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Enhanced Theory of Reasoned Action (TRA) Model for Investigating Computer Users' Intention to Purchase Full Antivirus Software after a Free Trial

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ABSTRACT

Virus is software with malicious intention. Newer forms of viruses emerge rapidly and spread widely. The most common defense against virus is detection and protection which is being provided by antivirus software. The antivirus software that comes with newly acquired system is only effective for a specified period of time. Full antivirus software has the potential to update itself automatically with new technologies in order to combat the rapidly emerging viruses. Motivated by such challenges, the goal of this research is to investigate the factors that may influence the intention of system owners to purchase full antivirus software after a free trial within the context of developing country. This study adopts an enhanced approach to resolving this issue. It develops enhanced model that is based on established TRA by adding self-efficacy and facilitating condition to the original TRA model. A field survey of 100 system owners was conducted to empirically compare the efficiency of the TRA based model. Confirmatory factor analyses and structural equation models revealed well-fitting models within the surveyed sample. In accordance with TRA predictions, subject norm was found to significantly predict intention to purchase full antivirus software for the overall survey sample. In support of Technology Acceptance Model TAM predictions attitude had significant effect on intention to purchase full antivirus software. Out of the two constructs that were used to enhanced TRA facilitating conditions was found to be significant. Some recommendations are provided to motivate and promote purchasing intention of full antivirus software in the studied environment.

Keywords: Security, Virus, Antivirus, Models, Self-efficacy, Constructs.

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1. INTRODUCTION

The computer virus is a program that copies itself to the computer without user permission and infects the system [48]. Virus basically means an infection which can be of many types of malware which include worms, Trojan horses, root kits, spyware and adware. Computer viruses are becoming more and more sophisticated and employ different methods of spreading. While email has been the primary method for the spread of these recent computer viruses, computer virus can also enter a network through compact disk (CD), floppy disk, internet download, file transfer and file sharing programs, or by remote users connecting directly to the corporate network with an infected personal computer (PC). Once a computer virus gets a network it can spread from computer to computer in multiple ways.

Computer is vulnerable to attacks which are most dangerous and hard to handle. Computer system has become an inevitable property of any organization. In almost all organizations, part of the job is dealing with information and it has been this way for thousands of years. The purpose of computer system is to manage the information needed to manage the organizations. Computers allow organizations to implement information systems in a faster and more efficient way. It provides information needed for the execution of certain business processes. Although the impact of virus attack is devastating and would lead one to believe that definite effort would be made to avoid them, alas contrary is the case. In June 2009, the U.S. Census Bureau released statistics confirmed that there are over 72 million households in the United States with Internet access.

Considering that these households have at least one computer connected to the Internet, and sometimes more, this equates to at least 72 million potential targets for attacks [12]. Attacks can take many forms. Malware based attacks result in infections such as computer viruses designed to cause damage, Trojan Horses designed to create back doors or spread viruses or spyware, or computer worms designed to spread themselves as rapidly as possible. Internet has opened up diverse and complex security problems on a scale much greater than that previously known. During fiscal year 2007, the department of homeland security received 37,000 reports of attempted breaches on government and private systems, which included 12,986 direct assaults on federal agencies and more than 80,000 attempted attacks on department of defense computer network systems.

A study by MacAfee Avert Labs reported that in the first quarter of 2009 over 12million new machines worldwide has been assimilated into botnet. That equates to an infection rate of 4million new computers infected per month. During that time 18% of all newly infected machines were in the United States. Overall, the United States accounts for 35% of all zombies under the control of spammers. Additionally, the number of unique viruses found in March 2009 was nearly that of any other month in 2008. This trend indicates that threats continue to grow at an ever-increase rate [12]. The continued success of exploits is probably related to a failure of many computer users having no intention to adequately protect their systems with computer security solutions. Computer users find it difficult to protect their system due to some factors such as finance, availability of the software etc.

While there is an increasing amount of software been developed on a daily basis, little attention has been given in literature to users' acceptance of the software. There has been a wide gap between the potentials of this antivirus software and the realization of such potentials. This can be explained by behavioral issues. As a consequence models like Theory of Planned Behavior TPB and TRA could be applied to this study in order to determine factors influencing owners' intention to purchase full anti-virus software after free trial. Motivated with these challenges this study investigates the intention of system owners towards purchasing full antivirus software after a free trial. We considered antecedents of intention based on the Theory of Reasoned Action (TRA).

In the last two decades, a number of studies have provided some theoretical frameworks for research in behavior towards Information Technology and Information System (IT/IS) [1,2,17,45]. Theory of Reasoned Action (TRA) has been proven to be successful in predicting and understanding user perceptions of ICT usage [44,45,5]. Related to the context of our study it has also served as theoretical basis for investigating acceptance of Information System (IS) products [43].In this study we enhance this theory to develop a new model. This model was validated through a survey of system owners. The enhanced model revealed those factors that actually affect system owners' intention to purchase full antivirus software.

This research tends to help in the current trend of technology development and how to enhance technology for the satisfaction of people and easy interaction. It reviews past works so as to help developers and users to move forward in the development and usage of software. Findings from this kind of research will help software developers to strategically reach and get users to adopt their products.
This research aims at addressing the following question

- Are people willing to purchase antivirus software?
- What are the factors that might hinder the purchase of particular antivirus software?
- Are the needs of the users being met by the available antivirus software?

The remainder of this paper is structured as follows. Section2 describes the theories used in this study, and subsequently we have the model based on these theories including the construct and the hypotheses. In section 3 we describe the research methodology encompassing the survey instrument and data collection procedure. The results of the data analysis to test the models are presented in section 4 including the interpretation of the results. Finally we crown it with the contribution of the study

2. THEORETICAL BACKGROUND AND RESEARCH MODELS

2.1 *Theory of Reasoned Action (TRA)*

Many Theories seek answers to the fundamental question of why people behave the way they do. TRA tends to be one of this numerous theories. TRA shown in figure 1, developed by Martin Fishbein and Icek Ajzen, posits that individual behaviour is driven by behavioural intentions. The theory received particular attention in the field of consumer behaviour as it provides a simple tool to identify possibilities to change customers' behaviour when using an innovation. To this regard, the actual use of an innovation is determined by the individual's behavioural intention to use it. The model resulting from their research is visualised in and consist of the following components:

- *Behavioural intentions*, these include the functions of an individual's attitude towards the behavior. Accordingly, the actual use of an innovation is determined by the individual's behavioural intention to use it.
- Subjective norm is defined as an individual's perception of whether people important to the individual think the behaviours should be performed.
- The *Attitude towards an act or a behaviour* are the individual's positive or negative feelings about performing a behaviour, determined through an assessment of one's beliefs regarding the consequences arising from a behavior and an evaluation of the desirability of these consequences.

