the structural model measurement stage. The structural model differs from the measurement model because the emphasis moves from the relationships between construct and measures variables to the significant of relationships among constructs replacing the two-headed arrows representing the correlations among constructs by one-headed or casual arrows; thus, the casual arrows signify the hypothesized relationship among constructs. Therefore, the relationships among constructs were specified after the transition from the measurement model to the structural model so that

estimations of each construct via standardized path coefficients, critical ratio and p-values along with the minimum cut-off towards the model fit indices were meaningfully considered in order to scrutinize the hypothesized relationships.

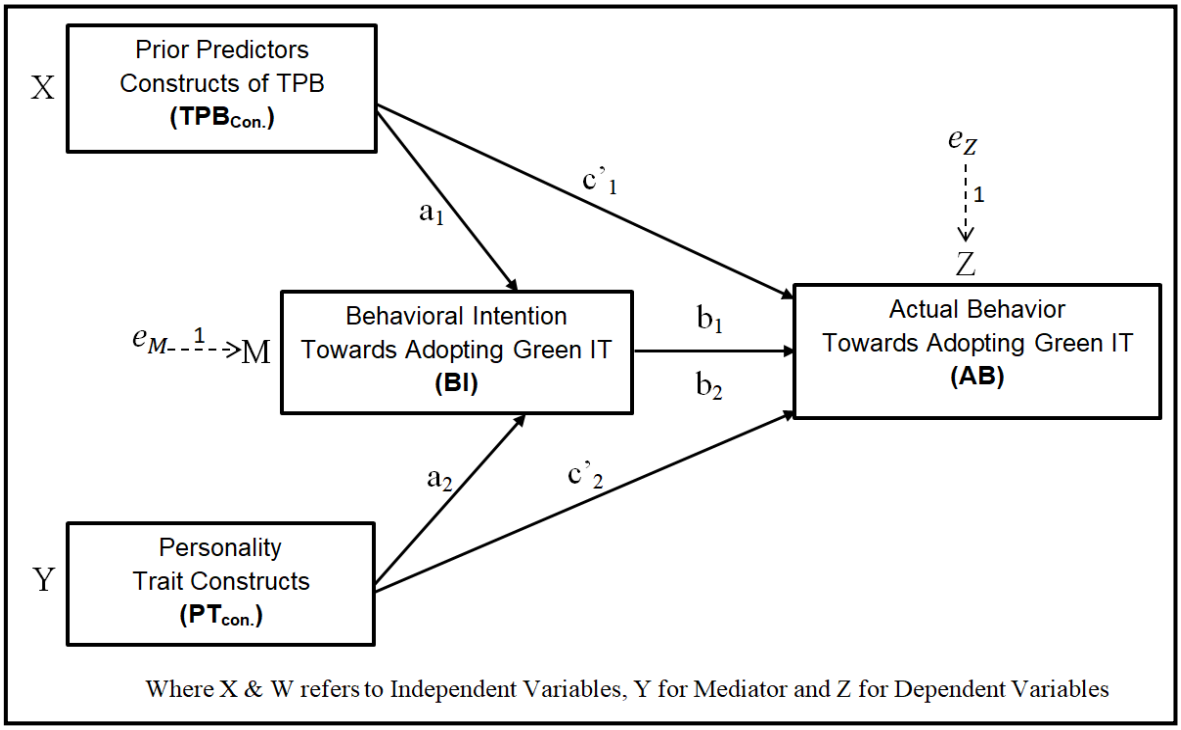
In this regard, Analysis of Moment Structures (AMOS) software tool was used for the entire analyses process where AMOS emerged as an added module to Statistical Package for Social Science (SPSS) known as analysis of covariance or causal modeling software with some vital plug-ins generated to automate several computations of SEM analysis.

3.8.4 Mediation Effect Analyses Techniques

According to Lowry and Gaskin (2014) mediation effect analysis usually used to describe the missing link in a chain of causation and applied to provide a more accurate explanation for the causal effect of antecedent on the dependent variable. Evidence indicated that mediation effect usually performed using the three-step approach(Baron & Kenny, 1986) and comparing the chi-square difference test with regard to the evaluation standards of (Hu & Bentler, 1999)based on the corrected chi-square values. An indirect, direct and total effects analysis of mediation model offers an explanation for how or why, two variables are related, where an intervening or mediating variable is assumed to be an intermediary towards the relationship among the independent and dependent variables (Nitzl, Roldan, & Cepeda, 2016). Exploring such effects usually allows researchers to confirm whether the empirical evidence is consistent with a mediation model X→Z→Y, which states remarkable influence to the relationship of independent variable X and dependent variable Y is causally mediated by Z which is a proposed mediator(Baron & Kenny, 1986; Sardeshmukh & Vandenberg, 2017).

According to Baron and Kenny (1986) and(Judd & Kenny, 1981), mediation effect can be determined via three regression models and figure 3-1 presents the three regression equations that must be estimated and separate coefficients for each equation should be specified so as to perform the testing process. In this regard, Model-1: linear regression equation was formulated to determine the actual behavior by the function of personality trait predictors and with the presence of mediator variable as well as model-2: regression equation was articulated to determine the actual behavior through personality traits variables with the absence of the mediator variable. Therefore, to test the direct, mediation /indirect/ effect and total effect of the predictors on actual behavior towards both models; thus, the causal three step approach developed by Baron and Kenny (1986) was used to assess the statistical significance of the relationship among personality trait variables to estimate the paths of mediation model as presented in Figure 3-1.

Figure 3-1: Mediation Model



Source: Deliberate based on Baron and Kenny (1986) casual step approach

According to testing a causal process of mediation analyses primary lay on the estimation and interpretation of the direct and indirect effects along with the inferential tests thereof. To derive these effects, one must also estimate the constituent components of the indirect effect; so, for this study context it means the effect of X and Y on M as well as the effect of Mon Z, although the constituent components of the indirect effects are not of primary interest in modern mediation analysis. Many researchers often estimate the total effect of X on Y as well, although doing so is not required for the purpose of interpretation. In this regard, the following mediation models represent by two linear equations for each consequent.

Model-1: Preliminary Mediation Equations

$$M = i_M + a_1 X + e_M \text{for } TPB_{con.} \text{and } M = i_M + a_2 Y + e_M \text{ for } PT_{con.}$$

$$Z = i_Z + c'_1 X + b_1 M + e_Y \text{ for } TPB_{con.} \text{ and } Z = i_Z + c'_2 X + b_2 M + e_Y \text{ for } PT_{con.}$$

Where$i_M$and $i_Z$represent to regression constants, $e_M$and $e_Z$to the errors in the estimation of M and Z, respectively as well as $a_1 \& a_2$, $c'_1 \& c'_2$ and $b$are the regression coefficients given to the antecedent variables in the estimation of the consequents. The coefficients of the model are treated as estimates of the putative causal influences of each variable on others, and the

analytical goal is to estimate these coefficients together so as to interpret the results. In this regard, the values of $c'_1$and c'_2 estimate the direct effects of prior predictor constructs. Thus, the equations for determining the direct effects of both X and Y variables on Z are presented in the following Model-2.

Model-2: Direct Effects (DE) of both X and Y variables on Z

$$\text{Model-2A}_{\textbf{DE of X on Z}}\text{:}\ \ c'_1 = \left[\hat{Z}|(X = x, M = m)\right] - [\hat{Z}|(X = x - 1, M = m)]$$

$$\text{Model-2B}_{\textbf{DE of Y on Z}}\textbf{:}c'_2 = \left[\hat{Z}|(Y = y, M = m)\right] - [\hat{Z}|(Y = y - 1, M = m)]$$

Where m refers to the value of M that is conditioned on or given and the hat over Z means estimated or expected from Model-1 (i.e. the effect of prior predictors of TPB constructs represented by X on actual behavior towards adopting green IT denoted by Z) as well as Model-2 (i.e. the effect of personality trait constructs represented by Y on actual behavior). In this regard, the two cases with $M = m$ indicates one unit variance on X and Y where c'_1 and c'_2 are the estimated values of Z for the case with $X = x$ and $Y = y$ minus the estimated values of Z for the case with $X = x - 1$ and $Y = y - 1$. Hence, c'_1 and c'_2 tells whether the case one unit higher on X and Y are estimated to be higher ($c'_1 \& c'_2 = +ve$) or lower ($c'_1 \& c'_2 = -ve$) on Z. In due course, the positive direct effect means that the case higher on X and Y are estimated to be higher on Z, whereas a negative direct effect means that the case higher on X and Y are estimated to be lower on Z. In the special cases where X and Y are dichotomous differing by single unit (i.e. 1 and 0); $\hat{Z}$ can be interpreted as group mean; thus, both c'_1 and c'_2 estimate the difference between the two group mean holding M constant that remain equivalent to the term of covariance analyses usually called adjusted mean difference.

According to Hayes (2018) statistical deliberations, the crucial issue in mediation analysis is determining the indirect effect prior predictors on dependent variables where the predictors in this study context are the theory of planned behavior ($X = TPB_{con.}$) and personality traits ($Y = PT_{con.}$) on dependent variable: actual behavior towards green IT ($Z = AB$) respectively. In this regard, the equations for determining the indirect effects of both X and Y variables on Z are presented in the following Model-3.

Model-3: Indirect Effects (IE) of both X and Y variables on Z

In this model, $a$quantifies how much two cases differ by one unit on *X* and *Y* are estimated to differ on *M*, with the sign determining whether each cases come to be higher on *X* and *Y* are estimated to be higher (+) or lower (−) on *M*. That is:

$$a_1 = [\acute{M}|(X = x)] - [\acute{M}|(X = x - 1)]$$

$$a_2 = [\acute{M}|(Y = y)] - [\acute{M}|(Y = y - 1)]$$

When *X* and *Y* are dichotomous variables and the two groups are coded such that they differ by one unit on *X* and *Y* (i.e. 0 and 1); $a_1 and\ a_2$ in Model-3 equation represents the difference between the group means. In addition the b_k coefficients have an interpretation analogous toc'_i, except with *M* as the antecedent. Two cases that differ by one unit on *M* that are equal on *X* and *Y*are estimated to differ by *b*units on *Z*. The results of a_j andc'_i could indicatethe values of $b_k$whether the cases become higher on *M* estimation as higher (+) or lower (−) on *Z*. That is:

$$b_1 = [\hat{Z}|(M = m, X = x)] - [\hat{Z}|(M = m - 1, X = x)]$$

$$b_2 = [\hat{Z}|(M = m, Y = y)] - [\hat{Z}|(M = m - 1, Y = y)]$$

In this regard, the indirect effect of *X* and Y on *Y* through *M* are the product of *a* and *b*as well as the indirect effects express cases that differ by one unit on *X* and *Y* are estimated to differ by abunits on *Y* as a result of the effect of *X* and *Y* on *M* which, in turn, affects *Y*. The indirect effect will be positive when the cases come to be higher on *X* and *Y* are estimated to be higher on *Z* if a_j and b_k are both positive or both negative, whereas it will be negative that is the case higher on *X* and *Y* are estimated to be lower on Z in eithera_j or b_k, but not both could be negative.

Model-4: Total Effects (IE) of both X and Y variables on Z

The direct and indirect effects perfectly partition how differences in *X* and *Y* map on to differences in *Z*, the *total effect* of *X* and *Y* denoted here asc_i and the total effects of c_i quantify how much two cases differ by one units on *X* and *Y* are estimated to differ on *Z*. That is:

$$c_1 = [\,\hat{Z}\,|\,(\,X = x)] - [\,\hat{Z}\,|(X = x - 1)$$

$$c_2 = [\,\hat{Z}\,|\,(\,Y = y)] - [\,\hat{Z}\,|(Y = y - 1)$$

In this regard, c can be derived by estimating Z from both X and Y alone in simple mediation model. That is:

$$Z = i_{Z*} + c_1 X + e_{Z*} \text{ for } TPB_{con}.$$

$$Z = i_{Z*} + c_2 Y + e_{Z*} \text{ for } PT_{con}.$$

When *X* and *Y* are dichotomous variables coded by single unit variances, $c_i$are the differences between the group means on *Z*: Regardless of whether *X* and *Y* are dichotomous, the total effect of *X* and *Y* variables on *Z* are equal to the sum of the direct and indirect effects of *X* and *Y*.

$$c_i = c'_i + a_j b_k$$

This relationship can be rewritten as $a_j b_k = c_i - c'_i$, which provides another definition of the indirect effects where the indirect effects indicate the differences among the total effect of *X* and *Y* variables on *Z* and the effect of *X and Y* variables on *Z* controlling for *M*, which represent the direct effects in this regard. The equivalence among the total effect of *X* and *Y* as well as the sum of the direct and indirect effects can be illustrated by substituting M into Z, thereby expressing *Z* as a function of only *X* and *Y*.

$$Z = i_Z + c'_i X + b_k\left(i_M + a_j X + e_M\right) + e_Z \text{ for } TPB_{con}.$$

$$Z = i_Z + c'_i Y + b_k\left(i_M + a_j Y + e_M\right) + e_Z \text{ for } PT_{con}.$$

Baron and Kenny (1986) asserted that the evidence for mediation is strongest when there is an indirect effect but no direct effect, which they call "Full Mediation or Complete Mediation" when there are both indirect and direct effects, they call it "Partial Mediation". Although full mediation is the gold standard where Iacobucci (2012)supplemented that tests are properly conducted and reported with "Partial Mediation" that is, mediation is usually accompanied by a direct effect. MacKinnon (2012) recommended structural equation modeling as the preferred method for mediation analysis due to the unreliability of the mediator and the dependent variable that typically diminish systematic relationships in multiple regressions; whereas, the mediator and the dependent variable may be separated from their measurement errors in structural equation modeling.

In addition, Gu, Strauss, Bond, and Cavanagh (2015) suggested causal three steps approach, difference in coefficients and product of coefficients or Sobel tests among the most frequently used techniques to determine mediation analysis particularly in the social science research whereas Iacobucci (2012)verified that Sobel test has statistical limitations rather the author suggested bootstrapping approach as an up-to-date superior option for verifying mediating

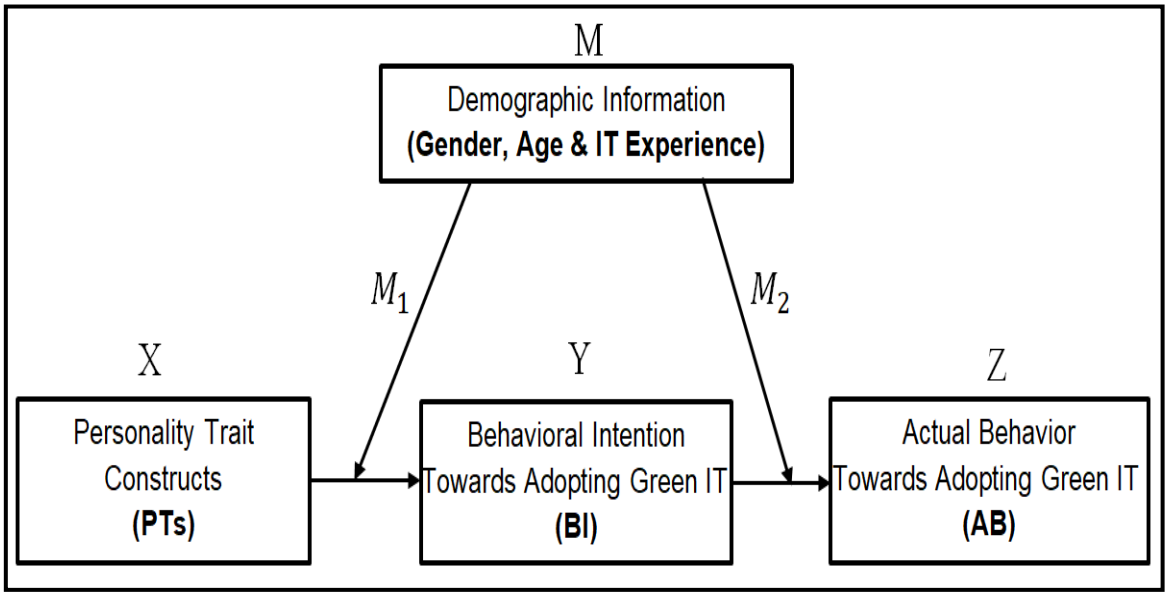
effects. Furthermore, evidences witnessed the powerfulness of bootstrapping approach that estimates the upper and lower limit according to the confidence interval (CI) in the indirect effect analysis and confidence interval above zero indicates a significant positive indirect effect(Ducas & Micciancio, 2015; Iacobucci, 2012).

In this regard, mediation effect analysis procedures resided based on the assumptions of Baron and Kenny (1986) casual step approach and Iacobucci (2012) proposition and standards of bootstrapping techniques within the structural equation modeling framework and the magnitude of an total indirect effect estimate as well as the significance could also be tested by dividing the magnitude of the total indirect effect by its standard error, producing a standard normally distributed variable in order to inspect the mediating effect of behavioral intention among the personality traits variables and the actual behavior of adopting green IT where the initial conceptual framework considers personality traits as independent variables as well as behavioral intention and actual behavior towards green IT adoption as mediator and dependent variables respectively. In addition, the researcher tested mediating effect in separate and aggregate paths among the independent variables and dependent variable using the Baron and Kenny (1986) three-step approach further confirmed by bootstrap testing method.

3.8.5 Moderating Effects Analyses Techniques

According to Sardeshmukh and Vandenberg (2017), moderation effect denotes when a third M variable (i.e. the moderator variable), affects the strength of the relationship between predictor variables and the outcome variables. In other words, the strength of the link between X→Y and Y→Z variables varies as a direct function or interference of third moderator variables. In due course, the moderating variables were specified as gender (male and female groups), age (younger and older age groups) and IT Experience (high and less IT experienced groups) to scrutinize the effect of each moderating variables towards the relationships among the three prior predictors of personality trait variables (i.e. consideration for future consequence, openness to new experience and neuroticism) and the mediator variable (i.e. behavioral intention to adopt green IT) as well as the link between behavioral intention and actual behavior to adopt green IT as presented in Figure 3-2.

Figure 3-2: Moderating Effect of M towards the Link between X→Y & Y→Z



Source: Researchers own Illustrating from the Proposed Research Model, 2020

Where M refers to the moderating variables: Gender, Age and IT experience and X to the three personality trait variables: consideration for future consequence, openness to new experience and neuroticism as well as Y to the mediating variable: behavioral intention and Z to actual behavior towards adopting green IT.

Mathematically, factorial analyses of variances are usually identical to the regression-based procedures for moderation analyses, but the regression procedures are more general and flexible where factorial analyses of variances assume categorical antecedents although continuous variables and sometimes used as covariates in analyses of covariance(Hayes, 2018). In this regard, the estimates of Y from two antecedents X and M_1as well as Z from Y and M_2towards the fully constrained model was demonstrated based on the multiple regression models' common assumptions. Hence, the equations for both Y and Z are presented in the following Equation-A:

$$Y = i_Y + b_{j1}X + b_{k1}M_1 + e_y$$
$$Z = i_Z + b_{j2}Y + b_{k2}M_2 + e_z \quad \rightarrow$$

Equation-A:
Fully Constrained Model (FCM)

Equation-A: the Fully Constrained Models (FCM) provide values of $\hat{Y}$ and $\hat{Z}$ derived from the models via combining both X &M_1 and Y &M_2 respectively wherethe models can be observed as X and Y increases by one unit (e.g., from −1 to 0, 0 to 1, and so forth) then$M_1$and M_2remain constant at that value chosen; while, $\hat{Y}$ and $\hat{Z}$ changes by one unit. In general term, these differences in $\hat{Y}$ and $\hat{Z}$ usually reached as X and Y changes by one unit respectively with values of M_1 and $M_2$where b_{j1}andb_{j2}remain fixedwhen $X = x$ and $Y = y$along with $M_1 = m_1$

and $M_2 = m_2$ most generally. Thus, the equations for both b_{j1} and b_{j2} are illustrated separately as follows:

$$b_{j1} = [\hat{Y} \mid (X = x, M_1 = m_1)] - [\hat{Y} \mid (X = x - 1, M_1 = m_1)]$$

$$b_{j2} = [\hat{Z} \mid (Y = y, M_2 = m_2)] - [\hat{Z} \mid (Y = y - 1, M_2 = m_2)]$$

As Hayes (2018) pointed out that the effects of X when one unit increase on $\hat{Y}$ and Y on $\hat{Z}$ typically remain independent on M_1 and M_2 towards fully constrained models. Regardless of the values of M_1 and M_2 change by one unit in X and Y incline to transform into separate changes of b_{j1} units in $\hat{Y}$ and b_{j2} units on $\hat{Z}$. In other words, the effects of one unit change in X towards $\hat{Y}$ as well as Y on $\hat{Z}$ remain unconditional on M_1 and M_2 through considering absolute independence. Aguinis, Edwards, and Bradley (2017) supplemented these arguments by proposing to pick up any value of X and Y to determine $\hat{Y}$ and $\hat{Z}$, the values of M_1 and M_2 tend to increase by one unit as well as $\hat{Y}$ and $\hat{Z}$ increases by b_{k1} and b_{k2} respectively. At the outset, the equations for both b_{k1} and b_{k2} are demonstrated as follows.

$$b_{k1} = [\hat{Y} \mid (M_1 = m_1, X = x)] - [\hat{Y} \mid (M_1 = m_1 - 1, X = x)]$$

$$b_{k2} = [\hat{Z} \mid (M_2 = m_2, Y = y)] - [\hat{Z} \mid (M_2 = m_2 - 1, Y = y)]$$

In due course, Hayes (2018) also specified that the effect of one unit change in M_1 and M_2 usually slant to take place on $\hat{Y}$ and $\hat{Z}$ as well as remain unconditional on X and Y respectively through considering independence assumption on both changes. However, Aguinis et al. (2017) revealed that regression models in these forms are not well-suited to test inquiries about moderation effects. In fact, such models remained contrast to what the concept of moderation embodies. Therefore, if X's effect on Y and Y's effect on Z are moderated by another variable that means X′s and Y's effects depend on that other variable. Nevertheless, these models to be fully constrained towards X's and Y's effects to be unconditional on M_1 and M_2 that means these values remain invariant across all values of M_1 and M_2.

To overcome such impediments in determine credible moderating effects, Hayes (2018) suggested to eliminate the constraint unconditionally and illustrate unconstraint model in such a way that X's and Y's effects can be dependent on M_1 and M_2 where X's effects on Y and Y's effect on Z would be expected to be poles apart. In generic terms, the unconstrained models for Y and Z are presented in Equation-B as follows:

$$Y = i_Y + f(M_1)X + b_{k1}M_1 + e_Y$$
$$Z = i_Z + f(M_2)Y + b_{k2}M_2 + e_Z \quad \rightarrow \quad \textbf{Equation-B}$$

Unconstrained Model (UCM)

Where $f(M_1 \& M_2)$ represent function ofM_1 and M_2based on the formula:$f(M_1) = b_{j1} + b_r M_1$and $f(M_2) = b_{j2} + b_r M_2$ for Y and Z correspondingly towards the unconstrained model. These functions of $f(M_1 \& M_2)$looklike simple linear regression models where bothb_{j1} and b_{j2}refer for constant values and $b_r$for the regression coefficient for $M_1 \& M_2$; so that the effect of X on Yand Y on Z to signpost the derived models. In this regard, the equations are obtained by substituting $b_{j1} + b_r M_1$on the behalf of $f(M_1)$and $b_{j2} + b_r M_2$to$f(M_2)$grounding on the above illustrated Equation-B: Unconstrained Model (UCM) as follows separately:

$$Y = i_Y + \left(b_{j1} + b_r M_1\right)X + b_{k1}M_1 + e_y$$
$$Z = i_z + \left(b_{j2} + b_r M_2\right)Y + b_{k2}M_2 + e_y$$

Hayes (2018)again disclosed that the above equations can be expanded by distributing X across the tenure defining the function of $f(M_1)$generallyheaded for the probable values of Y as well as Y to state the function of $f(M_2)$towards the estimated values of Z towards the demonstrated models. As the result, the equations for both $\hat{Y}$ and $\hat{Z}$ are presented as follows:

$$\hat{Y} = i_Y + b_{j1}X + b_{k1} + b_r M_1 X$$
$$\hat{Z} = i_Z + b_{j2}Y + b_{k2} + b_r M_2 Y$$

Where $M_1 X$signify product of X and M_1 as well as $M_2 Y$represent product of Y and W_2. Accordingly, the resulting equations remain as linear moderation models depicted conceptually in Equation-A and Equation-B. In due course, earlier and latest evidences indicated these approaches greatly provide unpretentious means of modeling data(Hayes, 2018; Sardeshmukh & Vandenberg, 2017; Saunders, 1956)in which X's effect on Y and Y's effect on Z that typically linger to be dependent onW_1 and W_2respectively along with their contrast indication to conditional approaches to test hypotheses about moderation.

Evidences indicated that even with today's high-powered computers, there are still computational inefficiencies due to the complexity to estimate a model particularly when the matrix grows exponentially larger in addition to number of observed moderating variables(Leong, Ooi, Chong, & Lin, 2013; Sardeshmukh & Vandenberg, 2017). In due course,

the unconstrained approach could allow factor loadings and error components of interaction terms to be freely estimated as well as the residual centering approaches applied as a two-step procedures where the indicator product terms can be regressed on the X and Z variables to generate residuals, where these residuals used as indicators of the latent interaction term in accordance with the unconstrained approach(MacKinnon & Pirlott, 2015; Zhao, Lynch Jr, & Chen, 2010). To this end, configural and metric invariance examination emerged as they simplifies the approach by omitting the constraints after mean centering the indicator variables while these approaches show promise in regards of their ability to mitigate the non-normality issues that usually demand further testing, as well as the approaches have yet to be refined enough to the point out where they can be easily adopted by researchers (Sardeshmukh & Vandenberg, 2017).

Hayes (2018) elaborated configural invariance tests to statistically determine whether the factor structure represented towards Confirmatory Factor Analyses (CFA) to achieve adequate fit when multiple groups are tested freely together without any cross-group path constraints. In this regard, the procedures for performing configural invariance tests were scrutinized based on Gaskin (2018) major suggestions such as building measurement model along with creating groups particularly easy to illustrate in AMOS software and then split the data along moderator variable. Based on Gaskin (2018) endorsements, the process of examination were determining whether the resultant models achieve good fit; and once the researcher became certain in this regard, then configural invariance would be confirmed but if it remained failed to pass the configural invariance test, then the procedures would inclined to look at the modification indices to improve the model fit or to see how to restructure the prior CFA. Besides, the next procedure after configural invariance test would be performing metric invariance tests via carrying out chi-square difference tests between the groups with similar evaluation measures in structural model. In due course, if the model presented with significant p-value for the chi-square difference test, then it can be concluded that there is difference between groups at model level where moderating effect of the specific variable can be confirmed, otherwise, would be preceded to pave the way of path level analyses that remained invariant. In other words, a composites performance would resided for evaluating each path diagram from the models considering the inclusiveness of whole dataset to create composites, instead of using the split dataset and the procedure would be opted to find out which factors remain different at each path level.

3.9 Qualitative Data Analysis Procedures

Creswell (2014) emphasized that mixed research approaches typically grounded on seeking convergence (triangulation) towards examining different facets of a phenomenon to discover different perspectives where a researcher could possible add a breadth or create any paradox to the prior study context. Erlingsson and Brysiewicz (2017) suggested content analyses as one of the best qualitative analysis technique used to determine the presence of certain words, themes, or concepts within some given qualitative data (i.e. text). In addition, Bengtsson (2016) specified main processes of content analysis such as keyword identifications, categorizing the keywords in themes and sub-themes as well as extracting meaningful patterns so as to critically evaluate the study background. Moreover, the main advantage of content analysis can be summarized as being reduced and simplified way of structuring and organizing the qualitative data to produce core issues or results in more systematized manner that satisfies the predefined research objectives (Neuendorf, 2016). In this regard, content analysis was used to analyze the qualitative data that was gathered from key informant interviews so that the researcher can enumerate and analyze the presence, meanings and relationships of such words, texts, themes, or concepts as well as content analysis can be applied either by using interpretive procedure to avoid or ensure minimal basis for a survey result, or by using the mechanisms of triangulations to broaden the findings of a certain enquiry.

3.10 Ethical Considerations

Since the 1970's interest in ethical issues regarding to information behavioral related studies particularly to an emerging technological behaviors has grown and there is a growing concern for ethical issues in behavioral research today (Hedgecoe, 2016). As a result of these concerns, ethical codes will be implemented as a means to prevent and offer protection mechanisms regarding ethical violations in social research. As suggested by Walliman (2011)a good starting point for dealing with ethical issues in the research process is to realize that there are numerous stakeholders in that research. Research ethics deals with how the researchers treat those who participate in the study and how the data can handle after collection.

Thus, one of the major ethical issues in a behavioral science research is informed consent. According to Iphofen (2017) argument respondents must be requested for their voluntary participation via informed consent in a certain study due to this setting allow a researcher to learn enough about the phenomenon to decide whether or not to participate. As pointed out by Kara and Pickering (2017), informed consents are expected describe the purpose of the study,

potential benefits and risks to participants, the need for absolute assurances that any confidentiality and anonymity issues as well as the right to withdraw from the study at any time. Since mixed method research approach combines quantitative and qualitative research, ethical considerations need to attend to typical ethical issues that surface in both forms of inquiry. Therefore, in addition to the above informed consent, the following ethical issues will be considered while conducting the study: protecting anonymity of respondents, avoiding deceptive practices, respecting vulnerable populations, respecting indigenous cultures, not disclosing sensitive information.

Chapter 4 : Data Presentation, Analyses and Discussions

4.1 Introduction

This chapter elucidates the details of the descriptive and inferential statistical analyses and presents the study results based on the data collected using self-administered questionnaires and interviews that were carried out as scheduled so as to address the initial objectives in line with proposed conceptual frameworks. In this regard, the descriptive analyses presented in the first part dwells to figure out respondents' demographic characteristics and preliminary data analyses via performing data screening and management along with normal distribution assessments. Subsequently, psychometric measurements analyses were elaborated by determining both measurement and structural model assessments using structural equation modeling (SEM) as well as presented mediation and moderation effects of the hypothesized relationships. Finally, the qualitative data analyses are presented based on the data obtained through key informant interview in order to triangulate the prior quantitative results.

4.2 Preliminary Data Analysis Results

Data screening and management as one of the fundamental preliminary data analysis were performed towards the raw data before starting the core analyses processes. According to Abdulwahab, Dahalin, and Galadima (2011) data screening is essential step in the analysis process for four reasons: first, to investigate the accuracy of the collected data; second, to study extreme cases, or outliers and fix them; third, to treat missing data values, and fourth, to manage the response set issue where the main issues of data screening procedure such as missing data, univariate normality, and outliers are related to the model variables. Thus, missing data is one of the common barriers in data analysis within social science research (Abdulwahab et al., 2011; Prykhodko et al., 2017). Therefore, as essential step before starting the analysis procedure is to define and treat for any king of missing data, such as incomplete answers or missing sections.

In this study, any questionnaire with any missing answers related to proposed model variables was immediately discarded since missing data remained to cause several problems in computing the fit measure such as Goodness-of-Fit-Index (GFI) in structural Equation Model using AMOS software (Ong & Puteh, 2017). In this regard, more than 350 questionnaires were distributed based on the sample frame and as the result, a total of 307 (87.7%) of the questionnaire were returned. In addition, 18out of 307 questionnaires were considered unusable because they had

missing response items according to the researcher's rule; thus, the remaining 289 (82.6%) questionnaires were completed and used in the entire analyses.

4.2.1 Descriptive Analyses Results

As the result of data screening and management, the self-administrated survey befitted to comprise the total sum of 289 respondents that include 242IT professionals and 47 managers from the total aggregated sample size (N=350). The following sub-sessions demonstrated the descriptive analyses of both groups as well as interpretations were also demonstrated based on each finding to articulate the typical implications towards this study context.

Table 4-1: Descriptive Results of Respondents Characteristics

Parameters	Categories	IT Professionals		Managers		Total	
		Freq.	%	Freq.	%	Freq.	%
Gender	Male	156	64.5	36	76.6	192	66.4
	Female	86	35.5	11	23.4	97	33.6
Age	18-25	7	2.9	-	-	7	2.4
	26-35	101	41.7	18	38.3	119	41.2
	36-45	95	39.3	21	44.7	116	40.1
	46 and above	39	16.1	8	17.0	47	16.3
Education	Bachelor Degree	192	79.3	33	70.2	225	77.9
	Post graduate Degree	50	20.7	14	29.8	64	22.1
	Total Sample (N)	N=242	100%	N=47	100%	N=289	100%

Source: Self-administered Survey Results, 2020

As illustrated in the above Table 4-1, the demographic characteristics of IT professionals' and managers respondents in terms of gender, age and educational level were presented based on the information provided from self-administrated survey. In this regard, 192 (66.4%) were found to be male and 97 (33.6%) female respondents. Thus, the result shows that the majority of participants were male respondents. Moreover, the age distributions of participants widely held as 119 (41.2%) from 26 to 35 years and 116 (40.1%) from 36 to 45 years while the least share 7 (2.4%) from 18 to 25 years and 47 (16.7%) participants specified as above 45 years. In addition, the majority of participants 225 (77.9%) were identified as bachelor degree holders and 64 (22.1%) as postgraduate level that indicated participants academic position to fairly apprehend the study context so as to suggest credible information. Therefore, the demographic distribution

results were restrained to determine moderating effect of gender and age towards the hypothesized relationships among personality traits, behavioral intention and actual behavior to adopt green IT in the proposed research model.

