



***Factors Influencing ICT Applications Usage among
Undergraduate Students in Somalia
and Their Level of Skills.***

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Abstract

ICT applications have become more popular in the field of education with a large broad range of users, including students from all levels of education. The study investigates the interrelationship among perceived usefulness, ease of use, cost-effectiveness, pressure, student's perception, and ICT applications use. The Technology Acceptance Model, Transaction Cost Economics and Theory of Reasoned Action were used to develop a research model. This study used a cross-sectional and cluster sampling technique, with sample size 382 undergraduate students from three universities in Mogadishu – Somalia using electronic data collection such as Kobo collect. Data analyzed using structural equation

modeling [SEM]. The results could help students to take benefit from different ICT applications and suggests the Minister of Education ,Cualture and Higher Education should include ICT subject in the curriculum at the levels of the secondary and the primary education.

Keywords: Usefulness, Ease Of Use, Cost-Effectiveness, Pressure, Students' Perception, TAM, TRA, TCE

Introduction

Students use different programs or apps on their computers and mobile devices (Domingo & Garganté, 2016). Students use the computer and mobile devices to complete homework, assignments, and pay bills to edit digital photos, post social media updates, and play games. They also use an antivirus program. Using ICT application, you can accomplish a variety of tasks on computers and mobile devices. An operating system is another kind of software that enables users to use applications such as a browser or word processing on a desktop or laptop(Shelly & Vermaat, 2011).

The use of technology has been changed society today as much as the industrial revolution changed society in the eighteenth and nineteenth centuries. People interact directly with computers in fields such as education, finance, government, health care, science, publishing, travel, and manufacturing. More than 70 percent of colleges offer distance learning classes(Shelly & Vermaat, 2011).

There are various types of ICT applications used by students such as:

- Productivity business and personal: these applications help the user in becoming more effective and efficient while performing daily activities at work school and home such software are (Word processing, Presentation, Spreadsheet, database, note-taking, calendar, project management and so on).
- Graphics and Media are software that is designed for the specific field of work such as power users such as engineers, architects, desktop publishers and graphic designers (Computer-aided design (CAD), desktop publishing, video, and audio editing, multimedia and website authoring and so on).
- Personal interest (lifestyle, medical, education, entertainment, and convenience).
- Communication apps (Blog, browser, chat room, email, file transfer, internet phone, mobile messaging, videoconference, and web feeds).
- Security: To protect your computers and mobile devices you can use one or more security tools such as (Personal firewall, antivirus, malware removers, and internet filters).
- File, disk, and system management (File manager, search, Image viewer, disk defragmenter, file compression disk cleanup, Uninstaller, screen saver, backup and restore, and PC maintenance).

ICT applications are available in a variety of forms such as retail, custom, web app, mobile app, mobile web app, shareware, freeware, open-source and public domain.

Retail software is copyrighted software and available for a single user or a company such as an operating system.

Custom software: is software that performs function specific to a business or industry.

Web app: is an application stored on a web server that you access through a browser.

Mobile app: are applications that you can download from app stores, sometimes called a marketplace.

Shareware is copyrighted software that is distributed at no cost for a trial period.

Freeware as the name suggests these are software at no cost by individuals or companies but it's copyrighted.

Open-source software: is software that allows users for alteration and redistribution.

Public – domain software has been donated for public use and has no copyright restrictions. Anyone can copy or distribute public-domain software to others at no cost.

Thousands of shareware, freeware, and public – domain programs are available on the internet for users to download. Examples include communications, graphics, and game programs.

Faculty of economics are incrementally becoming technology more dependent the major of students are expected to increase their skills information and communication technology (ICT). The term ICT

applications are referred to as a program created to make individuals more productive and help them with personal tasks(Shelly & Vermaat, 2011). The use of ICT means using personal computers which involves the ownership, type of computers, ICT skills, type ICT application uses and internet uses. Watson examined the role of ICT on students' learning and found that the youth committed to their job was developed by the use of IT. According to (Tcheeko & Ntah, 2005)there are four reasons for ICT application use and adaption which are cost-effectiveness, human resource capability, social acceptance, and service delivery.

Besides, there are empirical researches that have investigated Types of ICT applications used and the skills' level of nursing students in higher education(Harerimana & Mtshali, 2019).

Lack of empirical study in the factors affecting ICT usage among faculty of economic students. This study exam the interrelationships between usefulness, ease of use, cost of effectiveness, pressure from university, privacy, student's attitude towards ICT, and continuance usage of ICT applications. In this study, the researcher used two theories Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) both theories play an important role in making conceptual model and hypotheses. The main objective of this study is to explore the parameters which have influence the ICT applications to students of the economic department finally generalize the output for all students. In this study, the researcher needs to answer two research questions which are *(1) to what extent the level skills of ICT applications (2) What are the*

factors affecting the use of ICT applications by the faculty of economics students.

Theoretical framework, hypotheses, and conceptual model

In this section, the researcher proposes the theoretical framework and hypotheses related to the subject of a student's perception of ICT application use. The main reason for the people accepted the technology or ICT applications are perceived ease of use, benefits, cost-effectiveness, pressure from the institute and perception towards ICT use (Agichtein, Castillo, Donato, Gionis, & Mishne, 2008; Zhang, Wang, de Pablos, Tang, & Yan, 2015).

The researcher used theories such as the technology acceptance model, transaction cost economics, and the theory of planned behavior to explain the factors affecting ICT application usage.

Technology Acceptance Model

In 1989, Davis explored TAM theory to determine the technology use behavior, the main objective of Davis is to indicate that TAM is the general acceptance of technology use. The basic TAM theory included two basic beliefs such as perceived usefulness (PU) and Perceived Ease of Use (PEU) (Lai, 2017). Technology acceptance theory encourages that individuals use actual systems from emerging (1) perceived usefulness and (2) perceived ease of use (3) intention to use (4) actual system (Venkatesh, Morris, Davis, & Davis, 2003). TAM model investigated the relation among socio-demographic (such as education, age, and previous experience with technology), financial (such as

perceived benefit), and competitive factors (such as trialability or technical support) (Pierpaoli et al., 2013).