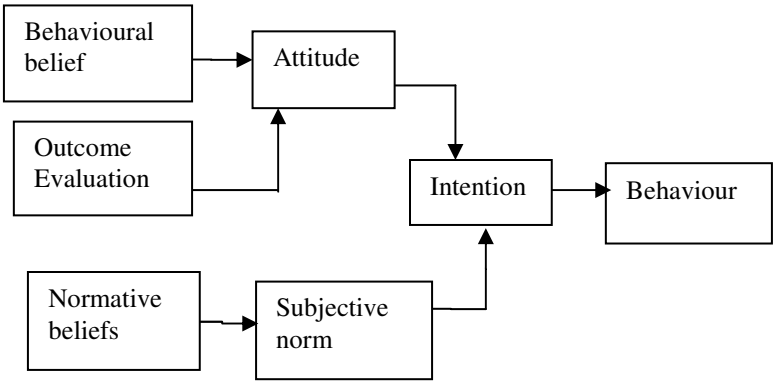

Figure 1. TRA Model

However the TRA is limited because it assumes that actions are totally under volitional control. This assumption fails to acknowledge that individuals' behaviors may be directed, by systemic constraints. To fix this change the Theory of Planned Behavior (TPB) in 1980 to predict an individual's intention to engage in a behavior at a specific time and place. The theory was intended to explain all behaviors over which people have the ability to exert self-control. The key component to this model is behavioral intent; behavioral intentions are influenced by the attitude about the likelihood that the behavior will have the expected outcome and the subjective evaluation of the risks and benefits of that outcome.

According to TPB, a person's actual behaviour in performing certain actions is directly influenced by his or her behavioural intention and, in turn, is jointly determined by his or her attitude, subjective norms and perceived behavioural controls toward performing the behaviour [2]. Behavioural intention is a measure of the strength of one's willingness to exert effort while performing certain behaviours.

In this study, Perceived Behavioural control was not tested but the indirect constructs was included in the original TRA model so as to test its effect. . Attitude (A) explains a user's favourable or unfavourable assessment regarding purchasing of the full antivirus. Subjective norm (SN) expresses the perceived social pressure of users who intends to purchase full antivirus software.

The original TRA model is enhanced with two basic constructs (self efficacy and facilitating condition). This is to enable us test the predictive power of Self-Efficacy and Facilitating Condition to users' intention to purchase full antivirus software directly. These two constructs are meant to reflect a person's perception of the ease or difficulty of carrying out a behaviour which are very relevant to the issue at hand. Self efficacy has been used in research work related to security in the past [30].

2.2 *Research Models*

The study investigates intentions to purchase full antivirus software after a free trial using an enhanced Theory of Reasoned Action (TRA). To predict whether a person *intends* to do something, the following needs to be ascertained: whether the person is in support of doing the behavior (**attitude**); what the person thinks significant people to him would want her/him to do (**subjective norm**) [20]. The research question deals with the intention of people to purchase full antivirus software after a free trial. In light of the requirements put forward by [2], a survey questionnaire was utilized.

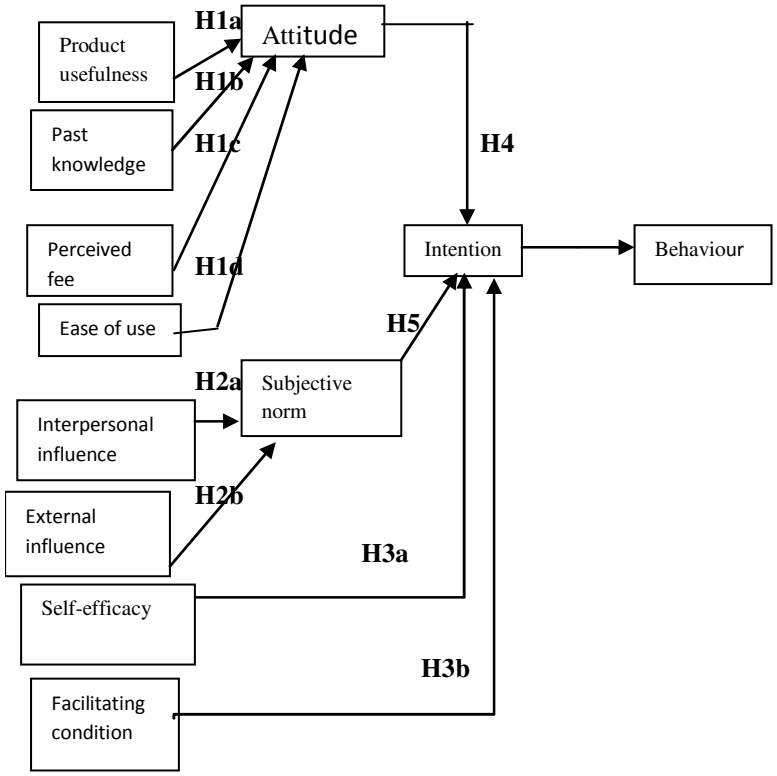

Figure 2.: Hypothesized Enhanced TRA Model

Behavioral beliefs:
H1a: Product usefulness is positively related to attitude toward purchasing a full antivirus software.

H1b: Past knowledge is positively related to Attitude towards purchasing full antivirus software.

H1c: Perceived fee is positively related to Attitude towards purchasing full antivirus software.

H1d: Ease of use is positively related to Attitude towards purchasing full antivirus software. **Normative Belief:**

H2a: Interpersonal influence is positively related to Subjective norm towards purchasing full antivirus software.

H2b: External influence is positively related to Subjective norm towards purchasing full antivirus software.