Table 4-2: Descriptive Results of Respondents ICT Experiences

Parameters	Measures	IT Professionals		Managers		Total	
		Freq.	%	Freq.	%	Freq.	%
Information Technology (IT) awareness	Moderate	76	31.4	2	4.3	78	27.0
	Good	122	50.4	30	63.8	152	52.6
	Very good	44	18.2	15	31.9	59	20.4
Information Technology (IT) skill and knowledge	Moderate	73	30.2	8	17.0	81	28.0
	Good	128	52.9	19	40.4	147	50.9
	Very good	41	16.9	20	42.6	61	21.1
Information Technology (IT) involvement	Less than 3 years	27	11.2	6	12.8	33	11.4
	Less than 6 years	33	13.6	12	25.5	45	15.6
	Less than 8 years	36	14.9	8	17.0	44	15.2
	Less than 12 years	103	42.6	13	27.7	116	40.1
	12 and more years	43	17.8	8	17.0	51	17.7
ICT Use: On daily bases	Less than 1 hour	35	14.5	7	14.9	42	14.5
	Less than 3 hours	52	21.5	6	12.8	58	20.0
	Less than 5 hours	50	20.7	13	27.7	63	21.8
	Less than 8 hours	87	36.0	14	29.8	101	35.0
	8 and more hours	18	7.4	7	14.9	25	8.7
	Total Sample (N)	N=242	100%	N=47	100%	N=289	100%

Source: Self-administered Survey Results, 2020

As demonstrated in the above Table 4-2, the majority 152 (52.5%) participants were specified with good level of information technology awareness and 59 (20.4%) as very good as well as the rest 78 (27%) participants as moderate level awareness from the total respondents. Thus, these result indicated that the majority of respondents were found with prolific awareness towards information technology. Furthermore, the majority of respondents 208 (72%) were specified with opulent information technology skill and knowledge as well as the rest 81 (28%) participants identified as moderate level. Accordingly, the majority of participants 211 (73%) were found with more than 5 years information technology involvement and the rest 78 (27%) with less than

5 years as well as 163 (56.3%) participants were identified with less than 5 hours of information technology daily usage and 126 (43.7%) with greater than 5 hours IC engagement per day. Therefore, the descriptive analyses result of respondents ICT experiences indicated that large number respondents specified with worthy level of information technology involvement and daily engagement among the sample respondents; thus, a composite mean of these four dispersals (awareness, skill and knowledge, involvement and usage) were determined to examine the moderating effect of IT experiences towards the hypothesized relationships among personality traits, behavioral intention and actual use behavior to adopt green IT.

4.2.2 Group Difference Assessment Results

For the purpose of inclusiveness to the overall study context, the self-administrated data were collected from both IT professionals and managers to determine green IT adoption at individual level in more comprehensive and modeled manner. Thus, group differences test towards the explored constructs were examined to check whether statistically significant difference existed across both groups so as to decide valid approach (separate or merged) throughout the entire analysis and interpretations process. According to (Pallant, 2010), an independent-samples t-test is parametric technique usually called sample t-test, independent t-test or student's t-test is an inferential statistics test that determines whether there is a statistically significant difference in the mean scores for the two groups (i.e. IT professionals and managers) comparison in terms of main factors in the study context.

In statistical terms, it refers to the probability that the two sets of scores came from the same population. In other words, an independent-samples t-test is used to compare the mean score, on some continuous variable, for two different groups of participants. Evidences suggested that major assumptions of parametric techniques such as considering normally distributed dataset with large size of sample or transforming variables if the distribution is not normal. In this regard, the dataset was examined to confirm whether it was normally distributed and as the result the aggregate mean score of independent and dependent variables dataset specified as negatively skewed at -0.433 and -0.391 respectively. In addition, they were revealed with -0.184 and -0.496 kurtosis values correspondingly as presented in Table 4-3.

Table 4-3: Aggregate Results of Normality Tests

Variables	Mean	Std. D	Skewness	Kurtosis
IVs	3.261	0.568	-0.261	-0.497
DVs	3.302	0.703	-0.414	-0.499

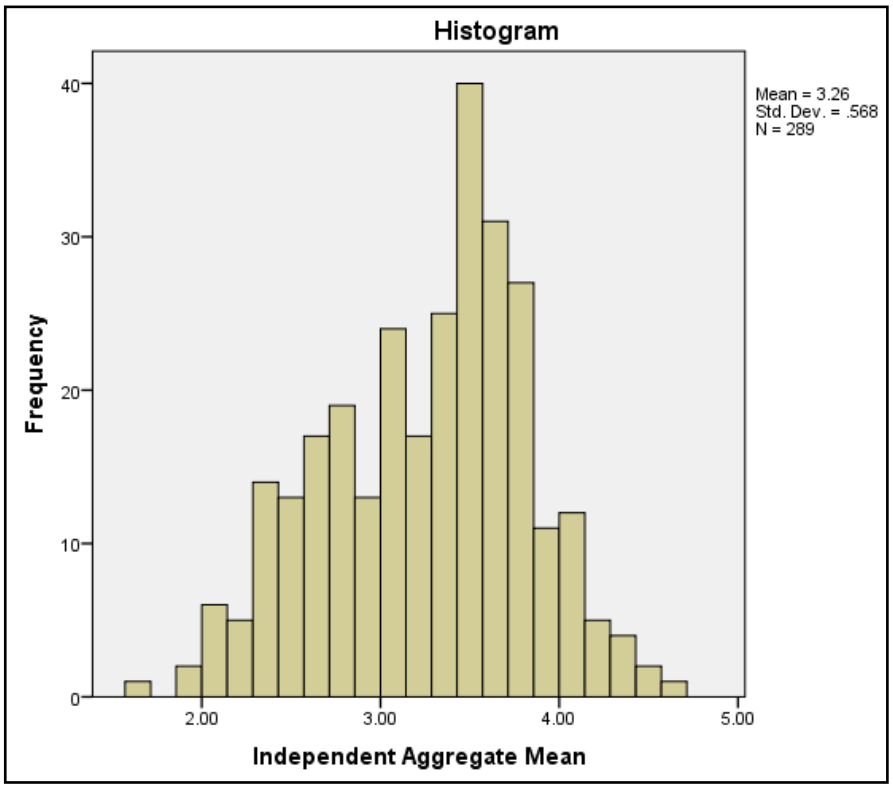
Criteria:

- Normal distributed dataset ranged between -1 up to 1 of skewness and kurtosis values

Source: Own Analysis Results, 2020

Accordingly, the normality measurement results of the independent variables: TPB indicators (ATT, SB and PBC) and personality traits (CFC, OE and NR) indicated a normally distributed dataset; thus, the assumptions for examining independent sample t-test to determine whether there existed a difference between both groups towards the main factors in this study context has met as presented in Figure 4-1.

Figure 4-1: IVs Normality Distribution Result

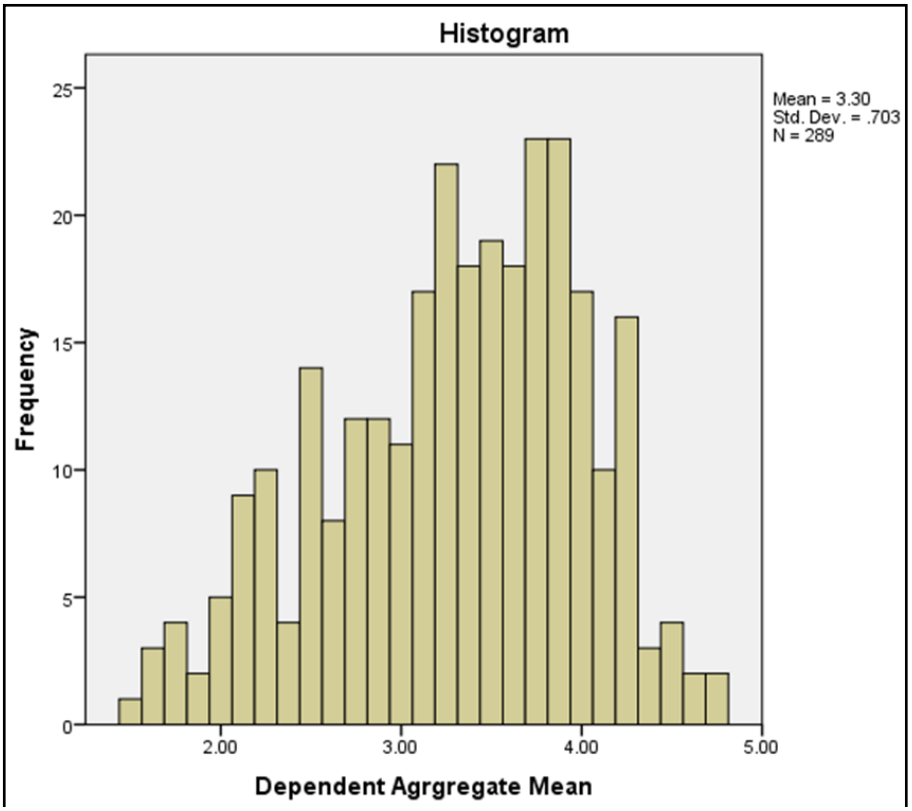


Source: Own Analysis Results, 2020

Similarly, the normality test of both behavioral intention and actual behavior as dependent variables specified as normally distributed dataset; hence, the assumptions for examining independent sample t-test had met the minimum acceptable level of dataset distribution to

determine whether there existed a difference between both groups towards the main variables in this study context as demonstrated in Figure 4-2.

Figure 4-2: DVs Normality Distribution Result



Source: Own Analysis Results, 2020

At the outset, the normality test of both dependent and independent variables similarly indicated as normally distributed dataset; therefore, the assumptions for examining independent sample t-test revealed with minimum acceptable level of dataset dispersal to determine whether there existed a difference between both sectors.

In this regard, group description has been set to determine group difference test by setting group category for both managers and IT professionals groups in the merged dataset. As presented in Table 4-4, the group statistics indicated that the sum 242IT professionals and 47 managers from the total sample of 289 as the result of data screening and management.

Table 4-4: Aggregate Group Difference Result via Respondents' Classifications

Aggregate Mean Score of Variables	Respondents' Category	N	Mean	Std. D
Independent	IT Professionals	242	3.234	0.564
	Managers	47	3.398	0.579
Dependent	IT Professionals	242	3.287	0.696
	Managers	47	3.380	0.736

Source: Own Analysis Results, 2020

Accordingly, the independent sample t-test output revealed with results of Levene's test of equality of variance so as to determine the variance of scores for the two groups. In this regard, the significance value Levene's test specified as p=0.87 and p=0.84 that were above the required cut-off (0.05) for both dependent and independent variables aggregate mean scores respectively; thus, the assumptions of equal variances had not been violated so that equal variance assumed t-test was taken to examine the differences of both sector groups as presented in Table 4-5.

Table 4-5: Group Difference Statistics

Aggregate Mean Score of Variables	Assumptions	Levene's Test for Equality of Variances		T-test for Equal Means		
		F	Sign.	T	DF	2TS
Independent	EVA	0.27	0.87	-1.81	287	0.07
	EVNA	--	--	-1.78	64.08	0.08
Dependent	EVA	0.042	0.84	-0.83	287	0.41
	EVNA	--	--	-0.80	63.01	0.43

Remarks:

- EVA refers to Equal Variance Assumed, EVNA to Equal Variance Not Assumed and 2TS to Two Tailed Significance

Source: Own Analysis Results, 2020

To this end, the two tailed significance level of the t-test for equal means revealed with 0.07 and 0.41 for independent and dependent variables respectively that were carried out through aggregating the mean score. Since, both results indicated no significance difference between the two groups, it was obvious determining both groups in separate dataset has no statistical significance so that the entire analysis was performed via merging both group datasets so as to explore green IT adoption at individual level.

In addition, the effect size statistics was also performed to determine the magnitude of the differences between both sector groups using the Cohen's ***d*** formula that operationally defined as small (0.20), medium (0.50) and large (0.80) magnitudes of effect sizes correspondingly. The effect size index for the t-test of difference between independent means is***d***, the difference expressed in units of (i.e., divided by) standard deviation within the population. Since, SPSS does not provide Cohen's ***d***towards the independent sample t-tests; Cohen's ***d*** formula was employed to calculating the value d via both groups' separate means to determine the magnitude of differences between towards the aggregate mean score of the IVs.

$$\boldsymbol{d}_{\text{Value for IVs}} = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\delta_1^3 + \delta_2^3}{2}}}$$

Where, $\bar{x}_1$ refers to the total mean score of IT professionals; $\bar{x}_2$ to the total mean score of Managers; δ_1 to the standard deviation of IT professionals and δ_2 refers to the standard deviation of IT professionals;

$$\boldsymbol{d}_{\text{Value for IVs}} = \frac{3.2344_{IT\ Prof.} - 3.3979_{Managers}}{\sqrt{\frac{0.5638^3_{IT\ Prof.} + 0.5791^3_{Managers}}{2}}}$$

$$\boldsymbol{d}_{\text{Value for IVs}} = \frac{-0.1635}{\sqrt{\frac{0.1792+0.1942}{2}}} = \frac{-0.1635}{\sqrt{\frac{0.3734}{2}}} = \frac{-0.1635}{\sqrt{0.1867}}$$

$$\boldsymbol{d}_{\text{Value for IVs}} = \frac{0.1635}{0.4321} = -0.3784$$

Accordingly, magnitude of the differences between both groups via Cohen's ***d***towards the prior predictors revealed with -0.3784 that was less than the smallest effect size cut-off (0.02); thus,

the entire analysis of the six prior predictors was determined through merging both groups in this study context. Likewise, Cohen's $\boldsymbol{d}$ formula was similarly employed to calculating the value $\boldsymbol{d}$ via both groups' separate means to determine the magnitude of differences between the aggregate mean score of behavioral intention and actual behavior as dependent variables.

$$\boldsymbol{d}_{\text{Value for DVs}} = \frac{3.2872_{IT\ Prof.} - 3.3803_{Managers}}{\sqrt{\frac{0.6964^3_{IT\ Prof.} + 0.7363^3_{Managers}}{2}}}$$

$$\boldsymbol{d}_{\text{Value for DVs}} = \frac{-0.0931}{\sqrt{\frac{0.3376+0.3992}{2}}} = \frac{-0.0931}{\sqrt{\frac{0.7369}{2}}} = \frac{-0.0931}{\sqrt{0.3684}}$$

$$\boldsymbol{d}_{\text{Value for DVs}} = \frac{-0.0931}{0.6070} = -0.153$$

In this regard, magnitude of the differences between both groups via Cohen's $\boldsymbol{d}$towards the both behavioral intention and actual use behavior revealed with -0.0153 that was less than the smallest effect size cut-off (0.02); thus, the entire analysis towards the dependent variables were determined through merging both groups in the entire analyses process of this study context.

4.2.3 Results of Scale Items Measurement

This section demonstrates the details and results of the analysis of reliability and validity of measurement scales utilized in the questionnaire to test the constructs proposed in the conceptual model. Each of the eight measurement scales, presenting each of the construct was assessed to determine its overall reliability. Additionally, Factor Analysis (FA) was conducted on each scale to study, and confirm, the validity of factor structures.

Prior to conducting the factor analysis, a reliability test was carried out to insure internal consistency of the eight constructs (latent variables). Cronbach's-alpha was used as a measure of the internal consistency of each of the eight latent variables constructed from the survey. Cronbach's alpha values higher than 0.7 are considered as reliable and internally consistent scale items(Denis, 2016).

In this regard, internal consistency refers to the degree to which the data is consistent across the questionnaire items with in single measurement scale (Denis, 2016). Thus, the results of Cronbach's Alpha values revealed as greater than 0.7so that the result endorsed internally consistent scale items for each constructs as shown in Table 4.6. In due course, Cronbach's coefficient alphas were calculated based on the average inter-item correlation used to measure internal consistency. Moreover, Ho and Yu (2015)mentioned that constructs reliability should be 0.7 or higher to indicate adequate convergence or internal consistency.

Table 4-6: Measurement scale analysis Result

Constructs	Indicators	Cronbach's Alpha Values	Remarks
ATT	5	0.889	High Reliability
SN	5	0.905	Excellent Reliability
PBC	4	0.920	Excellent Reliability
CFC	7	0.943	Excellent Reliability
OE	4	0.880	High Reliability
NR	4	0.890	High Reliability
BI	4	0.925	Excellent Reliability
AB	4	0.907	Excellent Reliability

Source: Own Analysis Results, 2020

The eight constructs in the survey questionnaire to prove that each scales satisfied the model constructs consistently and accurately; thus, scale reliability test was performed for the eight constructs to assess the internal consistency and reliability coefficient was run on Amos master validity plug-in for each set of alpha (α) value for ach variable. The result of the analysis indicated that all constructs revealed with minimum cut off 0.70 Cronbach's alpha (α) value where the result varied between 0.89 for trust and 0.94.Over all, the result shows that all alpha values of the study instruments were reliable with appropriate item scale reliability of each construct.

4.2.4 Collinearity Assessment Results

The degree of multicollinearity among indicators is another approach to check indicators validity. It can be assessed by using Variance Inflation Factor (VIF) and tolerance values that

indicate how much variance of endogenous constructs supposed explain by the other exogenous construct (Ong & Puteh, 2017). Evidences designated that Variance Inflation Factor (VIF) lower than 5 and tolerance higher than 0.2 indicate no collinearity issues towards the multicollinearity assessment (Tabachnick et al., 2007; Wong, 2013). According to Sinkovics, Henseler, Ringle, and Sarstedt (2016) suggestions, VIF greater than 10 indicate destructive collinearity. Since Amos Version 21.0 does not report VIF directly, SPSS Version 21.0 was used to generate VIF and Tolerance assessment results. In this regard, the assessment results towards the independent predictors TPB all together with the three personality traits and the mediating variable: behavioral intention to adopt green IT revealed with lower than 5 VIF as well as the reciprocal tolerance specified with above 0.2 and less than 1 values as presented in Table 4-7.

Table 4-7: Multicollinearity Valuation Results of IPs→BI Links

Model-1	Unstandardized Coefficients		Standardized Coefficients	Collinearity Statistics	
	β	S.E	β	Tolerance	VIF
(Constant)	-.025	.207			
ATT	.290	.066	.241	.605	1.653
SN	.150	.054	.143	.679	1.472
PBC	.181	.074	.199	.670	1.493
CFC	.157	.056	.153	.611	1.637
OE	.182	.057	.163	.683	1.463
NR	.068	.059	.064	.578	1.729

a. Dependent Variable: Behavioral Intention

Source: Own Analysis Results, 2020

In addition, the multicollinearity assessment towards the independent predictors comprising the mediating variable: behavioral intention to adopt green IT and the actual behavior to adopt green IT disclosed with lower than 5 VIF as well as the reciprocal tolerance specified with above 0.2 and less than 1 value as presented in Table 4-8.

Table 4-8: Multicollinearity Valuation Results of IPs & BI→AB Links

Model-2	Unstandardized Coefficients		Standardized Coefficients	Collinearity Statistics	
	β	S.E	β	Tolerance	VIF
(Constant)	.989	.246			
ATT	.095	.080	.078	.566	1.768
SN	.430	.065	.405	.661	1.513
PBC	-.048	.057	-.052	.636	1.572
CFC	.117	.067	.112	.594	1.684
OE	.041	.069	.036	.660	1.516
NR	-.035	.071	-.033	.576	1.737
BI	.114	.071	.113	.503	1.987
a. Dependent Variable: Actual Behavior					

Source: Own Analysis Results, 2020

Therefore, the both results implied no multicollinearity issues among the specified relationships and also consistent with the assumptions of Henseler and Sarstedt (2013) towards multicollinearity valuation among the endogenous and exogenous constructs.

4.2.5 Measurement Scales assessment Results

Measurement scale assessments were performed to determine structural dimensionality of factors items that can be reflected through grouping factor items based on strong correlations typically considered as imperative since it indicates the degree to which the test of items adequately represent the construct.

4.2.5.1 Unidimensionality Valuation Results of Scale Items

Thus, EFA was performed based on the correlation coefficient matrix of the survey's items: each item scales data structure towards the independent and dependent variables. In this case, if all the survey items found to be correlated then the survey would represent a single factor. Asymmetrically, if all the correlations between the items are close to zero; the inter-item correlation matrix would imply each item in the survey would represent a factor whereas the exceed values from the cut off level (0.3), indicate that the item correlation matrix usually considered as well suited for factor analysis to the data reduction technique (Tabachnick et al., 2007). In this regard, the correlation demonstrated the relationship between the variables of the

research model and provides comparisons with the sample data to determine how well the proposed model captures important properties of study sample (Prykhodko et al., 2017). Thus, the corrected item-total correlation, Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO), Bartlett's Test of Sphericity and factor loading were performed to determine unidimensionality data structure for each constructs' scale items and proceed for multidimensionality assessments (Denis, 2016; Wong, 2016).

I. Attitude (ATT) towards Green IT

Attitude towards green IT construct has designed by comprising five scale items (ATT1.1 to ATT1.5) to measure individuals' belief towards the consequences of performing ecosystem related behavior multiplied by individuals' evaluation of these consequences which involve in either positive or negative credence to perform a specific behavior. Thus, correlation coefficient matrix, KMO and Bartlett's Test of Sphericity as well as factor loading were calculated for the data structure of the five scale items so as to determine the concern of unidimensionality as illustrated in Table 4-9.

Table 4-9: Assessment Results for ATT's Scale Items

1	Correlation Matrix[a]		ATT1.1	ATT1.2	ATT1.3	ATT1.4	ATT1.5
	Correlation	ATT1.1	1.000	.646	.567	.618	.614
		ATT1.2	.646	1.000	.519	.675	.592
		ATT1.3	.567	.519	1.000	.618	.614
		ATT1.4	.618	.675	.618	1.000	.700
		ATT1.5	.614	.592	.614	.700	1.000
	a. Determinant = .067						
2	KMO and Bartlett's Test						
	Kaiser-Meyer-Olkin Measure of Sampling Adequacy					0.870	
	Bartlett's Test of Sphericity		Approx. Chi-Square			770.263	
			df			10	
			Sig			.000	
3	Component Matrix[a]		Components (1)				
	ATT1.1		.827				
	ATT1.2		.824				
	ATT1.3		.792				
	ATT1.4		.871				
	ATT1.5		.847				
	Extraction Method: Principal component Analysis a.1 component extracted						

Source: Own Analysis Results, 2020

In this regard, the inter-item correlation coefficients among scale items revealed with greater than 0.3 with less than 1 value of determinant that indicated the measure items of attitude were significantly correlated. In terms of the inter-item correlations, any results less than 0.30 usually indicate a tendency to measure something different rather than the respective construct. In addition, the test of Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) reflects the sum of partial correlations towards the sum of the correlations and varies between 0 and 1, where a value closer to 1 commonly refer for sample adequacy (Kline, 2014).

According to (Tabachnick et al., 2007), Bartlett's Test of Sphericity should be significant at the minimum of $p<0.05$ as well as the KMO index ranges from 0 to 1, with 0.6 suggested as the minimum cut off for considering the appropriateness of factorability of scale items. In due course, the KMO analysis result revealed with 0.870, that was above the minimum acceptable level and indicated for adequate sampling as well as significant Bartlett's test of Sphericity at $p<0.001$ with 770.263 chi-square and 10 degree of freedom indicating significant association among the scale items. Thus, the result satisfied the minimum acceptable level to determine factor loading of each item scales of attitude item scales.

Furthermore, factor loadings of the scale items were determined via principal component analysis to determine whether the items achieved the minimum loadings levels. Generally, factor loading below 0.7 commonly considered low, and low-loading items should be repressed (Hair, Sarstedt, Ringle, & Mena, 2012b) as well as the recommended cut-off (0.70) was taken as minimum criteria to determine their statistical significance to explain their respective construct (Hair et al., 2012b). To this end, the five indicators of attitude towards green IT construct were disclosed as internally consistent scale items with greater than 0.7 factor loading values. Thus, the result indicated that the scale items specified with unidimensional data structure and appropriate to proceed for examining further multidimensionality as a prerequisite in determining the hypothesized relationships in the proposed conceptual framework.

II. Subjective Norm (SN) towards Green IT

Subjective norm towards green IT construct has designed by comprising five scale items (SN2.1 to SN2.5) to measure individual's perception that most people who are considered important to him/her think that he/she should or should not perform the behavior in question. Thus, inter-item correlation coefficient matrix, KMO and Bartlett's Test of Sphericity as well as factor loading were calculated for its scale items data structure so as to determine concern of unidimensionality as illustrated in Table 4-10.

Table 4-10: Assessment Results for SN's Scale Items

1	Correlation Matrix[a]		SN2.1	SN2.2	SN2.3	SN2.4	SN2.5
	Correlation	SN2.1	1.000	.671	.685	.659	.629
		SN2.2	.671	1.000	.652	.645	.702
		SN2.3	.685	.652	1.000	.620	.672
		SN2.4	.659	.645	.620	1.000	.622
		SN2.5	.629	.702	.672	.622	1.000
	a. Determinant = .049						
2	KMO and Bartlett's Test						
	Kaiser-Meyer-Olkin Measure of Sampling Adequacy					0.887	
	Bartlett's Test of Sphericity			Approx. Chi-Square		863.077	
				df		10	
				Sig		.000	
3	Component Matrix[a]			Components (1)			
	SN2.1			.857			
	SN2.2			.863			
	SN2.3			.853			
	SN2.4			.831			
	SN2.5			.852			
	Extraction Method: Principal component Analysis a.1 component extracted						

Source: Own Analysis Results, 2020

In this regards, the correlation coefficients among SN scale items revealed with greater than 0.3with less than 1 value of determinant that indicated the measure items of SN were correlated as well as KMO analysis result specified as 0.887, that was above the minimum acceptable level (0.6) and indicated for adequate sampling with significant Bartlett's test of Sphericity at $p<0.001$ with 863.077 chi-square and 10 degree of freedom; thus, the result satisfied the minimum acceptable level to determine factor loading of each SN item scales. Therefore, the five items were disclosed as internally consistent data structure with greater than 0.7 factor loading values and specified as unidimensional and appropriate to proceed for examining further multidimensionality assessments.

III. Perceived Behavioral Control (PBC) towards Green IT

Perceived Behavioral Control (PBC) towards green IT construct has designed by comprising four scale items (PBC3.1 to PBC3.4) to measure individual's perception that he/she possessed the necessary skills, resources or opportunities to successfully perform a certain action. Thus, inter-item correlation coefficient matrix, KMO and Bartlett's Test of Sphericity as well as factor

loading were calculated for the data structure of the four scale items so as to determine the concern of unidimensionality as illustrated in Table 4-11.

Table 4-11: Assessment Results for PBC's Scale Items

1	Correlation Matrix[a]		PBC3.1	PBC3.2	PBC3.3	PBC3.4
	Correlation	PBC3.1	1.000	.696	.814	.726
		PBC3.2	.686	1.000	.712	.766
		PBC3.3	.814	.712	1.000	.755
		PBC3.4	.726	.766	.755	1.000
	a. Determinant = .048					
2	KMO and Bartlett's Test					
	Kaiser-Meyer-Olkin Measure of Sampling Adequacy					0.831
	Bartlett's Test of Sphericity		Approx. Chi-Square			866.417
			df			6
			Sig			.000
3	Component Matrix[a]		Components (1)			
	PBC3.1		.898			
	PBC3.2		.878			
	PBC3.3		.914			
	PBC3.4		.904			
	Extraction Method: Principal component Analysis a.1 component extracted					

Source: Own Analysis Results, 2020

In this regards, the inter-item correlation coefficients among PBC scale items revealed with greater than 0.3 and less than 1 value of determinant that indicated the measure items of PBC were correlated as well as KMO analysis result specified as 0.831, that was above the minimum acceptable level (0.6) and indicated for adequate sampling with significant Bartlett's test of Sphericity at $p<0.001$ with 866.417 chi-square and 6 degree of freedom; thus, the result satisfied the minimum acceptable level to determine factor loading of each PBC item scales. Therefore, the five items were disclosed as internally consistent data structure with greater than 0.7 factor loading values and specified as unidimensional and appropriate to proceed for examining further multidimensionality assessments.

IV. Consideration for Future Consequence (CFC) Trait

Theory of planned behavior has been extended by comprising consideration for future consequence personality trait in the proposed framework and designed by comprising seven scale items (CFC4.1 to PBC4.7) to measure individual's perception of possession for the necessary skills, resources or opportunities to successfully perform the a certain action. Thus,

inter-item correlation coefficient matrix, KMO and Bartlett's Test of Sphericity as well as factor loading were calculated for the data structure of the items to determine the concern of unidimensionality as illustrated in Table 4-12.

Table 4-12: Assessment Results for CFC's Scale Items

1	Correlation Matrix[a]		CFC4.1	CFC4.2	CFC4.3	CFC4.4	CFC4.5	CFC4.6	CFC4.7
	Correlation	CFC4.1	1.000	.700	.789	.680	.689	.665	.757
		CFC4.2	.700	1.000	.712	.669	.678	.924	.688
		CFC4.3	.789	.712	1.000	.688	.667	.664	.822
		CFC4.4	.680	.669	.688	1.000	.700	.681	.693
		CFC4.5	.689	.678	.667	.700	1.000	.668	.634
		CFC4.6	.665	.924	.664	.681	.668	1.000	.647
		CFC4.7	.757	.688	.822	.693	.634	.647	1.000
	a. Determinant = .001								
2	KMO and Bartlett's Test								
	Kaiser-Meyer-Olkin Measure of Sampling Adequacy							0.890	
	Bartlett's Test of Sphericity	Approx. Chi-Square						1944.960	
		df						21	
		Sig						0.000	
3	Component Matrix[a]	Components (1)							
	CFC4.1	.871							
	CFC4.2	.889							
	CFC4.3	.884							
	CFC4.4	.843							
	CFC4.5	.829							
	CFC4.6	.868							
	CFC4.7	.867							
Extraction Method: Principal component Analysis a.1 component extracted									

Source: Own Analysis Results, 2020

In this regards, the inter-item correlation coefficients among CFC scale items revealed with greater than 0.3 and less than 1 value of determinant that indicated the measure items of CFC were correlated as well as KMO analysis result specified as 0.821, that was above the minimum acceptable level (0.6) and indicated for adequate sampling with significant Bartlett's test of Sphericity at $p<0.001$ with 610.402 chi-square and 10 degree of freedom; thus, the result satisfied the minimum acceptable level to determine factor loading of each CFC scales items. Therefore, the seven items were disclosed as internally consistent data structure with greater than

0.7 factor loading values and specified as unidimensional and appropriate to proceed for examining further multidimensionality assessments.

V. Openness to New Experience (OE) Trait

Openness to new experience was encompassed in the proposed conceptual framework by containing four scale items (OE5.1 to OE5.4) to measure individual's perception towards preserving the necessary skills, resources or opportunities to successfully perform a certain action. Thus, inter-item correlation coefficient matrix, KMO and Bartlett's Test of Sphericity as well as factor loading were calculated for the data structure of the scale items to determine the concern of unidimensionality as presented in Table 4-13.

Table 4-13: Assessment Results for NR's Scale Items

1	Correlation Matrix[a]		OE5.1	OE5.2	OE5.3	OE5.4
	Correlation	OE5.1	1.000	.666	.674	.736
		OE5.2	.666	1.000	.604	.629
		OE5.3	.674	.604	1.000	.577
		OE5.4	.736	.629	.577	1.000
	a. Determinant = .118					
2	KMO and Bartlett's Test					
	Kaiser-Meyer-Olkin Measure of Sampling Adequacy					0.821
	Bartlett's Test of Sphericity		Approx. Chi-Square			611.884
			df			6
			Sig			.000
3	Component Matrix[a]		Components (1)			
	OE5.1		.900			
	OE5.2		.843			
	OE5.3		.828			
	OE5.4		.859			
	Extraction Method: Principal component Analysis a.1 component extracted					

Source: Own Analysis Results, 2020

In this regards, the inter-item correlation coefficients among OE scale items revealed with greater than 0.3 and less than 1 value of determinant that indicated the measure items of OE were correlated as well as KMO analysis result specified as 0.821, that was above the minimum acceptable level (0.6) and indicated for adequate sampling with significant Bartlett's test of Sphericity at $p<0.001$ with 611.884 chi-square and 6 degree of freedom; thus, the result satisfied the minimum acceptable level to determine factor loading of each OE scales items. Therefore, the four items were disclosed as internally consistent data structure with greater than 0.7 factor

loading values and specified as unidimensional and appropriate to proceed for examining further multidimensionality assessments.

VI. Neuroticism (NR) Trait

Neuroticism was incorporated in the proposed conceptual framework as personality trait by comprehending four scale items (NR6.1 to NR6.4) to measure individuals' perception towards negative emotions such that anxiety, nervousness, and depression when stressors situation is perceived. Thus, inter-item correlation coefficient matrix, KMO and Bartlett's Test of Sphericity as well as factor loading were calculated for the data structure of the scale items to determine the concern of unidimensionality as presented in Table 4-14.

Table 4-14: Assessment Results for NR's Scale Items

1	Correlation Matrix[a]		NR6.1	NR6.2	NR6.3	NR6.4
	Correlation	NR6.1	1.000	.704	.678	.624
		NR6.2	.704	1.000	.667	.713
		NR6.3	.678	.667	1.000	.642
		NR6.4	.624	.713	.642	1.000
	a. Determinant = .103					
2	KMO and Bartlett's Test					
	Kaiser-Meyer-Olkin Measure of Sampling Adequacy					0.833
	Bartlett's Test of Sphericity		Approx. Chi-Square			650.566
			df			6
			Sig			.000
3	Component Matrix[a]		Components (1)			
	NR6.1		.866			
	NR6.2		.890			
	NR6.3		.859			
	NR6.4		.857			
	Extraction Method: Principal component Analysis a.1 component extracted					

Source: Own Analysis Results, 2020

In this regards, the inter-item correlation coefficients among NR scale items revealed with greater than 0.3 and less than 1 value of determinant that indicated the measure items of NR were correlated as well as KMO analysis result specified as 0.833, that was above the minimum acceptable level (0.6) and indicated for adequate sampling with significant Bartlett's test of Sphericity at $p<0.001$ with 650.566 chi-square and 6 degree of freedom; thus, the result satisfied the minimum acceptable level to determine factor loading of each NR scales items. Therefore, the four items were disclosed as internally consistent data structure with greater than 0.7 factor

loading values and specified as unidimensional and appropriate to proceed for examining further multidimensionality assessments.