Perceived of benefit

Perceived usefulness is to what extent that the person trusts that using a special technology will improve his/her performance (Davis, 1989). Perceived usefulness is directly impacted by perceived ease of use. A study conducted by Huang & Chen, (2010) that perceived ease of use of application software can positively predict perceived usefulness by students and perceived benefits is the key factor for students' willingness to be directed through a system 's learning process.

Perceived ease of use

Several studies indicated that the main reason people adopted technology is perceived ease of use free more effort to understand. According to (Davis, 1989) defined perceived ease of use is to what extent that a person believes that using new technology will be free from effort. The number of ICT applications is increasing among the students due to ease of use (Li, Zhao, Xu, & Pu, 2020).

Transaction cost economics

Transaction cost economics proposes that the cost acquired in making an economic exchange. Several of coordination costs exist such as; (1) search and information costs. (2) Bargaining costs. (3) Policy and enforcement costs. Search and information costs are the costs in determining that the required good is available on the market who has the lowest price. Bargaining costs are the costs needed to come to an

acceptable agreement with other parties to the transaction. Policy and enforcement costs are the costs of making sure the other party sticks to the terms of the contract. Transaction cost theory explains that the total cost incurred by a firm can group two large components such as transaction cost and production.

The theory appears primarily in the field of economics (McIvor, 2009; Tadelis & Williamson, 2012; Williamson, 2019), but later was applied in the field of technology (Aubert, Rivard, & Patry, 2004; Singh & Teng, 2016; Susarla, Barua, & Whinston, 2009).

The perceived cost of effectiveness

The majority of application software companies such as Microsoft, Mendeley, Autodesk and so on offers the students and scholars with no cost application software. For example, Microsoft Office in Education offers free student access to their incredibly powerful office 365 services. The Mendeley Desktop is a reference manager which provides web, desktop, and mobile version to the students and academic researchers with no cost (Patak, Naim, & Hidayat, 2016). Application software needs to complete functionality, availability within the right timeframe, and reasonable price (Steven & Peterson, n.d.).

Pressure from university

Application software is the software that enables or tells users to accomplish a specific task, so most of the universities in Somalia include each faculty with the subject of application software which means that students should understand basic skills related to the computer. Faculty

economics and management science is the one the faculties that are compulsory to their students to study the course of computer application.

Information privacy

Personal information means any information such as ID, name, phone number, home address, email address, license number, physical characteristics (facial dimensions, fingerprints or handwriting), credit card number, and family relationship.

Privacy is the right to the personal information to be protected rather than personal information itself(Mai, 2016). There are five methods to explore the right to privacy such as the right to get the reward for the value of one's information, the right to be free from unwanted access (e.g. Physical access, access via short messaging service), the right to have personal information expressed accurately and correctly (integrity), the right not to allow personal information to be used in an unwanted way (e.g. sale of information, exposure of information matching) and the right not to allow personal information to be collected by others without one's knowledge and consent (e.g. through the use of CCTV and cookies)(Chen, 2016). Information privacy is the ability of a user to personally control information about one's self (Sarikakis & Winter, 2017).

The majority of application software such as word processing, PowerPoint, and Excel allows users to set a password to protect their documents, but the problem is most of the students are lack of awareness how simply hackers can steal their data or documents.

Theory of Reasonable Action

The theory of reasoned action is one of the famous theories used about one factor that determines the behavioral intention of the person's perception towards that behavior. Attitude toward the behavior is defined as the individual's positive or negative feelings about performing a behavior. It's determined through an assessment of none's beliefs(Hill, Fishbein, & Ajzen, 1977).

Students' perception of ICT use

According to (Attard & Holmes, 2020) the students identified that application software comes with five different impacts such as providing new methods to learn, increasing engagement to learning, fostering autonomous learning. Facilitating access to information and promoting collaborative learning. Increase communication between pupils and teachers in the classroom(Boticki, Baksa, Seow, & Looi, 2015). Several studies have shown the majority of students believe that application software plays an important role in their academic performance(Boticki et al., 2015; Mallernee, 2018)

ICT application usage

The majority of the students use many ICT applications such as MS Word for writing documents, creating and sending email applications, social media applications (Facebook, WhatsApp, Imo, and so on) (Harerimana & Mtshali, 2019). ICT application has changed the academic performance for the students with an increase in their performance of learning(Oye, Iahad, Madar, & Rahim, 2012).

In this study the researcher will investigate the six hypotheses below:

Hypothesis 1. There is a relationship between usefulness and the student's perception of ICT use.

Hypothesis 2. Ease of use has an impact on the student's perception of ICT use.

The first two hypotheses have been derived from TAM (Venkatesh et al., 2003)

Hypothesis 3. There is a relationship between perceived cost-effectiveness and student's perception towards ICT use

Hypothesis 4. There is a relationship between information privacy and the student's perception of ICT use.

Hypothesis 5. There is a relationship between pressure and the student's perception of ICT use.

Hypothesis 6. There is a relationship between student' attitude an ICT application usage

Hypothesis six is related to the Theory of Reasoned Action (Ajzen, 1988). The use of ICT applications will be effect by the student's attitude and belief about the value of ICT and the perception of him or her to enhance their knowledge.

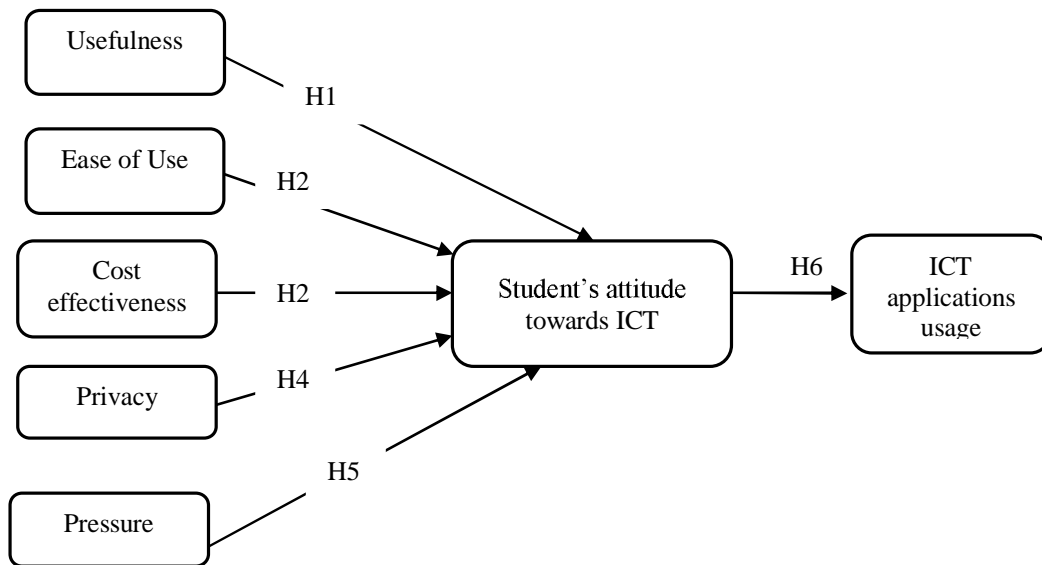


Fig1. Proposed model

Method

The researcher proposed six hypotheses in Fig 1 and tested the hypotheses, the study was mainly concerned with the factors to influence the use of ICT applications.