Control belief:
H3a: Self- efficacy is positively related to Perceived behavioural control towards purchasing full antivirus software.

H3b: Facilitating condition is positively related to perceived behavioural control towards purchasing full antivirus software.

The remaining hypotheses in our model as proposed by the theories and validated by previous studies are:

H4: Attitude is positively related to behavioural intention to purchase full antivirus software.

H5: Subjective norm is positively related to behavioural intention to purchase full antivirus software

3. RESEARCH METHODOLOGY

The study is an empirical one that made use of a quantitative questionnaire to collect the data. As there was no manipulation of any variable, the research is classified as a non-experimental design. Since ICT has taken the major sphere of the world, the questionnaire was administered to people of all sectors, age groups of 18 above. Antivirus software has become a necessity for all phones and computer system, putting this into consideration the questionnaire was not limited to a particular industry. The sample consists of 100 people that has a computer system and receives an income.

3.1 Sampling strategy

The study used a non-probability sampling strategy since participation in the study depends on the availability of participants and willingness to participate in the research study.

3.2 Instrument

The following steps were taken in the construction of the questionnaire for the purposes of the present study.

a) The most commonly perceived advantages and disadvantages of performing the behavior were determined.
b) The most significant people or groups of people who would approve or disapprove of the behavior were identified.
c) The perceived barriers or facilitating features which could make it easier or more difficult to adopt the behavior were identified.
d) As the present study is an Enhanced TRA model, items were included to evaluate all of the constructs

The study made use of a 6-page questionnaire, which included a cover letter explaining the study to potential respondents. The items were constructed using the guidelines specified by Ajzen. The questionnaire consists of 37 items, six of which are demographic questions.

This set of demographic questions provides information about the sample, this included education, occupation, gender, age. Many things were taken into consideration when constructing the questionnaire, the consequences of participant fatigue and response rates. Since the model used was derived from TRA including Self efficacy and Facilitating Condition the guidelines stipulated by Ajzen was incorporated. The questionnaire has 8 measures, namely

- Actual behavior;
- Intention;
- Attitude toward the behaviour;
- Subjective norm;
- Behavioural belief;
- Outcome Evaluation
- Normative belief;
- Control belief

It is necessary to measure all the constructs that are denoted in the model. These measure titles did not appear on the final questionnaire that went out to respondents. Unless otherwise indicated, 7-point Likert type scales and semantic differential scales were used to measure all responses to the items in the questionnaire. The final survey instruments are shown in Table 1 The questionnaire appeared to contain clear and understandable instructions and was relatively easy to understand.

Table 1: Questionnaire items

CONSTRUCT	ITEMS	SOURCE
Product usefulness (PU 1-2)	Purchasing a full antivirus software after a free trial would make my system more robust (better withstand attacks or misuse).	Woon and Kankanhalli (2007),
	The operations on my system will be more secured with the purchase of full antivirus software.	
Ease of use (EU 1-3)	It does not take too long a time to learn to use a full antivirus software.	Wang et al (2012),
	I am likely to purchase an antivirus software that I can control its operation after a free trial.	
	I am likely to purchase a full antivirus software which operation does not slow down the operation of my system after a free trail.	
Perceived fee (PF 1-2)	I will likely purchase a full antivirus software that is affordable after a free trial.	Wang et al (2012),
	I will prefer to purchase full antivirus software online after a free trail.	
CONSTRCT	**ITEM**	**SOURCE**
Past knowledge (PK 1-2)	I feel confident to purchase a full antivirus software online because I am well expose to the internet	
	My previous knowledge of antivirus software are good, so it is very likely I purchase an antivirus software after a free trial.	
External influence (EI 1-3)	Media reports suggest the purchase of full antivirus software after a free trial is a good idea.	Bhattacherjee (2000), Icek ajzen (2002), Wood and Kankanhalli (2007)
	Experts consistently recommend the purchase of full antivirus software after a free trial.	
	Government/professional bodies encourage the purchase of full antivirus software after a free trial.	
Interpersonal influence (II 1-4)	Almost all my peers has purchased a full antivirus software.	Bhattacherjee (2000), Icek ajzen (2002), Wood and Kankanhalli (2007)
	Almost all my co -workers think purchasing a full antivirus software after a free trial is good idea	
	My peers/co-workers/friends/family think we should all purchase a full antivirus software after a free trial on our system.	
	My peers/co-workers/friends/family recommend that I should purchase antivirus software after a free trial.	
CONSTRUCT	**ITEM**	**SOURCE**

Self-efficacy (SE 1-3)	I am capable of purchasing a full antivirus software online after a free trial on my own without the help of others	Icek ajzen (2002), Wood and Kankanhalli (2007)
	Purchasing antivirus software is made easy with ready internet access on ground	
	Purchasing full antivirus software is an easy decision for me due to recent change in technology	
Facilitating condition (FC 1-4)	My organisation/friends/family is ready to purchase a full antivirus software for me after a free trial, on demand for one.	Icek ajzen (2002), Wood and Kankanhalli (2007)
	I am most likely to purchase a full antivirus software whose free trial is longer than 6 month	
	I am most likely to purchase full antivirus software after a free trial from a software developer that has a quantitative and qualitative information about the product online	
	I will most likely purchase an antivirus software from a software developer that has a good website quality	
CONSTRUCT	**ITEM**	**SOURCE**
Attitude (A 1-3)	Purchasing a full antivirus software after a free trial is a good idea	Woon and Kankanhalli (2007), Taylor and Todd (1995)
	Purchasing full antivirus software after a free trial is necessary	
	I like the idea of purchasing a full anti-virus software	
Subjective norm (SN 1-3)	People who influence my decision think I should purchase a full antivirus software.	Icek Ajzen (2002), Woon and Kankanhalli (2007)
	People who are important to me think I should purchase a full antivirus software.	
	People whose opinion I value prefer I purchase an antivirus software.	
Intention (IN 1-3)	I would purchase antivirus software whenever possible.	Icek Ajzen (2002), Woon and Kankanhalli (2007)
	I intend to purchase full antivirus Software to protect critical information on my system	
	I will try to purchase full antivirus software	

4. QUANTITATIVE DATA ANALYSIS

A total of 100 people completed and returned the refined questionnaire. The respondents consisted of 48 females and 52males; 19 of these respondents were between the ages of 18and 24, 45 were between 25 and 34, 26 were between 35 and 39, while 10 were above 40. All of the participants agreed to their present usage of a free trial anti-virus software.