VII. Behavioral Intention (BI) to adopt Green IT

Behavioral Intention as a melded TPB mediating construct deliberate through incorporating four scale items (BI7.1 to BI7.4) to measure the degree to which an individual has developed conscious plans to perform or not perform some specified future behavior. In addition, behavioral intention was involved as a mediating variable to determine the initial decision made by individuals as the result of the proposed prior TPB predictors and personality traits. Thus, inter-item correlation coefficient matrix, KMO and Bartlett's Test of Sphericity as well as factor loading were calculated to determine unidimensionality concern as presented in Table 4-15.

Table 4-15: Assessment Results for BI's Scale Items

1	Correlation Matrix[a]		BI7.1	BI7.2	BI7.3	BI7.4
	Correlation	BI7.1	1.000	.707	.748	.755
		BI7.2	.707	1.000	.717	.883
		BI7.3	.748	.717	1.000	.726
		BI7.4	.755	.883	.726	1.000
	a. Determinant = .034					
2	KMO and Bartlett's Test					
	Kaiser-Meyer-Olkin Measure of Sampling Adequacy					0.806
	Bartlett's Test of Sphericity		Approx. Chi-Square			965.484
			df			6
			Sig			.000
3	Component Matrix[a]		Components (1)			
	BI7.1		.886			
	BI7.2		.917			
	BI7.3		.880			
	BI7.4		.933			
	Extraction Method: Principal component Analysis a.1 component extracted					

Source: Own Analysis Results, 2020

In this regards, the inter-item correlation coefficients among BI scale items revealed with greater than 0.3 and less than 1 value of determinant that indicated the measure items of BI were correlated as well as KMO analysis result specified as 0.806, that was above the minimum acceptable level (0.6) and indicated for adequate sampling with significant Bartlett's test of Sphericity at $p<0.001$ with 965.484 chi-square and 6 degree of freedom; thus, the result satisfied the minimum acceptable level to determine factor loading of each BI scales items. Therefore, the

four items were disclosed as internally consistent data structure with greater than 0.7 factor loading values and specified as unidimensional and appropriate to proceed for examining further multidimensionality assessments.

VIII. Actual Behavior (AB) to adopt Green IT

Actual behavior as a melded TPB outcome construct deliberate through incorporating four scale items (AB8.1 to AB8.4) to measure the extent of individuals' actual involvement in performing real comportment towards adopting green IT practices. Thus, inter-item correlation coefficient matrix, KMO and Bartlett's Test of Sphericity as well as factor loading were calculated for the data structure of the scale items to determine the concern of unidimensionality as presented in Table 4-16.

Table 4-16: Assessment Results for AB's Scale Items

1	Correlation Matrix[a]		AB8.1	AB8.2	AB8.3	AB8.4
	Correlation	AB8.1	1.000	.692	.682	.646
		AB8.2	.692	1.000	.778	.730
		AB8.3	.682	.778	1.000	.731
		AB8.4	.646	.730	.731	1.000
	a. Determinant = .071					
2	KMO and Bartlett's Test					
	Kaiser-Meyer-Olkin Measure of Sampling Adequacy					0.849
	Bartlett's Test of Sphericity		Approx. Chi-Square			755.072
			df			6
			Sig			.000
3	Component Matrix[a]		Components (1)			
	AB8.1		.850			
	AB8.2		.906			
	AB8.3		.904			
	AB8.4		.878			
	Extraction Method: Principal component Analysis a.1 component extracted					

Source: Own Analysis Results, 2020

In this regards, the inter-item correlation coefficients among BI scale items revealed with greater than 0.3 and less than 1 value of determinant that indicated the measure items of NR were correlated as well as KMO analysis result specified as 0.849, that was above the minimum acceptable level (0.6) and indicated for adequate sampling with significant Bartlett's test of Sphericity at $p<0.001$ with 755.072 chi-square and 6 degree of freedom; thus, the result satisfied the minimum acceptable level to determine factor loading of each AB scales items. Therefore,

the four items were disclosed as internally consistent data structure with greater than 0.7 factor loading values and specified as unidimensional and appropriate to proceed for examining further multidimensionality assessments.

4.2.5.2 Multidimensionality Valuation Results of Scale Items

Statistically, examining the multidimensionality of scale items is usually achieved through determining convergent and discriminant validity of the constructs. Convergent validity is a function of the association between two different measurement scales which are supposed to measure the same concept and is achieved when multiple indicators operate in a consistent manner (Park, 2015; Shaffer, DeGeest, & Li, 2016). Discriminant validity refers to the assurance of constructs validity and tests whether the items do not unintentionally measure something else (Shaffer et al., 2016). In addition, it also states to an instrument's ability to differentiate among groups between which it should theoretically be able to differentiate.

IX. Convergent Validity Assessment Results

Convergent validity examination considers the level of instrument items correlation to one another scales to determine initial theoretically assumptions (Ong & Puteh, 2017). Thus, the determination of such inspection refers to the extent to which items sought to reflect one particular unobserved construct (Straub et al., 2004) and Composite Reliability (CR), Average Variance Extracted (AVE)and Maximum Reliability (Max-R (H)) were used to measure the convergent validity of the constructs.

In this regard, the examination of convergent validity relies on average variance extracted (AVE) mainly used to calculate the explanatory power of all variables dimension to the average variation. The higher the AVE determines the higher the reliability and convergent validity. According to Lowry and Gaskin (2014), AVE should be above at least 0.5 and if the AVE exceeds from 0.5 generally signifies appropriate convergent validity. The constructs have convergent validity when the composite reliability exceeds the criterion of 0.70. As presented in Table 4-17, the results composite reliability for each scale exceeded the criterion of 0.70, thus indicated there was no overlap between the study measures as well as the result of average variance extracted for each construct exceeded the recommended minimum limit of 0.50 which disclosed virtuous explanatory power of all variables dimensions to the average variation.

Table 4-17: Convergent Validity Results of IVs

Construct	C.R.	AVE	Max R(H)
CFC	0.944	0.705	0.946
ATT	0.890	0.619	0.895
SN	0.905	0.656	0.906
NR	0.891	0.672	0.892
PBC	0.920	0.743	0.925
OE	0.882	0.652	0.893

Criteria:
Composite Reliability (CR)>0.70, Average Variance Extracted (AVE)>0.5 and Maximum Reliability (MaxR(H))>0.07 with minimum significance relationship levels at **p<0.05

Source: Own Analysis Results, 2020

Moreover, maximum reliability (MaxR (H)) assessment revealed with greater than 0.7 along with minimum significance relationship levels at p<0.05. Therefore, the results of both prior TPB predictors and personality traits as independent predictors specified with adequate convergent validity.

Table 4-18: Convergent Validity Results of DVs

Construct	C.R.	AVE	Max R(H)
BI	0.924	0.755	0.946
AB	0.908	0.712	0.915

Criteria:
Composite Reliability (CR)>0.70, Average Variance Extracted (AVE)>0.5 and Maximum Reliability (MaxR(H))>0.07 with minimum significance relationship levels at **p<0.05

Source: Own Analysis Results, 2020

As presented in Table 4-18, CR for both behavioral intention and actual behavior exceeded the criterion of 0.70 that signposted there was no overlap between the study measures and AVE for each construct surpassed the recommended minimum limit of 0.50 that revealed upright explanatory power of both variables dimension to the average variation as well as the maximum reliability assessment with greater than 0.7, thus, all relationships minimum significance levels at p<0.05. Therefore, the results indicated acceptable level of convergent validity for independent, mediating and dependent variables.

X. Discriminant Validity Assessment Results

Discriminant validity refers to the assurance of constructs validity and tests whether the items do not unintentionally measure something else (Shaffer et al., 2016). In addition, it also states to an instrument's ability to differentiate among groups among which it should theoretically be able to differentiate. Discriminant validity was tested through inter-factor correlations (Ong & Puteh, 2017). Discriminant validity was assessed by comparing the absolute value of the correlation among each construct to determine the square root of the average variance extracted by the respective construct as presented in Table 4-19.

Table 4-19: Discriminant Validity Results of DVs

Construct	Correlation Matrix								MSV Value
	CFC	ATT	SN	AB	NR	PBC	BI	OE	
CFC	**0.840**								0.339
ATT	0.583***	**0.787**							0.376
SN	0.473***	0.480***	**0.810**						0.329
AB	0.392***	0.388**	0.573***	**0.844**					0.329
NR	0.501***	0.537***	0.495***	0.314***	**0.820**				0.305
PBC	0.459***	0.442***	0.427***	0.257***	0.553***	**0.862**			0.305
BI	0.530***	0.613***	0.504***	0.395***	0.522***	0.546***	**0.870**		0.376
OE	0.438***	0.456***	0.459***	0.333***	0.522***	0.426***	0.512***	**0.808**	0.273

Remark:

- The square root of the average variance extracted values are on the diagonal; and correlations Matrix at $p<0.001$

Source: Own Analysis Results, 2020

According to Ong and Puteh (2017), to determine discriminant validity, the square roots of the AVEs should be higher than the correlations in order to satisfy discriminant validity requirement. Moreover, Wong (2016)suggestions discriminant validity would be supported, if the specified correlations values should be lower than the squared inter-scale correlation of each construct as well as AVE results should exceed from the maximum shared square variance (MSV). In this regard, the result specified that the correlations values with lower values than the squared inter-scale correlation of each construct with lower as well as AVE found greater value than MSV. Therefore, the results indicated acceptable level of discriminant validity for independent, mediating and dependent variables. To this end, a multidimensionality of the data structure was achieved due to the minimum criteria of the convergent and discriminant validities are satisfied.

Thus, the prior TPB predictors, personality traits, the mediator and the dependent variables specified with no convergent and discriminant issues as well as disclosed as multidimensional and appropriate to exceed for measurement model and path analysis using structural equation modeling so as to determine the hypothesized relationships.

4.2.6 Measurement Model Result

The measurement model specifies the relationships that suggest how measured variables represent a construct that is not measured directly (Kline, 2016). The measurement model was assessed using the goodness-of-fit (GOF) test. In this regard, absolute fit indices such as Chi-square (x^2), Root Mean Square Error of Approximation (RMSEA) and Goodness-of-fit (GFI)were employed used to measure how well a prior model fits the sample data where x^2 used to measure the magnitude of discrepancy among the sample and the fitted covariance metrics, RMSEA to determine how well the model fits with unknown but optimally chosen parameter estimates towards the population covariance metrics and GFI to measure the proportion of variance that is accounted by the estimated population covariance. In addition, P of the Close Fit (PClose) was also determined to access the model fitness that refers to the measure of one-sided test of the null hypothesis that is the RMSEA equals 0.05 usually called a close-fitting model where the alternative one-sided hypothesis that is the RMSEA is greater than 0.05. Accordingly, Incremental fit indices such as Incremental Fit Index (IFI), Tucker-Lewis Fit Index (TLI) and Comparative fit Index (CFI) were also scrutinized to analyzes the model fit by examining the discrepancy between the data and the hypothesized model, while adjusting for the issues of sample size inherent in the chi-squared test of model fit, and the Normed Fit Index.

In this regard, factor dimension reduction for the scale item of the prior TBP predictors, and personality traits variables were computed and revealed as 6 (six) components with greater than 1 initial Eigen values and 74.96% variance of the overall model. As a result, the first three prior predictors: consideration for future consequence, subjective norm, and explained the model with greater than 2 Eigen values at 40.16%, 9.35% and 7.58% total variance respectively. In addition, the other three prior predictors: perceived behavioral control, openness for new experience and neuroticism explained the model with greater than 1 Eigen values at 6.69%, 6.20% and 4.99% total shared variance correspondingly considering the assumptions of principal component analysis as presented in Table 4-20.

Table 4-20: IVs' Total Variance Explained Results

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	11.645	40.156	40.156	11.645	40.156	40.156	8.474
2	2.712	9.352	49.509	2.712	9.352	49.509	6.801
3	2.198	7.578	57.087	2.198	7.578	57.087	7.204
4	1.940	6.690	63.777	1.940	6.690	63.777	6.374
5	1.797	6.198	69.975	1.797	6.198	69.975	6.072
6	1.447	4.988	74.963	1.447	4.988	74.963	7.033
7	.634	2.186	77.149				
8	.577	1.989	79.138				
9	.505	1.740	80.879				
10	.478	1.649	82.528				
11	.434	1.495	84.023				
12	.421	1.450	85.473				
13	.403	1.388	86.861				
14	.397	1.367	88.229				
15	.361	1.244	89.473				
16	.329	1.134	90.607				
17	.316	1.091	91.698				
18	.298	1.027	92.726				
19	.264	.911	93.637				
20	.249	.860	94.497				
21	.243	.838	95.335				
22	.230	.794	96.129				
23	.224	.771	96.901				
24	.191	.657	97.558				
25	.183	.631	98.189				
26	.167	.574	98.763				
27	.149	.515	99.278				
28	.144	.497	99.775				
29	.065	.225	100.000				

Extraction Method: Principal Component Analysis.
a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Source: Own Analysis Results, 2020

According to (Osborne, 2015) argument, there are two main approaches of rotation, the primary rotation type is orthogonal rotation that do not force correlation among factors and allowed to assume a correlation of zero as well as the second rotation type is oblique assume some extent of correlation among factor solutions particularly in social science researches. Similarly, orthogonal rotation results in solutions that are easier to interpret and to report; however, they do require the

researcher to assume that the underlying constructs are independent or not correlated whereas oblique approaches allow for the factors to be correlated, but they are more difficult to interpret, describe and report (Abdi, 2003). In practice, the two approaches: orthogonal and oblique often result in very similar solutions, particularly when the pattern of correlations among the items is clear and many researchers conduct both orthogonal and oblique rotations and then report the clearest and easiest to interpret and suggested to start with an oblique rotation to check the degree of correlation between factors (Tabachnick et al., 2007, p. 638).

According to (Pallant, 2010), there are different rotation techniques provided by SPSS such as varimax, quartimax and equamax for orthogonal rotations as well as direct oblimin and promax for oblique rotations. (Abdi, 2003) also argued that varimax rotation (also called Kaiser-Varimax rotation) which was developed by Kaiser (1958) indubitably used as the most popular rotation method by far towards orthogonal type of rotation. In addition, varimax is considered as simple solution when each factor has a small number of large loadings and a large number of zero or small loadings and varimax searches for a rotation that is a linear combination of the original factors such that the variance of the loadings is maximized to make best use of it.

In due course, promax rotation has the advantage of being fast and conceptually simple. Its name derives from procrustean rotation because it tries to fit a target matrix which has a simple structure. Since behavior is rarely partitioned into neatly packaged units that function independently of one another in behavioral studies, the oblique rotation via promax technique was selected to determine the correlation among the factors and the rotation was determined by a rotation matrix where the rows stand for the original factors and the columns for the new rotated factors. In this regard, promax rotation was determined based on the standardization procedure that enabled the researcher to reproduce simple structure. Thus, the rotated component matrix revealed with 8 (eight) components and specified as greater than 0.7 loading for each factor structures as well as no cross loadings among the item scales as demonstrated in Table 4-21.

Table 4-21: IVs Factor Loading Results via Rotated Pattern Matrix[a]

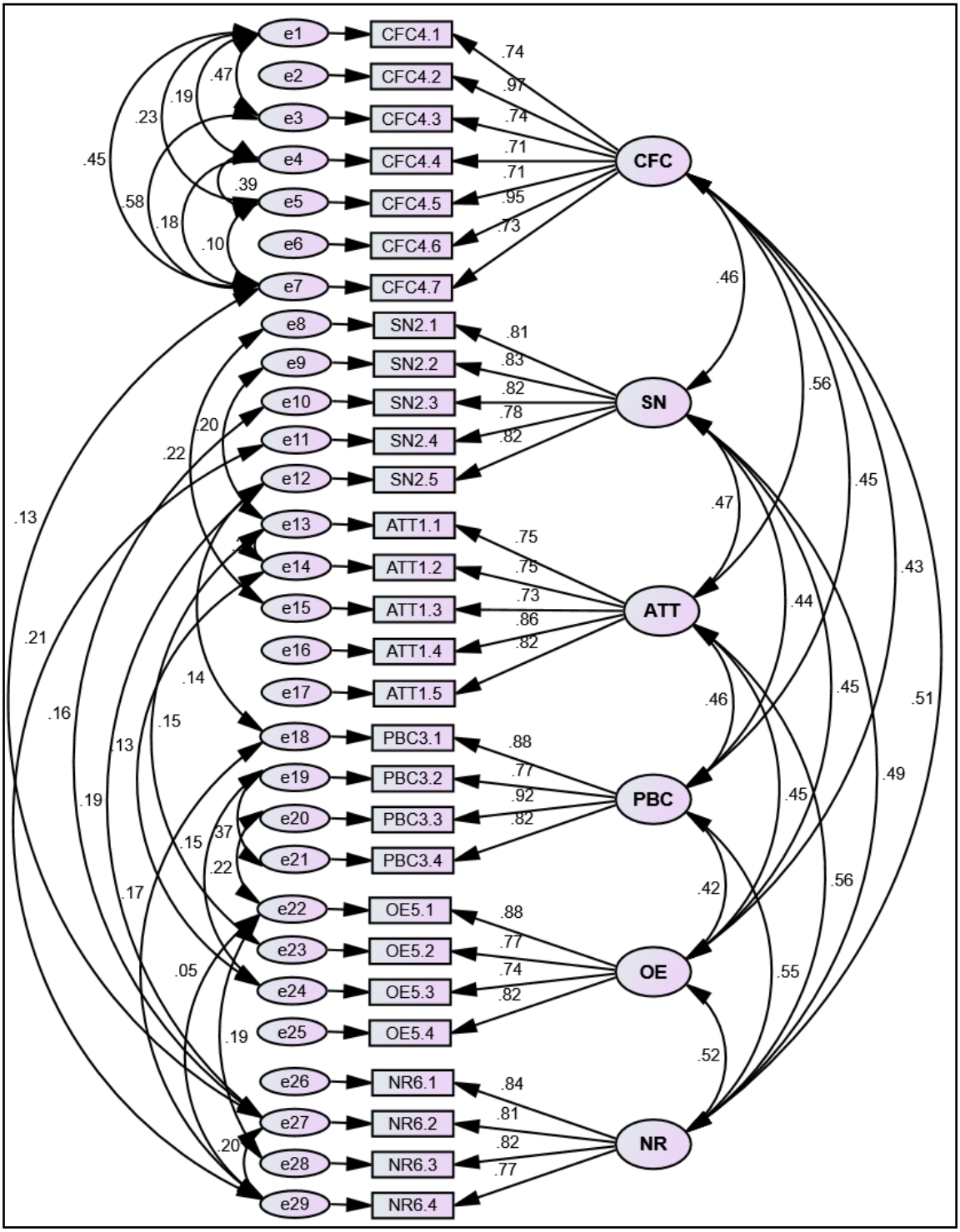
Indicators	Components					
	1	2	3	4	5	6
CFC4.3	.899					
CFC4.7	.878					
CFC4.5	.878					
CFC4.4	.865					
CFC4.1	.837					
CFC4.2	.822					
CFC4.6	.800					
SN2.2		.924				
SN2.5		.840				
SN2.1		.827				
SN2.3		.822				
SN2.4		.812				
ATT1.4			.844			
ATT1.1			.843			
ATT1.5			.838			
ATT1.2			.804			
ATT1.3			.759			
PBC3.4				.931		
PBC3.3				.883		
PBC3.2				.880		
PBC3.1				.866		
OE5.1					.900	
OE5.4					.841	
OE5.2					.839	
OE5.3					.818	
NR6.2						.943
NR6.4						.847
NR6.1						.825
NR6.3						.810

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

Source: Own Analysis Results, 2020

Accordingly, the factors loading of the prior TPB predictors and personality traits revealed with greater than 0.7 and less 0.6 standardized covariance estimates that satisfied the minimum acceptable level criteria for determining model fit indices at measurement model level illustrated below in Figure 4-3.

Figure 4-3: IVs' Loadings and covariance estimate Results of the Measurement Model



Source: Own Analysis Results, 2020

In this regard, the standardized covariance estimates and critical ratio (C.R) towards the link among the prior TPB predictors and personality traits found at the range of 0.205 up to 0.386 regression weights along with 5.852 up to 7.114 critical ratio values that indicated the significant covariance estimates at $p<0.001$ so as to obtain modification indices towards the specified threshold as presented in Table 4-22.

Table 4-22: IVs' Standardized Covariance Estimate C.R Results

Parameters	Estimates	S.E.	C.R.	P
CFC←→SN	.231	.037	6.153	***
CFC←→ATT	.225	.033	6.734	***
CFC←→PBC	.252	.041	6.104	***
CFC←→OE	.205	.035	5.852	***
CFC←→NR	.250	.038	6.520	***
SN←→ATT	.237	.039	6.011	***
SN←→PBC	.308	.051	5.997	***
SN←→OE	.269	.044	6.083	***
SN←→NR	.302	.047	6.407	***
ATT←→PBC	.264	.043	6.093	***
ATT←→OE	.219	.037	5.910	***
ATT←→NR	.279	.041	6.784	***
PBC←→OE	.285	.049	5.825	***
PBC←→NR	.386	.054	7.114	***
OE←→NR	.311	.046	6.770	***

Remark:

- ^{ns}(Not Significant) $p>0.05$, ** (Significant) $P<0.05$ and *** (Highly Significant)$P<0.001$

Source: Own Analysis Results, 2020

As the result, the model fit summary disclosed with 476.919 chi-square and 337 degree of freedom values respectively as well as 1.42 minimum discrepancy divided by its degree of freedom and significant at $p<0.001$. In addition, the goodness-of-fit measures revealed with greater than the minimum acceptable level of 0.90 as well as root mean square error approximate with 0.038 which indicated less than the maximum cut of (0.08) and .996 PClose result that specified within the maximum and minimum acceptable level (0.02 up to 1) as demonstrated in Table 4-23.

Table 4-23: IVs' Model Fit Summary

Model	Goodness-of-Fit (GOF) Results									
	CMIN	DF	P	CMIN/DF	GFI	IFI	TLI	CFI	RMSEA	PClose
Default	476.919	337	.000	1.415	.903	.978	.973	.978	.038	.996
Saturated	.000	0	--	--	1.00	1.00	--	1.00	--	--
Independence	6743.7	406	.000	16.610	.182	.000	.000	.000	.233	.000

Source: Own Analysis Results, 2020

Therefore, the measurement model of the prior TPB predictors and personality traits disclosed with adequate model fit indices to perform structural measurement (i.e. path analysis)so as to determine the hypothesized relationships in the proposed conceptual framework as presented in Table 4-23.

Moreover, the factor dimension reduction for the scale item of both mediating and dependent variables were computed via principal component analysis extraction method and revealed with 2 (two) components that were greater than 1 initial Eigen values as well as 80.34% total variance were specified from the overall model as presented in Table 4-24.

Table 4-24: DVs' Total Variance Explained Results

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	4.444	55.554	55.554	4.444	55.554	55.554	3.752
2	1.983	24.789	80.343	1.983	24.789	80.343	3.606
3	.364	4.545	84.888				
4	.363	4.531	89.419				
5	.297	3.708	93.127				
6	.230	2.880	96.007				
7	.214	2.670	98.677				
8	.106	1.323	100.000				

Extraction Method: Principal Component Analysis.
a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Source: Own Analysis Results, 2020

As a result, the first components explained the model at 55.55% total variance with greater than 2 Eigen values as well as the second component explained the model at 24.79 total variances with greater than 1 Eigen values correspondingly via principal component analysis extraction method.

Table 4-25: DVs' Factor Loading Results via Rotated Pattern Matrix[a]

Indicators	Components	
	1	2
BI7.4	.956	
BI7.2	.927	
BI7.1	.869	
BI7.3	.859	
AB8.4		.923
AB8.3		.921
AB8.2		.870
AB8.1		.811

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

Source: Own Analysis Results, 2020

Accordingly, the rotated component matrix specified as greater than 0.7 loading of each rotated factor structures with no cross loadings among the item scales as demonstrated in Table 4-21. In addition, the specified model revealed at 0.210 standardized covariance estimates that satisfied the minimum acceptable level (i.e. less 0.6) as well as 5.245 critical ratio value that indicate statistical significant relationship at $p<0.001$ towards the BI and AB link so as for determining model fit indices as illustrated below in Table 4.26.

Table 4-26: DVs' Standardized Covariance Estimate C.R Results

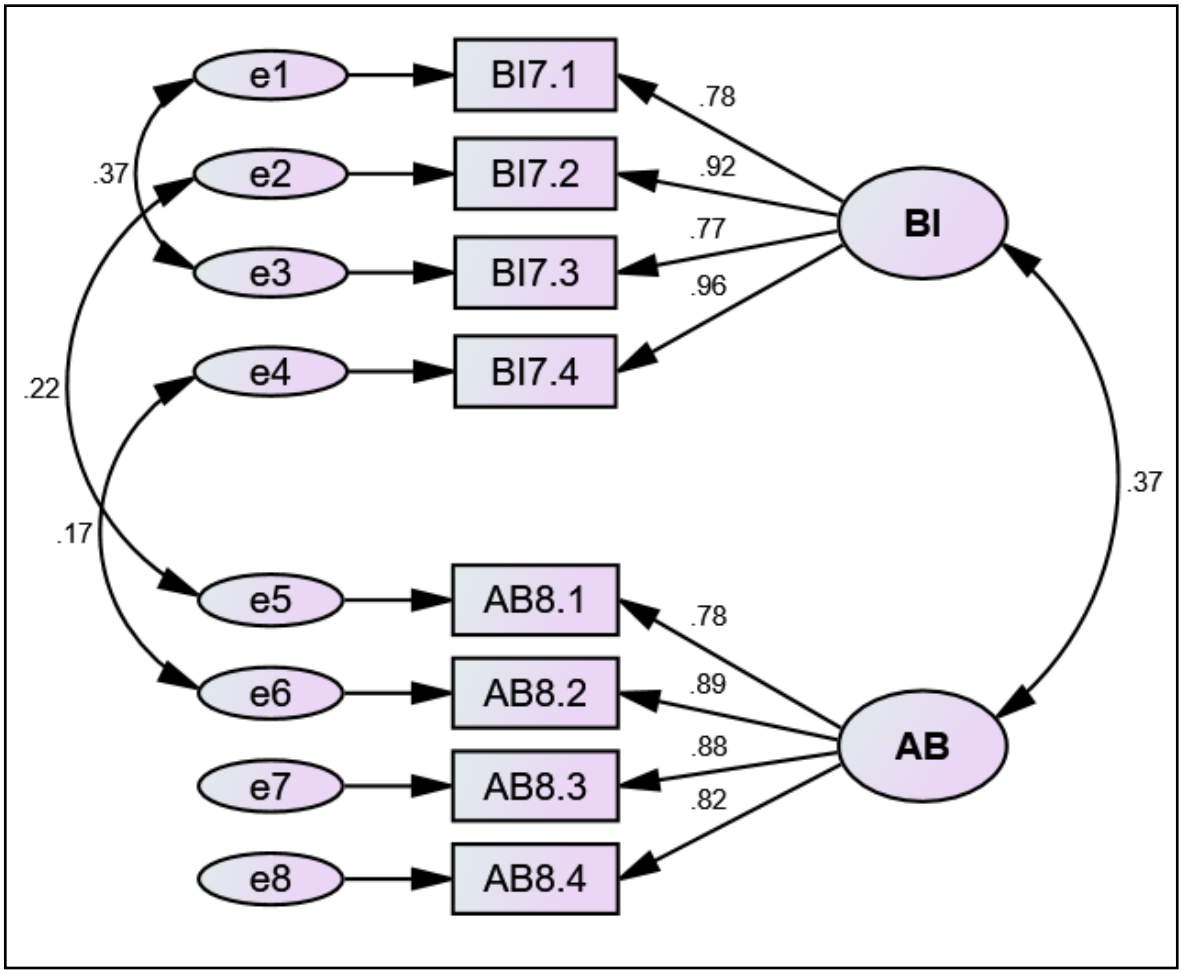
Parameters	Estimates	S.E.	C.R.	P
BI←→AB	.210	.040	5.245	***
e1←→e3	.128	.024	5.290	***
e2←→e5	.052	.017	3.175	.002

Remark:
- ^{ns}(Not Significant) $p>0.05$, ** (Significant) $P<0.05$ and *** (Highly Significant)$P<0.001$

Source: Own Analysis Results, 2020

Correspondingly, the factors loading of the mediating and dependent variables revealed with greater than 0.7 and less 0.6 standardized covariance estimates that satisfied the minimum acceptable level criteria for determining model fit indices at measurement model level illustrated below in Figure 4-3.

Figure 4-4: DVs' Loadings and Covariance Estimates of the Measurement Model



Source: Own Analysis Results, 2020

As the result, the model fit summary of the DVs disclosed with 42.231 chi-square and 17 degree of freedom values respectively as well as 2.48 minimum discrepancy divided by its degree of freedom and significant at $p<0.001$. In addition, the goodness-of-fit measures revealed with greater than the minimum acceptable level of 0.90 as well as root mean square error approximate with 0.072 which indicated less than the maximum cut of (0.08) and .087 PClose result that specified within the maximum and minimum acceptable level (0.02 up to 1) as shown in Table 4-27.

Table 4-27: DVs' Model Fit Summary

Model	Goodness-of-Fit (GOF) Results									
	CMIN	DF	P	CMIN/DF	GFI	IFI	TLI	CFI	RMSEA	PClose
Default	42.231	17	.001	2.484	.965	.986	.977	.986	.072	.087
Saturated	.000	0	--	--	1.00	1.00	--	1.00	--	--
Independence	1820.96	28	.000	65.034	.331	.000	.000	.000	.472	.000

Source: Own Analysis Results, 2020

4.2.7 Mediation Effect Assessment Results

Mediating effects were computed in separate and aggregate paths among the independent variables and dependent variable using the Baron and Kenny (1986) three-step mediation analyses as well as the results of the mediating effects were further confirmed by bootstrapping approach as demonstrated in the next subsections.

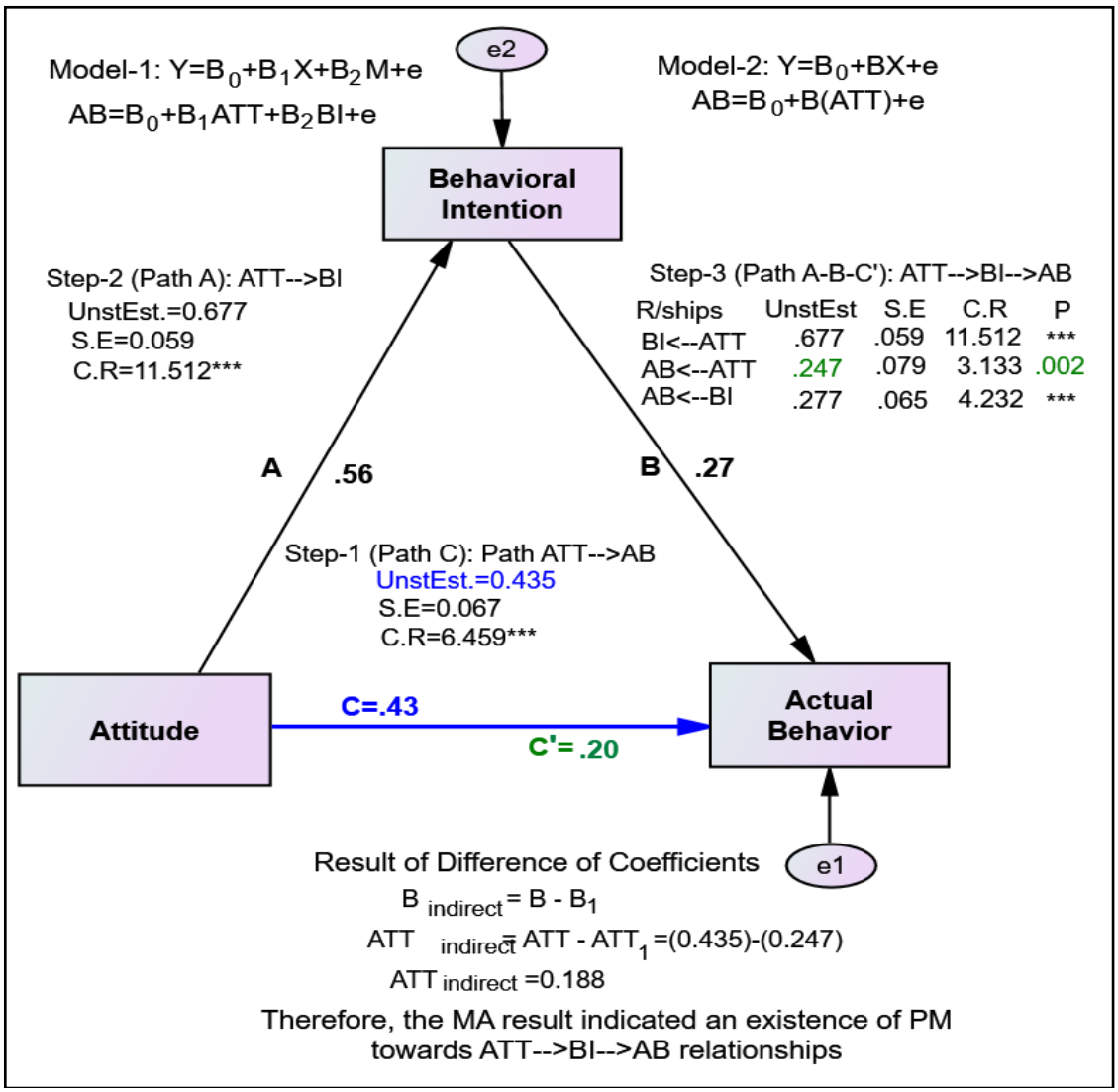
4.2.7.1 Mediation Effect Analysis Result of ATT→AB Link

Behavioral intention refers to the initial decisions made by individuals to adopt green IT and primarily hypothesized to mediate or carry out its relative contribution of the regression weight encountered by attitude to adopt green IT towards predicting the actual behavior to adopt green IT. In this regard, the mediating effect of behavioral intention in the first casual step approach revealed that attitude directly affected the actual behavior in the absence of mediator variable: behavioral intention with 0.435 Unstandardized Estimates and 6.459 critical ratio values respectively where the direct effect (ATT→AB) indicated as highly significant at $p<0.001$.