Sample and procedure

The population of this study was a public and private university in Somalia special Mogadishu city, because of Mogadishu is one of the densely populated cities in Somalia with 2.45 million people residing within 35 squares miles (91km²). According to the Heritage Studies(2013), over 50,000 students are enrolled at higher education institutes 49% of these students are enrolled at universities in South-central, 35% in Somaliland, and 16% in Puntland. The majority of these students are

enrolled in the faculties of information technology and business administration, approximately 44% of students are registered in different information technology (IT), business administration, and social science. In this study, the population is undergraduate students of four faculties: Information technology, business, social science, and health science. The procedure of this study is a cluster sampling technique, cluster sampling which means that the researcher divides the population into separated groups, called clusters then the sample random is selected from the population (Taherdoost & Group, 2016).

Research instrument and response rate

A questionnaire survey was developed as an instrument for data collection. The variables used for perceived usefulness (PU), perceived ease of use (PEU), cost-effectiveness, information privacy, and pressure from the university, student's attitude, and ICT application usage. Five-points of Likert scale were used for those variables where 5 represented strongly agree and 1 represented strongly disagree. Data collected through an online survey was developed and administered using Kobo Collect, the student is requested to fill the questionnaire using their Smartphones and laptops it took more than 5 mints to complete the survey. The study used SEM (Structure Equation Modeling) for confirmatory factor analysis. The reliability and validity of the study were adapted and above 0.8 and 0.7 respectively. Several studies show the construct reliability and validity should greater 0.6 and 0.7 (Hafiz & Shaari, 2013; Joe F. Hair, Sarstedt, Ringle, & Mena, 2012; Mercer & Murphy, 2008).

After the data has been collected from the respondents, editing of the data was undertaken to confirm the completeness and consistency of the data (Sekaran, 2003; Zikmund, 2006). According to this study over 450 students requested to fill the questionnaire but 382 students were suitable for this study. The researcher requested the student complete the questionnaire for home or before the class began.

Data analysis

The data were analyzed using IBM SPSS- Amos [International Business Machine, Statistics Package for Social Science – Analysis of Moment Structure] and Excel spreadsheet, three steps followed to analysis the data collected: The first step for data analysis entitled the characteristics of respondents where descriptive analysis applied special using frequency and percentage. The second step means and standard deviation used to explain the level of ICT application skills by the students. In the third step, factor analysis was employed and structural equation modeling was worked to confirm the model fit. The last step regression used to test the six hypotheses in the study.

Properties of measure

To check the normal distribution of the data, this study used the absolute values of skewness and kurtosis. The skewness ranged from $-.059$ to 0.392 and kurtosis $-.016$ to 2.532 . Regarding kline's (2011) should be (skewness < 3 ; kurtosis < 8).

Results

The study conducted by four faculties, the population of the study was 450. The sample size of the study was calculated by the level of confidence 95% and 5% of margin error.

Characteristics of participants

Table 1 indicates the characteristics of the respondents. Several males participate in this study made up of 75.9% of the sample while the number of females made up 24.1%. The majority of the respondents were the age group between 20 – 29 years (82.7%) this indicates that most of the students are undergraduate, less than 20 years (11.5%), and final between the ages 30 – 39 years (5.8%). The major of the students their mode of attendance was fulltime 81.4% and the lower percentage was part-time 18.6%. The majority of participants have experience in using computers between 2 – 4 years (88.5%) indicates the majority of the students start using computers at the level of the university, between 5 – 6 years (5.2%) and less than 1 year (4.7%). The majority of students receive their course materials by soft and hard copies (71.5%), hard copy (18.3%), and soft copy (10.2%). The majority of the students identified that their university doesn't offer lab with computers (61.8%), sometimes (31.4%) and 6.8% their university offer a Lab. 69.1% of the students indicated their university does not offer a lab with computers and internet, where few students identified their university offer computer lab and internet. The majority of the students indicated their university does not offer e-library resources were few students identified that they offer. The majority of the students have no desktop computers were 88.5% answered no and 11.5% answered yes. 89.3% have a laptop and 10.7

have no. 81.7 have a tablet and 18.4% have a tablet. 94.2% have a smartphone and 5.8% few students. 53.9 of the students identified that their teacher allows using a personal device such as a tablet, smartphone, and laptop, 41.9 sometimes were few identified does not allow.

Table 1: profile data

Characteristics	Items	Frequency(n)	Percentage (%)
Gender	Male	290	75.9
	Female	92	24.1
Age group	Less than 20	44	11.5
	20 – 29	316	82.7
	30 – 39	22	5.8
Mode of attendance	Fulltime	311	81.4
	Part time	71	18.6
Experience in using computers	Less than 1 year	18	4.7
	2 – 4 years	338	88.5
	5 – 6 years	20	5.2
	Above 6 years	6	1.6
Method for receiving course materials	Soft copy	39	10.2
	Hard copy	70	18.3
	Both soft and hard copies	273	71.5
Has the university provided you a lab with computers?	No	236	61.8
	Sometimes	120	31.4
	Yes	26	6.8
Has the university provided you a lab	No	264	69.1
	Sometimes	111	29.1

Characteristics	Items	Frequency(n)	Percentage (%)
with computers and the internet to practice the lessons?	Yes	7	1.8
	No	241	63.1
Does your university have an e-library resource?	Yes	141	36.9
	No	338	88.5
Do you have a desktop computer?	Yes	44	11.5
	No	41	10.7
Do you have a laptop?	Yes	341	89.3
	No	312	81.7
Do you have a tablet?	Yes	70	18.4
	No	22	5.8
Do you have a smartphone	Yes	360	94.2
	No	16	4.2
Does your teacher allow you to use personal devices?	Sometimes	160	41.9
	Yes	206	53.9
	No	16	4.2

The table1 used descriptive analysis with frequency and percentage Level of ICT applications skills by the students

This study indicates the majority of the student has various levels and competence in using ICT applications. To measure the level of competence of the student, the researcher scaled the questions as (1= none, 2= A little, 3= somewhat, 4= A lot). Participating in social networks such as Facebook, WhatsApp, Imo, etc. (3.42 ± 1.03).