Table 2 Overall Statistics of the Respondents

	N	Minimum	Maximum	Mean	Mode	Median	Std. Deviation	Skewness	Kurtosis
	Statistic	Statistic	Statistic	Statistic	statistics	statistics	Statistic	Statistic	Statistic
PU1	100	1.00	7.00	2.22	1.00	2.00	1.56721	1.811	3.165
PU2	100	1.00	7.00	1.85	1.00	2.00	1.10440	1.956	5.535
EU1	100	1.00	6.00	1.93	1.00	2.00	1.12146	1.499	2.435
EU2	100	1.00	7.00	2.03	1.00	2.00	1.30620	1.775	3.639
EU3	100	1.00	7.00	2.04	1.00	2.00	1.27065	1.612	3.277
PF1	100	1.00	7.00	1.79	1.00	2.00	1.09448	2.552	9.234
PF2	100	1.00	7.00	2.29	1.00[a]	2.00	1.38020	1.484	2.509
PK1	100	1.00	7.00	2.43	2.00	2.00	1.44429	1.159	.927
PK2	100	1.00	7.00	2.37	1.00	2.00	1.35330	1.167	1.594
EI1	100	1.00	7.00	2.54	2.00	2.00	1.25867	.373	-.890
EI2	100	1.00	7.00	2.00	2.00	2.00	1.18918	1.986	5.257
EI3	100	1.00	7.00	2.69	2.00	2.00	1.61242	1.021	.312
II1	100	1.00	7.00	3.12	3.00	3.00	1.91369	.814	-.332
II2	100	1.00	7.00	2.89	2.00	2.00	1.85263	.962	-.096
II3	100	1.00	7.00	2.87	1.00	2.00	1.84585	.824	-.403
II4	100	1.00	7.00	3.54	4.00	4.00	1.76624	.224	-.740
SE1	100	1.00	6.00	2.10	1.00	2.00	1.10554	.989	8.07
SE2	100	1.00	7.00	2.04	1.00	2.00	1.34780	1.795	3.509
SE3	100	1.00	7.00	1.96	1.00	2.00	1.27065	2.156	5.401
FC1	100	1.00	7.00	3.45	4.00	3.50	1.86068	.325	-.754
FC2	100	1.00	7.00	2.90	1.00	3.00	1.63608	.700	-.096
FC3	100	1.00	7.00	2.32	2.00	2.00	1.33242	1.403	2.344
FC4	100	1.00	7.00	2.30	1.00	2.00	1.39624	1.513	2.706
AT1	100	1.00	7.00	1.74	1.00	1.00	1.28409	2.722	8.042
AT2	100	1.00	7.00	2.59	3.00	2.00	1.42910	1.139	1.511
SN1	100	1.00	7.00	2.61	1.00	2.00	1.72267	1.134	.480
SN2	100	1.00	7.00	2.81	2.00	2.00	1.71561	1.012	.277
SN3	100	1.00	7.00	2.63	1.00[a]	2.00	1.68568	1.249	1.002
IN1	100	1.00	7.00	2.19	1.00	2.00	1.36844	1.700	3.320
IN2	100	1.00	7.00	1.89	1.00	1.00	1.20517	1.593	2.776
IN3	100	1.00	7.00	2.04	1.00	2.00	1.51037	2.103	4.190
Valid N (listwise)	100								

4.1 ***Intentions, attitudes and subjective norms***

The response rates to the Intentions, Attitudes and Subjective Norms are shown in Table 3 Ninety per cent (90%) of the respondents has an intention to purchase a full anti-virus software, 78% of the respondents indicated that people who are important to them wants them to purchase a full anti-virus software, 93% of the respondents thinks purchasing a full anti-virus software after a free trial is a good idea and that its necessary, 90% of the respondent are capable of purchasing a full anti-virus software on their own, while 67% are most likely to purchase an antivirus software whose free trial period is longer than 6months

Table 3: Response Rate to Direct Measure Constructs of Actual Behavior

Item	1	2	3	4	5	6	7	mean	S.D
INTENTION									
IN1	36%	35%	16%	7%	2%	1%	3%	2.19	1.36844
IN2	52%	24%	13%	7%	3%	0%	1%	1.89	1.20517
IN3	46%	34%	9%	3%	2%	1%	5%	2.04	1.51037
SUBJECTIVE NORM									
SN1	33%	25%	20%	7%	5%	5%	5%	2.61	1.72267
SN2	25%	27%	23%	8%	7%	4%	6%	2.81	1.71561
SN3	29%	29%	20%	9%	5%	1%	7%	2.63	1.68568
ATTITUDE									
AT1	57%	31%	5%	2%	1%	1%	3%	1.74	1.28409
AT2	25%	27%	28%	13%	1%	3%	3%	2.59	1.42910
SELF EFFICACY									
SE1	36%	33%	20%	8%	2%	1%	0%	2.10	1.10554
SE2	45%	28%	18%	2%	3%	2%	2%	2.04	1.34780
SE3	43%	37%	13%	1%	2%	2%	2%	1.96	1.27065
FACILITATING CONDITION									
FC1	21%	13%	16%	23%	14%	3%	10%	3.45	1.86068
FC2	25%	20%	22%	18%	7%	4%	4%	2.90	1.63608
FC3	30%	35%	20%	9%	2%	2%	2%	2.32	1.33242
FC4	34%	29%	24%	7%	1%	2%	3%	2.30	1.39624

4.2 Behavioral beliefs, Outcome evaluation normative beliefs and Control beliefs

Table 4 displays the response rates to the indirect measures for individual constructs. Ninety five per cent (95%) of the total population believe that purchasing a full anti-virus software will make their system more robust i.e. withstand attacks and misuse and that the operations can be controlled, 96% of this is are ready to purchase a full anti-virus software if affordable, 86% would like to purchase online, 85% has a good knowledge of antivirus software.