In the second step, attitude affected the mediator variable with 0.677 Unstandardized estimates and 11.512 critical ratio values respectively besides the relationship (ATT→BI) specified with highly significant at $p<0.001$. The final step was examining the indirect effect attitude on actual behavior upon the addition of the mediator and result revealed that the Unstandardized regression weight shrank from 0.435 to 0.247 and critical ratios values from 6.459 to 3.133 correspondingly as well as the link declined its significance level from $p<0.001$ to $p=0.002$. Accordingly, the effect of BI on AB was also revealed with 0.277 Unstandardized estimates and 4.232 critical ratios values within significant effect at $p<0.001$. Though, the casual steps (ATT→BI→AUB) analysis result disclosed a decline towards the level statistical significance between attitude and actual behavior, the link remained significant so that this indicated an

existence of partial mediation effect of behavioral intention towards the relationships between ATT and AB at this level as demonstrated in Figure 4-5.

Figure 4-5: ME Results (ATT→BI→AUB) Using Casual Steps Approach



Source: Own Analysis Results, 2020

In the second step, attitude affected the mediator variable with 0.677 Unstandardized estimates and 11.512 critical ratio values respectively besides the relationship (ATT→BI) specified with highly significant at $p<0.001$. The final step was examining the indirect effect attitude on actual behavior upon the addition of the mediator and result revealed that the Unstandardized regression weight shrank from 0.435 to 0.247 and critical ratios values from 6.459 to 3.133 correspondingly as well as the link declined its significance level from $p<0.001$ to $p=0.002$. Accordingly, the effect of BI on AB was also revealed with 0.277 Unstandardized estimates and 4.232 critical ratios values within significant effect at $p<0.001$. Though, the casual steps (ATT→BI→AUB) analysis result disclosed a decline towards the level statistical significance

between attitude and actual behavior, the link remained significant so that this indicated an existence of partial mediation effect of behavioral intention towards the relationships between ATT and AB at this level.

Furthermore, In this regard, further valuation bootstrapping was performed to double confirm whether a mediation effect existed or not in the relationship between ATT and AB considering empirical representation of the resampling distribution via boot strapping approach. Bootstrapping generates an empirical representation of the sampling distribution of the indirect effect by treating the obtained sample of size N as a representation of the population in miniature, one that is repeatedly resampled during analysis as a means of representing the original sampling process (Laitinen, Ginzboorg, Asokan, & Bajko, 2016). (Lukin & Walker, 2017) highly recommend bootstrap procedure to examine the indirect effect through estimations results of lower and upper bound limits should provide none zero values in between to endorse a mediation effect (full, partial or not any) in the proposed framework. Thus, the researcher created 5,000 bootstrap data samples by randomly sampling with replacements from the aggregate dataset (N = 289) so as to perform the bootstrapping.

Table 4-28: ME (ATT→BI→AUB) Result via Bootstrapping Approach

Constructs Relationships	Estimates	C.R	P Values	Standardize Effect Matrices					Bootstrapping Result
				Direct Effects		Indirect Effects			
				LB	UB	LB	UB	2TS	
BI← ATT	.561	11.512	***	.464	.649	--	--	--	Partial Mediation Existed
AUB←ATT	.202	3.133	.002	.073	.332	.075	.232	.000	
AUB←BI	.273	4.232	***	.127	.405	--	--	--	

Remark:

- LB refers to Lower Bound, UP to Upper Bound, C.R to Critical Ratio and 2TS to Two Tailed Significance

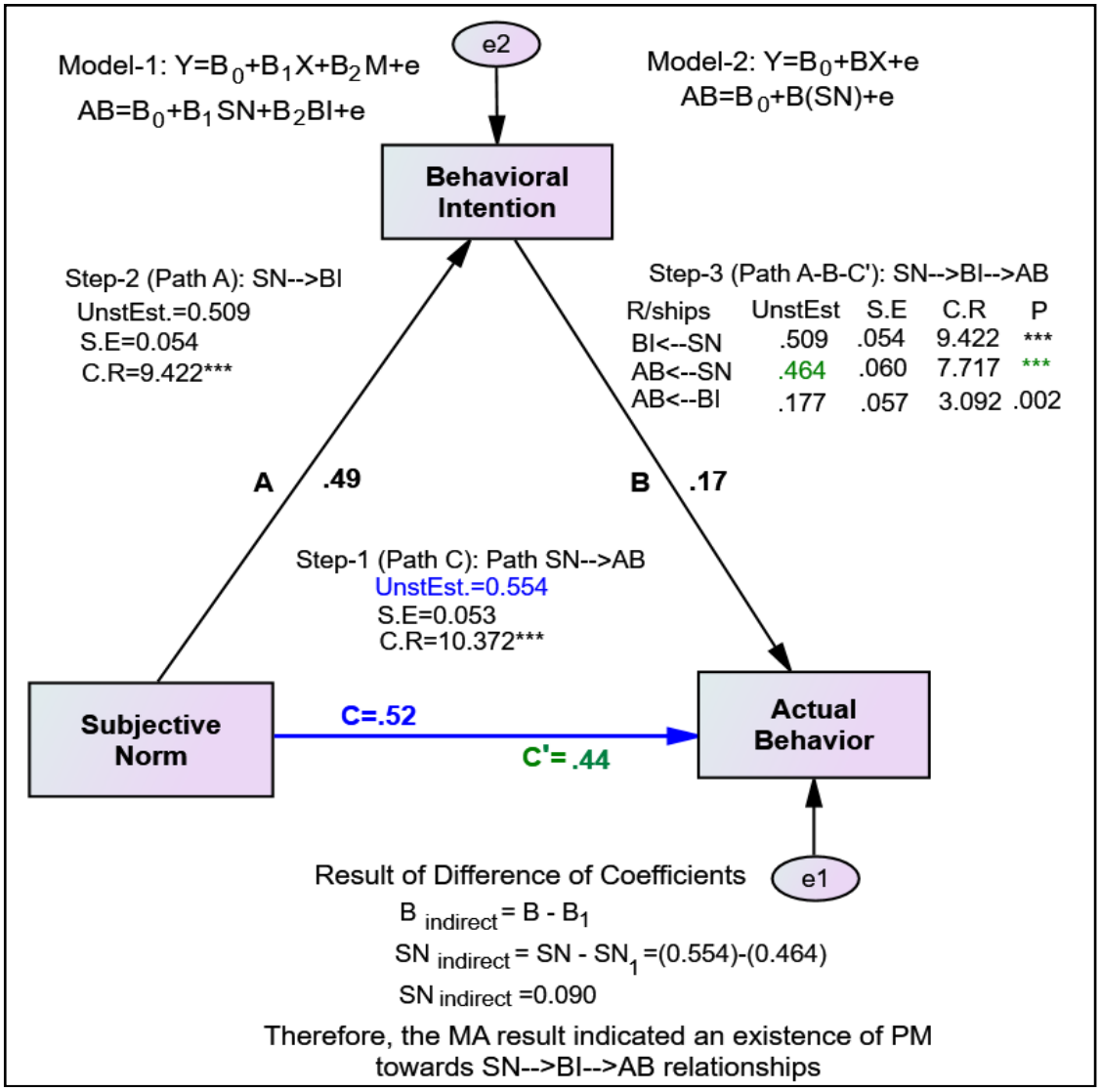
Source: Own Analysis Results, 2020

As presented in Table 4-28, the result of bootstrapping analysis of ATT indirect effect on AB (ATT→BI→AB) found with none zero value in between the lower bound (0.075) and lower bounds (0.232) along with significant indirect effect at $p<0.001$ which indicate the existence of meditation effect. Therefore, the finding of both casual step and bootstrapping approaches confirmed the existence of **partial mediation effect** of behavioral intention towards the relationships of attitude and actual behavior to adopt green IT.

4.2.7.2 Mediation Effect Analysis Result of SN→AB Link

Behavioral intention to adopt green IT practices was primarily hypothesized to mediate or carry out its relative contribution of the regression weight encountered by subjective norm towards predicting the actual behavior of adopting green IT belief. Thus, the direct effect result of subjective norm on actual behavior indicated a significant effect at p<0.001 within 0.554 Unstandardized estimates and 10.372 critical ratio values through without the mediator variable in the first causal step as presented in Figure 4-6.

Figure 4-6: ME Results (SN→BI→AUB) Using Casual Steps Approach



Source: Own Analysis Results, 2020

Then after, the relationship of SN and BI was also found with significant effect along with 0.509 Unstandardized regression weight and 9.422 critical ratio values at p<0.001. On the final step, the indirect effect of the SN on AB upon the addition of mediator variable, the standardized

estimates minimized from 0.554 to 0.464 and critical ratios from 10.372 into 7.717 respectively likewise the level of significance remained as highly significant effect at p<0.001. Accordingly, the effect of behavioral intention on actual behaviors to adopt green IT was correspondingly proceeded as 0.177 Unstandardized estimates and 3.092 critical ratio values with statistically significant effect at p<0.005. Thus, the casual step (SN→BI→AB) analysis result indicated partial mediation effect of behavioral intention to adopt green IT.

In this regard, the three step approaches indicated an existence of partial mediation effect of behavioral intention in the relationship of subjective norm and actual behavior. However, further bootstrapping valuation was performed to double confirm whether mediation effect of intention existed or not through examining the lower and upper limits within the empirical representation of the resampling distribution. Similarly, the dataset resampled into 5,000 number of bootstrap samples by using 95% confidence level to the aggregate dataset (N = 289) in order to perform bootstrapping and the indirect effect result of subjective norm towards actual behavior via bootstrapping approach (SN→BI→AB) indicated that there was no zero value in between the lower bound (0.022) and upper bounds (0.158) along with significant indirect effect at p<0.001 that double confirmed the existence of meditation effect as presented in Table 4-29.

Table 4-29: ME (SN→BI→AB) Result via Bootstrapping Approach

Constructs Relationships	Estimates	C.R	P Values	Standardize Effect Matrices					Bootstrapping Result
				Direct Effects		Indirect Effects			
				LB	UB	LB	UB	2TS	
BI← SN	.485	9.422	***	.376	.581	--	--	--	Partial Mediation Existed
AB←SN	.437	7.717	***	.312	.545	.022	.158	.000	
AB←BI	.175	3.092	.002	.042	.299	--	--	--	

Remark:

- LB refers to Lower Bound, UP to Upper Bound, C.R to Critical Ratio and 2TS to Two Tailed Significance

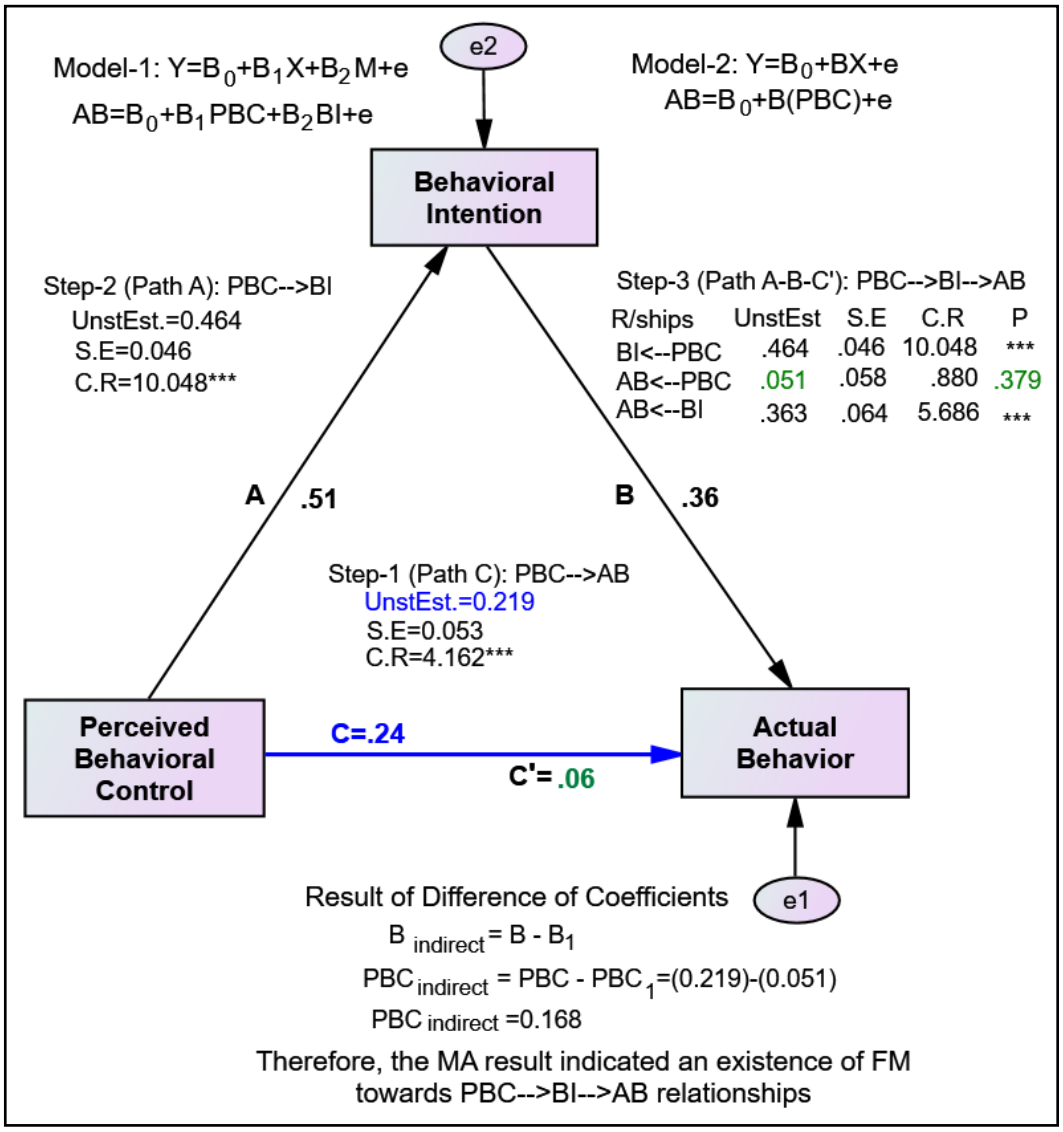
Source: Own Analysis Results, 2020

Therefore, the analysis of causal steps and bootstrapping approaches revealed that behavioral intention **partially mediates** towards the relationships of subjective norm and actual behavior to adopt green IT.

4.2.7.3 Mediation Effect Analysis Result of PBC→AB Link

As demonstrated in Figure 4-5, the indirect effect of perceived behavioral control on the actual behavior of adopting green was similarly scrutinized using the three causal steps approach and the results indicated that PBC substantially affect the actual behavior in the absence of mediator with 0.219 Unstandardized estimates and 4.162 critical ratio values along with high significant relationship at p<0.001 as presented in Figure 4-7..

Figure 4-7: ME Results (PBC→BI→AB) Using Casual Steps Approach



Source: Own Analysis Results, 2020

Accordingly, the direct effect of PBC to BI was also found as 0.464 Unstandardized estimates and 10.048 critical ratio values that confirmed highly significant relationship at p<0.001. The indirect effect of the PBC on AB upon the addition of mediator variable, the Unstandardized

estimates shrank from 0.219 to 0.051 and critical ratios from 4.162 to 0.880 that signposted an absolute shifted to insignificant relationship at p=0.379.In addition, the regression weight of BI towards AB has specified with 0.363 Unstandardized estimates and 5.686 critical ratio values with highly significant relationship at p<0.001. To this end, the casual steps (PBC→BI→AB) analysis result revealed complete mediation effect of behavioral intention between perceived behavioral control and actual behavior to adopt green IT.

Even though, the three step approach are indicated the existence of complete or full mediation effect of behavioral intention in the relationship between PBC and AB, further valuation was performed using the bootstrapping approach to double confirm whether a mediation effect existed or not in the relationship between PBC and AB considering empirical representation of the resampling distribution. Likewise, the dataset resampled into 5,000 number of bootstrap samples by using 95% confidence level to the aggregate dataset (N = 289) in order to perform bootstrapping and the indirect effect result of perceived behavioral control towards actual behavior via bootstrapping approach (PBC→BI→AB) specified that there was no zero value in between the lower bound (0.109) and upper bounds (0.261) along with significant indirect effect at p<0.001 that confirmed the existence of meditation effect as presented in Table 4-30.

Table 4-30: ME (PBC→BI→AB) Result via Bootstrapping Approach

Constructs Relationships	Estimates	C.R	P Values	Standardize Effect Matrices					Bootstrapping Result
				Direct Effects		Indirect Effects			
				LB	UB	LB	UB	2TS	
BI← PBC	.509	10.048	***	.407	.604	--	--	--	Complete Mediation Existed
AB←PBC	.055	.880	.379	-.074	.187	.109	.261	.000	
AB←BI	.359	5.686	***	.211	.481	--	--	--	

Remark:
- LB refers to Lower Bound, UP to Upper Bound, C.R to Critical Ratio and 2TS to Two Tailed Significance

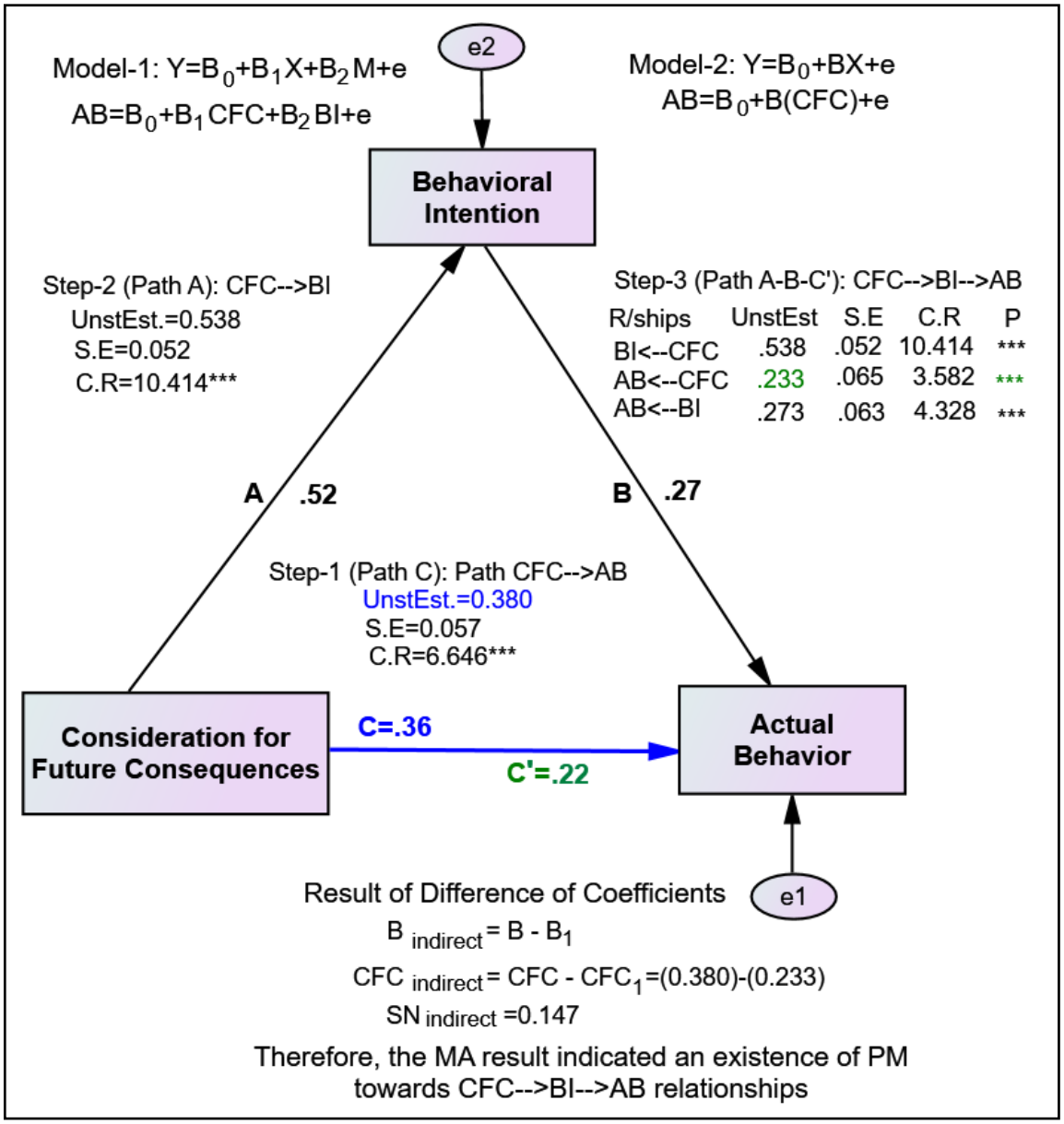
Source: Own Analysis Results, 2020

Therefore, the analysis of causal steps and bootstrapping approaches revealed that behavioral intention **completely or fully mediates** towards the relationship between perceived behavioral control and actual behavior to adopt green IT.

4.2.7.4 Mediation Effect Analysis Result of CFC→AB Link

The analysis result of the first causal step to determine CFC's direct effect revealed with 0.380 Unstandardized estimates and 6.646 critical ratio values and specified as statistical significance link at p<0.001 in the absence of mediator as presented in Figure 4-8.

Figure 4-8: ME Results (CFC→BI→AB) Using Casual Steps Approach



Source: Own Analysis Results, 2020

Accordingly, the direct effect of CFC towards BI specified as 0.538 Unstandardized regression weight and 10.414 critical ratio values specified with significant effect at p<0.001. On the third step, the indirect effect of CFC towards AB upon the addition of mediator variable, the Unstandardized estimates shrank from 0.380 to 0.233 and critical ratios from 6.646 into 3.582

respectively as well as the link remained highly significant at p<0.001. Accordingly, the effect of BI on AB was also identified with 0.273 Unstandardized estimates and 4.328 critical ratios values within highly significant link at p<0.001. Though, the casual steps (CFC→BI→AB) analysis result shown a decline towards the regression weight, the link remained significant so that this indicated an existence of partial mediation effect of behavioral intention. However, further valuation bootstrapping was performed to double confirm whether a mediation effect existed or not in the relationship between CFC and AUB considering empirical representation of the resampling distribution; thus, the dataset similarly resampled into 5,000 number of bootstrap samples by using 95% confidence level to the aggregate dataset (*N* = 289) so as to perform bootstrapping.

As presented in Table 4-31, the result of bootstrapping analysis of CFC's indirect effect on AB (CFC→BI→AB) found with none zero value in between the lower bound (0.068) and upper bounds (0.214) along with significant indirect effect at p<0.001 which indicate the existence of meditation effect.

Table 4-31: ME (CFC→BI→AB) Result via Bootstrapping Approach

Constructs Relationships	Estimates	C.R	P Values	Standardize Effect Matrices					Bootstrapping Result
				Direct Effects		Indirect Effects			
				LB	UB	LB	UB	2TS	
BI← CFC	.523	10.414	***	.420	.608	--	--	--	Partial Mediation Existed
AUB←CFC	.223	3.582	***	.089	.349	.068	.214	.000	
AUB←BI	.270	4.328	***	.130	.398	--	--	--	

Remark:

- LB refers to Lower Bound, UP to Upper Bound, C.R to Critical Ratio and 2TS to Two Tailed Significance

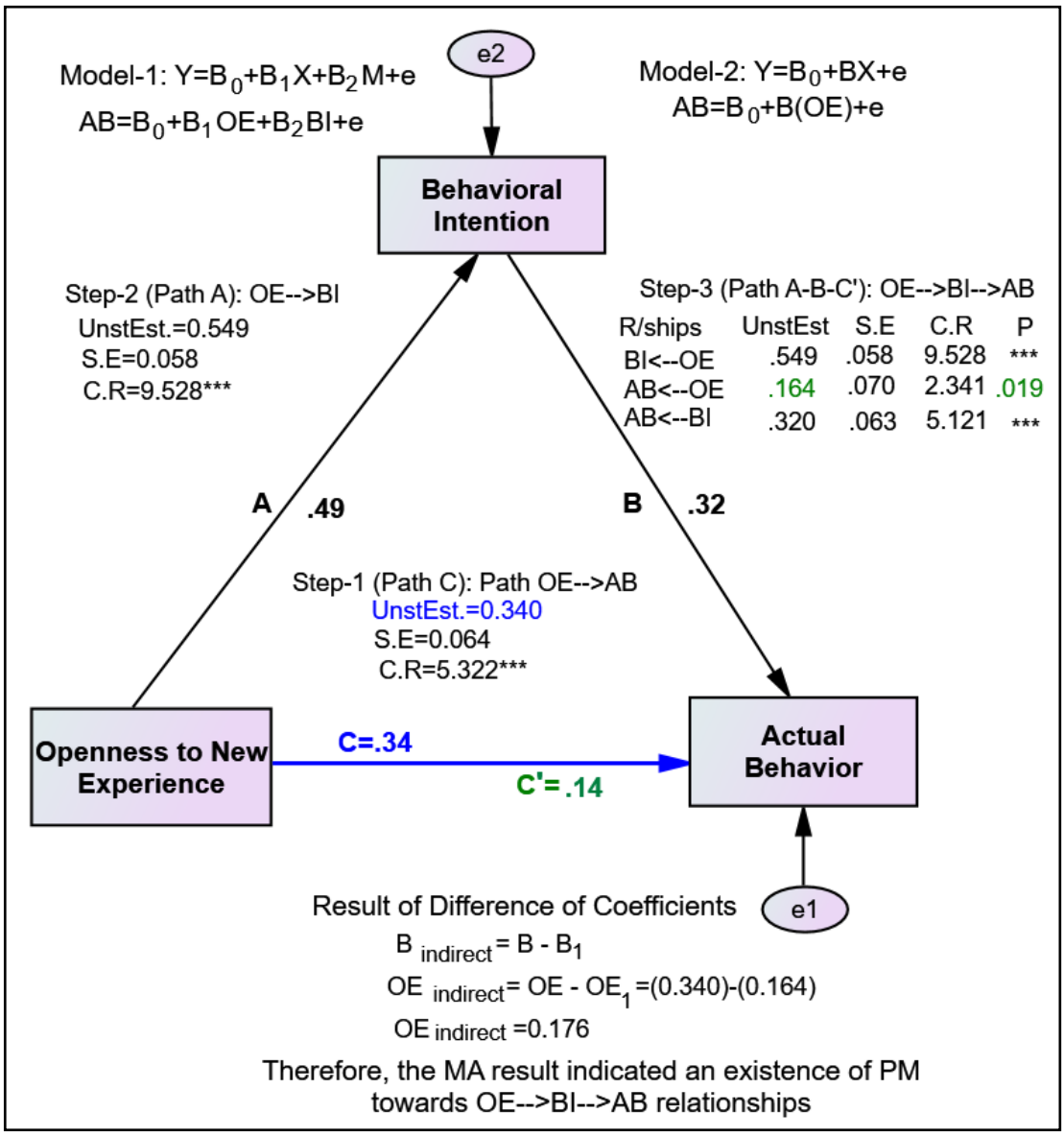
Source: Own Analysis Results, 2019

Therefore, the results of both casual steps approaches and bootstrapping confirmed the existence of **partial mediation effect** of behavioral intention towards the relationships of consideration for future consequences and actual behavior to adopt green IT.

4.2.7.5 Mediation Effect Analysis Result of OE→AB Link

The primary causal step analysis result revealed that openness to new experience significantly affected actual behavior by 0.34 Unstandardized estimates and 5.322 critical ratios values at p<0.001 in the absence of mediator as presented in Figure 4-9, the.

Figure 4-9: ME Results (OE→BI→AB) Using Casual Steps Approach



Source: Own Analysis Results, 2020

On the second step, the effect of openness to new experience towards the mediators variable similarly signposted 0.549 and 9.528 values of both Unstandardized estimates and critical ratio respectively within high level of statistical significance at $p<0.001$. Subsequently, the indirect effect of openness to new experience towards actual behavior upon the presence of the mediator variable: Behavioral intentions enlighten some extent of decline of Unstandardized estimates and critical ratio values from 0.340 to 0.161 and critical ratios from 5.322 into 2.341 when comparing with the first causal step of OE→AB relationship as well as the level of significant relationship was also slightly loosen from $p<0.001$ into $p=0.019$ that remained with significant indirect effect. Accordingly, the effect of behavioral intention on use behavior was also found

with 0.320 and 5.121 Unstandardized estimates and critical ratios values correspondingly at high level of statistical significance ($p<0.001$) as demonstrated in Figure 4-9. To this end, the casual steps of OE→BI→AB relationship endorsed partial mediation effect of behavioral intention at this point.

Even though, the three steps approach indicated an existence of partial mediation effect of behavioral intention in the relationship of openness to new experience and actual behavior, further bootstrapping valuation was performed to confirm whether a mediation effect of BI existed or not through empirical representation of the resampling distribution; thus, the dataset similarly resampled into 5,000 number of bootstrap samples by using 95% confidence level to the aggregate dataset (N = 289) so as to perform bootstrapping. As presented in Table 4-32, the result of bootstrapping analysis of OE's indirect effect on AB (OE→BI→AB) found with none zero value in between the lower bound (0.083) and upper bounds (0.231) along with significant indirect effect at $p<0.001$ which indicate the existence of meditation effect.

Table 4-32: ME (OE→BI→AB) Result via Bootstrapping Approach

Constructs Relationships	Estimates	C.R	P Values	Standardize Effect Matrices					Bootstrapping Result
				Direct Effects		Indirect Effects			
				LB	UB	LB	UB	2TS	
BI← OE	.490	9.528	***	.383	.578	--	--	--	Partial Mediation Existed
AUB←OE	.144	2.341	.019	.015	.274	.083	.231	.000	
AUB←BI	.316	5.121	***	.159	.447	--	--	--	

Remark:

- LB refers to Lower Bound, UP to Upper Bound, C.R to Critical Ratio and 2TS to Two Tailed Significance

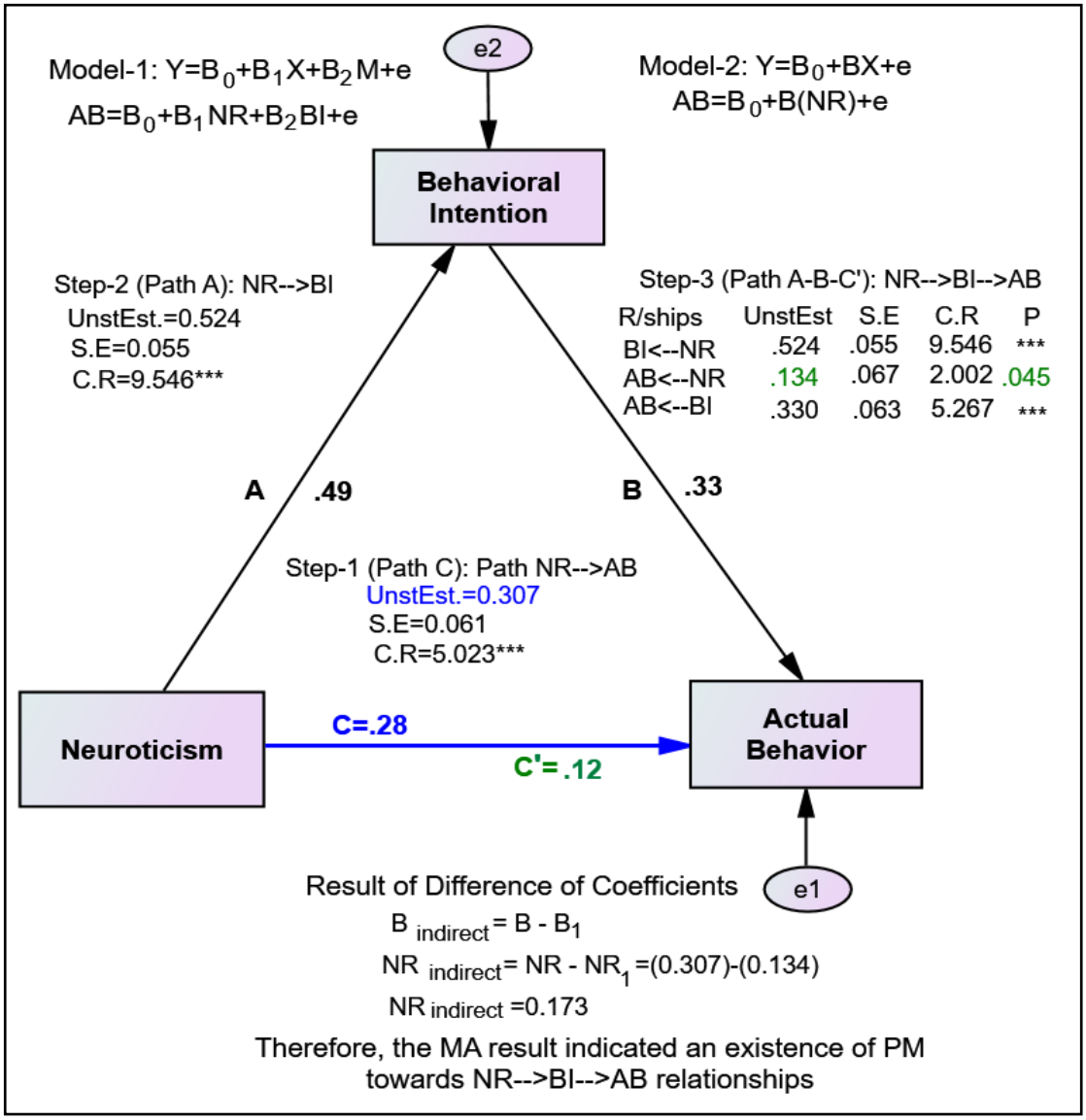
Source: Own Analysis Results, 2020

Therefore, the results of both casual steps approaches and bootstrapping confirmed the existence of **partial mediation effect** of behavioral intention towards the relationships of openness to new experiences and actual behavior to adopt green IT.

4.2.7.6 Mediation Effect Analysis Result of NR→AB Link

As demonstrated in Figure 4-10, the indirect effect of neuroticism on the actual behavior of adopting green IT similarly tested using the three step analysis and the results indicated that NR substantially affected AB in the absence of mediator with 0.307 Unstandardized estimates and 5.523 critical ratio values respectively along with statistically significant relationship at $p<0.001$.