Participate in social networks (Facebook, WhatsApp, Imo, etc) (73.8%, $n = 282$). Capture and edit digital photos, movies or other graphics (72.5%, $n = 277$). Using a browser for web surfing (72.0%, $n = 275$). Installing the software on the computer (69.1%, $n = 264$). Edit text online containing internet links and images (68.3%, $n = 261$). Create a presentation with video or audio clips (64.4%, $n = 246$). Use emails to communicate with others (67.1%, $n = 256$). Edit text online containing internet links and images (68.3%, $n = 261$). Download and install software on a computer (61.5%, $n = 235$). Create a presentation with simple animation functions (64.4%, $n = 246$). Use a spreadsheet (40.3%, $n = 154$). Produce text using Ms word program (26.2%, $n = 100$). 52.6%, $n = 201$ have a little knowledge of producing text and using Ms- word program. Participating in a discussion forum on the Internet (25.7%, $n = 96$). Edit a questionnaire online has a little (86.4%, $n = 330$). Using Photoshop, Flash for creating graphics (22.3%, $n = 85$). Create and maintain blogs or websites (22.3%, $n = 85$). Create a database (21.5%, $n = 82$). Video/audio software for creating and editing movies and audio (15.4%, $n = 59$). Registering and participating in online training programs have no knowledge (59.2%, $n = 226$). Using SPSS for data analysis does not know (59.7%, $n = 228$). Using e-library resources of the university to complete a class assignment (12.6%, $n = 48$). Using Turnitin for plagiarisms checker (5.5%, $n = 21$). Using Mendeley as a reference manager software (4.2%, $n = 16$).

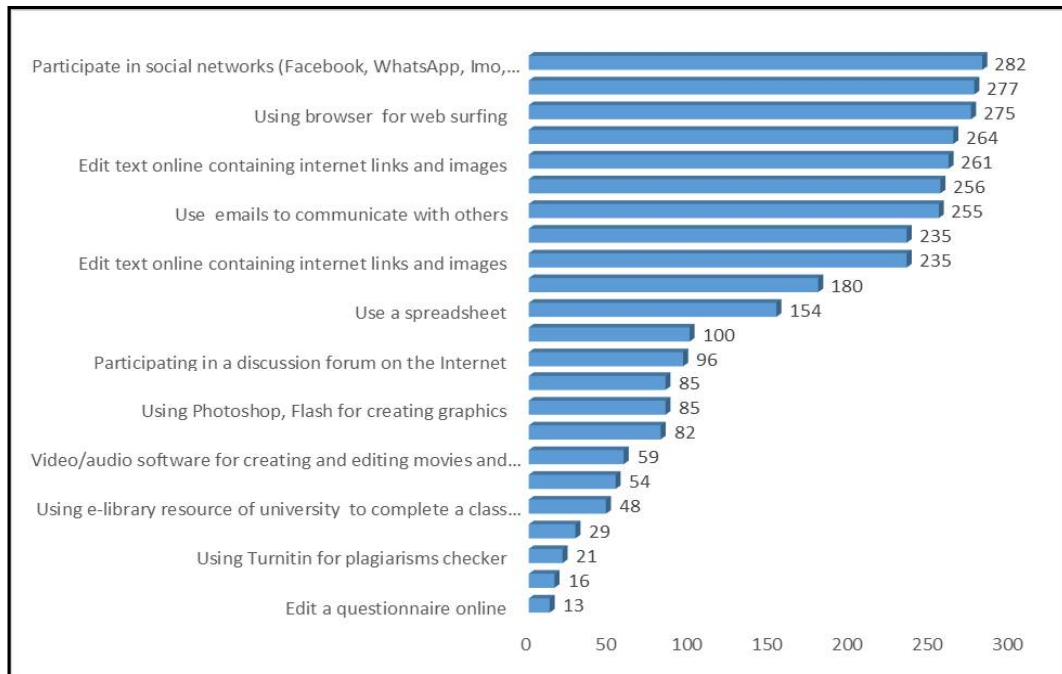


Fig. 2 Level of ICT applications

Reliability and validity

Structural equation modeling was employed to assess the relationship between theories. Structural equation modeling is a multivariate statistical analysis method that is used to analyze the structural relationship. Structural equation modeling [SEM] is also called casual modeling because it examines the suggested casual relationships (Byrne, 2013). Most of the researchers prefer between 200 to 400 sample sizes with 10 to 15 indicators, in this study the sample size was 382 with the 37 items to confirm the hypotheses. There are two types of models: measurement model and structural model in the structural model represents the theory that shows how a hypothesis is related to another

hypothesis in the measurement model represents the theory that specifies how measured variables come together to represent the theory (Johnston, 2014).