Table 4: Indirect Measure for the Model Constructs

Item	1	2	3	4	5	6	7	mean	S.D
Behavioral belief (Attitude)									
PU1	42%	25%	23%	2%	1%	1%	6%	2.22	1.56721
PU2	48%	30%	17%	2%	1%	1%	1%	1.85	1.10440
EU1	45%	34%	12%	6%	1%	2%	0%	1.90	1.10554
EU2	44%	30%	16%	4%	3%	1%	2%	2.03	1.30620
EU3	44%	28%	16%	8%	2%	0%	2%	2.04	1.27065
Outcome Evaluation									
PF1	48%	36%	12%	1%	1%	0%	2%	1.79	1.09448
PF2	33%	33%	20%	6%	5%	0%	3%	2.29	1.38020
PK1	30%	33%	19%	5%	10%	1%	2%	2.43	1.44429
PK2	32%	27%	25%	9%	4%	1%	2%	2.37	1.35330
Normative belief									
EI1	25%	31%	14%	26%	3%	1%	0%	2.54	1.25867
EI2	38%	42%	10%	6%	2%	0%	2%	2.00	1.18918
EI3	25%	33%	16%	12%	5%	6%	3%	2.69	1.61242
II1	24%	18%	27%	12%	2%	6%	11%	3.12	1.91369
II2	26%	28%	17%	11%	4%	6%	8%	2.89	1.85263
II3	30%	21%	21%	8%	5%	10%	5%	2.87	1.84585
II4	17%	13%	18%	25%	12%	8%	7%	3.54	1.76624

5. DATA ANALYSIS AND RESULTS

This section presents the results of the data analysis carried out in this research study. The statistical analysis was performed on the statistical software SPSS. The main objective of this project was to answer the following question: Do the four proposed determinants (i.e. Attitudes, Subjective Norms, Self-Efficacy and Facilitating Condition) significantly predict intentions to purchase? In order to examine this, a questionnaire was piloted and some statistical analyses were carried out, the results of which are provided in this section. In terms of the response rate, of the 120 questionnaire distributed, 100 pieces were collected. According to Francis [21], a sample size of 80 would be acceptable. Some of the data was discarded. Data was entered into the statistical package, SPSS. The distributions of each variable were inspected, and checked for data entry errors by observing whether all responses were in the range represented by the response format. The statistical analysis followed the instructions specified by [2,21].

5.1 Reliability and validity

The models construct were assessed for reliability using Cronbach's alpha. All construct had adequate reliability of at least 0.7.

The items were tested for validity using factor analysis with principal component analysis and varimax rotation. Convergent validity was assessed by checking loadings to see if items for the same construct correlate highly among themselves. Loadings of 0.45-0.54 are considered fair, 0.55-0.62 good, 0.63-0.70 very good, 0.71 and above excellent [13]. Factor analysis yielded seven components with Eigen values above 1. All questions had at least a fair loading on their intended construct

5.2 Psychometrics of the Scales

Item Analysis and Factor Analysis a number of variables were assessed and the reliability of these was each measured. The common measure of internal consistency of a questionnaire is Cronbach's alpha or the alpha coefficient. The range of the alpha coefficient is from 0 to 1. As a rule of thumb an alpha value of 0 .70 or greater is considered acceptable for items to be valid [40]. The reliabilities for each variable are shown in Table 5. As an indication of the reliability of the items used to provide direct measures of attitude, subjective norm and intention, the factor analysis was used to check whether each scale measured a single construct. The items were subjected to principle components factor analysis. The results are reported in Table 6.

Table 5: Items Factor loadings Final Cronbach's alpha Factor analysis

CONSTRUCT	# OF ITEMS	CRONBACH'S ALPHA
Product usefulness (PU)	2	0.939
Ease of use (EU)	3	0.702
Perceived fee (PF)	2	0.836
Past knowledge (PK)	2	0.702
External influence (EI)	3	0.707
Interpersonal Influence (II)	4	0.839
Self-efficacy (SE)	3	0.776
Facilitating condition (FC)	4	0.853
Attitude (AT)	2	0.704
Subjective norm (SN)	3	0.949
Intention (IN)	3	0.892

Table 6: Impact Of Facilitating Condition, Attitude, Subjective Norms, And Intention

	Component						
Items	1	2	3	4	5	6	7
PU1	-.098	**.983**	-.007	.067	.022	-.057	.039
PU3	.035	**.904**	-.149	.290	.220	.013	-.074
EU2	-.087	**.932**	-.172	-.027	-.033	.110	.254
EU3	**.804**	-.015	-.019	-.198	-.069	.333	.437
EU4	**.747**	.204	-.174	-.067	-.271	.496	.127
PF1	**.802**	.210	-.174	.080	-.205	.297	-.028
PF2	**.709**	-.269	-.389	.396	-.004	.336	.052
PK1	**.650**	-.279	-.382	.424	-.130	.352	-.120
PK2	**.888**	-.196	.047	-.243	-.004	.055	.173
EI1	-.177	-.077	**.818**	-.318	.265	.103	.296
EI2	-.273	-.141	**.832**	-.256	.089	.365	.072
EI3	-.438	-.320	**.470**	.393	-.155	-.090	.493
II1	**.675**	-.117	.020	.543	-.045	-.328	.264
II2	**.802**	.145	.337	-.269	.236	-.207	.137
II3	**.805**	-.215	.382	.008	.349	.017	-.139
II4	.486	-.552	.244	**.610**	-.074	.127	.032
SE1	-.222	-.249	-.541	-.389	**.600**	.196	.164
SE2	-.115	-.203	-.515	-.117	**.800**	.135	-.073
SE3	-.072	-.264	-.273	**.637**	.534	.049	.310
FC1	**.476**	.028	-.060	.299	.197	-.697	.168
FC2	**.661**	-.344	-.271	-.492	.265	-.194	.018
FC3	**.840**	.188	-.377	-.298	-.031	-.080	.110
FC4	**.921**	-.205	.059	-.116	.153	-.214	-.074
AT1	-.057	**.967**	.037	.078	.154	.056	.156
AT2	**.654**	.564	.354	.095	.273	-.095	.011
SN1	**.790**	-.193	.456	.078	.195	.033	-.255
SN2	**.702**	.364	.421	.176	.208	.290	-.161
SN3	**.790**	.216	.447	.121	.136	.051	-.297
IN1	**.798**	.040	-.143	-.333	-.232	-.042	.295
IN2	**.891**	.287	-.186	.072	-.081	-.223	-.158
IN3	**.737**	-.184	-.083	-.353	-.459	-.248	-.029

From table 6 it is evident that Facilitating condition, Attitude, subjective norms, and intention scales all load on a single factor.