Figure 4-10: ME Results (NR→BI→AB) Using Casual Steps Approach



Source: Own Analysis Results, 2020

On the second step, the effect of neuroticism towards the mediators variable similarly signposted 0.524 and 9.546 values of both Unstandardized estimates and critical ratio respectively within high level of statistical significance at p<0.001.Subsequently, the indirect effect of neuroticism towards actual behavior upon the presence of the mediator variable: Behavioral intentions enlighten some extent of decline of Unstandardized estimates and critical ratio values from 0.307 to 0.134 and critical ratios from 5.023 into 2.002 when comparing with the first causal step of OE→AB relationship as well as the level of significant relationship was also slightly loosen from p<0.001 into p=0.045 that remained with significant indirect effect. Accordingly, the effect of behavioral intention on use behavior was also found with 0.330 and 5.267 Unstandardized estimates and critical ratios values correspondingly at high level of statistical significance

(p<0.001) as demonstrated in Figure 4-9. To this end, the casual steps of OE→BI→AB relationship that endorsed partial mediation effect of behavioral intention at this point.

Even though, the three steps approach indicated an existence of partial mediation effect of behavioral intention in the relationship of neuroticism and actual behavior, further bootstrapping valuation was performed to confirm whether a mediation effect of BI existed or not through empirical representation of the resampling distribution so as to perform bootstrapping. As presented in Table 4-33, the result of bootstrapping analysis of NR's indirect effect on AB (OE→BI→AB) found with none zero value in between the lower bound (0.090) and upper bounds (0.236) along with significant indirect effect at p<0.001 which indicate the existence of meditation effect.

Table 4-33: ME (NR→BI→AB) Result via Bootstrapping Approach

Constructs Relationships	Estimates	C.R	P Values	Standardize Effect Matrices					Bootstrapping Result
				Direct Effects		Indirect Effects			
				LB	UB	LB	UB	2TS	
BI← NR	.490	9.546	***	.394	.574	--	--	--	Partial Mediation Existed
AUB←NR	.124	2.002	.045	-.010	.248	.090	.236	.000	
AUB←BI	.326	5.267	***	.187	.452	--	--	--	

Remark:
- LB refers to Lower Bound, UP to Upper Bound, C.R to Critical Ratio and 2TS to Two Tailed Significance

Source: Own Analysis Results, 2020

Thus, the results of both casual steps approaches and bootstrapping confirmed the existence of **partial mediation effect** of behavioral intention towards the relationships of neuroticism and actual behavior to adopt green IT. Therefore, there results of the mediation effect of behavioral intention towards the relationships among the TPB predictors and personality trait and the actual behavioral revealed with either partial or complete mediation effect so that the hypothesis (H8) was accepted.

4.2.8 Structural Model Assessment Results via SEM

Structural model assessments were determined through examining the path analysis to test the hypothesized theoretical model or the causal relationships among the constructs. In this regard, the assessment of measurement model usually focuses on covariance based relationship whereas structural model assessments were employed to measures the structural relationships between the

independents predictors and dependent constructs. The causal arrows indicates that the hypothesized relationships between the constructs, as presented in the initial research framework. Based on the initial research model, structural paths were drawn directly from the prior TPB predictors and personality traits to the mediator variable: BI as well as behavioral intention to actual behavior so as to examine the effects of each predictor to the actual behavior to adopt green IT in the presence of the mediator variable. In due course, the results of the path analysis towards the initial research model indicated that all the relationship revealed with significant effects at $p<0.05$ except neuroticism personality trait.

In due course, BI was confirmed for having a partial mediation effect result between TPB predictors and actual behavior link; thus, ATT's effect on BI revealed with 0.290 Unstandardized estimates and 4.476 critical ratio values and statistical significant link at $p<0.05$ or $p<0.001$ so that the **hypothesized (H1) relationship was accepted** as well as this result was also consistent with (Dezdar, 2017; Gholami et al., 2013; Molla et al., 2014; Yoon, 2018). In addition, the this finding was also supported by the interview result that reveals individuals' attitude towards environmental concern was perceived as a major drive to make an initial decision of adopting green IT practices at individual level.

Based on the analysis of the data collected, attitude appears to be the most significant factor affecting individuals' adoption intention of green IT. This indicates the vital role of attitude in green IT acceptance by IT users and signifies the importance of attitude cultivation and management in technology adoption. Based on Molla et al. (2014) study, green IT attitude refers to "sentiments, values, and norms in relation to climate change, eco-sustainability, and IT's role", in which includes to what extent users are aware of the influence of IT on environmental sustainability where TPB posits that positive beliefs or attitudes about a behavior and its outcomes will lead to an increase in that behavior. According to Gholami et al. (2013), beliefs about the relationship between humans and the environment increase individual awareness, which turns into pro-environmental behavior. Consequently, this result was also supported by interview result that confirms the impact of attitude towards making an initial decision for environmental concerns since an individual with an ecological world view remain aware of its environmental impact. Majority of interviewee perceived that individuals come to be more likely to adopt a green approach as part of daily activities particularly in Ethio-telecom context.

In investigating the influence of attitude on adopting green IT, the interview data indicated the importance of distinguishing between those who believe in the role of humans in environmental

degradation and climate change, and those who are climate change skeptics. Hence, the attitudes of former group may have a positive impact on their pro-environmental behavior, while the latter have the negative influence.

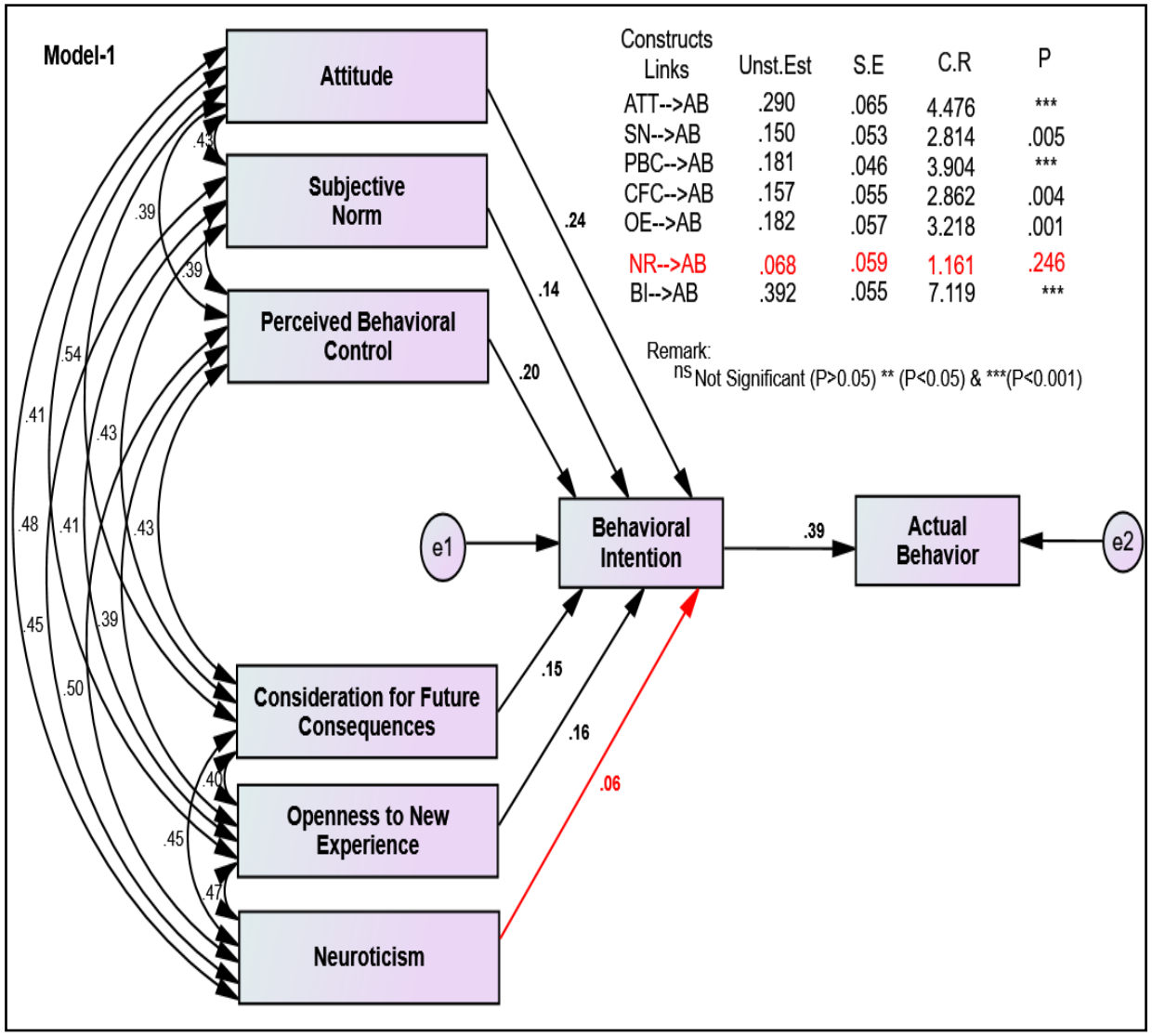
Moreover, SN's effect on BI revealed with 0.150 Unstandardized estimates and 2.814 critical ratio values where the hypothesized (H2) relationship articulated in the proposed model that indicated BI to have a direct positive influence towards the link between SN and AB **(H2) hypothesis was accepted** and as well as PBC's effect on BI revealed with 0.181 Unstandardized estimates and 3.904 critical ratio values so that the hypothesized (H3) relationship articulated in the proposed model that indicated BI to have a direct positive influence towards the link between PBC and AB **(H3) hypothesis was accepted**. SN has the second highest impact on the adoption intention after attitude. Similarly, the interview data indicated that IT users are likely to place more weight on opinions of others or look at the influence of people in their social environment on behavioral intentions. Correspondingly, this occurrence was consistently demonstrated by Yoon (2018) and Dezdar (2017) where SN is the social influences impacting on an individual's intention to perform or not to perform (Ojo et al., 2019).

The majority of interviewee agreed that subjective norm could be determined by the normative expectations of others e.g. "my friends think that I should use buy a green product" and motivation to comply e.g. "I generally want to do what my friends think I should do" with these expectations as well as perceived behavioral control were alleged for having less influence on behavioral intention as compared to attitude and subjective norm. This is probably because of the activities of being "green" in IT like powering off the PC when not in use, using email to minimize paper use, etc., are not complicated, and most of the time, IT users have the high level of control in these behaviors (Gholami et al., 2013).

Subjective norm and perceived behavioral control significantly affect the intention, this means SN's and PBC's indirect effect on actual behavioral to adopt green IT. A plausible explanation may be based on motivational theory that green IT adoption may be considered as an intrinsic motivational factor, and SN and PBC may be extrinsic motivational factors that could help the individuals to self-regulate their motivation on green IT adoption (Kranz & Picot, 2011). Furthermore, this leads to the fact that people's beliefs have significant control over the behavior, and, therefore, performance or nonperformance of the behavior is up to them (Molla et al., 2014). In addition, significance of SN may be an evidence of existence of the perceived social pressure

to perform the green IT behavior, which basically relates to one's intuition about others' exertion of influence (Ojo et al., 2019).

Figure 4-11: Path Analysis Result of the Initial Proposed Model



Source: Own Analysis Results, 2020

Furthermore, consideration for future consequences' effect on BI specified as 0.157 Unstandardized estimates and 2.862 critical ratio values; openness to new experiences' effect on BI also revealed with 0.182 Unstandardized estimates and 3.218 critical ratio values as well as BI to AB revealed 0.392 Unstandardized estimates and 7.119 critical ratio value where the three links were statistically significant at $p<0.05$ and $p<0.001$. Therefore, the hypothesized (H4, H5 and H7) relationship articulated in the proposed model that indicated BI to have a direct positive influence of CFC, OE towards AB link as well as BI towards AB link was **accepted** as illustrated in Figure 4-11.

Furthermore, openness, which refers to people's willingness to make adjustments to existing attitudes and behaviors once they have been exposed to new ideas or situations (McCrae & Costa Jr, 1985, 1997), is also been found impacting the adoption intention in this research. This result is consistent with prior research conducted by (Choon et al., 2014; Dezdar, 2017; Gholami et al., 2013). The study data indicated that the individuals who have great execution performance on openness tend to display a proclivity to not only listen to new ideas but also to change their own ideas and beliefs and consequently change their behavior as a result of new experiences and information. It also shows that individuals who are high in openness are more likely to initiate, implement and adopt green IT practices. The planning to advance their environmental performance through the adoption of green practices need to train environmental issues and green IT practices to all employee in Ethio-telecom. Thus, Ethio-telecom should communicate more at individual level in terms of green ICTs overview, received benefits and enabling technologies.

Finally, it was found that BI influences AB. Similar results were found by earlier studies (Choon et al., 2014; Samoei & Moturi, 2016; Wang, Fan, Zhao, Yang, & Fu, 2016). This means that BI among the individuals eventually leads to AB among them. Employee can drive the greener environment by initiating green activities or acting as green champions to support green initiatives in the industry.

Table 4-34: Path analysis Result Summary

Parameters	Hypothesis	Standardize Path Coefficient (β)	S.E	C.R	P	Outcomes
BI ← ATT	H1	.241	.065	4.476	***	Accepted
BI ← SN	H2	.143	.053	2.814	.005	Accepted
BI ← PBC	H3	.199	.046	3.904	***	Accepted
BI ←CFC	H4	.153	.055	2.862	.004	Accepted
BI ← OE	H5	.163	.057	3.218	.001	Accepted
BI← NR	H6	.064	.059	1.161	.246	Rejected
AUB ← BI	H7	.387	.055	7.119	***	Accepted

Remark:
[ns] Not Sign. (p>0.05), ** Sign. (P<0.05) and ***Highly Sign. (P<0.001)

Source: Own Analysis Results, 2020

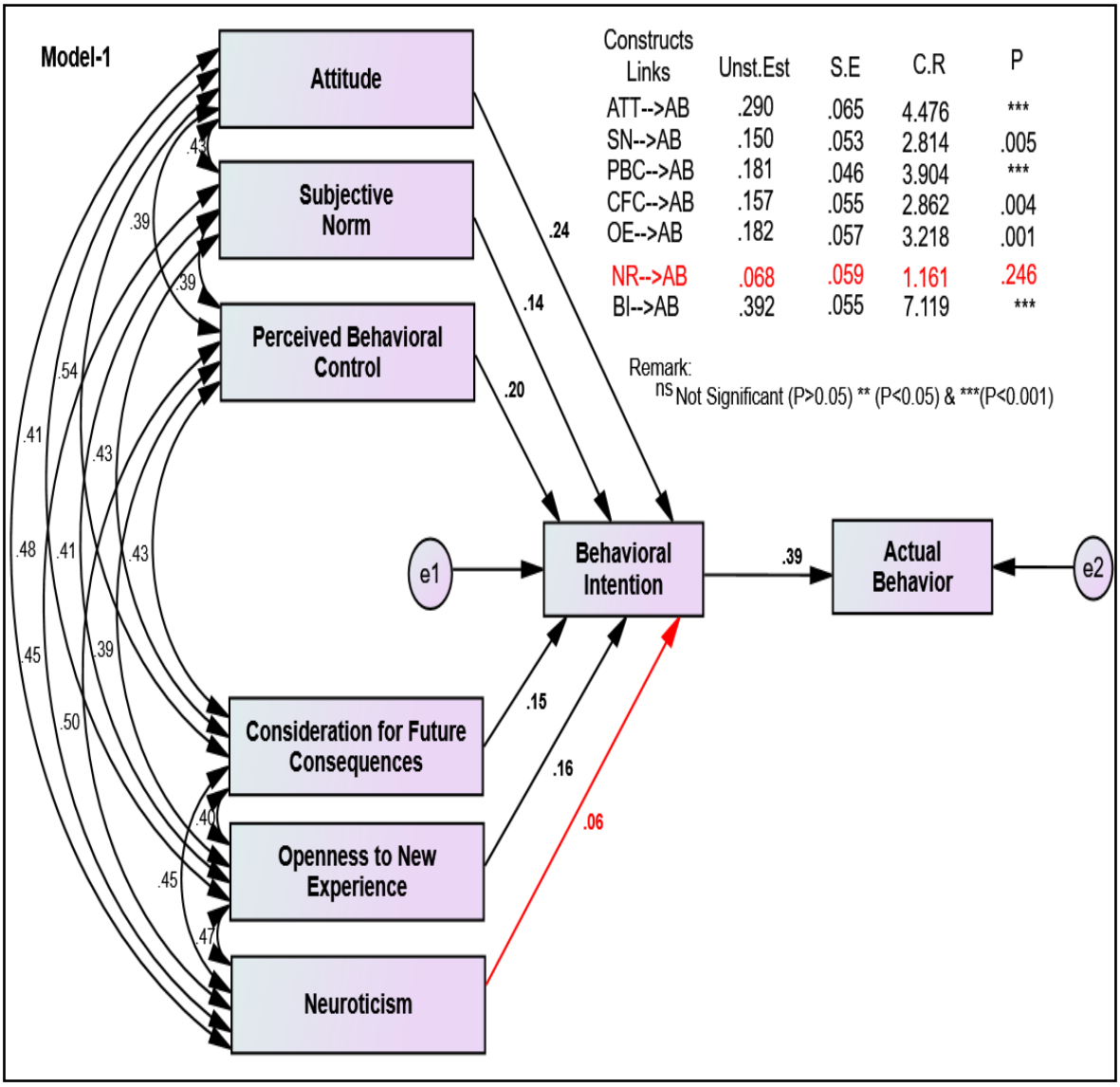
Therefore, Ethio-telecom should involve its employee in green campaigns which highlight environmental safe objectives and help in reducing pollutions and resource consumption. It is also recommended that universities implement incentive mechanisms for green employee based on their environmental performance. The incentives for green employee students may motivate them to assign resources and effort toward environmental initiatives and to monitor environmental behaviors at their daily activities. However, neuroticism personality trait revealed with 0.068 Unstandardized estimate and 1.161 critical ratio values with insignificant link at p=0.246 so that the hypothesized (H6) relationship articulated in the proposed model that indicated BI to have a direct positive influence of NR towards AB link was **rejected** as demonstrated in Table 4-34.

4.2.9 Final Model Refinement Result

According to Xiong, Skitmore, and Xia (2015), model refinement method is usually employed to update the initial model based on the analysis results and objectives where this technique is typically employed to assess and improve the initial structural paths through adding or removing links so as to come up with a better fit model that fits to specific study context. Based on Paul, Swart, Zhang, and MacLeod (2015) suggestions revised models were developed for the purpose of comparisons towards the proposed research model so as to clip the unsurpassed model. There are several recommendation towards model refinement procedures, likewise the comparisons each nested models towards the chi-square values, fit indices and degree of freedom were considered to select the final model (Grace, Schoolmaster Jr, Guntenspergen, Little, Mitchell, Miller, & Schweiger, 2012).

As it was illustrated in the Figure 4-12, the initial research Model-1 a duplicate model of the research model and drown directly from the prior TPB predictors and personality traits towards the mediator variable: behavioral intention as well as behavioral intention towards actual behavior so as to compare the effects of each predictors indirect effect towards the actual behavior to adopt green IT in the presence of the mediator variable.

Figure 4-12: Path Analysis Results of the Initial Model-1



Source: Own Analysis Results, 2020

As presented in Table 4-55, the model fit summary of the initial research model was revealed with 16.212 chi-square and 6 degree of freedom that indicated above the unacceptable level of minimum discrepancy divided by its degree of freedom (CMI/DF <5). In addition, the model fit indices result revealed with 0.675 TLI value (i.e. less than the minimum acceptable value 0.90) and 0.179 root mean square errors approximate (i.e. greater than the minimum cut off0.08) and 0.177 cloth fit which was away from fit measures as presented in Table 4-35.

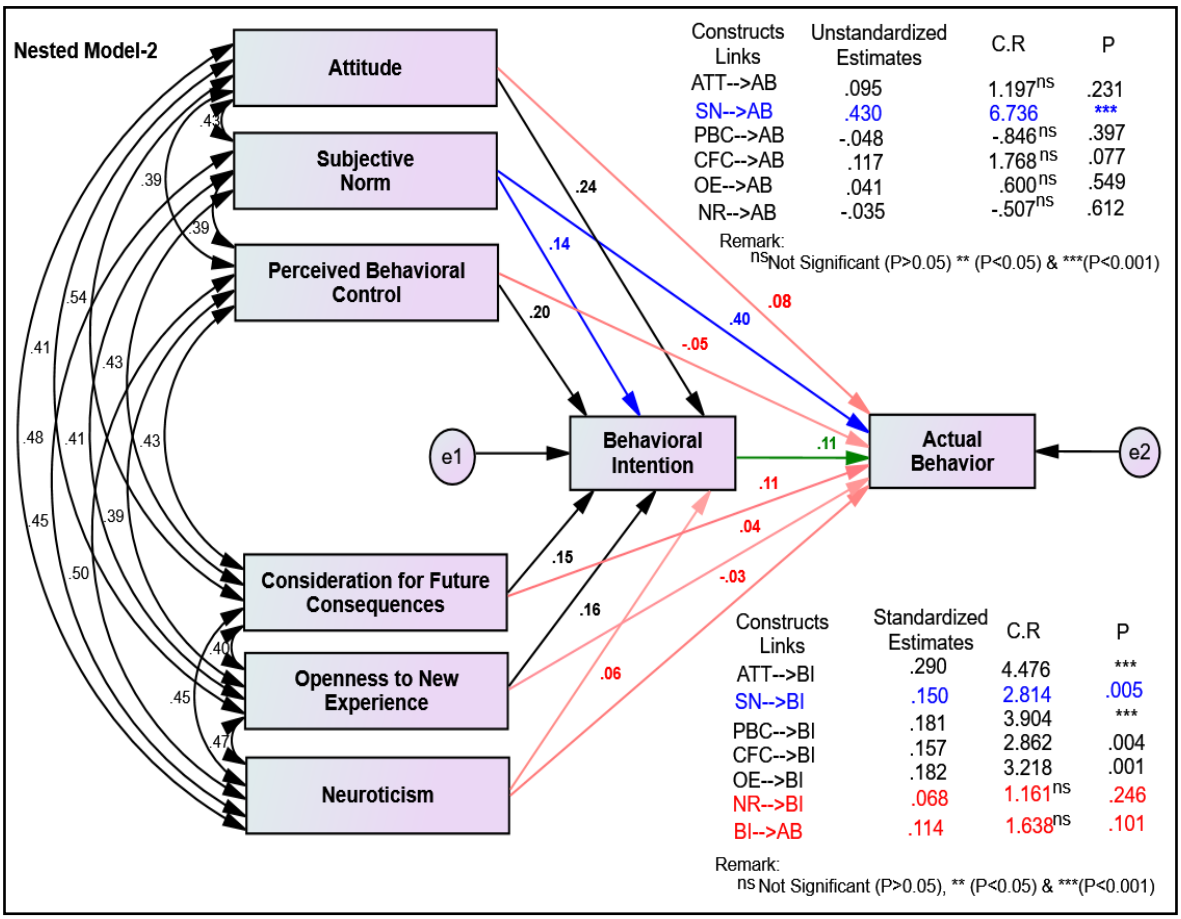
Table 4-35: Model Fit Summary of the Initial Research Model-1

Model	Goodness-of-Fit (GOF) Results									
	CMIN	DF	P	CMIN/DF	GFI	IFI	TLI	CFI	RMSEA	PClose
Default	61.212	6	.000	10.202	.954	.932	.675	.930	.179	.000
Saturated	.000	0	--	--	1.00	1.00	--	1.00	--	--
Independence	821.41	28	.000	29.336	.426	.000	.000	.000	.314	.000

Source: Own Analysis Results, 2020

The nested Model-2 was also developed based on the initial model assumption so as to drive better fit model via model refinement procedure. Thus, the initial research model relationships were taken as they were and the relationships were added direct relationships from the prior TPB predictors and personality traits towards actual behavior of adopting green IT altogether as presented in Figure 4-13.

Figure 4-13: Path Analysis Results of the Nested Model-2

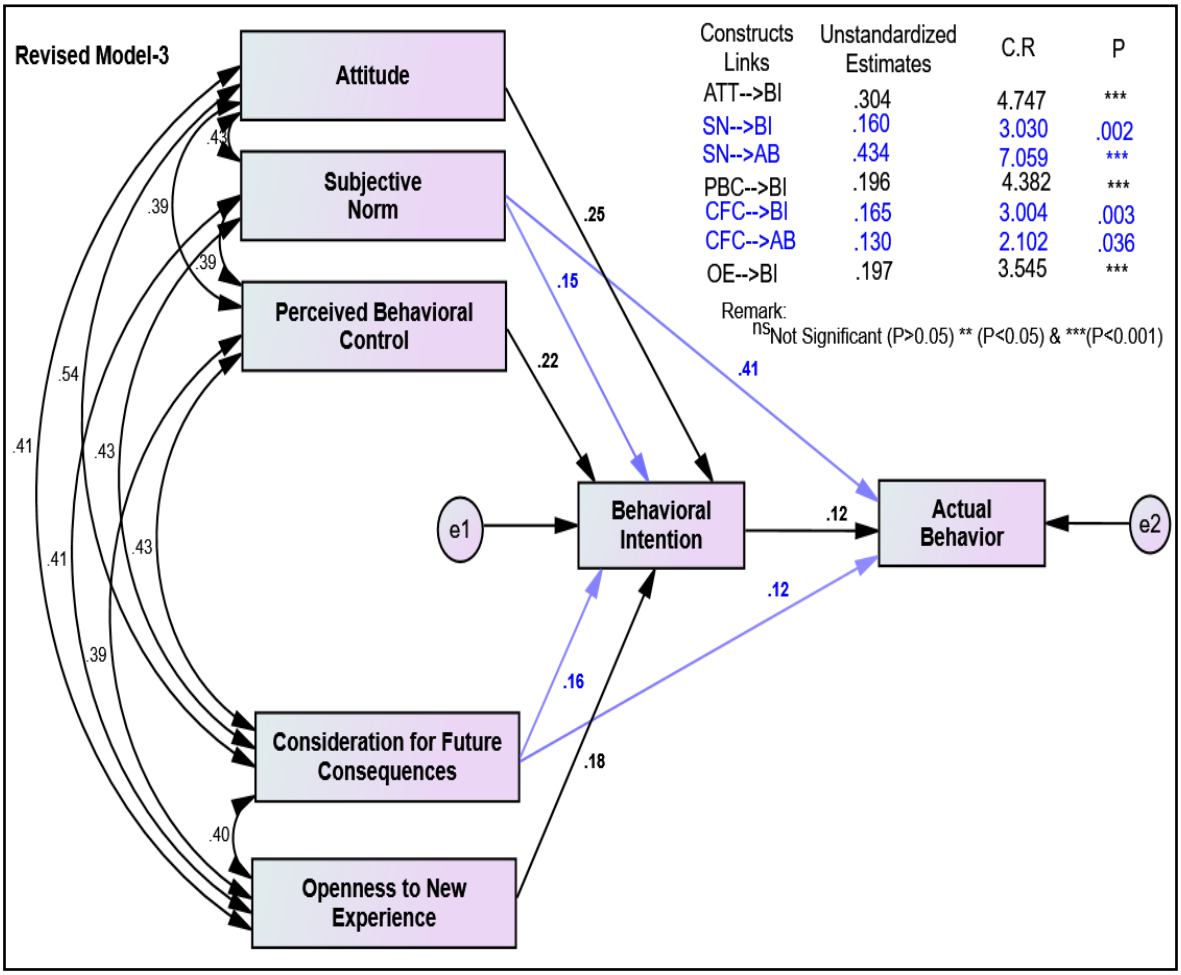


Source: Own Analysis Results, 2020

In this regard, the link among the five predictors and BI except neuroticism found with significant relationships at p<0.05 as well as the result of standardized estimates ranges from 0.157 to 0.290. However, Neuroticism were found -0.35 standardized estimates towards the direct link towards behavioral intention as well as 0.68 regression weight towards the direct link to actual behavior that indicated in significant effect at p>0.05.

Furthermore, the revised Model-3 was developed through removing the insignificant relationships. Meanwhile, the path from subjective norm to both behavioral intention and actual behavior remained as it was drown in the nested Model-2 due to its significant effect towards both links as illustrated in Figure 4-14.

Figure 4-14: Path Analysis Results of the Revised Model-3



Source: Own Analysis Results, 2020

In this regard, the model fit summary of the revised model-3 revealed with 2.44 chi-square and 3 degree of freedom and 0.813 value of minimum discrepancy divided by its degree of freedom. In

addition, the model fit indices result revealed with greater than 0. 90 goodness-of-indices as well as 0.000 root mean square errors approximate and 0.732 cloth fit measures as presented that indicated a fulfillment of the minimum acceptable level goodness-of-fit measures as presented in Table 4-36.

Table 4-36: Model Fit Summary of the RevisedModel-3

Model	Goodness-of-Fit (GOF) Results									
	CMIN	DF	P	CMIN/DF	GFI	IFI	TLI	CFI	RMSEA	PClose
Default	2.44	3	.486	.813	.998	1.00	1.00	1.00	.000	.732
Saturated	.000	0	--	--	1.00	1.00	--	1.00	--	--
Independence	662.08	21	.000	31.53	.470	.000	.000	.000	.326	.000

Source: Own Analysis Results, 2020

At the outset, the procedure of model refinement was examined through computing chi-square difference among the initial research Model-1 and the revised Model-3. Thus, if the chi-square difference among the models came to be significant, then the model with the better fit indices becomes the favored model. Likewise, if the chi-square difference is not significant, the model with less chi-square value or higher degree of freedom would be favored model. However, if the chi-square difference both models came to be significant and with almost similar fit, then the principle of the less complicated model with higher degree of freedom value would be the preferred model.

Table 4-37: Comparison of the Proposed and Revised Models

Fit Indices	Initial Model-1	Revised Model-3
CMIN	61.212	2.440
DF	6	3
P	.000	.486
CMIN/DF	10.202	.813
GFI	.954	.998
IFI	.932	1.001
TLI	.675	1.006
CFI	.930	1.000
RMSEA	.179	.000
PClose	.000	.732

Remark:
^{ns} Not Sign. (p>0.05), ** Sign. (P<0.05) and ***Highly Sign. (P<0.001)

Source: Own Analysis Results, 2020

Since, the revised Model-3 revealed with lesser chi-square value ($x^2 = 2.440$) than the initial Model-1 ($x^2 = 61.212$)and also greater than 0.90 goodness-of-fit measures respectively; so that the revised Model-3 was preferred since its inclusive explanatory power towards the individuals belief of green IT in this study context based on the aforementioned procedures and criteria as presented in Table 4-37.

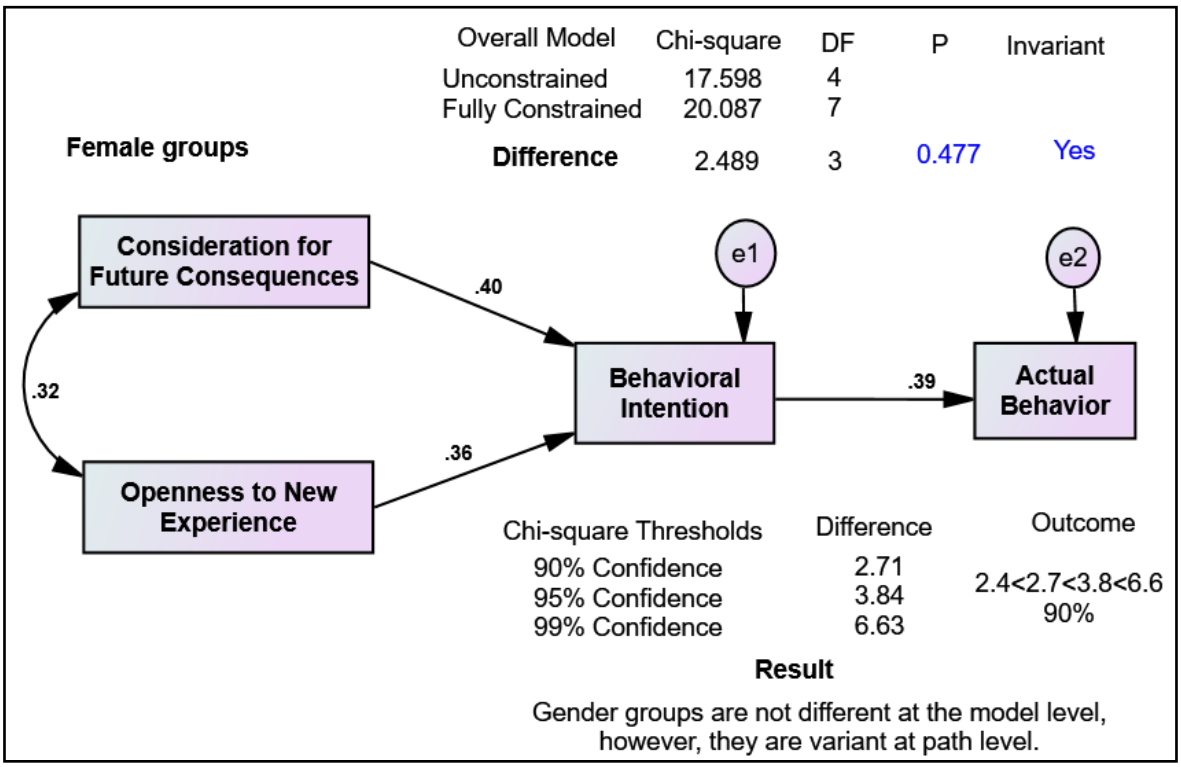
4.2.10 Moderating Effect Analysis Results

The effects of moderators: gender, age and IT experience on the relationship between the independent predictors and dependent variable were analyzed and the potential moderations effects of the demographic features towards the hypothesized relationships in the research model were determined through employing multi-group enquiry based on analogous characteristics of individuals' via Analysis of Momentum Structures (AMOS) version 21.0. The initial assumption in the research model was to explore the whether there exists a variability across the groups towards the effects of moderator variables' on the hypothesized relationships in the research model via chi-square difference examinations considering differences in regression weight.