In this study, confirmatory factor analysis [CFA] was applied to detect the interrelationship between observed variables and latent variables. The researcher must address two important aspects of a measure: validity and reliability (Byrne, 2001) and (Sparkman, Hair, Anderson, Tatham, & Grablosky, 1979). The validity of data is referred as the degree to which the findings truly represent the phenomenon you are claiming to measure in other words the validity is a solid claim according to Joseph F; Hair, Black, Babin, & Anderson (2010) describe the validity as the extent to which a measure or set of measures correctly represents the concept of the study. There are three major types of validity such as construct validity, external validity, and criterion validity, in this study the construct validity was examined both convergent and discriminant validity. Table 2. Shows the range of standardized loadings between 0.64 and 0.90. Regarding (Sparkman et al., 1979) with a factor of loading should be 0.50 or greater thus establishing convergent validity, further average variance extracted (AVE) in this study are between 0.527 and 0.74. According to (Fornell & Larcker, 1981a) the AVE should be 0.5 or greater than. The AVE was used to supporting convergent validity. Besides structural equation modeling, the reliability of the data is defined as the degree of measurement error present in any measure or the degree to which the research method produces stable and consistent results (Hafiz & Shaari, 2013). The construct reliability (CR) and Cronbach alpha are comparable to all

variables that were above 0.850. The construct reliability should be greater than 0.7 (J. Hair, Black, Babin, & Anderson, 2010). All square mean correlation (SMC) are greater or equal to 0.522. According to (Bollen, 1989) square mean correlation or (R^2) must be at least 0.4. The discriminant validity the maximum shared square variance (MSV) should be less than to average variance extracted (AVE) (Fornell & Larcker, 1981b). The study all MSV is less AVE.

Table 2. Confirmatory factor analysis results

Construct	Items	Loadings	SMC	CR	AVE	MSV	Alpha
Perceived Usefulness	PU1	0.64	0.74				
	PU2	0.86	0.61				
	PU3	0.78	0.59	0.910	0.592	0.298	0.911
	PU4	0.77	0.64				
	PU5	0.80	0.69				
	PU6	0.83	0.48				
	PU7	0.69	0.58				
Perceived Ease of Use	PE1	0.73	0.57				
	PE2	0.75	0.49				
	PE3	0.70	0.51	0.817	0.527	0.181	0.816
	PE4	0.72	0.65				
Cost-effectiveness	CE1	0.81	0.72				
	CE2	0.85	0.82				
	CE3	0.90	0.76	0.934	0.741	0.181	0.932

Construct	Items	Loadings	SMC	CR	AVE	MSV	Alpha
	CE4	0.87	0.75				
	CE5	0.86	0.68				
Pressure	P1	0.82	0.81				
	P2	0.90	0.77				
	P3	0.88	0.79				
	P4	0.89	0.62	0.942	0.701	0.354	0.943
	P5	0.85	0.52				
	P6	0.78	0.52				
	P7	0.72	0.58				
Privacy purpose	PP1	0.76	0.77				
	PP2	0.88	0.72				
	PP3	0.86	0.77	0.926	0.678	0.298	0.927
	PP4	0.88	0.61				
	PP5	0.78	0.59				
	PP6	0.76	0.61				
Student's perception	SP1	0.78	0.60				
	SP2	0.75	0.56				
	SP3	0.77	0.60	0.850	0.586	0.515	0.847
	SP4	0.76	0.57				
Continuance usage	CU1	0.81	0.65				
	CU2	0.82	0.67				
	CU3	0.80	0.64	0.899	0.691	0.515	0.845
	CU4	0.87	0.76				

All factor loadings are significance at $p < 0.001$ SMC; Square Mean Correlation; CR = Construct reliability; AVE = Average Variance Extracted

The discriminant validity investigates the pattern structure coefficient to determine whether factors in measurement models are empirically unique(Sinn, 1997). Table 3. Indicates that discriminant validity is determined the square – root of average variance extracted [AVE]. The correlation among the study variables is presented in the lower off-diagonal (Fornell & Larcker, 1981a).

Table3. Descriptive statistics and discriminant validity test result.

	Mean	SD	PU	PE	CE	P	PP	SP	CU
Perceived Usefulness(PU)	2.902	0.731	0.769						
Perceived Ease of Use (PE)	2.772	0.794	0.404	0.726					
Cost effectiveness (CE)	2.291	0.801	0.409	0.426	0.861				
Pressure from university (P)	4.025	0.604	0.370	0.315	0.240	0.838			
Privacy purpose (PP)	3.537	0.771	0.546	0.3150	0.238	0.512	0.823		
Student's perception (SP)	3.967	0.546	0.422	0.293	0.233	0.595	0.529	0.765	
Continuance usage (CU)	3.815	0.644	0.279	0.181	0.233	0.557	0.402	0.717	0.831

Hypothesis testing result

Hypothesis 1. Proposes that there is a positive relationship between perceived usefulness and student's attitude toward ICT usage. ($\beta = 0.275, p < 0.001, t = 7.715$). Hypothesis 1. Accepted and suggests that the students have more benefits using ICT applications in the classroom or outside of the classroom and simple they can work their assignments in quickly with help application software such as word processing. This supports previous studies (FoAleksander Aristovnik Damijana Keržič Nina Tomažević Lan Umek & Article, 2016; Harerimana & Mtshali, 2019; Yang, Li, & Lu, 2015). The study found that the students have more useful using ICT applications and they need to enhance their knowledge for application software.

Hypothesis 2. Identifies that there is a relationship between perceived ease of use and student's attitude toward ICT usage ($\beta = 0.169, p < 0.001, t = 4.396$). The hypothesis 2 indicates that the majority of the students suggested using ICT applications are more ease and friendly use no complexity, with the simplicity of these applications the students are likely to learn more about of this software, this supports with the prior studies (Attard & Holmes, 2020; Teo & Noyes, 2011; Terzis & Economides, 2011). The study found that using and learning ICT applications is ease according to the student's perception.

Hypothesis 3. It indicates that there is a relationship between perceived cost-effectiveness and the student's attitude toward ICT usage ($\beta = 0.145, p < 0.001, t = 4.255$). Thus supporting hypothesis 3. The majority of the students identified that they receive application

software with no cost means free, this emphasis some of the application software companies offer the student free application such Microsoft, Autodesk, Mendeley and so on, with support of previous studies(Chang et al., 2012; Danner & Pessu, 2013; Perbawaningsih, 2013; Umar & Jalil, 2012). The study found that the application software is available to the students with no cost or less cost.

Hypothesis 4. Shows that there is pressure is positively related to student's attitude toward ICT usage($\beta = 0.528, p < 0.001, t = 12.104$). supporting hypothesis 4. The course of computer application & IT are required to the students of the faculties IT, business administration, social science, and nursing, this supports the previous studies(Clark, Austin, & Craike, 2015; Moghaddam & Khatoon-abadi, 2013; Sampath Kumar & Biradar, 2010; Sarkar, 2012; Yunus, 2007). The study found the majority of the universities include the course of ICT application.