Taking into account Nunnally [40] criteria for reliability, most of the scales used in this study have been shown to be reliable with Cronbach's alpha values above 0.65. One item was excluded from the product usefulness scale as this increased the Cronbach's alpha positively.

6. STRUCTURAL EQUATION MODELING

The research models were tested by structural equation modelling (SEM) using AMOS with maximum-likelihood estimation. AMOS is a covariance-based approach towards SEM. Covariance-based SEM is best suited for confirmatory research with a sound theory base [22], as in the case of this study. In addition, as the sample size was between the minimum range of 80-100 and the maximum of 120 and the constructs were all reflective, AMOS was also chosen over LISREL (which has larger sample size requirements) and PLS (which is suitable for exploratory research).

Model fit is indicated by multiple indices including the model chi-square (x^2) to degrees of freedom ratio (x^2/df), adjusted goodness of fit index (AGFI), comparative fit index (CFI) and root mean square error of approximation (RMSEA). As the x^2-test is extremely sensitive to sample size [11,22] the x^2/ df (which is less sensitive) is used instead. Acceptable model fit is indicated by values of x^2/df less than 3, AGFI greater than 0.80 [22], CFI greater than 0.90, and RMSEA less than 0.08 for reasonable fit and less than 0.06 for a good model fit [29]. Model testing and refinement was done in a progressive manner. The full research was tested using an Enhanced TRA model as shown in *fig 3, the x²/df* value 2.54 indicated a valid model and the RMSEA value of 0.088 suggested a reasonable fit. The CFI value of (0.924) is acceptable. The model suggested a reasonable fit with the exception of AGFI (0.63) which is below the acceptable level of 0.8. The Enhanced model was tested with all having a direct path to intention, so as to determine whether the non-significant indirect path will load significantly to intention. it was observed that past Knowledge was significant to intention while perceived fee In order to understand the phenomenon, further analysis was performed on different sub-groups of respondents to observe if there were differences in the final model results for the sub-groups. The first group consists of male. The second group consists of females. There were 52 respondents in the male group and 48 in the female group.

load negatively. The Enhanced TRA was able to account for 35% of the variance in intention, 37% of the variance in attitude and 50% of the variance in subjective norm. The Enhanced TRA was able to show that once there are Facilitating Conditions (Motivations) users are more likely to purchase a full antivirus software.

Model goodness-of-fit
x^2 = 129.441
x^2/df =2.54
AGFI= 0.633
CFI=0.924
RMSEA=0.088

*Fig 3 Standardized path coefficient and model fit indices for Enhanced TRA base model. Note: Paths significant at *p<0.01*

Table 7: Enhanced TRA model results for male and female

	All (100)	Male (52)	Female(48)
Goodness of fit			
x²/df	*2.54*	*2.54*	*2.54*
AGFI	*0.633*	*0.633*	*0.633*
CFI	*0.924*	*0.924*	*0.92*
RMSEA	*0.088*	*0.088*	*0.088*
Std regression weights			
PU → A	*0.34*	*0.39*	*0.32*
EU → A	*0.39*	*0.24*	*0.49*
PF → A	*-0.03*	*0.25*	*-0.49*
PK → A	*0.08*	*-0.17*	*0.54*
II → SN	*0.63*	*0.48*	*0.78*
EI → SN	*0.17*	*0.27*	*0.05*
A → IN	*0.18*	*-0.23*	*0.49*
SN → IN	*0.43*	*0.28*	*0.50*
SE → IN	*0.04*	*0.19*	*0.01*
FC → IN	*0.16*	*0.40*	*0.01*
Squared multiple correlations			
AT	*0.37*	*0.38*	*0.53*
IN	*0.35*	*0.41*	*0.56*
SN	*0.50*	*0.40*	*0.65*

p<0.01

It was observed that the interpersonal influence (II) to subjective norms (SN) is not significant for the female group and likewise the external influence (EI) to subjective norm (SN). Past knowledge (PK) to attitude (AT) was not significant for the male group while it was significant for the female group, Self efficacy and facilitating condition was significant to the male group but was not for the female group. This therefore implies that female group needs no influence from any one whosoever to carry out their intention. All the tested hypotheses are valid for the male group except for past Knowledge (which implies that prior knowledge to an act for it to be performed). Further analysis was also performed on other sub-groups of respondents to observe if there were differences in the final model results for the sub-groups. The first group consists of those with low income (<500-10000). The second group consist of high income (10001- 30,001). There were 16 respondents in the low income group and 84 in the high income group.

Table 8: Enhanced TRA model results for low and high income respondents

	All (100)	High income (<500-10,001)	Low income (10,001-30,000)
Goodness of fit			
x^2/df	*2.54*	*2.54*	*2.54*
AGFI	*0.633*	*0.633*	*0.633*
CFI	*0.924*	*0.924*	*0.924*
RMSEA	*0.088*	*0.088*	*0.088*
Std regression weights			
PU → A	*0.34*	*0.45*	*0.27*
EU → A	*0.39*	*0.33*	*0.5*
PF → A	*-0.03*	*-0.06*	*-0.49*
PK → A	*0.08*	*0.09*	*-0.24*
II → SN	*0.63*	*0.63*	*0.60*
EI → SN	*0.17*	*0.18*	*0.15*
A → IN	*0.18*	*0.18*	*-0.06*
SN → IN	*0.43*	*0.69*	*0.63*
SE → IN	*0.04*	*-0.10*	*-0.42*
FC → IN	*0.16*	*-0.38*	*0.08*
Squared multiple correlations			
AT	*0.37*	*0.46*	*0.29*
IN	*0.35*	*0.50*	*0.45*
SN	*0.50*	*0.52*	*0.31*

$p<0.01$

The subgroup tested attitude has a positive path coefficient of 0.18 among the high income earners, but the low income earners loaded negatively with path coefficient of -0.06. The results shown in *table 4.4* indicate that subjective norm still loaded very highly.