4.2.10.1 Results on the Moderating Effect of Gender

The moderating effect of gender on the relationships among the personality traits and behavioral intention as well as behavioral intention and the actual behavior were determined through examining a multi-group analysis. In this regard, the chi-square and degree of freedom values for the unconstrained model revealed with 17.598 and 4 respectively. In addition, the fully constrained model revealed with 20.087 and 7 chi-square and degree of freedom values. To this end, the chi-square difference test shown invariance across both groups with 2.489 chi-square difference and insignificance variation at p=0.477 within 95% level of confidence, likewise the effect both gender groups towards each link came to be dissimilar in every single path level. The metric invariance test results of the unconstrained and fully constrained models across the gender groups were computed as presented in Figure 4-15.

Figure 4-15: Female Group Metric Invariance Results



Source: Own Analysis Results, 2020

Accordingly, the effect of female group path level relationships among consideration for future consequences and behavioral intention (CFC→BI) and openness to new experience and behavioral intention (OE→BI) as well as behavioral intention and actual behavior (BI→AB) revealed as0.401, 0.363 and 0.393standardized regression weights correspondingly with highly significant links at p<0.001as presented in Table 4-38.

Table 4-38: Female Group Configural Invariance Results

Parameters	Standardize path coefficient (Beta)	S.E	C.R	P-Values
BI ← CFC	.401	.097	4.763	***
BI ←OE	.363	.108	4.304	***
AB ← BI	.393	.093	4.194	***

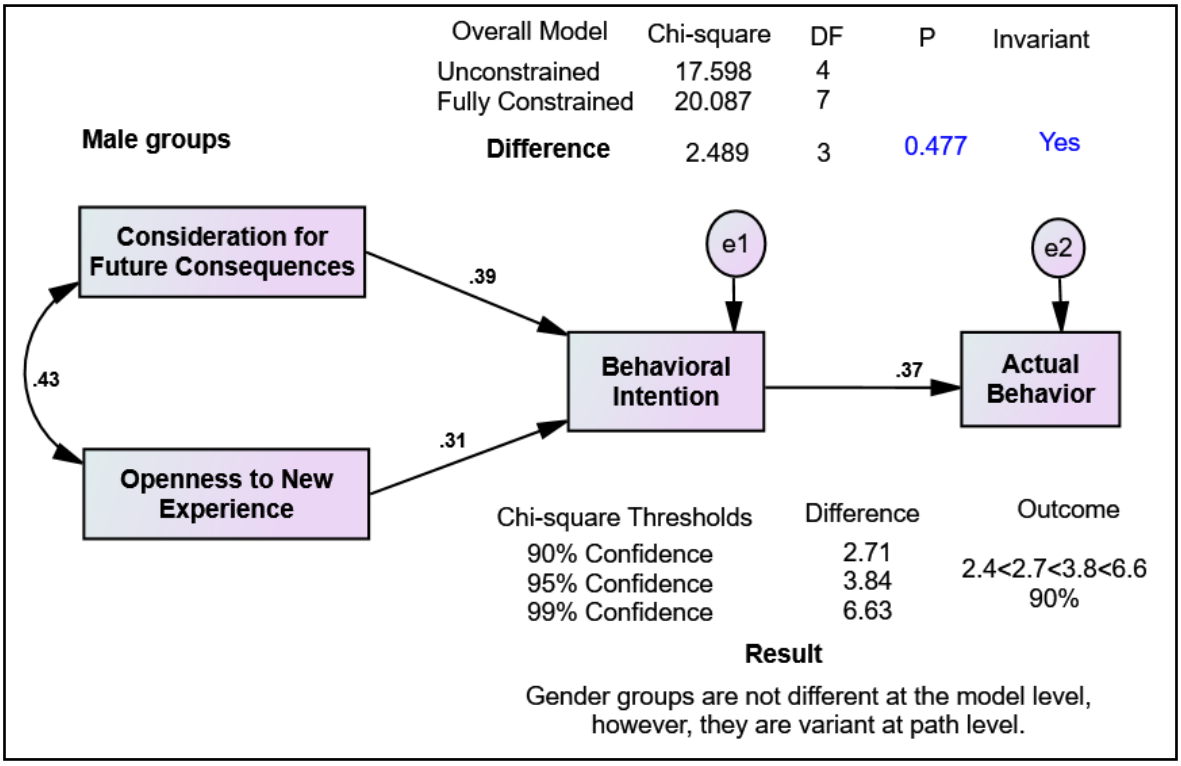
Remark: ^{ns} Not Sign. (p>0.05), ** Sign. (P<0.05) and ***Highly Sign. (P<0.001)

Source: Own Analysis Results, 2020

Regarding the effect of male group towards the relationship among consideration for future consequences and behavioral intention (CFC→BI) and openness to new experience and behavioral intention (OE→BI) as well as behavioral intention and actual behavior revealed as

0.401, 0.363 and 0.393 standardized regression weights correspondingly with highly significant link at p<0.001as presented in Figure 4-16.

Figure 4-16: Male Group Metric Invariance Results



Source: Own Analysis Results, 2020

In this regard, the relationship among independent predictors and behavioral intention as well as behavioral intention and actual behavior to adopt green IT indicated statistically significant relationships at p<0.05 for male group as presented in Table 4-39.

Table 4-39: Male Group Configural Invariance Results

Parameters	Standardize path coefficient (Beta)	S.E	C.R	P-Values
BI ← CFC	.393	.062	6.090	***
BI ←OE	..311	.068	4.826	***
AB ← BI	.373	.069	5.557	***

Remark: [ns] Not Sign. (p>0.05), ** Sign. (P<0.05) and ***Highly Sign. (P<0.001)

Source: Own Analysis Results, 2020

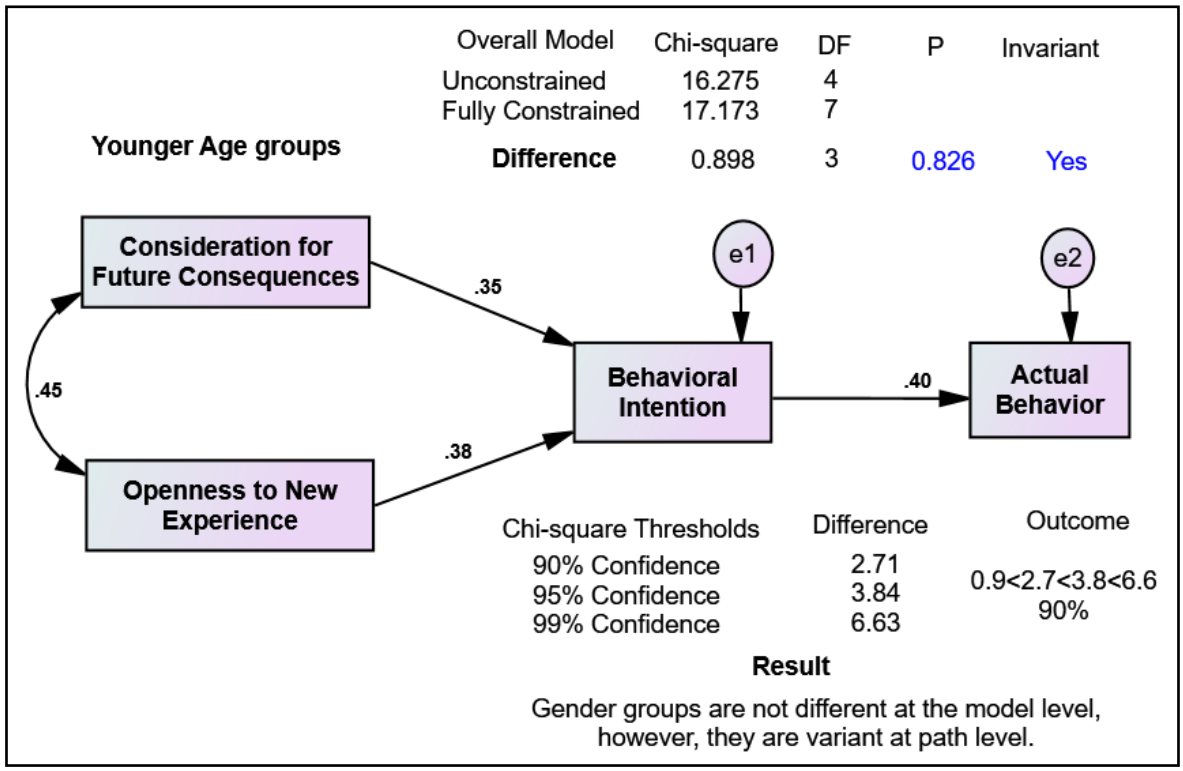
Therefore, the analysis result indicated that the relationship between CFC and BI specified as invariant across gender groups as the results of the metric invariance test of chi-square differences ($\Delta\chi2$=2.489, p=0.477) at 95% level of confidence. Thus, the relationship between

CFC and BI was stronger in female sample (β=0.41, p<0.001) than it was in the male sample (β=0.379, p<0.001), as result the hypothesis (H1a) was accepted. Similarly, the relationship between OE and BI was stronger in the female sample (β=0.363, p<0.001) than the sample of males (β =0.327, p<0.001), thus, the hypothesis (H2a) was accepted. Accordingly, the relationship between BI and AB was found stronger in the female sample (β=0.393, p<0.001) than the sample of males (β =0.389, p<0.001), hence, the hypothesis (H4a) was accepted. However, examining the moderating effect of gender towards the hypothesized relationship between NR and BI (H3a) was discarded or voided since this link was found insignificant in structural model measurement.

4.2.10.2 Results on the Moderating Effect of Age

The moderating effect of age on the relationships among the personality traits and behavioral intention as well as behavioral intention and the actual behavior were determined through examining a multi-group analysis. The metric invariance test results of the unconstrained and fully constrained models across the gender groups were computed as presented in Figure 4-17.

Figure 4-17: Younger Age Groups' Metric Invariance Results



Source: Own Analysis Results, 2020

In this regard, the chi-square and degree of freedom values for the unconstrained model revealed with 16.275 and 4 respectively. In addition, the fully constrained model revealed with 17.173

chi-square and 7 degree of freedom values. To this end, the chi-square difference test shown invariance across both younger and older groups with 0.898 chi-square difference and insignificance variation at p=0.826 within 95% level of confidence, likewise the effect both age groups towards each link came to be dissimilar in every single path level. Accordingly, the moderating effect of younger group path level relationships among consideration for future consequences and behavioral intention (CFC→BI) and openness to new experience and behavioral intention (OE→BI) as well as behavioral intention and actual behavior (BI→AB) revealed as 0.346, 0.375 and 0.395 standardized regression weights with highly significant links at p<0.001respectivelyas presented in Table 4-40.

Table 4-40: Younger Age Groups' Configural Invariance Results

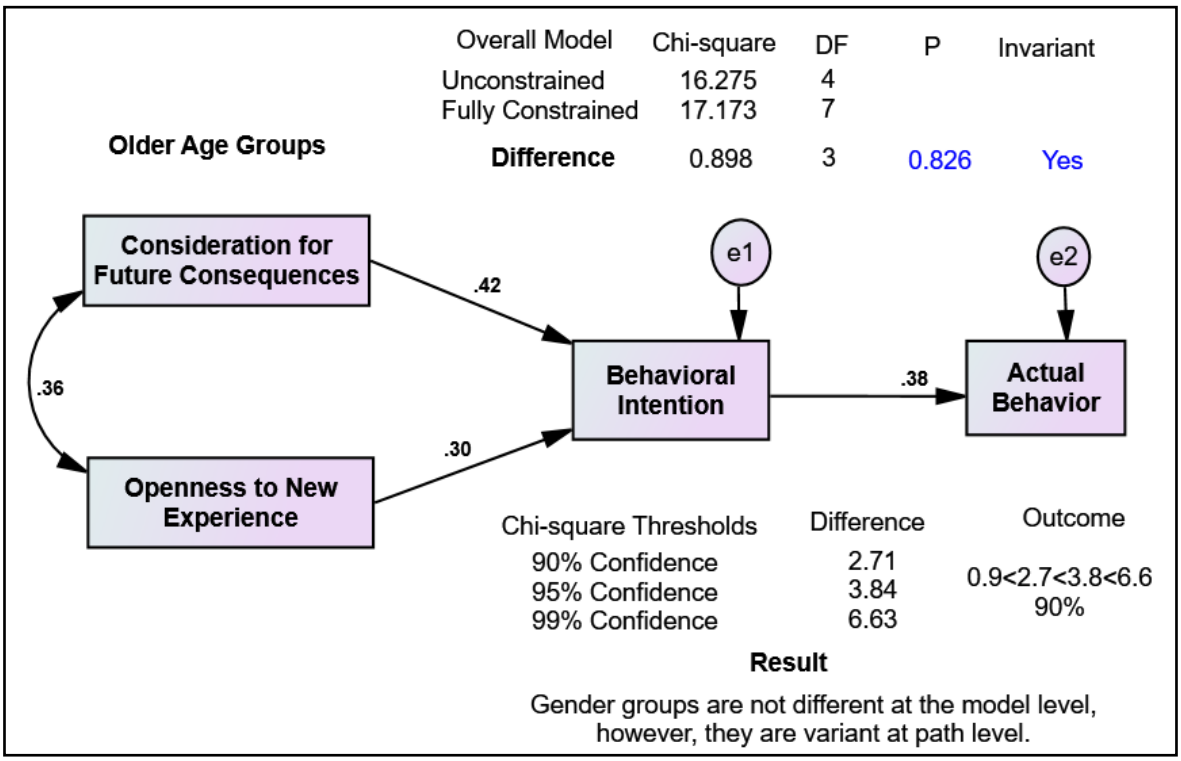
Parameters	Standardize path coefficient (Beta)	S.E	C.R	P-Values
BI ← CFC	.346	.084	4.381	***
BI ←OE	..375	.092	4.749	***
AB ← BI	.395	.078	4.813	***

Remark: ns Not Sign. (p>0.05), ** Sign. (P<0.05) and ***Highly Sign. (P<0.001)

Source: Own Analysis Results, 2020

Furthermore, the moderating effect of older age group towards the relationship among consideration for future consequences and behavioral intention (CFC→BI) and openness to new experience and behavioral intention (OE→BI) as well as behavioral intention and actual behavior were revealed as 0.420, 0.303 and 0.382 standardized regression weights with highly significant link at p<0.001correspondingly as presented in Figure 4-18.

Figure 4-18: Older Age Groups' Metric Invariance Results



Source: Own Analysis Results, 2020

In this regard, the relationship among independent predictors and behavioral intention as well as behavioral intention and actual behavior to adopt green IT indicated statistically significant relationships at p<0.001 for age group as presented in Table 4-41.

Table 4-41: Older age Group Configural Invariance Results

Parameters	Standardize path coefficient (Beta)	S.E	C.R	P-Values
BI ← CFC	.420	.068	6.227	***
BI ←OE	..303	.073	4.491	***
AB ← BI	.382	.077	5.258	***

Remark: [ns] Not Sign. (p>0.05), ** Sign. (P<0.05) and ***Highly Sign. (P<0.001)

Source: Own Analysis Results, 2020

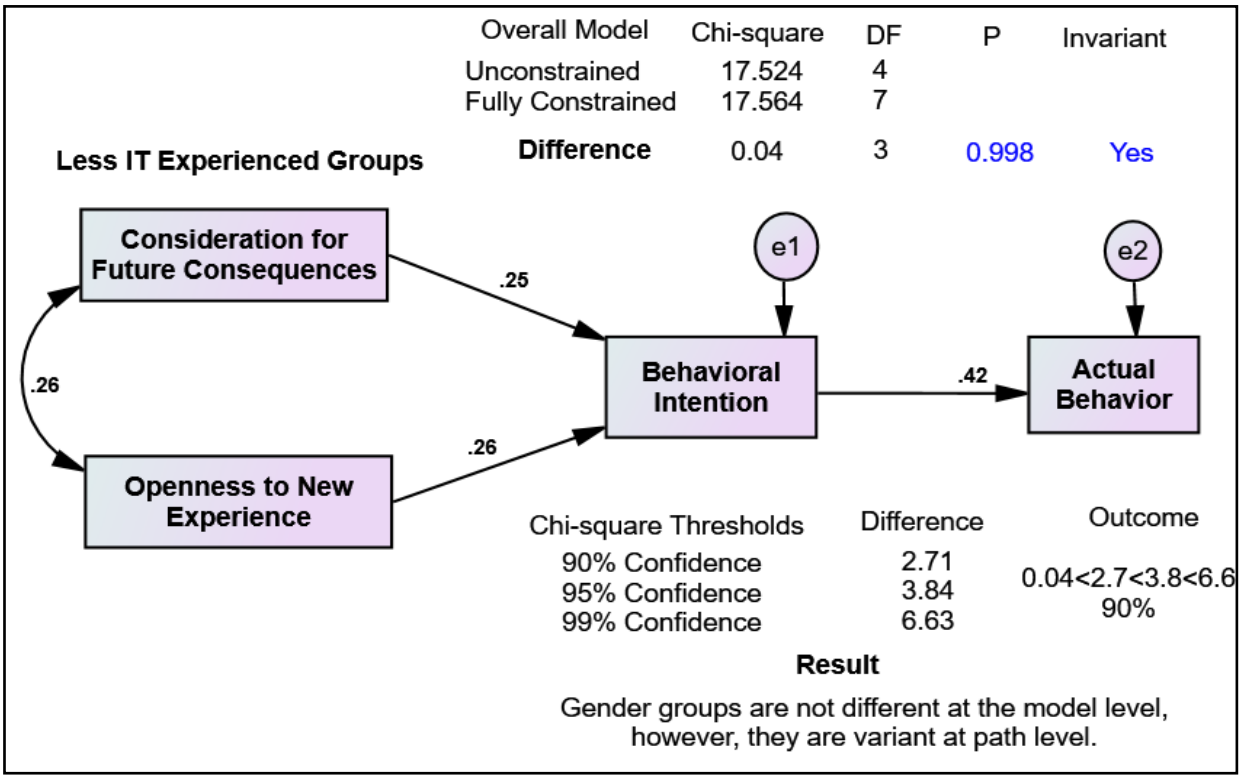
Therefore, the analysis result indicated that the relationship between CFC and BI specified as invariant across age groups as the results of the metric invariance test of chi-square differences ($\Delta\chi2$=0.898, p=0.826) at 95% level of confidence. Thus, the relationship between CFC and BI was stronger in older age sample group (β=0.420, p<0.001) than it was in the younger age sample group (β=0.346, p<0.001), as result the hypothesis (H1b) was rejected. Similarly, the relationship between OE and BI was stronger in the younger age sample group (β=0.375,

p<0.001) than the sample of older age sample group (β=0.303, p<0.001), thus, the hypothesis (H2b) was accepted. Accordingly, the relationship between BI and AB was found stronger in the young age sample group (β=0.395, p<0.001) than the sample of older age sample group (β=0.382, p<0.001), hence, the hypothesis (H4b) was accepted. However, examining the moderating effect of age group towards the hypothesized relationship between NR and BI (H3b) was discarded or voided since this link was found insignificant in structural model measurement.

4.2.10.3 Results on the Moderating Effect of IT Experiences

The moderating effect of IT experience on the relationships among the personality traits and behavioral intention as well as behavioral intention and the actual behavior were determined through examining a multi-group analysis. The metric invariance test results of the unconstrained and fully constrained models across the IT experience group were computed as presented in Figure 4-17.

Figure 4-19: Less IT Experienced Groups' Metric Invariance Results



Source: Own Analysis Results, 2020

In this regard, the chi-square and degree of freedom values for the unconstrained model revealed with 17.524chi-square and 4 degree of freedom respectively. In addition, the fully constrained model revealed with 17.564chi-square and 7degree of freedom values. To this end, the chi-

square difference test indicated no variance across both less IT experienced and IT experienced groups with 0.04 chi-square difference and insignificance variation at p=0.998 within 95% level of confidence, likewise the effect both age groups towards each link came to be dissimilar in every single path level. Accordingly, the moderating effect of less IT experienced group path level relationships among consideration for future consequences and behavioral intention (CFC→BI) and openness to new experience and behavioral intention (OE→BI) as well as behavioral intention and actual behavior to adopt green IT (BI→AB) revealed as 0.247, 0.260 and 0.423 standardized regression weights respectively with statistical insignificance links at p>0.05 as presented in Table 4-42.

Table 4-42: Less IT Experienced Groups' Configural Invariance Results

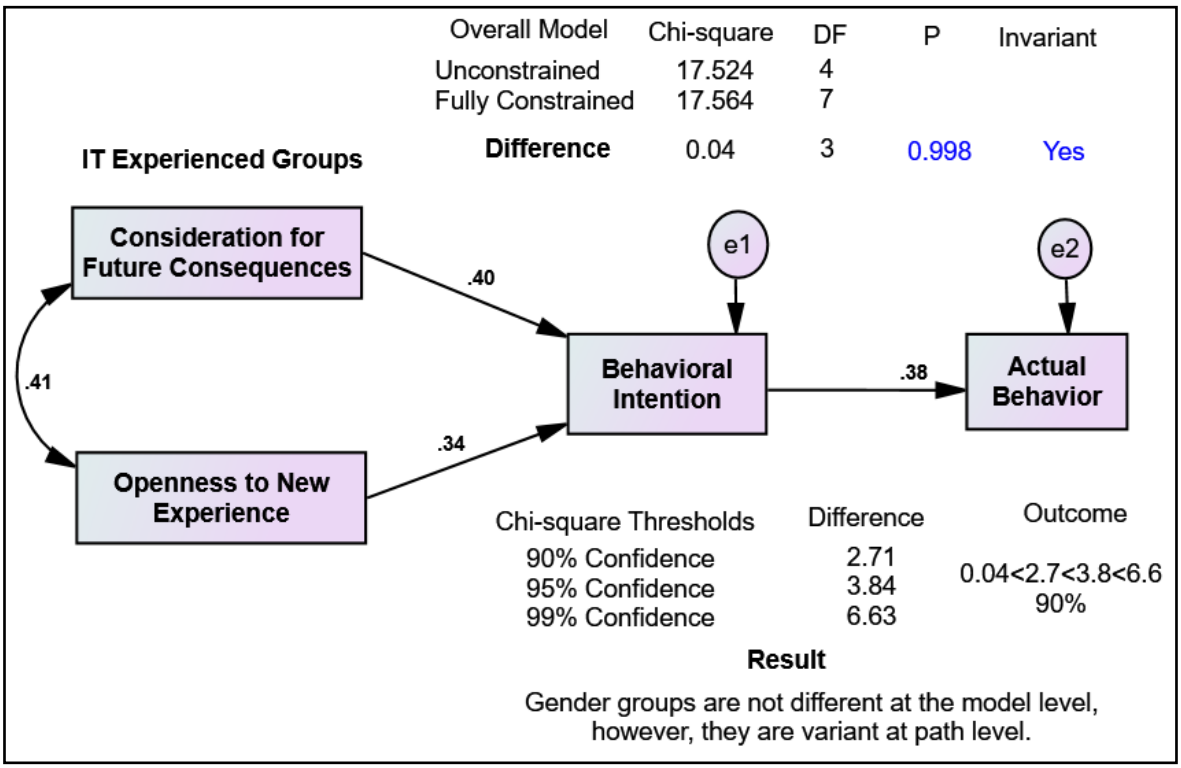
Parameters	Standardize path coefficient (Beta)	S.E	C.R	P-Values
BI ← CFC	.247	.381	.970	.332
BI ←OE	.260	.326	1.025	.305
AB ← BI	.423	.238	1.741	.082

Remark: ^{ns} Not Sign. (p>0.05), ** Sign. (P<0.05) and ***Highly Sign. (P<0.001)

Source: Own Analysis Results, 2020

Furthermore, the moderating effect of IT experienced group towards the relationship among consideration for future consequences and behavioral intention (CFC→BI) and openness to new experience and behavioral intention (OE→BI) as well as behavioral intention and actual behavior were revealed as 0.397, 0.338 and 0.384 standardized regression weights with highly significant link at p<0.001correspondingly as presented in Figure 4-18 and Table 4-43

Figure 4-20: IT Experienced Groups' Metric Invariance Results



Source: Own Analysis Results, 2020

In this regard, the relationship among independent predictors and behavioral intention as well as behavioral intention and actual behavior to adopt green IT indicated statistically significant relationships at p<0.001 for IT experience groups as presented in Table 4-43.

Table 4-43: IT Experienced Groups' Configural Invariance Results

Parameters	Standardize path coefficient (Beta)	S.E	C.R	P-Values
BI ← CFC	.397	.053	7.613	***
BI ←OE	.338	.058	6.473	***
AB ← BI	.384	.057	6.871	***

Remark: ^{ns} Not Sign. (p>0.05), ** Sign. (P<0.05) and ***Highly Sign. (P<0.001)

Source: Own Analysis Results, 2020

Therefore, the analysis result indicated that the relationship between CFC and BI specified as invariant across age groups as the results of the metric invariance test of chi-square differences ($\Delta\chi2$=0.04, p=0.998) at 95% level of confidence. Thus, the relationship between CFC and BI was stronger in IT experienced sample group (β=0.397, p<0.001) than it was in the less experienced sample group (β=0.247, p=0.332), as result the hypothesis (H1c) was accepted. Similarly, the relationship between OE and BI was stronger in the IT experienced sample group

(β=0.338, p<0.001) than the sample of less IT experienced sample group (β=0.260, p=0.305), thus, the hypothesis (H2c) was supported. Accordingly, the relationship between BI and AB was found stronger in the less IT experienced sample group (β=0.423, p=0.082) than the sample of IT experienced sample group (β =0.384, p<0.001) where less experienced group revealed with insignificant link. Hence, the hypothesis (H4c) was supported. However, examining the moderating effect of IT experience group towards the hypothesized relationship between NR and BI (H3b) was discarded or voided since this link was found insignificant in structural model measurement.

Therefore, moderating variables taking gender first, the nested model comparison shows that the model explains relatively better the pro-environmental IT practice and Green IT behavior of females. However, there were no differences in the patch coefficients between the male and female models. In terms of age, the model explains better the younger IT professionals' openness to new experience and seems that the younger IT professionals and managers were engaged with innovative pro-environmental IT practices; however, consideration for future consequence were stronger for older age group since older adults remained more deliberate and future-oriented towards ecosystem challenges.

Regarding IT experience, the model has a relatively higher explanatory power for those that had IT experienced professionals and managers and the paths between CFC→BI and OE→BI were stronger for this group. These findings, although as inconclusive as the findings of the previous literature (Abeliotis et al., 2010; Gholami et al., 2013; Molla et al., 2014); shed some light on the role of demographic differences in developing green IT beliefs and attitudes among these IT professionals and in encouraging them to engage in pro-environmental IT practices.

Chapter 5 : Conclusions and Recommendations

5.1 : Introduction

This study context designated a fundamental ecosystem perceptive particularly for ICT intensive sectors like Ethio-telecom to adopt green IT practices taking socio-demographic characteristics of individuals towards preserving green IT awareness so as to address the potential ecosystem challenges. In addition, it also helps to identify individual level cognitive beliefs towards green IT practices so as to cognize what is performing well and what demands improvement. In this regard, this chapter presents summary of findings and contributions and implications based on the data presentation and analyses as well as conclusions were drown and recommendations put forwarded along with the guidance provided for further studies.

5.2 Summary of Findings

Based on the analyses results, attitude appears to be the most significant factor affecting individuals' intention to adopt green IT practices. This indicated that the important role of attitude in green IT acceptance decision-making by individual IT users. This signifies the importance cultivating and managing individuals' attitude towards green IT adoption. In due course, similar results were found by previous scholars (Dezdar, 2017; Gholami et al., 2013; Molla et al., 2014; Yoon, 2018) towards the impact of attitude on behavioral intention. Based on Molla et al. (2014) study, green IT attitude refers to sentiments, values, and norms in relation to climate change, eco-sustainability, and IT's role that comprise to what extent users are aware of the influence of IT on environmental sustainability where TPB posits that positive beliefs or attitudes about a behavior and its outcomes will lead to an increase in that behavior as well as consistent towards this findings.

According to Gholami et al. (2013), beliefs about the relationship between humans and the environment increase individual awareness, which turns into pro-environmental behavior. Consequently, this result was also supported by interview result that confirms the positive impact of attitude towards making an initial decision for environmental concerns since an individual with an ecological world view and is aware of its environmental impact; he/she will be more likely to adopt a green approach as part of daily activities. In investigating the influence of attitude on practicing green IT, the interview data indicated the significance of distinguishing those who believe in the role of humans in environmental degradation and climate change, and those who are climate change skeptics. Hence, the attitudes of former group may have a positive impact on their pro-environmental behavior, while the latter have the negative influence.

Moreover, PBC appears to have the next strong influence on behavioral intention as compared to SN, CFC and OE. This is probably because of the activities of being "green" in IT like powering off the PC when not in use, using email to minimize paper use, etc., are not complicated, and most of the time, IT users have the high level of control in these behaviors but inquisitiveness on a behavior in question remained significant to react in response (Gholami et al., 2013). In addition, plausible explanation may be based on motivational theory that green IT adoption may be considered as an intrinsic motivational factor, and PBC may be extrinsic motivational factors that could help individuals to self-regulate their motivation on green IT adoption (Kranz & Picot, 2011). Furthermore, this leads to the fact that people's beliefs have significant control over the behavior, and, therefore, performance or nonperformance of the behavior is up to them (Molla et al., 2014).

Consideration of Future Consequences, that is one of the frequently adopted measures of individual's future perspective in social psychological research (Costa Jr et al., 1986; Strathman et al., 1994), is related to environmental concerns and importance of being "Green" in IT indicated significant impact of individual consideration on the potential future outcomes of their current behavior to green IT adoption. Openness which refers found significant impact towards behavioral intention in this research since people's willingness to make adjustments to present attitudes and behaviors usually initiated once they have been exposed to new ideas or situations (Costa Jr et al., 1986; McCrae & Costa Jr, 1985); and consistent with several evidences (Choon et al., 2014; Dezdar, 2017).

Accordingly, subjective norm revealed as least significant impact on the behavioral intention in the proposed model. This indicated that IT users are likely to place more weight on opinions of others or look at the influence of people in their social environment on behavioral intentions. This occurrence was also illustrated by Yoon (2018) and Dezdar (2017). SN is the social influences impacting on an individual's intention to perform or not to perform (Ojo et al., 2019). In due course, subjective norm was found positive effect on both behavioral intention and actual behavior to adopt green IT since it determined by the normative expectations of others (e.g. "my friends think that I should use a green product") and motivation to comply (e.g. "I generally want to do what my friends think I should do") with these expectations (Molla et al., 2014). In addition, the significance of SN remained an evidence towards the existence of the perceived social pressure to perform green IT behavior, which basically relates to one's intuition about others' exertion of influence (Ojo et al., 2019).

In contrast, this study context found neuroticism with no significance as compared to other personality trait factors in the research model, its importance cannot be ignored since neurotic personalities are most likely to view technological advances in their work as threatening and stressful, and to have generally negative thought processes when considering technological advances (Zhou & Lu, 2011) where highly neurotic people tend to be fearful, sad, embarrassed, distrustful, and have difficulty managing stress (Costa Jr et al., 1986).

Furthermore, the proposed model revealed that the female group explained relatively better pro-environmental IT practice and green IT belief while there were no differences in the patch coefficients in the overall moderating effect model. In terms of age, the model explains better for younger IT professionals' and managers' openness to new experience that indicated profound engagement along with innovative pro-environmental IT practices; however, consideration for future consequence were stronger for older age group and designated that older adults remained more deliberate and future-oriented towards ecosystem challenges.

Regarding IT experiences, the model has a relatively higher explanatory power for those who were IT experienced individuals towards the relationships among consideration for future consequence and openness for new experience on behavioral intention to adopt green IT. Although as inconclusive as the findings of the previous literature (Abeliotis et al., 2010; Gholami et al., 2013; Molla et al., 2014); this finding shed some light on the role of demographic differences in developing green IT beliefs and attitudes at individual level so as to encourage pro-environmental IT practices particularly in ICT intensive sectors like Ethio-telecom.

5.3 Contributions and Implications

This study has important implications for research and practice. The first contribution of this study is that it brings research on green IT adoption from organizational level to individual level. The concept of green IT has been defined in almost all organizational perspectives. Therefore, most previous studies on green IT have been focused on green IT adoption in organizations. This study defined green IT adoption in the individual context and proposed framework for green IT adoption and expected to contribute to the activation of green IT research at individual level in an inclusive and modeled manner.

In addition, the research makes an original contribution by applying personal trait incorporating with TPB to study the factors that influence green IT adoption. The research models and

hypotheses developed in this study can be used by other researchers in future studies by combining with other personality trait such as neuroticism and other environmental prone factors towards cognitive beliefs. The research helps to identify the influencing factors that contribute towards users' intention so as to determine actual behavior towards green IT adoption in Ethio-telecom at individual level.

The findings indicated that the majority of the IT professionals and managers that responded to the survey were concerned about climate change and the overwhelming majority believed that IT had a dual role in causing and mitigating environmental problems. However, the way in which these IT professionals sought to increase their knowledge of green IT issues remains unclear. This means either that these IT professionals and managers were using alternative means to increase their knowledge, or that there is a need to promote green IT education. In addition, enabling green IT researchers and practitioners to understand IT users' behavior towards greenery conceptions remained as an imperative concern since ICT can be used as a tool to track environmental footprint of the business by monitoring and reporting footprint analysis and to increase energy efficiency, for example deploying computerized models. In this regard, the association between consideration for future consequences and behavioral intention remained stronger for female, older and experienced users as well as openness for new experienced stronger for females, younger and experienced users. In addition, the relationship between behavioral intention and actual behavior to adopt green is stronger for female, younger and experienced group of individuals. Therefore, detail knowledge about environmental sustainability awareness based on socio-demographic distribution is required for IT managers or higher leadership to decided ways of creating greenery awareness through maintaining climate resilience practices as well as building a cumulative knowledge in addressing how environmental sustainability context affects these IT professionals' and managers' beliefs and actions in general.