Hypothesis 5. Privacy is positively related to student's attitudes toward ICT usage($\beta = 0.474, p < 0.001, t = 10.500$). Thus supporting the hypothesis 5. This proposes that the students who have left their application software without a password are more likely to have fallen victim to information stolen information. This supports previous studies(Hoffmann, 2012; Jeilani, 2018; Mohamed & Ahmad, 2012).

Hypothesis 6. Student's perception is positively related to ICT application usage($\beta = 0.640, p < 0.001, t = 16.237$) supporting the hypothesis6. Suggests the majority of the students have a positive attitude towards the use of ICT applications, this support with the previous studies (Ashaari, Judi, Mohamed, & Tengku Wook, 2011; Oye et al.,

2012; Whiting & Williams, 2013). The study found that the majority of student's beliefs using ICT applications enhance their academic performance.

Table4. Summary of research hypotheses

Hypothesis	Results
H1: There is a relationship between usefulness and the student's perception of ICT use.	Accepted
H2: Ease of use has an impact on the student's perception of ICT use.	Accepted
H3: There is a relationship between perceived cost-effectiveness and the student's perception of ICT use.	Accepted
H4: There is a relationship between information privacy and the student's perception of ICT use.	Accepted
H5: There is a relationship between pressure and student's perception of ICT use.	Accepted
H6: There is a relationship between student' attitude an ICT application usage	Accepted

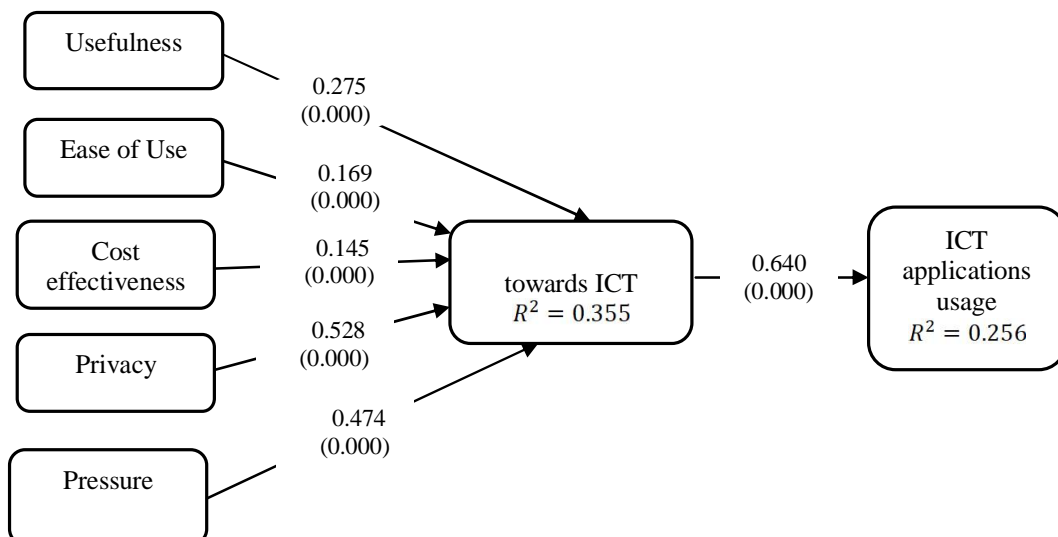


Fig 3. Result of the model test

Model fit

The modal fit in covariance structure models and it evaluates the value of inconsistency between the sample and fixed covariance, the good model fit should show that the level of significance p-values > 0.05 . The chi-square statistics are often referred to as either goodness or badness of bit measurement (Hafiz & Shaari, 2013). Other model fits were employed such as GFI, AGFI, CMIN/df, CFI, NFI, TLI, and RMSEA. The table4. Shows the result of structural equation modeling that explores the model is fit were $\chi^2 = 810.974$, DF= 596, Q =1.361, GFI = 0.901, AGFI =0.881, CFI= 0.977, NFI = 0.927, TLI = 0.977 and RMSEA = 0.031.

Table4. Model fit indexes

Characteristics	Required	Achieved
Chi – Square		810.974
Degree of freedom(df)		596
P- value	$>.05$	0.000
Relative – Chi – Sq	< 5	1.36
Goodness Fit Index(GFI)	≥ 0.9	0.90
Adjusted Goodness Fit Index(AGFI)	≥ 0.9	0.88
Comparative Fit Index (CFI)	≥ 0.9	0.98
Normed Fit Index (NFI)	≥ 0.9	0.93
Tucker Lewis Index(TLI)	≥ 0.9	0.98
Root Mean Square Error of Approximation (RMSEA)	< 0.08	0.03

Conclusion and suggestion

In this study, the researcher identified the variables such as perceived usefulness, perceived ease of use, perceived cost-effectiveness, perceived pressure from the university, student's perception, and ICT application usage.

Perceived usefulness

The perceived usefulness is one of the main factors that encourage the students to use application software when responding to their assignment, the majority of the students identified that the course material available as soft copy. The result implies that students have more advantages in using ICT applications this brings the dependability of using this application.

Perceived ease of use

Perceived ease of use, the evidence proposes that sustainable use of ICT applications overall is perceived ease of use and friendly. This emphasizes with the past researches on perceived ease of use and usefulness of sustainable labels on apparel products (Ma, Gam, & Banning, 2017). The effects of perceived usefulness and perceived ease of use on continuance intention to use E-Government (Hamid, Razak, Bakar, & Abdullah, 2016).

Perceived cost-effectiveness

Perceived cost-effectiveness, the result proposes that the price of ICT application is free means no cost, the majority of the respondents identified that some companies offer the students ICT applications at no

cost. This is the emphasis with prior studies such as: comparing the effectiveness and cost-effectiveness of ICT interventions (Piper, Zuilkowski, Kwayumba, & Strigel, 2016), understanding the ICT investment effectiveness (Mathswenyego, Klopper, & Lubbe, 2013).

Perceived pressure from the university

Perceived pressure from the university, the result suggests the majority of the student identified that the universities include requirement courses of ICT applications because the national curriculum of Somalia was included technology studies before 2018.