7. DISCUSSION

The main aim of this study was to assess whether enhancing TRA with facilitating condition and self efficacy has any effect in explaining users intention to purchase a full antivirus software after free trial, it also aimed to understand the influence of peoples' attitudes, perceptions of social norms and efficacy on their intentions to purchase a full antivirus software after free trial. The result of this research showed:

7.1 Attitudes

Attitude towards purchasing full antivirus software was explained quite alright by both ease of use and product usefulness, perceived fee loaded negatively to attitude, past knowledge was non-significant to attitude but loaded significantly to intention. The significant influence of product usefulness indicates that users strongly believe that purchasing full antivirus software will improve the security of their system.

7.2 Subjective Norms

Subjective norm was both determined by interpersonal influence (II) and eternal influence (EI) for male and for the sample as a whole but II and EI was non-significant for the female group.

7.3 Self-Efficacy & Facilitating Condition

Self-efficacy was showed to be insignificant to intention while Facilitating condition was. This implies that users believe that no extra ability is needed in purchase and usage of an antivirus software and are likely to purchase it if there are motivating factors/provision made available to them.

7.4 Implications

The results of the study showed that intention to purchase full antivirus software after free trial is largely influenced by subjective norm. This implies that if external influence such as media houses, government e.tc could let people understand more the benefit of using antivirus software and the damage that virus could cost, probably more people will be more willing to purchase antivirus software.

The income rate was also tested so as to decide the effect income has on the purchase of full antivirus software as shown in *table 8.* it was observed that high income earners had a positive attitude towards the purchase of full antivirus software while low income earner do not. The reason had been that most full antivirus software is expensive to purchase. Users believe that if the fee could be brought as low as possible the software would be easier for purchase.

8. CONCLUSION

This research investigated the factors influencing the intention to purchase full antivirus software after free trial. As part of the research validation, the study developed a survey instrument to measure the factors that are likely to influence intention. Intention was determined primarily by subjective norm, past knowledge, Facilitating condition and attitude. Self-efficacy did not influence intention although facilitating condition did.

However emphasis should be placed more on subjective norm to influence people purchase of this software. Majority of free Anti-Virus software users has a right attitude toward purchasing it. With the continual increase in malware people now see that the security of their information is based on how secure their systems are (smartphones, Notebooks etc.). This research was able to deduce that Facilitating Condition and Subjective Norm (How people who influence ones decision feels about an action being performed) goes a long way in determine whether the action will be carried out.

The Research showed that 95% of the respondent believes that antivirus software can make their system more robust (System ability to resist change without adapting its initial stable configuration). Base on personal discussion with respondents it was discovered that some respondent have used free antivirus software which ended up changing their system configuration and in fact didn't provide the maximum security from malwares.

As a whole it was discovered that 96% of the respondents were ready to purchase full antivirus software whose free trial provides a secure system and robustness and which is very affordable. 98% of the total Respondent (population) knew the important of antivirus software and were willing to purchase a full version of it. Media houses should be involved in propagating information about virus and antivirus. Antivirus software developer should also enhance their product usefulness and the software should become more user friendly, robust and easy to use. Most of the respondent agreed that if the product is easy to use, they are likely to purchase it. The cost of antivirus software to residents of developing countries should be lower than that of their counterparts in developed countries.

8.1 Direction for Future Work

This research is a preliminary effort towards examining factors that influence intention to purchase full antivirus software after free trial base on a sample size of 100. Further research can be conducted with a large sample size. Although this research was tested with an Enhanced TRA Model (i.e TRA model that included Self-Efficacy and facilitating condition), further research could examine other factors to increase the explanatory power.

8.2 Contribution to Knowledge

This study has been able to identify some factors that influence the purchase of full antivirus software after a free trial within the context of a developing country. These factors will enable software developer to have a grip of the computer users by using social media to advertise their antivirus software and negative consequences that virus can have on computer system. They should also make the user interface of the antivirus software more interactive and friendly.

REFERENCES

[1] Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl, & J. Beckmann (Eds.), Springer series in social psychology (pp. 11-39). Berlin: Springer.

[2] Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179-211.

[3] Ajzen, I. and Driver, B. (1992). Application of the theory of planned behavior to leisure choice. Journal of Leisure Research, 24(3), 207.

[4] Ajzen, I.and Fishbein, M. (1980). Understanding attitudes and predicting social behavior. Englewood Cliffs: Prentice-Hall.

[5] AnolBhattacherjee (2000). Acceptance of E-Commerce Services: The Case of Electronic Brokerages. IEEE Transactions On Systems, Man, And Cybernetics—Part A: Systems And Humans, Vol. 30,pp 411-420

[6] Bandura, A. 1986 Social foundations of thought and action: A social cognitive theory, Prentice-Hall, Englewood Cliffs, New Jersey.

[7] Bandura, A. 1977 "Self-Efficacy: Toward a Unifying Theory of Behavioral Change," Psychology Review (84): 191-215.

[8] Bagozzi, R. P., Davis, F. D., and Warshaw, P. R. (1992). "Development and test of a theory of technological learning and usage". Human Relations, 45(7): 660-686.

[9] Behavioural change models Accessed 2013 :http://sph.bu.edu/otlt/MPH-Modules/SB/SB721-Models/SB721-Models3.html.

[10] BH Consulting (2006). Computer virus and solutions: version 1.0 pp 1-7

[11] Bhattacherjee, A., 2000. Acceptance of e-commerce services: the case of electronic brokerages. IEEE Transactions on Systems, Man, and Cybernetics—Part A: Systems and Humans 30 (4), 411–420.

[12] Chet L. C and Jeffery J.(2012). "Analysing Home PC Security Adoption Behavior" Journal of Computer Information Systems: 20-29.

[13] Comrey. A.I., 1973. A first Course in Factor Analysis. New York, NY: Academic Press.

[14] Cook M., Cambell. .D.T, 1979.Quasi-Experimentation: Design and Analysis issues for Field settings. Boston, MA: Houghton Mifflin.