5.4 Conclusions

In most of prior behavioral studies, the trend indicated an application of single framework or theory as research model. Many have used DOI, TAM, TRA and UTAUT2 in their studies. This research however incorporated TPB with personality traits as a research model to study green IT adoption in Ethio-telecom. The data collected from 289 individuals revealed several findings. The TPB factors, i.e. ATT, SN and PBC, have a significant influence on BI. Likewise, CFC and OE also have an impact on BI. The study has also confirmed direct effect of BI on AB among

the IT professional and managers in Ethio-telecom. In this regard, attitude or the beliefs about the consequences of performing the behavior multiplied by his or her evaluation of these consequences are influencing the green IT adoption of IT professionals and managers the most in Ethio-telecom.

Therefore, to promote the commitment of individuals to green IT adoption, green IT practitioners should consider creating a more green IT environment-friendly that enables IT users to adopt them. The research also finds that CFC has a direct positive effect on the BI. Hence, green IT educators or promoters should consider educating IT users on the consequences of the environmental impact towards IT usage so to increase the level of awareness and CFC among IT users in Ethio-telecom. The other important influencing factors was openness to new experience that refers to people's willingness to make adjustments to existing attitudes and behaviors once they have been exposed to new ideas or situations; thus, OE found high significant association with BI that indicated individuals willingness to new experience influenced towards making initial decisions to adopt green IT in Ethio-telecom.

Although, the research found neuroticism with no significance as compared to other personality trait factors in the research model, its importance cannot be ignored. Neuroticism (NR) defined as the differences in emotions while individuals experience stressors as well as refers to individuals express negative emotions that is anxiety, nervousness, and depression (He & Veronesi, 2017). Neurotic people tend to be anxious, self-conscious and paranoid (Lane & Manner, 2011). Highly neurotic people tend to be fearful, sad, embarrassed, distrustful, and have difficulty managing stress (Costa Jr et al., 1986). Empirical research suggests that neuroticism is negatively associated with several constructive elements of work behavior, including Smartphone ownership (Lane & Manner, 2011). Neurotic personalities are most likely to view technological advances in their work as threatening and stressful, and to have generally negative thought processes when considering technological advances for example the case of mobile commerce acceptance (Zhou & Lu, 2011).

Since this study context has limitations, future research should extend the findings to other social cultural contexts before generalizing it. Besides that, the individual sometimes has difficulty in rating their behavior accurately so that findings might change, as green IT technology becomes established and consumers become more experienced in its use. In addition, a longitudinal research should be conducted to test the consistency of result findings; where, this research sample consists only of IT professionals and managers in Ethio-telecom. Also, this research

includes three from the most common personal traits and five TBP factor models into the integrated research model. Future studies could extend the research model to examine relationships between others, differences in personal traits and the five-factor models of TPB and other technology adoption.

5.5 Recommendations

This study context have laid useful insight on green IT adoption at individual level using inclusive framework so that a certain recommendation were forwarded to successfully adopt green IT and insure pro-environmental awareness. These insights are helpful for the organization to take a certain measures so as to address the concern at grass root level. The proposed framework can be used as a guideline for adopting green IT at individual level. Furthermore, the following recommendations are forwarded on how to maintain green IT practice to address potential challenges of ICT ecosystem footprint towards the issue of climate change considering the major issues that this study addressed.

Primarily, ICT has a long term impact to the environment in several ways where the momentum toward these changes is irreversible. When leaders are able to communicate about issues critical to sustainable environment, the traditional process will undergo a fundamental transformation, with decisions of being resolved in new and more effective ways. In particular, it considers whether ICT will simply support and amplify conventional practice or whether it will have transformative effect on greener concern. It begins to explore how users practice technology through imagining what the technological environment surroundings look like. For IS educators, the results suggest that curriculum materials need to address the cultivation of pro-environmental individual actions in the use of IT and the formation of both general and IT-specific environmental beliefs and attitudes. For managers that are writing green IT strategies, the results imply that such strategies need to consider the environmental beliefs and actions of IT professionals and develop mechanisms (such as building institutional green IT memory and knowledge, and defining green IT performance expectations) to cultivate pro-environmental behavior among IT professionals.

In this regard, the power of technologies expected to carry on a certain advancement to the point where it will be able to deliver practically anything that can be imagined so that the company should establishing a baseline for exploration as core knowledge area towards sustainable development. Moreover, technological advances make powerful computing tools available to almost everyone at affordable prices; thus, providing a focus attention for long and short term

trainings and designing public relation strategies for sustainable awareness campaigns expected to change young age individuals' cognitive belief towards pro-environment consciousness particularly in ICT intensive sectors like Ethio-telecom. Accordingly, implementing green IT practices such as turn off equipment when not in use, duplex printing, use of network printers, and print only if necessary are recommended to improve greener attitude via adopting green IT practices. These practices can be implemented as core value and critical performance measure so as to contribute to the overall endeavor for maintaining eco-friendly environment.

Reference

Abdi, H. (2003). Factor rotations in factor analyses. *Encyclopedia for Research Methods for the Social Sciences. Sage: Thousand Oaks, CA*, 792-795.

Abdulwahab, L., Dahalin, Z., & Galadima, M. (2011). Data screening and preliminary analysis of the determinants of user acceptance of telecentre. *Journal of Information Systems: New Paradigms, 1*(1), 11-23.

Abeliotis, K., Koniari, C., & Sardianou, E. (2010). The profile of the green consumer in Greece. *International Journal of Consumer Studies, 34*(2), 153-160.

Aguinis, H., Edwards, J. R., & Bradley, K. J. (2017). Improving our understanding of moderation and mediation in strategic management research. *Organizational Research Methods, 20*(4), 665-685.

Ainin, S., Naqshbandi, M. M., & Dezdar, S. (2016). Impact of adoption of Green IT practices on organizational performance. *Quality & Quantity, 50*(5), 1929-1948.

Ajayi, V. (2017). Primary Sources of Data and Secondary Sources of Data. *Benue State University*.

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes, 50*(2), 179-211.

Ajzen, I. (2011). The theory of planned behaviour: reactions and reflections: Taylor & Francis.

Ajzen, I., & Fishbein, M. (1975). A Bayesian analysis of attribution processes. *Psychological bulletin, 82*(2), 261.

Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological bulletin, 84*(5), 888.

Ajzen, I., & Madden, T. J. (1986). Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. *Journal of experimental social psychology, 22*(5), 453-474.

Akman, I., & Mishra, A. (2014). Green information technology practices among IT professionals: Theory of planned behavior perspective. *PROBLEMY EKOROZWOJU–Problems of Sustainable Development, 9*(2), 47-54.

Akman, I., & Mishra, A. (2015). Sector diversity in green information technology practices: technology acceptance model perspective. *Computers in Human Behavior, 49*, 477-486.

Alavi, H., & Hąbek, P. (2016). Addressing research design problem in mixed methods research. *Management Systems in Production Engineering, 21*(1), 62-66.

Alem, F. (2019). *A Framework for Green Use and Disposal of ICT Devices: The case of World Vision Ethiopia.* (Master of Science in Information Science (Information Systems)), Addis Ababa University, Addis Ababa.

Ali, M., Shifa, A., Shimeles, A., & Woldeyes, F. B. (2015). Information technology and fiscal capacity in a developing country: evidence from Ethiopia.

Alkali, A., Abdul-Azeez, I. A., Mansor, N., Chikaji, A., & Dodo, Y. (2017). Towards low carbon universities in Nigeria: Agenda for green information technology. *Chemical Engineering Transactions, 56*, 733-738.

Allport, F. H., & Allport, G. W. (1921). Personality Traits: Their Classification and Measurement. *The Journal of Abnormal Psychology and Social Psychology, 16*(1), 6.

Alziady, A. A. D. J., & Enayah, S. H. (2019). Studying the effect of institutional pressures on the intentions to continue green information technology usage. *Asian Journal of Sustainability and Social Responsibility, 4*(1), 4.

Arbuckle, J., & Wothke, W. (2012). Structural equation modeling using AMOS: An Introduction [EB].

Asongu, S. A. (2018). ICT, openness and CO 2 emissions in Africa. *Environmental Science and Pollution Research, 25*(10), 9351-9359.

Babagana, S. A., Mat, N. B., & Ibrahim, H. B. (2019). Moderating Effect of Employee Participation on Factors that Determine Effective Performance Appraisal (EPA): Data Screening and Preliminary Analysis. *International Journal of Academic Research Business and Social Sciences, 9*(4), 116-134.

Balkin, R. S. (2014). Principles of quantitative research in counseling: A humanistic perspective. *The Journal of Humanistic Counseling, 53*(3), 240-248.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual review of psychology, 52*(1), 1-26.

Bansal, P., & Roth, K. (2000). Why companies go green: A model of ecological responsiveness. *Academy of management journal, 43*(4), 717-736.

Barnham, C. (2015). Quantitative and qualitative research: Perceptual foundations. *International Journal of Market Research, 57*(6), 837-854.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of personality and social psychology, 51*(6), 1173.

Bengtsson, M. (2016). How to plan and perform a qualitative study using content analysis. *NursingPlus Open, 2*, 8-14.

Bollen, K. A., & Pearl, J. (2013). Eight myths about causality and structural equation models *Handbook of causal analysis for social research* (pp. 301-328): Springer.

Borthakur, A., & Govind, M. (2017). Emerging trends in consumers' E-waste disposal behaviour and awareness: A worldwide overview with special focus on India. *Resources, Conservation and Recycling, 117*, 102-113.

Bose, R., & Luo, X. (2012). Green IT adoption: a process management approach. *International Journal of Accounting & Information Management, 20*(1), 63-77.

Bossle, M. B., de Barcellos, M. D., Vieira, L. M., & Sauvee, L. (2016). The drivers for adoption of eco-innovation. *Journal of Cleaner Production, 113*, 861-872.

Bowen, P. W., Rose, R., & Pilkington, A. (2017). Mixed methods-theory and practice. Sequential, explanatory approach. *International Journal of Quantitative and Qualitative Research Methods, 5*(2), 10-27.

Bryman, A. (2012). *Social research methods*: Oxford university press.

Busic-Sontic, A., & Brick, C. (2018). Personality trait effects on green household installations.

Cai, Z., Fan, X., & Du, J. (2017). Gender and attitudes toward technology use: A meta-analysis. *Computers & Education, 105*, 1-13.

Campbell, D. T. (1963). Social attitudes and other acquired behavioral dispositions.

Caroro, R. A., & Hernandez, A. A. (2018). *Migrating Office Processes to Automation: An Evaluation on Green IT Practices in a University in the Philippines.* Paper presented at the 2018 IEEE 10th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment and Management (HNICEM).

Chang, C.-T., Hajiyev, J., & Su, C.-R. (2017). Examining the students' behavioral intention to use e-learning in Azerbaijan? The general extended technology acceptance model for e-learning approach. *Computers & Education, 111*, 128-143.

Chen, A. J., Watson, R. T., Boudreau, M.-C., & Karahanna, E. (2011). An institutional perspective on the adoption of Green IS & IT. *Australasian journal of information systems, 17*(1).

Chen, Y. S. (2013). Towards green loyalty: driving from green perceived value, green satisfaction, and green trust. *Sustainable Development, 21*(5), 294-308.

Choon, T. G., Sulaiman, A., & Mallasi, H. (2014). Intention to use green IT among students. *International Journal of Research in Business and Technology, 4*(2), 2291-2118.

Chou, D. C., & Chou, A. Y. (2012). Awareness of Green IT and its value model. *Computer Standards & Interfaces, 34*(5), 447-451.

Chow, W. S., & Chen, Y. (2009). Intended belief and actual behavior in green computing in Hong Kong. *Journal of computer information systems, 50*(2), 136-141.

Coan, R. W. (1959). A comparison of oblique and orthogonal factor solutions. *The Journal of Experimental Education, 27*(3), 151-166.

Costa Jr, P. T., McCrae, R. R., Zonderman, A. B., Barbano, H. E., Lebowitz, B., & Larson, D. M. (1986). Cross-sectional studies of personality in a national sample: II. Stability in neuroticism, extraversion, and openness. *Psychology and aging, 1*(2), 144.

Creswel, J. W. (2009). Research design: Qualitative, quantitative, and mixed methods approaches. *Los angeles: University of Nebraska–Lincoln*.

Creswell, W. J. (2014). Research Design.: Qualitative, Quantitative, Mixed Methods Approaches: University Of Nebraska-Lincoln.

Crowley, S. L., & Fan, X. (1997). Structural equation modeling: Basic concepts and applications in personality assessment research. *Journal of personality assessment, 68*(3), 508-531.

Dagher, G., Itani, O., & Kassar, A. N. (2015). The impact of environment concern and attitude on green purchasing behavior: Gender as the moderator. *Contemporary Management Research, 11*(2).

Dalvi-Esfahani, M., Ramayah, T., & Nilashi, M. (2017). Modelling upper echelons' behavioural drivers of Green IT/IS adoption using an integrated Interpretive Structural Modelling–Analytic Network Process approach. *Telematics and Informatics, 34*(2), 583-603.

David, M. K., & Ching, L. L. (2014). Using the Key Informants Interviews (KIIs) Technique: A Social Sciences Study with Malaysian and Pakistani.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science, 35*(8), 982-1003.

Deng, Q., & Ji, S. (2015). Organizational green IT adoption: Concept and evidence. *Sustainability, 7*(12), 16737-16755.

Denis, D. J. (2016). *Applied univariate, bivariate, and multivariate statistics*: John Wiley & Sons.

Dezdar, S. (2017). Green information technology adoption: Influencing factors and extension of theory of planned behavior. *Social Responsibility Journal, 13*(2), 292-306.

Dolma, S. (2010). The central role of the unit of analysis concept in research design. *İstanbul Üniversitesi İşletme Fakültesi Dergisi, 39*(1), 169-174.

Dray, S., & Josse, J. (2015). Principal component analysis with missing values: a comparative survey of methods. *Plant Ecology, 216*(5), 657-667.

Ducas, L., & Micciancio, D. (2015). *FHEW: bootstrapping homomorphic encryption in less than a second.* Paper presented at the Annual International Conference on the Theory and Applications of Cryptographic Techniques.

Ehrenberg, A., Juckes, S., White, K. M., & Walsh, S. P. (2008). Personality and self-esteem as predictors of young people's technology use. *Cyberpsychology & behavior, 11*(6), 739-741.

Erlingsson, C., & Brysiewicz, P. (2017). A hands-on guide to doing content analysis. *African Journal of Emergency Medicine, 7*(3), 93-99.

Ethio-telecom. (2019). Ethio-telecom 3 Years Bridge Strategic Plan. Retrieved October 12, 2019, 2019, from https://www.ethiotelecom.et/?s=strategy

Evans, D., Gruba, P., & Zobel, J. (2011). *How to write a better thesis*: Melbourne Univ. Publishing.

Eveland, J. D. (1979). Issues in using the concept of "adoption of innovations". *The Journal of Technology Transfer, 4*(1), 1-13.

Evereklioglu, C. (2014). How to write a thesis and turn it into publication. *Correspondance*.

Flora, D. B., & Flake, J. K. (2017). The purpose and practice of exploratory and confirmatory factor analysis in psychological research: Decisions for scale development and validation. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement, 49*(2), 78.

Foster, K. A., & Maas, C. D. (2014). An exploratory factor analysis of the resource generator-United States: A social capital measure. *The British Journal of Social Work, 46*(1), 8-26.

Fredricks, A. J., & Dossett, D. L. (1983). Attitude–behavior relations: A comparison of the Fishbein-Ajzen and the Bentler-Speckart models. *Journal of personality and social psychology, 45*(3), 501.

Freeman, E. (2016). *Saving the Planet: An Assessment of Green Computing Practice Among Tertiary Institutions in Ghana.* Paper presented at the INCEDI 2016 Conference.

Gaskin, J. E. (2018). Measurement Model Invariance. *StatWiki.* Retrieved Feb 22, 2020, 2020, from http://statwiki.kolobkreations.com

Gazzola, P., Del Campo, A. G., & Onyango, V. (2019). Going green vs going smart for sustainable development: Quo vadis? *Journal of Cleaner Production*.

Gholami, R., Sulaiman, A. B., Ramayah, T., & Molla, A. (2013). Senior managers' perception on green information systems (IS) adoption and environmental performance: Results from a field survey. *Information & Management, 50*(7), 431-438.

Gnambs, T., & Kaspar, K. (2015). Disclosure of sensitive behaviors across self-administered survey modes: a meta-analysis. *Behavior research methods, 47*(4), 1237-1259.

Golding, C. (2017). Advice for writing a thesis: Based on what examiners do. *Open Review of Educational Research, 4*(1), 46-60.

Gottlieb, J. (2018). Understanding active sampling strategies: Empirical approaches and implications for attention and decision research. *Cortex, 102*, 150-160.

Goyal, Y., Arya, M. S., & Nagpal, S. (2015). *Energy efficient hybrid policy in green cloud computing.* Paper presented at the 2015 International Conference on Green Computing and Internet of Things (ICGCIoT).

Grace, J. B., Schoolmaster Jr, D. R., Guntenspergen, G. R., Little, A. M., Mitchell, B. R., Miller, K. M., & Schweiger, E. W. (2012). Guidelines for a graph-theoretic implementation of structural equation modeling. *Ecosphere, 3*(8), 1-44.

Gray, D. E. (2013). *Doing research in the real world*: Sage.

Griffin, B., & Hesketh, B. (2004). Why openness to experience is not a good predictor of job performance. *International Journal of selection and assessment, 12*(3), 243-251.

Gu, J., Strauss, C., Bond, R., & Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clinical psychology review, 37*, 1-12.

Guest, G., Namey, E., Taylor, J., Eley, N., & McKenna, K. (2017). Comparing focus groups and individual interviews: findings from a randomized study. *International Journal of Social Research Methodology, 20*(6), 693-708.

Hadi, N. U., Abdullah, N., & Sentosa, I. (2016). An easy approach to exploratory factor analysis: Marketing perspective. *Journal of Educational and Social Research, 6*(1), 215.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modeling: Rigorous applications, better results and higher acceptance. *Long range planning, 46*(1-2), 1-12.

Hair, J. F., Sarstedt, M., Pieper, T. M., & Ringle, C. M. (2012a). The use of partial least squares structural equation modeling in strategic management research: a review of past practices and recommendations for future applications. *Long range planning, 45*(5-6), 320-340.

Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012b). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the academy of marketing science, 40*(3), 414-433.

Harlacher, J. (2016). An Educator's Guide to Questionnaire Development. REL 2016-108. *Regional Educational Laboratory Central*.

Harrell Jr, F. E. (2015). *Regression modeling strategies: with applications to linear models, logistic and ordinal regression, and survival analysis*: Springer.

Hart, S. L. (1997). Beyond greening: strategies for a sustainable world. *Harvard business review, 75*(1), 66-77.

Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. 370 Seventh Avenue Suite 1200, New York, NY 10001-1020: Guilford publications.

He, P., & Veronesi, M. (2017). Personality traits and renewable energy technology adoption: A policy case study from China. *Energy Policy, 107*, 472-479.

Hedgecoe, A. (2016). Reputational risk, academic freedom and research ethics review. *Sociology, 50*(3), 486-501.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2014). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science, 43*(1), 115-135.

Henseler, J., & Sarstedt, M. (2013). Goodness-of-fit indices for partial least squares path modeling. *Computational Statistics, 28*(2), 565-580.

Hernandez, A. A. (2017). Green IT adoption practices in education sector: a developing country perspective. *International Journal of Sociotechnology and Knowledge Development (IJSKD), 9*(3), 1-16.

Ho, A. D., & Yu, C. C. (2015). Descriptive statistics for modern test score distributions: Skewness, kurtosis, discreteness, and ceiling effects. *Educational and psychological measurement, 75*(3), 365-388.

Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural equation modelling: Guidelines for determining model fit. *Electronic journal of business research methods, 6*(1), 53-60.

Hoyle, R. H. (2012). *Handbook of structural equation modeling*: Guilford press.

Hu, L. t., & 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.

Hwang, S. O., Tan, S. Y., & Bien, F. (2018). *Proceedings of the Sixth International Conference on Green and Human Information Technology: ICGHIT 2018* (Vol. 502): Springer.

Iacobucci, D. (2012). Mediation with categorical variables compleat. *Journal of Consumer Psychology, 22*(4), 603-604.

Igbaria, M., Parasuraman, S., & Baroudi, J. J. (1996). A motivational model of microcomputer usage. *Journal of management information systems, 13*(1), 127-143.

Iphofen, R. (2017). *Finding common ground: Consensus in research ethics across the social sciences*: Emerald Group Publishing.

Israel, G. D. (1992). Determining sample size.

ITU, I. T. U. (2014). *WSIS+10 Statement on the Implementation of WSIS Outcomes*. Geneva: Retrieved from https://www.itu.int/net/wsis/implementation/2014/forum/inc/doc/outcome/362828V2E.pdf.

Jain, S. K., & Kaur, G. (2006). Role of socio-demographics in segmenting and profiling green consumers: an exploratory study of consumers in India. *Journal of International Consumer Marketing, 18*(3), 107-146.

Jamshed, S. (2014). Qualitative research method-interviewing and observation. *Journal of basic and clinical pharmacy, 5*(4), 87.

Jayalath, J., Chathumali, E., Kothalawala, K., & Kuruwitaarachchi, N. (2019). *Green Cloud Computing: A Review on Adoption of Green-Computing attributes and Vendor Specific Implementations*.

Judd, C. M., & Kenny, D. A. (1981). Process analysis: Estimating mediation in treatment evaluations. *Evaluation review, 5*(5), 602-619.

Kamaru, A. (2015). *Green IT Practices and Environmental Management Performance in the Banking Industry of Kenya.* School of Business, University of Nairobi.

Kara, H., & Pickering, L. (2017). New directions in qualitative research ethics: Taylor & Francis.

Keith, T. Z. (2019). *Multiple regression and beyond: An introduction to multiple regression and structural equation modeling*: Routledge.

Kirkegaard, E. O. (2016). Some new methods for exploratory factor analysis of socioeconomic data. *Open Quantitative Sociology & Political Science*.

Klimova, A., Rondeau, E., Andersson, K., Porras, J., Rybin, A., & Zaslavsky, A. (2016). An international Master's program in green ICT as a contribution to sustainable development. *Journal of Cleaner Production, 135*, 223-239.

Kline, P. (2014). *An easy guide to factor analysis*: Routledge.

Kline, R. B. (2016). *Principles and practice of structural equation modeling*: Guilford publications.

Koo, C., & Chung, N. (2014). Examining the eco-technological knowledge of Smart Green IT adoption behavior: A self-determination perspective. *Technological forecasting and social change, 88*, 140-155.

Kranz, J., & Picot, A. (2011). *Why are consumers going green? the role of environmental concerns in private green-IS adoption.* Paper presented at the ECIS.

Kriston, L., Schäfer, J., Jacob, G. A., Härter, M., & Hölzel, L. P. (2013). Reliability and validity of the German version of the Young Schema Questionnaire–Short Form 3 (YSQ-S3). *European Journal of Psychological Assessment*.

Kumar, S. (2018). Understanding Different Issues of Unit of Analysis in a Business Research.

Laitinen, P., Ginzboorg, P., Asokan, N., & Bajko, G. (2016). Method and apparatus for providing bootstrapping procedures in a communication network: Google Patents.

Lane, W., & Manner, C. (2011). The impact of personality traits on smartphone ownership and use. *International Journal of Business and Social Science, 2*(17).

Lawrence, W. N. (2014). Social Research Methods: Qualitative and Quantitative Approaches: Pearson Education Limited.

Leavy, P. (2017). *Research design: Quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches*: Guilford Publications.

Lei, C. F., & Ngai, E. W. T. (2013). *Green Information Technologies Adoption: A Managerial Perspective.* Paper presented at the PACIS.

Lei, C. F., & Ngai, E. W. T. (2014). *A Research Agenda on Managerial Intention to Green IT Adoption: from norm activation Perspective.* Paper presented at the Pacis.

Leong, L.-Y., Ooi, K.-B., Chong, A. Y.-L., & Lin, B. (2013). Modeling the stimulators of the behavioral intention to use mobile entertainment: does gender really matter? *Computers in Human Behavior, 29*(5), 2109-2121.

Leulseged, R. (2017). *Assessment of Ethio Telecom Readiness for the Implementation of Cloud Computing Services.* (Master of Science in Information Science), Addis Ababa University, Addis Ababa. Retrieved from http://etd.aau.edu.et/bitstream/handle/123456789/13995/Ruth%20Leulseged_2017.pdf?sequence=1&isAllowed=y

Li, B., Wu, W., Wang, Q., Zhang, F., Xing, J., & Yan, J. (2019). *Siamrpn++: Evolution of siamese visual tracking with very deep networks.* Paper presented at the Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.

Linehan, M., & Fisher, C. (2018). Green IT: Hofstra University's Information Technology Upgrades Created Unplanned Sustainable "Green Benefits" by Increasing Efficiency and Reducing Costs *The Palgrave Handbook of Sustainability* (pp. 615-632): Springer.

Lowry, P. B., & Gaskin, J. (2014). Partial least squares (PLS) structural equation modeling (SEM) for building and testing behavioral causal theory: When to choose it and how to use it. *IEEE transactions on professional communication, 57*(2), 123-146.

Lukin, S., & Walker, M. (2017). Really? well. apparently bootstrapping improves the performance of sarcasm and nastiness classifiers for online dialogue. *arXiv preprint arXiv:1708.08572*.

MacKinnon, D. (2012). *Introduction to statistical mediation analysis*: Routledge.

MacKinnon, D. P., & Pirlott, A. G. (2015). Statistical approaches for enhancing causal interpretation of the M to Y relation in mediation analysis. *Personality and Social Psychology Review, 19*(1), 30-43.

Madden, T. J., Ellen, P. S., & Ajzen, I. (1992). A comparison of the theory of planned behavior and the theory of reasoned action. *Personality and social psychology Bulletin*, *18*(1), 3-9.

Mago, B. (2015). *Adoption of Green Information Technology for Sustainable Development in Context of UAE.* Paper presented at the 2015 International Conference on Developments of E-Systems Engineering (DeSE).

Malhotra, A., Melville, N. P., & Watson, R. T. (2010). Information systems and environmental sustainability. *MIS quarterly*, *24*(2), 429-430.

Malison, K., & Thammakoranonta, N. (2018). *The awareness on green ICT among Thai employees: A factor analysis.* Paper presented at the 2018 International Conference on Information Management and Processing (ICIMP).

Mammo, Y. (2016). Analysis of Ethiopia's national ICT policy and strategy: insights into policy issues and policy goals. *Ethiopian Journal of Education and Sciences*, *11*(2), 75-89.

Mamo, K. (2015). *Assessing Green Computing Readiness in Government Organizations in Addis Ababa.* (Master of Science in Information Science (Information Systems)), Addis Ababa University, Addis Ababa. Retrieved from http://etd.aau.edu.et/handle/123456789/14075

Mathieson, K. (1991). Predicting user intentions: comparing the technology acceptance model with the theory of planned behavior. *Information systems research*, *2*(3), 173-191.

McCrae, R. R., & Costa Jr, P. T. (1985). Openness to experience. *Perspectives in personality*, *1*, 145-172.

McCrae, R. R., & Costa Jr, P. T. (1997). Conceptions and correlates of openness to experience *Handbook of personality psychology* (pp. 825-847): Elsevier.

McCusker, K., & Gunaydin, S. (2015). Research using qualitative, quantitative or mixed methods and choice based on the research. *Perfusion*, *30*(7), 537-542.

McDonald, R. P., & Ho, M.-H. R. (2002). Principles and practice in reporting structural equation analyses. *Psychological methods*, *7*(1), 64.

Memon, M. A., Ting, H., Ramayah, T., Chuah, F., & Cheah, J. (2017). A review of the methodological misconceptions and guidelines related to the application of structural equation modeling: A Malaysian scenario. *Journal of applied structural equation modeling*, *1*(1), 1-13.

Miles, J., & Shevlin, M. (2007). A time and a place for incremental fit indices. *Personality and individual differences*, *42*(5), 869-874.

Milewski, A. V., Young, T. P., & Madden, D. (1991). Thorns as induced defenses: experimental evidence. *Oecologia*, *86*(1), 70-75.

Mishra, D., Akman, I., & Mishra, A. (2014). Theory of reasoned action application for green information technology acceptance. *Computers in Human Behavior*, *36*, 29-40.

Mitchell, M. L., & Jolley, J. M. (2012). *Research design explained*: Cengage Learning.

Moghavvemi, S., Salleh, N. A. M., Sulaiman, A., & Abessi, M. (2015). Effect of external factors on intention–behaviour gap. *Behaviour & Information Technology*, *34*(12), 1171-1185.

Molla, A. (2008). GITAM: A Model for the Adoption of Green IT. *ACIS 2008 Proceedings*, 64.

Molla, A., & Abareshi, A. (2011). *Green IT Adoption: A Motivational Perspective.* Paper presented at the PACIS.

Molla, A., Abareshi, A., & Cooper, V. (2014). Green IT beliefs and pro-environmental IT practices among IT professionals. *Information Technology & People*, *27*(2), 129-154.

Molla, A., Cooper, V. A., & Pittayachawan, S. (2009). IT and eco-sustainability: Developing and validating a green IT readiness model. *ICIS 2009 proceedings*, 141.

Mulaik, S. A., James, L. R., Van Alstine, J., Bennett, N., Lind, S., & Stilwell, C. D. (1989). Evaluation of goodness-of-fit indices for structural equation models. *Psychological bulletin*, *105*(3), 430.

Neuendorf, K. A. (2016). *The content analysis guidebook*: sage.

Newby, P. (2014). *Research methods for education*: Routledge.

Nitzl, C., Roldan, J. L., & Cepeda, G. (2016). Mediation analysis in partial least squares path modeling. *Industrial Management & Data Systems*.

Noppers, E. H., Keizer, K., Bolderdijk, J. W., & Steg, L. (2014). The adoption of sustainable innovations: driven by symbolic and environmental motives. *Global Environmental Change*, *25*, 52-62.

NPC. (2016). *Growth and Transformation Plan II (GTP II) from 2015/16 to 2019/20*. Addis Ababa: National Planning Commission.

Ojo, A. O., Raman, M., & Downe, A. G. (2019). Toward green computing practices: A Malaysian study of green belief and attitude among Information Technology professionals. *Journal of Cleaner Production*, *224*, 246-255.

Ong, M. H. A., & Puteh, F. (2017). Quantitative Data Analysis: Choosing Between SPSS, PLS, and AMOS in Social Science Research. *International Interdisciplinary Journal of Scientific Research, 3*(1), 14-25.

Osborne, J. W. (2015). What is rotating in exploratory factor analysis? *Practical Assessment, Research, and Evaluation, 20*(1), 2.

Osborne, J. W., & Banjanovic, E. S. (2016). *Exploratory factor analysis with SAS*: Sas Institute.

Pallant, J. (2010). SPSS Survival Manual 4th edition McGraw Hill: England.

Park, H. M. (2015). Univariate analysis and normality test using SAS, Stata, and SPSS.

Paul, R. C., Swart, W., Zhang, A. M., & MacLeod, K. R. (2015). Revisiting Zhang's scale of transactional distance: Refinement and validation using structural equation modeling. *Distance Education, 36*(3), 364-382.

Prada-Ramallal, G., Roque, F., Herdeiro, M. T., Takkouche, B., & Figueiras, A. (2018). Primary versus secondary source of data in observational studies and heterogeneity in meta-analyses of drug effects: a survey of major medical journals. *BMC medical research methodology, 18*(1), 97.

Prestholdt, P. H., Lane, I. M., & Mathews, R. C. (1987). Nurse turnover as reasoned action: Development of a process model. *Journal of Applied Psychology, 72*(2), 221.

Prykhodko, S., Prykhodko, N., Makarova, L., & Pugachenko, K. (2017). *Detecting outliers in multivariate non-Gaussian data on the basis of normalizing transformations.* Paper presented at the 2017 IEEE First Ukraine Conference on Electrical and Computer Engineering (UKRCON).

Rahi, S. (2017). Research design and methods: A systematic review of research paradigms, sampling issues and instruments development. *International Journal of Economics & Management Sciences, 6*(2), 1-5.

Raineri, N., & Paillé, P. (2016). Linking corporate policy and supervisory support with environmental citizenship behaviors: The role of employee environmental beliefs and commitment. *Journal of business ethics, 137*(1), 129-148.

Raykov, T. (2011). On testability of missing data mechanisms in incomplete data sets. *Structural equation modeling: a multidisciplinary journal, 18*(3), 419-429.

Ringner, M. (2008). What is principal component analysis? *Nature biotechnology, 26*(3), 303-304.

Rogers, E. M. (1976). New product adoption and diffusion. *Journal of consumer research, 2*(4), 290-301.

Rogers, E. M. (2010). *Diffusion of innovations*: Simon and Schuster.

Roopa, S., & Rani, M. (2012). Questionnaire designing for a survey. *Journal of Indian Orthodontic Society, 46*(4_suppl1), 273-277.

Rosenthal, M. (2016). Qualitative research methods: Why, when, and how to conduct interviews and focus groups in pharmacy research. *Currents in pharmacy teaching and learning, 8*(4), 509-516.

Rowlands, I. H., Scott, D., & Parker, P. (2003). Consumers and green electricity: profiling potential purchasers. *Business Strategy and the Environment, 12*(1), 36-48.

Rueda, S., Moriano, J. A., & Liñán, F. (2015). Validating a theory of planned behavior questionnaire to measure entrepreneurial intentions. *Developing, shaping and growing entrepreneurship*, 68-78.

Ryoo, S. Y., & Koo, C. (2013). Green practices-IS alignment and environmental performance: The mediating effects of coordination. *Information Systems Frontiers, 15*(5), 799-814.

Sadaf, A., Newby, T. J., & Ertmer, P. A. (2016). An investigation of the factors that influence preservice teachers' intentions and integration of Web 2.0 tools. *Educational Technology Research and Development, 64*(1), 37-64.