Student's perception

Student's perception, the majority of the student's belief that ICT applications play an important role in academic performance such as downloading learning materials, completing assignments, giving a presentation of the classwork processing and analyzing data, and browsing relevant websites. This support with the study student's perception of implementing ICT in learning (Charles & Issifu, 2015), the impact of ICT on schools (Naji, 2017)

ICT applications use

Most of the students use various types of ICT applications such learning skills tool [MS – word for writing documents, MS - PowerPoint for presentation, MS – Excel for calculation and graphics]. Informational management tool [Google search, social media networking research websites, and so on]. Reference management tools [Mendeley, EndNote, Zotero and so] and Turnitin as a plagiarism checker. This supports with

the prior studies such as types of ICT applications used and skill's level of nursing students (Harerimana & Mtshali, 2019), an exploration of technology use mediate students engagement with mathematics (Attard & Holmes, 2020)

In the study the majority of the students start using computers at the level of university this needs to improve and the ministry of higher education should include the curriculum at the level of secondary and primary education.

Research implications

The study started with the following research questions (1) to what extent the level skills of ICT applications (2) What are the factors affecting the use of ICT applications by the faculty of economics students.

ICT application has forced the students to use it. Most of the students use ICT applications to download materials related to their subjects, simply complete their assignments, assist to do their research projects, and stay connected and maintain the relationship. However, the use of ICT applications is not without obstacles most of the students started with the interaction of this application software at the level of higher education.

Based on the Technology Acceptance Model, Transaction Cost Economics and Theory Reasoned Action, the research encompasses and confirms a research model in gaining insights into factors influencing ICT applications to use and their level of skills by the undergraduate students in Somalia. The finding suggests that the students have a

positive attitude in using ICT applications through variables such as perceived usefulness, perceived ease of use, cost-effectiveness, and pressure from the university. The study also shows that the majority of the student's interests using ICT applications through mobile technology instead of a computer. Since there has been a significant body of work related to the students' perception towards ICT application, there is a need to emphasize and advance the technology adaption in the context of developing countries such as Somalia.

The findings make clear that the students use a huge number of ICT applications, some of them used frequently while in the classroom or outside of the classroom.

Limitation of the research

Several limitations cause to directions for future research. First, the research sample size was 382, only undergraduate students for the faculties, IT, business administration, social science, and nursing were included. The population and sample were drawn only three universities located in the Mogadishu – Somalia, The capital city of Somalia, so the finding would not be generalized to the entire country. Future research may consider teachers' perception of ICT use when in the classroom or outside using different samples. Second, the data collected only using questionnaire method observations and interviewing may offer insights on the level of students of ICT applications use and their skills.

References

- Agichtein, E., Castillo, C., Donato, D., Gionis, A., & Mishne, G. (2008). Finding High-quality Content in Social Media. Agichtein, Eugene Castillo, Carlos Donato, Debora Gionis, Aristides Mishne, Gillard. *International Conference on Web Search and Data Mining*. <https://doi.org/10.1145/1341531.1341557>
- Ashaari, N. S., Judi, H. M., Mohamed, H., & Tengku Wook, T. M. (2011). Student's Attitude Towards Statistics course. In *Procedia - Social and Behavioral Sciences*. <https://doi.org/10.1016/j.sbspro.2011.05.041>
- Attard, C., & Holmes, K. (2020). "It gives you that sense of hope": An exploration of technology use to mediate student engagement with mathematics. *Heliyon*, 6(1), e02945. <https://doi.org/10.1016/j.heliyon.2019.e02945>
- Aubert, B. A., Rivard, S., & Patry, M. (2004). A transaction cost model of IT outsourcing. *Information and Management*. <https://doi.org/10.1016/j.im.2003.09.001>
- Bollen, K. A. (1989). A New Incremental Fit Index for General Structural Equation Models. *Sociological Methods & Research*. <https://doi.org/10.1177/0049124189017003004>
- Boticki, I., Baksa, J., Seow, P., & Looi, C. K. (2015). Usage of a mobile social learning platform with virtual badges in a primary school. *Computers and Education*. <https://doi.org/10.1016/j.compedu.2015.02.015>
- Byrne, B. M. (2001). Structural Equation Modeling With AMOS, EQS, and LISREL: Comparative Approaches to Testing for the Factorial Validity of a Measuring Instrument. *International Journal of Testing*. https://doi.org/10.1207/s15327574ijt0101_4
- Byrne, B. M. (2013). *Structural Equation Modeling With AMOS. Structural Equation Modeling With AMOS*. <https://doi.org/10.4324/9781410600219>

- Chang, L. W., Mwanika, A., Kaye, D., Muhwezi, W. W., Nabirye, R. C., Mbalinda, S., ... Bollinger, R. C. (2012). Information and communication technology and community-based health sciences training in Uganda: Perceptions and experiences of educators and students. *Informatics for Health and Social Care*. <https://doi.org/10.3109/17538157.2010.542530>
- Charles, B.-A., & Issifu, Y. (2015). Innovation in Education: Students' Perceptions of Implementing ICT in Learning in Second-Cycle Institutions in Ghana. *Procedia - Social and Behavioral Sciences*, 197(February), 1512–1519. <https://doi.org/10.1016/j.sbspro.2015.07.103>
- Chen, J. (2016). Book review: Privacy Revisited: A Global Perspective on the Right to the Left Alone. *SCRIPTed*. <https://doi.org/10.2966/scrip.130316.382>
- Clark, M. L. E., Austin, D. W., & Craike, M. J. (2015). Professional and Parental Attitudes Toward iPad Application Use in Autism Spectrum Disorder. *Focus on Autism and Other Developmental Disabilities*. <https://doi.org/10.1177/1088357614537353>
- Danner, R. B., & Pessu, C. O. A. (2013). A survey of ICT competencies among students in teacher preparation programmes at the university of Benin, Benin city, Nigeria. *Journal of Information Technology Education: Research*. <https://doi.org/10.28945/1762>
- Davis, F. D. (1989). Davis 1989.pdf. *Information Technology*. <https://doi.org/10.2307/249008>
- Domingo, M. G., & Garganté, A. B. (2016). Exploring the use of educational technology in primary education: Teachers' perception of mobile technology learning impacts and applications' use in the classroom. *Computers in Human Behavior*. <https://doi.org/10.1016/j.chb.2015.11.023>
- FoAleksander Aristovnik Damijana Keržič Nina Tomažević Lan Umek, & Article. (2016). Interactive Technology and Smart Education Article information : DEMOGRAPHIC DETERMINANTS OF USEFULNESS OF E- LEARNING TOOLS AMONG STUDENTS OF PUBLIC ADMINISTRATION. *Demographic Determinants of Usefullness of E-Learning Tools Among Students of Public Administaration*.