[15] Cronbach. I., 1951) "Coefficient alpha and internal structure of tests". Psychometrika 16 (3): 297-334

[16] Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. 1989 "User acceptance of computer technology: A comparison of two theoretical models". Management Science, 35: 982-1003.

[17] Eagly, A. H., and Chaiken, S. 1993. The psychology of attitudes. Fort Worth: Harcourt Brace Jovanovich College Publishers.

[18] Fishbein, M., and Ajzen, I. 1975. Belief, attitude, intention, and behavior : An introduction to theory and research. Reading, Mass Don Mills, Ontario: Addison-Wesley.

[19] Fazio, R. H. and Williams, C. J. 1986: Attitude Accessibility as a Moderator of the Attitude-Perception and Attitude-Behavior Relations: An Investigation of the 1984 Presidential Election. Journal of Personality and Social Psychology, 51(3): 505-514.

[20] Francis, J. J., Eccles, M. P., Johnston, M., Walker, A., Grimshaw, J., Foy, R., Kaner, E. F. S., Smith, L., &Bonetti, D. (2004). Constructing questionnaires based on the theory of planned behaviour: a manual for health services researchers. Quality of Life and Management of Living Resources, 2-42.

[21] Gefen, D., Straub, D.W., Boudreau, M., 2000. Structural equation modelling and regression: guidelines for research practice. Communications of AIS 4 (7), 1–77.

[22] K.L. (2003). The theory of reasoned action. In J.P. Dillard & M. Pfau (Eds.), The persuasion handbook: Developments in theory and practice (pp. 259 – 286). Thousand Oaks, CA: Sage.

[23] Hemphill, J.F., & Howell, A.J. (2000). Adolescent offenders and stages of change. Psychological Assessment, 12, 371-380.

[24] Hale, J. L., Householder, B.J., & Greene,

[25] http://en.wikipedia.org/wiki/Technology_acceptance_model

[26] http://en.wikipedia.org/wiki/Robustness

[27] http://www.referenceforbusiness.com/encyclopedia/Clo-Con/Computer-Security.html#ixzz3G0a9xbg8

[28] Hu, L., Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structural analysis: conventional criteria versus new alternatives. Structural Equation Modelling 6 (1), 1–55.

[29] Hyeun-Suk Rhee Cheongtag Kim, Young U. Ryu (2009) Self-efficacy in information security: Its influence on end users' information security practice behavior. comp u t e r s & s e c u r i t y 2 8 pp. 8 1 6 – 8 2 6.

[30] Irene M.Y.Woon, Atreyi K. (2007). Investigation of IS profesionals' intention to practice-secure development of applications: International .Journal of .Human-computer studies 65 (2007) 29-41.

[31] Jones, J. W. "Personality and epistemology (1989): Cognitive social learning theory as a philosophy of science," Zygon (24:1), pp. 23-38.

[32] Lippke, S., &Plotnikoff, R.C. (2006). Stages of change in physical exercise: A test of stage discrimination and non-linearity. American journal of Health Behavior, 30, 290-301.

[33] Lou S. and Kathryn C. D. (2009). Higher education students' attitudes towards ICT-based learning interactions using the theory of planned behavior (TPB): Proceedings ascilite Auckland 2009

[34] Montano, D.andKasprzyk, D. (2002). The Theory of Resaoned Action and The Theory of Planned Behavior. In K. Glanz, B. K. Rimer& F. M. Lewis (Eds.), Health Behavior and Health Education: Theory, Research, and Practice (3rd ed., pp. 67- 96). San Francisco: Jossey-Bass.

[35] McAfee Avert Labs, (2009). McAfee Threats Report: First Quarter 2009, Retrieved April 10, 2010, from http:// resources.mcafee.com/content/AvertReportQ109.

[36] Mathieson, k. (1991). Predicting User Intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behavior, Information systems Research 2(3), 173-191.

[37] McConnaughy, E.A.; Diclemente, C.C., Prochaska, J.O., &Velicer W.F. (1989). Stages of change in Psychotherapy: a follow-up report. Psychotherapy: Theory, Research and Practice 26, 494-503.

[38] Nancy B. Kurland (1995). Ethical Intentions and The Theories Of Reasoned Action and Planned Behavior, Journal of Applied Social Psychology, 25:4, 297-313

[39] Nunnally, J. C. (1978). Psychometric theory. New York: McGraw-Hill.

[40] Pahnila, S., Siponen, M., & Mahmood, A. (2007). Employees' behavior towards IS security policy compliance. In System sciences, 2007. HICSS 2007. 40Th annual Hawaii international conference on.

[41] Reimenschneider, C. and McKinney, V. (2002). Assessing Belief differences in small business adopters and non-adopters of web-based E-commerce, Journal of computer Information Systems 42(2), 101-107.

[42] Ritu A. and Jayesh P. (2000). A Field Study of the Adoption of Software Process Innovations by Information Systems Professionals: IEEE Transactions On Engineering Management, Vol. 47, No. 3, August 2000 (pp 295-308)

[43] Siragusa, L., Dixon, K.C (2009). Theory of planned behavior: higher education students' attitudes towards ICT-based learning interactions, Proceedings ascilite Auckland,2009, 969-980.

[44] Taylor S., Todd .P.A., (1995). Understanding information technology usage a test of computing models. Information systems Research 6 (2), 144-176.

[45] Ting Wang ,Lih-Bin Oh ,Kanliang Wang ,Yufei Yuan (2012). User adoption and purchasing intention after free trial: an empirical study of mobile newspapers.

[46] U.S. Census Bureau, (2007), Computer and Internet Use in the United States: October 2007, Population Division, Education & Social Stratification Branch.

[47] Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425-478.

[48] Vinod, P.; Jaipur, R.; Laxmi, V. & Gaur, M. (2009). "Survey on Malware Detection Methods", Hack. 74.

[49] Wilson, C. (2005). Computer attack and cyber terrorism: Vulnerabilities and policy issues for congress. Federation of American Scientists, Washington DC.

[50] Wixom, B. H., & Todd, P. A. (2005). A theoretical integration of user satisfaction and technology acceptance. Information Systems Research, 16(1), 85-102