Sahin, C. (2018). Social Media Addiction Scale-Student Form: The Reliability and Validity Study. *Turkish Online Journal of Educational Technology-TOJET, 17*(1), 169-182.

Sajja, S. K., & Padmavathy, N. (2017). *Green Communication: An Emerging Telecommunication Technology-Its Research Challenges, Techniques and Applications.* Paper presented at the International Conference on Information, Communication and Computing Technology.

Samoei, I. C., & Moturi, C. A. (2016). An Assessment of Green ICT Effect on Sustainable Environment in Institutions of Higher Learning in Kenya.

Samuels, P. (2017). Advice on exploratory factor analysis.

Sardeshmukh, S. R., & Vandenberg, R. J. (2017). Integrating moderation and mediation: A structural equation modeling approach. *Organizational Research Methods, 20*(4), 721-745.

Saunders, D. R. (1956). Moderator variables in prediction. *Educational and psychological measurement, 16*(2), 209-222.

Savin-Baden, M., & Howell-Major, C. (2013). Qualititative Research: The Essential Guide to Theory and Practice. *Qualitative Research: The Essential Guide to Theory and Practice. Routledge*.

Sedgwick, P. (2014). Unit of observation versus unit of analysis. *Bmj, 348*, g3840.

Shaffer, J. A., DeGeest, D., & Li, A. (2016). Tackling the problem of construct proliferation: A guide to assessing the discriminant validity of conceptually related constructs. *Organizational Research Methods, 19*(1), 80-110.

Sharma, R., & Mishra, R. (2014). A review of evolution of theories and models of technology adoption. *Indore Management Journal, 6*(2), 17-29.

Sheeran, P., Trafimow, D., & Armitage, C. J. (2003). Predicting behaviour from perceived behavioural control: Tests of the accuracy assumption of the theory of planned behaviour. *British journal of social psychology, 42*(3), 393-410.

Shirokova, G., Osiyevskyy, O., & Bogatyreva, K. (2016). Exploring the intention–behavior link in student entrepreneurship: Moderating effects of individual and environmental characteristics. *European Management Journal, 34*(4), 386-399.

Singh, A. S. (2017). Common procedures for development, validity and reliability of a questionnaire. *International Journal of Economic, Commerce and Management, 5*, 790-801.

Sinkovics, R. R., Henseler, J., Ringle, C. M., & Sarstedt, M. (2016). Testing measurement invariance of composites using partial least squares. *International marketing review*.

Song, Y., Son, Y.-J., & Oh, D. (2015). Methodological issues in questionnaire design. *Journal of Korean Academy of Nursing, 45*(3), 323-328.

Sreen, N., Purbey, S., & Sadarangani, P. (2018). Impact of culture, behavior and gender on green purchase intention. *Journal of Retailing and Consumer Services, 41*, 177-189.

Strathman, A., Gleicher, F., Boninger, D. S., & Edwards, C. S. (1994). The consideration of future consequences: Weighing immediate and distant outcomes of behavior. *Journal of personality and social psychology, 66*(4), 742.

Sugih, P. P. D. A., Nugroho, E., & Hartanto, R. (2017). *Analysis on green IT applications usage for the firm's competitive advantage strategy.* Paper presented at the 2017 15th International Conference on Quality in Research (QiR): International Symposium on Electrical and Computer Engineering.

Sukarman, H., & Putri, N. K. S. (2018). *Green Information Technology Policy in Indonesia.* Paper presented at the 2018 International Conference on Information Management and Technology (ICIMTech).

Suryawanshi, K. (2019). Green Information and Communication Technology Techniques in Higher Technical Education Institutions for Future Sustainability *Data Management, Analytics and Innovation* (pp. 35-43): Springer.

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics* (Vol. 5): Pearson Boston, MA.

Tadesse, G., & Bahiigwa, G. (2015). Mobile phones and farmers' marketing decisions in Ethiopia. *World development, 68*, 296-307.

Taherdoost, H. (2016a). Sampling methods in research methodology; How to choose a sampling technique for research.

Taherdoost, H. (2016b). Validity and reliability of the research instrument; how to test the validation of a questionnaire/survey in a research. *How to Test the Validation of a Questionnaire/Survey in a Research (August 10, 2016)*.

Tamimi, H., & Bensefia, A. (2018). *Factors influencing green data centers in UAE.* Paper presented at the 2018 Advances in Science and Engineering Technology International Conferences (ASET).

Tarhini, A., Teo, T., & Tarhini, T. (2016). A cross-cultural validity of the E-learning Acceptance Measure (ElAM) in Lebanon and England: A confirmatory factor analysis. *Education and Information Technologies, 21*(5), 1269-1282.

Taylor, S. J., Bogdan, R., & DeVault, M. L. (2016). Introduction into Qualitative Research Methods: A Guidebook and Resource. np: John Wiley & Sons Inc. Accessed.

Thomson, S., & van Belle, J.-P. (2015). Antecedents of Green IT adoption in South African higher education institutions. *Electronic Journal of Information Systems Evaluation, 18*(2), 172.

UNDP. (2011). *Ethiopia's Climate-Resilient Green Economy: Green economy strategy*. Addis Ababa: Retrieved from https://www.undp.org/content/dam/ethiopia/docs/Ethiopia%20CRGE.pdf.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186-204.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.

Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS quarterly*, 157-178.

Walliman, N. (2011). *Research methods: The basics*: Routledge.

Wang, S., Fan, J., Zhao, D., Yang, S., & Fu, Y. (2016). Predicting consumers' intention to adopt hybrid electric vehicles: using an extended version of the theory of planned behavior model. *Transportation, 43*(1), 123-143.

Wati, Y., & Koo, C. (2012). *Toward green IS adoption behaviors: A self-determination perspective.* Paper presented at the 2012 45th Hawaii International Conference on System Sciences.

Watson, J. C. (2017). Establishing evidence for internal structure using exploratory factor analysis. *Measurement and Evaluation in Counseling and Development, 50*(4), 232-238.

West, P. (2016). Simple random sampling of individual items in the absence of a sampling frame that lists the individuals. *New Zealand Journal of Forestry Science, 46*(1), 15.

Williams, B., Onsman, A., & Brown, T. (2010). Exploratory factor analysis: A five-step guide for novices. *Australasian Journal of Paramedicine, 8*(3).

Wilson, V. (2016). Research methods: Sampling. *Evidence Based Library and Information Practice, 11*(1 (S)), 69-71.

Woldu, G. E. (2016). *A framework for Measuring Sustainable Green Information Technology Practices in Universities of South Africa.* Ph. D. Thesis, North-West University, Potchefstroom, South Africa.

Wong, K. K.-K. (2013). Partial least squares structural equation modeling (PLS-SEM) techniques using SmartPLS. *Marketing Bulletin, 24*(1), 1-32.

Wong, K. K.-K. (2016). Mediation analysis, categorical moderation analysis, and higher-order constructs modeling in Partial Least Squares Structural Equation Modeling (PLS-SEM): A B2B Example using SmartPLS. *Marketing Bulletin, 26*.

Wongpakaran, T., Wongpakaran, N., Sirirak, T., Arunpongpaisal, S., & Zimet, G. (2018). Confirmatory factor analysis of the revised version of the Thai multidimensional scale of perceived social support among the elderly with depression. *Aging & mental health, 22*(9), 1149-1154.

World Bank. (2017). *Country Partnership Framework for the Democratic Republic of Ethiopia (2018-2022).* (Report No. 119576-ET). Retrieved from https://www.worldbank.org/en/country/belarus/publication/cpf-2018-2022.

Wu, W.-Y., & Ke, C.-C. (2015). An online shopping behavior model integrating personality traits, perceived risk, and technology acceptance. *Social Behavior and Personality: an international journal, 43*(1), 85-97.

Xia, D., Zhang, M., Yu, Q., & Tu, Y. (2019). Developing a framework to identify barriers of Green technology adoption for enterprises. *Resources, Conservation and Recycling, 143*, 99-110.

Xiong, B., Skitmore, M., & Xia, B. (2015). A critical review of structural equation modeling applications in construction research. *Automation in Construction, 49*, 59-70.

Yamane, T. (1967). Research Methods: Determination of Sample Size.

Yoon, C. (2018). Extending the TAM for Green IT: A normative perspective. *Computers in Human Behavior, 83*, 129-139.

Zhao, X., Lynch Jr, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of consumer research, 37*(2), 197-206.

Zhou, T., & Lu, Y. (2011). The effects of personality traits on user acceptance of mobile commerce. *Intl. Journal of Human–Computer Interaction, 27*(6), 545-561.

Appendixes

Appendix-01: Survey Questionnaire

Code: _____

Addis Ababa University
College of Natural and Computational Science
School of Information Science

Title of the Research:

Green Information Technology (IT) Adoption in Ethiopian Telecom Industry

1. Introduction

Green Information Technology (IT) refers to the study and practice of computing devices in terms of designing, manufacturing, using and disposing of personal computers and servers along with the associated sub systems such as displays, printers, storage devices, networking and communication systems so as to guarantee no or minimal impact on environment. In this regard, the purpose of this study is to explore factors affecting green IT adoption via determining the substantial cognitive beliefs, behaviors and actions of individuals (i.e. the IT professionals and managers) along with the personality traits that are pertinent to environmental concerns as the results of ICT expansions by Ethio-telecom.

Dear Participant, this research is being conducted by Awet Brhane and the information provided will only be used for the partial fulfillment of the requirements for the Degree of Master of Science in Information Science, Information Systems Track, at College of Natural and Computational Science, School of Information Science in Addis Ababa University under the supervision of Dr. Workshet Lamenew.

2. Reason for your Selection

You have been selected for the study due to the researcher's preliminary assessment indications of your ICT related engagements that would enable you to share your beliefs, behaviors and actions towards adopting green IT in Ethio-telecom context.

3. Participant's Responsibilities

If you agree to voluntary participate in this study context, you are kindly invited to read and understand the information provided in order to fill a paper-based survey questionnaire that only encompasses your reflections by carrying out few minutes.

4. Rights, Privileges and associated Risks

As a voluntary participant, there are no personally associated risks to participate in this study along with your absolute rights to withdraw at any time. If any questions cause you concern, you are free, not to answer them besides you are not expected to provide any personal information or records aiming to complete the survey questions.

5. Benefits or Paybacks of your Participation

No promise or guarantee of benefits can be made to encourage you to participate in the study. Hence, participating in this research may create you an opportunity to reflect back and share your experiences. If you would like a copy of this investigation results, please let one of us knows about it so as to provide you at the end of this study.

6. Extent of Anonymity and Confidentiality Issues

Each survey questionnaire has uniquely coded and personally identifiable information should not be indicated. All information you provide will be combined and analyzed with responses of other participants as well as the results will be only used to write up the M.Sc. thesis. In due course, responses will be kept confidential at all times and only members of the research team will have access to the data.

7. Contact Address for any Inquiry

If you have any questions regarding this research, you can forward your enquiry via contacting one of us with the down mentioned contact addresses. So, if you agree to participate, please proceed to answer the paper based survey questionnaire illustrated in three parts and we kindly request you to return it back to one of the enumerators or the researcher after completion.

With Best Regards,

Awet Brhane
Researcher
Addis Ababa University
College of Natural and Computational Science
School of Information Science
Information System Track

Contact Address
+251-930-65-14-34
+251-924-91-24-00
awetb@emi.gov.et
awetlondon@gmail.com
www.aau.edu.et

Workshet Lamenew (Ph.D.)
Research Advisor
Addis Ababa University
College of Natural and Computational Science
School of Information Science
Information System Track

Contact Address
+251-911-43-53-18
workshet.lamenew@aau.edu.et
workshet@gmail.com
www.aau.edu.et

Part 1: General questions associated to respondent's demographic information
Instruction: Please select an appropriate option to the best of you knowledge for each question

1. **Overall Respondents Background Information**

1.1 Gender:

- ○ Male
- ○ Female

1.2 Age:

- ○ 18-25 Years
- ○ 26-35 Years
- ○ 36-45 Years
- ○ Above 45 Years

1.3 Education Level

- ○ High Scholl or below
- ○ Diploma or Professional Certificate
- ○ Bachelor Degree
- ○ Post-graduate Degree

2. **Respondents background towards Information Technology (IT) Experience**

2.1 How do you describe your general Information Technology (IT) awareness?

- ○ Very Poor
- ○ Poor
- ○ Moderate
- ○ Good
- ○ Very Good

2.2 How would you label your Information Technology (IT) skill and knowledge?

- ○ Very Poor
- ○ Poor
- ○ Moderate
- ○ Good
- ○ Very Good

2.3 How long have you been involved in Information Technology (IT) related professions?

- ○ Less than 3 Years
- ○ Less than 6 Years
- ○ Less than 8 Years
- ○ Less than 12 Years
- ○ 12 and more Years

2.4 How often do you probably use ICT devices and systems per day?

- ○ Less than 1 Hour
- ○ Less than 3 Hour
- ○ Less than 5 Hour
- ○ Less than 8 Hour
- ○ More than 8 Hour

Part 2: Level of Agreement Enquiries associated with main constructs of the Research

Instruction: In the following Table-1, the left side indicates the statement for each constructs and the right side is prepared for rating your perspective based on your level of agreement 1 to 5 scales. Thus, the ranges of the scales indicate: **1**= "**Strongly Disagree**", **2**= "**Disagree**", **3**= "**Neutral**", **4**="**Agree**", **5**="**Strongly Agree**". So, please select an appropriate option on one of the scales that certainly describe your level of agreement/disagreement based on each statement.

Table1: Indicators Statement Associated to each Constructs

No	Statements of each construct	1	2	3	4	5
A. Predictive Constructs of Theory of Planned Behavior (TPB)						
1. Attitude towards Green IT (ATT)						
ATT1-1	It is easy for me to learn how to practice green IT in my organization	○	○	○	○	○
ATT1-2	I have no difficulties to maintain green IT practices in my overall ICT engagements	○	○	○	○	○
ATT1-3	I believe that there are favorable situations of developing greenery mindset to adopt green IT practices in my organization	○	○	○	○	○
ATT1-4	I believe that greenery attitude have vital role to reduce carbon emission footprints as the results of ICT expansions	○	○	○	○	○
ATT1-5	For me, creating green IT awareness promotes environmental sensitive attitude	○	○	○	○	○
2. Subjective Norm towards Green IT (SN)						
SN2-1	Most people who are important to me think I should adopt green IT practices	○	○	○	○	○
SN2-2	Most people who influence my behavior expected me to adopt green IT practices	○	○	○	○	○
SN2-3	If I adopt green IT practices, people who are important to me would also want to do the same way	○	○	○	○	○
SN2-4	People whose opinion I value would prefer to adopt green IT practices in their ICT engagements	○	○	○	○	○
SN2-5	Many people like me would prefer to adopt green IT practices in their day to day activity	○	○	○	○	○

No	Statements of each construct	1	2	3	4	5
3. Perceived Behavioral Control towards Green IT (PBC)						
PBC3-1	I have positive thoughts towards the applications green IT practices in my ICT engagements	○	○	○	○	○
PBC3-2	If I wanted to I would adopt green IT practices easily as sooner as possible	○	○	○	○	○
PBC3-3	I believe that adopting green IT concerns would not be difficult to me to practice them on regular basis	○	○	○	○	○
PBC3-4	I believe that it is up to me whether I adopt green IT practices or not in my ICT engagements	○	○	○	○	○
B. Predictive Constructs of Personality Traits						
4. Consideration for Future Consequence (CFC)						
CFC4-1	I usually act to satisfy immediate green IT concerns, figuring out the future will take care of itself	○	○	○	○	○
CFC4-2	My behavior tend to be influenced by immediate outcomes of my actions towards adopting green IT practices	○	○	○	○	○
CFC4-3	My conveniences remain as major factor to make decisions or to take any action towards adopting green IT practices	○	○	○	○	○
CFC4-4	I am willing to scarify my immediate well-being in order to achieve future outcomes of adopting green IT	○	○	○	○	○
CFC4-5	I believe the importance of recognizing the warnings of ecosystem even if the negative role of ICT expansions would take place in long run	○	○	○	○	○
CFC4-6	I generally ignore ICT's role to future eco-warnings since problems will be resolved before they reach at crisis level	○	○	○	○	○
CFC4-7	I only act to satisfy the immediate apprehensions since future problems can be dealt in long run	○	○	○	○	○
5. Openness to New Experiences (OE)						
OE5-1	I am always curious towards adopting green IT practices in my ICT related engagements	○	○	○	○	○
OE5-2	I would like to demonstrate new ideas towards adopting green IT practices in my ICT related engagements	○	○	○	○	○

No	Statements of each construct	1	2	3	4	5
OE5-3	I have basic interest to go over green IT concern in my ICT related engagements in more innovative way	○	○	○	○	○
OE5-4	I usually want to share my experiences towards the progressive values of adopting green IT to others	○	○	○	○	○
6. Neuroticism (NR)						
NR6-1	I am easily anxious/nervous/ when I thing about adopting green IT practices in my ICT related engagements	○	○	○	○	○
NR6-2	I am somewhat depress while I tend to employ green IT practices in my ICT related engagements	○	○	○	○	○
NR6-3	I believe that my impulsiveness/working mood/ matters to consider green IT practices	○	○	○	○	○
NR6-4	I think that my behavior towards adopting green IT remains vulnerable to the organizational culture /lacks self-confidence/	○	○	○	○	○
C. Outcome Behavioral Constructs towards Adopting Green IT						
7. Behavioral Intention to adopt Green IT (BI)						
BI7-1	I intend to continue performing green IT practices in using ICT related equipment and systems	○	○	○	○	○
BI8-2	I will recommend others to adopt green IT practices in using ICT related equipment and systems	○	○	○	○	○
BI8-3	My position remains positive towards adopting green IT practices in my ICT related engagements	○	○	○	○	○
BI8-4	I would like to have plans towards adopting green IT practices in using ICT related equipment and systems	○	○	○	○	○
8. Actual Behavior to adopt Green IT (AB)						
AB8-1	I believe that frequent green IT awareness promotions would play critical role in sustaining environmental friendly behavior	○	○	○	○	○
AB8-2	For me, adopting green IT practices on regular bases typically advance users consciousness and self-discipline towards greenery concerns	○	○	○	○	○
AB8-3	Adopting green IT practices are crucial solutions towards reducing carbon emissions as the result of ICT expansions	○	○	○	○	○
AB8-4	I will continue adopting green IT practice on regular basis to contribute my fair share to sustainable environment	○	○	○	○	○

Part 3: Open-ended questions associated with Green IT Adoption

Instruction: Please write your brief reactions towards each respective green IT adoption enquiries based on your experience and understanding in the space provided or by attaching separate paper.

1. How do you level green IT awareness in Ethio-telecom? Can you explain individuals' (i.e. IT professionals and managers) green IT beliefs in terms maintain eco-friendly practices in their ICT related engagements?

2. Personality traits represent individuals' specific patterns of thoughts, feelings, and behaviors as well as comprise Consideration of Future Consequence (CFC), Openness to New Experience (OE) and Neuroticism (NR) in this study context. In due course, please demonstrate your experience regarding the following three sub questions associated to the cognitive beliefs and behaviors towards green IT in terms of **Gender**, **Age**, **Educational Level** and **ICT Experience** differences in Ethio-telecom as the result of the massive ICT expansions that reside to carbon emission footprints.

   2.1 What sort of individuals (IT professionals and managers) do you think are more conscious towards Consideration of Future Consequences (CFC) personality trait in terms of green attitude? a) Male or Female? b) Older or Younger age group? c) ICT Experienced or inexperienced? Why?

   Note: Consideration of Future Consequences (CFC) reflects the level of thoughtfulness for the potential distant outcomes of environmental alarms that influence their current behaviors?

2.2 What sort of individuals do you think are associated with Openness to New Experience (OE) personality trait greenery mindset? a) Male or Female? b) Older or Younger age group? c) ICT Experienced or inexperienced? Why?

Note: Openness to New Experience (OE) reflects to the desiring behavior for exploring unfamiliar practices that don for being indebted for novel ideas in resolving environmental crises?

2.3 What sorts of individuals do you think are characterized with Neuroticism (NR) personality trait in terms of green IT awareness? a) Male or Female? b) Older or Younger age group? c) ICT Experienced or inexperienced? Why?

Note: Neuroticism (NR) reflects to extent of being expressive to negative emotions (i.e. anxiety, nervousness, and depression) considering the potential ecosystem dangers.

3. Please explain the major challenges of adopting green IT practices and the so far efforts made to maintain greenery awareness in terms creating environmental sensitive values, beliefs and culture in your organizations.

4. What do you think should be done to effectively adopt green IT practices in Ethio-telecom: as one of the ICT intensive sectors in the country by considering its vulnerability to ecosystem challenges in order to support the overall exertions to ensure sustainable environment?

5. If you have some comments and suggestion, please do not hesitate to share us besides we are highly pleased to acknowledge your valuable inputs so as to advance this study context.

Please save and email it to awetlondon@gmail.com

Thank you for your time
We value your voluntary participation!

Appendix-02: Interview Guide

Key Informant Interview Guiding Principles

- Make an appointment in advance with the key informant interviewer and agree on a specific time and convenient place to meet
- Welcome key informant interviewer and provide details information about the background of the study and research gap as well as the objective and significance
- Request for permission to record the discussions as well as explain why it is essential for the study and clarify the rulebooks of confidentiality and anonymity issues of the study
- Inform key informant interviewer's right to refuse responding for any questions without any preconditions
- Value the time and cooperation of the key informant interviewer

1. Questions related to general beliefs, behaviors of individuals towards green IT

Instruction: Suggest the interview to explain each question statements to the best of his/her understanding based on the foregoing experiences

1.1 Ethio-telecom has designed bridge strategy for three years from 2019 to 2022 which recognizes importance of ICT ecosystem to reduce its impact on environment. So what do you think is the level green IT awareness?

1.2 Can explain the monitoring mechanisms to evaluate the so far accomplishments regarding the eco-friendly practice in Ethio-telecom?

1.3 What is the level individuals (IT professionals and Managers) awareness towards green IT in Ethio-telecom?

1.4 Does Ethio-telecom crafted policies, standards, and strategies? Do you think individuals' are conscious about these practices if they already exist? Why?

1.5 Can you explain the behavior, belief and action of individuals towards realizing eco-friendly practices in their ICT related engagements?

2. Questions related to the impact personality traits towards green IT adoption

Instruction: Brief the interviewee about the five commonly addressed personality traits

- **Consideration for future consequence (CFC)** refers to individuals' beliefs towards the consequences of performing the behavior multiplied by future consequence evaluations; thus, it refers for being careful, thorough, responsible and organized personal characteristics.
- **Openness to new experience (OE)** represents a person's receptivity to new ideas and experiences as well as associated with being imaginative, curious, broad-minded and independent.
- **Neuroticism (NR)** refers for being anxious and usually susceptible to stress as well as comprises anxious, depressed, worried, nervous, and insecure personalities

2.1 What kinds of individuals do you think are more conscious towards green IT concern based on the explanations about the above mentioned personality traits?

2.2 Do you think the personality traits towards green IT adoption differ via the demographic characteristics (gender, age, education level and IT experiences) of individuals? How?

2.3 Can you please share your work related experience towards individuals' perception towards green IT adoption particularly in using ICT resources.

2.4 Do you think green IT adoption should the prior concern of in Ethio-telecom? Why?

2.5 Can you explain the current green IT practices in Ethio-telecom?

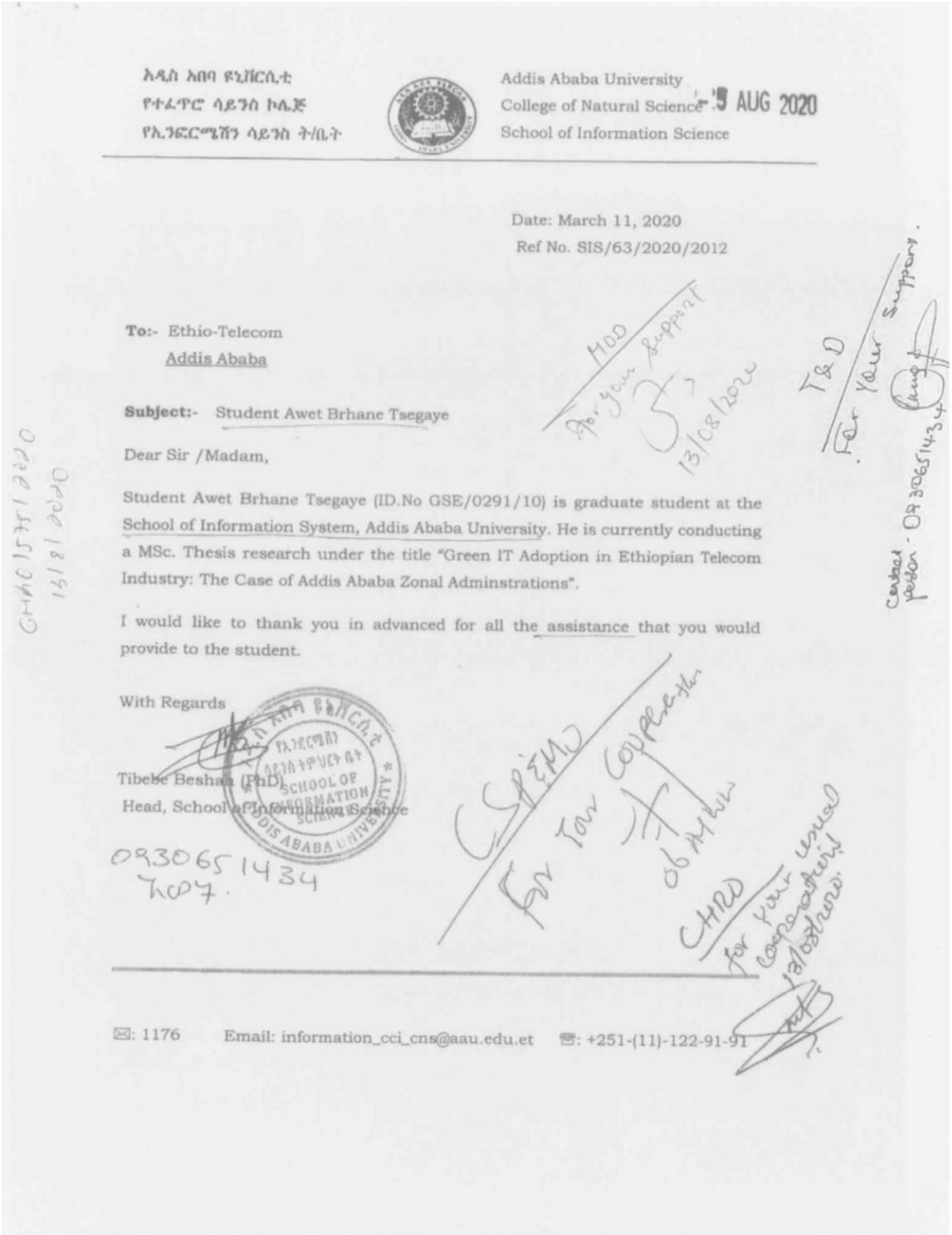
2.6 What do you think should be done to successfully adopt green IT concern at individual level in Ethio-telecom as one of the ICT intensive organizations?

2.7 Please share if you have some comments, recommendation or any other suggestion regarding the study context

Thank you for your time

We value your voluntary participation!

Appendix-03: Approval for Data Collection in Ethio-telecom



አዲስ አበባ ዩኒቨርሲቲ
የተፈጥሮ ሳይንስ ኮሌጅ
የኢንፎርሜሽን ሳይንስ ት/ቤት

Addis Ababa University
College of Natural Science
School of Information Science

5 AUG 2020

Date: March 11, 2020
Ref No. SIS/63/2020/2012

To:- Ethio-Telecom
Addis Ababa

Subject:- Student Awet Brhane Tsegaye

Dear Sir /Madam,

Student Awet Brhane Tsegaye (ID.No GSE/0291/10) is graduate student at the School of Information System, Addis Ababa University. He is currently conducting a MSc. Thesis research under the title "Green IT Adoption in Ethiopian Telecom Industry: The Case of Addis Ababa Zonal Adminstrations".

I would like to thank you in advanced for all the assistance that you would provide to the student.

With Regards

Tibebe Beshah (PhD)
Head, School of Information Science

SCHOOL OF INFORMATION SCIENCE
ADDIS ABABA UNIVERSITY

0930651434

HOD For your support 13/08/2012

T&D For your support

Contact person - 0930651434

CHRD for your cooperation!

✉: 1176 Email: information_cci_cns@aau.edu.et ☎: +251-(11)-122-91-91

Appendix-04: Approved Organizational Structure

ethio telecom
ኢትዮ ቴሌኮም

P.O. Box 1047 Addis Ababa Ethiopia
tel.: +251 (0) 115 5157 00
www.ethiotelecom.et

ጉዳዩ፡ የኩባንያችን ኔትወርክ ዲቪዥን ላይ የተደረገ የአደረጃጀት ለውጥን ስለማሳወቅ

የዋና ሥራ አስፈጻሚ ጽ/ቤት ህዳር 22 ቀን 2012 ዓ.ም

ለሁሉም የኢትዮ ቴሌኮም ማህበረሰብ

ክትትል ፡ ጥላሁን ነጋሽ
ስልክ፡ 0911490296
ኢሜይል Tilahun.negash@ethiotelecom.et

የደብዳቤ ቁ. et/CEO/232/2019

ኢትዮ ቴሌኮም የአገልግሎት አሰጣጡን እና የደንበኞች አያያዙን የቴሌኮም ኢንዱስትሪው ከደረሰበት ደረጃ ለማድረስ ሰፊ የመሠረተ ልማት ዝርጋታ፣ የአገልግሎት ተደራሽነት የሚያሳለብቱ አማራጭ ምርትና አገልግሎቶችን በማቅረብ እንዲሁም የአገልግሎት አሰጣጥና ጥራት ለማረጋገጥ የሚረዱ እርምጃዎችን በመውሰድ ሰፊ እንቅስቃሴ ሲያደርግ መቆየቱ ይታወሳል፡፡ በተጨማሪም በኔትወርክ መሠረተ ልማት፣ በሞባይል ጣቢያዎች፣ በአገልግሎት ሽፋን፣ በቬንደር ቁጥር፣ በደንበኛና ሠራተኛ ብዛት እንዲሁም በቴክኖሎጂ ረገድ ሰፊ እድገትና ለውጦች ተመዝግበዋል፡፡

እንደሚታወቀው በ2011 በጀት ዓመት ከተጀመሩ የሪፎርም ሥራዎች መካከል አንዱ የተቋም አደረጃጀት ለውጥ ሲሆን፤ በዚህም የተለያዩ የሥራ ክፍሎች አደረጃጀት ላይ መሠረታዊ ለውጦች በማካሄድ ከፍተኛ መሻሻሎችና ተጨባጭ ውጤቶች ተመዝግበዋል፡፡ ይሁን እንጂ የኔትወርክ አደረጃጀት ከ2003ዓ.ም ጀምሮ ላለፉት ስምንት ዓመታት የቆየ ቢሆንም የአደረጃጀት ለውጡ እንዲዘገይ ተደርጓል፡፡

ለዚህም ለኔትወርክ አደረጃጀት ለውጥ መዘግየት በዋነኝነት እንደምክንያት የሚጠቀሰው የኩባንያውን ሰፊ ሀብትና የሰው ኃይል የያዘ ክፍል እንደመሆኑ መጠን ሁሉንም የአደረጃጀት ለውጥ በአንድ ጊዜ በማከናወን የኩባንያውን የተረጋጋ የአገልግሎት አሰጣጥ ሂደት ላይ አሉታዊ ተጽዕኖ ላለመፍጠርና የቢዝነስ ቀጣይነትን ለማረጋገጥ እንዲቻል ሲሆን፤ በተጨማሪም አደረጃጀቱ ከኦፕሬሽን ልህቀት ባሻገር የውድድር ገበያውን ታሳቢ ባደረገ መልኩ መቃኘት ስለሚገባው በቂ ዝግጅት ለማድረግም ጭምር ታስቦ የተደረገ ነው፡፡

Bringing new possibilities

ethio telecom
ኢትዮ ቴሌኮም

P.O. Box 1047 Addis Ababa Ethiopia
tel.: +251 (0) 115 5157 00
www.ethiotelecom.et

በዚሁ መሰረት አዲሱ አደረጃጀት የውድድር ገበያን ያማከለና እያደገ የመጣውን የተቋሙን የኔትወርክ ሪሶርስ፣ ደንበኛና ሠራተኛ በአግባቡ ለማስተዳደር የሚያስችል አደረጃጀት በመፍጠር ደንበኛ ተኮር በመሆን የደንበኞች እና የቢዝነስ ፍላጎቶችን በተሟላ መልኩ ምላሽ ለመስጠት ያስችላል። ከዚህም በተጨማሪ የአገልግሎት ጥራትና የኔትወርክ የመገኘት መጠንን ለማሳደግ ብሎም ለመሠረተ ልማት አስተዳደርና ለኔትወርክ አገልግሎቶች ሚዛናዊና በቂ ትኩረት በመስጠት የኦፕሬሽን ልህቀትና የተሻለ የውድድር አቋም ለመፍጠር ይረዳል።

ስለሆነም ሁሉም የኢትዮ ቴሌኮም ማህበረሰብ አዲሱን አደረጃጀት በሥራ ላይ በማዋል ኩባንያችንን ብቁ፣ ተወዳዳሪና ተመራጭ ለማድረግ ያሰብነውን ዓላማ ለማሳካት ተገቢውን ድጋፍና ትብብር እንድታደርጉ እያሳሰብኩ፤ አዲሱ የኔትወርክ አደረጃጀት ከዚህ ደብዳቤ ጋር አባሪ ተደርጎ የተላከ መሆኑን እገልጻለሁ።

ከሠላምታ ጋር

ፍሬሕይወት ታምሩ
ዋና ሥራ አስፈጻሚ
02 DEC 2014

ግልባጭ፣

ለኢትዮ. ቴሌኮም ሥራ አመራር ቦርድ ጽ/ቤት

ለፋይል

አባሪ፤ 24 ገጽ