- Fornell, C., & Larcker, D. F. (1981a). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*. <https://doi.org/10.1177/002224378101800104>
- Fornell, C., & Larcker, D. F. (1981b). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*. <https://doi.org/10.2307/3151312>
- Hafiz, B., & Shaari, J. A. N. (2013). Confirmatory factor analysis (CFA) of first order factor measurement model-ICT empowerment in Nigeria. *International Journal of Business Management and Administration*, 2(5), 81–88. Retrieved from <http://academeresearchjournals.org/journal/ijbma>
- Hair, J., Black, W., Babin, B., & Anderson, R. (2010). Multivariate Data Analysis: A Global Perspective. In *Multivariate Data Analysis: A Global Perspective*.
- Hair, Joe F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science*. <https://doi.org/10.1007/s11747-011-0261-6>
- Hair, Joseph F.; Black, W. C., Babin, B. J., & Anderson, R. E. (2010). Multivariate Data Analysis. *Vectors*. <https://doi.org/10.1016/j.ijpharm.2011.02.019>
- Hamid, A. A., Razak, F. Z. A., Bakar, A. A., & Abdullah, W. S. W. (2016). The Effects of Perceived Usefulness and Perceived Ease of Use on Continuance Intention to Use E-Government. *Procedia Economics and Finance*. [https://doi.org/10.1016/s2212-5671\(16\)00079-4](https://doi.org/10.1016/s2212-5671(16)00079-4)
- Harerimana, A., & Mtshali, N. G. (2019). Types of ICT applications used and the skills' level of nursing students in higher education: A cross-sectional survey. *International Journal of Africa Nursing Sciences*, 11(July), 100163. <https://doi.org/10.1016/j.ijans.2019.100163>
- Hill, R. J., Fishbein, M., & Ajzen, I. (1977). Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research. *Contemporary Sociology*. <https://doi.org/10.2307/2065853>

- Hoffmann, B. C. (2012). An exploratory study of a user's Facebook security and privacy settings. *Theses, Dissertations, and Other Capstone Projects*. Retrieved from <http://cornerstone.lib.mnsu.edu/cgi/viewcontent.cgi?article=1069&context=etds>
- Huang, Y. F., & Chen, C. J. (2010). The impact of technological diversity and organizational slack on innovation. *Technovation*. <https://doi.org/10.1016/j.technovation.2010.01.004>
- Jeilani, A. (2018). An exploration of the Frequent Use of Social Networking Sites and Severity Attack among Undergraduate Students in Somalia .
- Johnston, R. (2014). Confirmatory Factor Analysis (CFA). In *Encyclopedia of Quality of Life and Well-Being Research*. https://doi.org/10.1007/978-94-007-0753-5_524
- Lai, P. (2017). THE LITERATURE REVIEW OF TECHNOLOGY ADOPTION MODELS AND THEORIES FOR THE NOVELTY TECHNOLOGY. *Journal of Information Systems and Technology Management*. <https://doi.org/10.4301/s1807-17752017000100002>
- Li, X., Zhao, X., Xu, W. (Ato), & Pu, W. (2020). Measuring ease of use of mobile applications in e-commerce retailing from the perspective of consumer online shopping behaviour patterns. *Journal of Retailing and Consumer Services*, 55(January), 102093. <https://doi.org/10.1016/j.jretconser.2020.102093>
- Ma, Y. J., Gam, H. J., & Banning, J. (2017). Perceived ease of use and usefulness of sustainability labels on apparel products: application of the technology acceptance model. *Fashion and Textiles*. <https://doi.org/10.1186/s40691-017-0093-1>
- Mai, J. E. (2016). Big data privacy: The datafication of personal information. *Information Society*. <https://doi.org/10.1080/01972243.2016.1153010>
- Mallernee, N. (2018). *Exploring the use of iPads for literacy instruction in the 1:1 K-6 classroom. Dissertation Abstracts International Section A: Humanities and Social Sciences*.
- Mathswenyego, S., Klopper, R., & Lubbe, S. (2013). ICT investment effectiveness in the South African post office. In *Proceedings of the European Conference on e-Government, ECEG*.

- McIvor, R. (2009). How the transaction cost and resource-based theories of the firm inform outsourcing evaluation. *Journal of Operations Management*. <https://doi.org/10.1016/j.jom.2008.03.004>
- Mercer, S. W., & Murphy, D. J. (2008). Validity and reliability of the CARE Measure in secondary care. *Clinical Governance*. <https://doi.org/10.1108/14777270810912969>
- Moghaddam, B. K., & Khatoon-abadi, A. (2013). Factors affecting ICT adoption among rural users : A case study of ICT Center in Iran. *Telecommunications Policy*, 37(11), 1083–1094. <https://doi.org/10.1016/j.telpol.2013.02.005>
- Mohamed, N., & Ahmad, I. H. (2012). Information privacy concerns, antecedents and privacy measure use in social networking sites: Evidence from Malaysia. *Computers in Human Behavior*, 28(6), 2366–2375. <https://doi.org/10.1016/j.chb.2012.07.008>
- Naji, S. (2017). The Impact of ICT on Schools. *IOSR Journal of Business and Management*. <https://doi.org/10.9790/487x-1901078385>
- Oye, N. D., Iahad, A., Madar, M. J., & Rahim, A. (2012). THE IMPACT OF E-LEARNING ON STUDENTS PERFORMANCE IN TERTIARY INSTITUTIONS. *IRACST – International Journal of Computer Networks and Wireless Communications*.
- Patak, A. A., Naim, H. A., & Hidayat, R. (2016). Taking mendeley as multimedia-based application in academic writing. *International Journal on Advanced Science, Engineering and Information Technology*. <https://doi.org/10.18517/ijaseit.6.4.890>
- Perbawaningsih, Y. (2013). Plus Minus of ICT Usage in Higher Education Students. *Procedia - Social and Behavioral Sciences*. <https://doi.org/10.1016/j.sbspro.2013.10.392>
- Piper, B., Zuilkowski, S. S., Kwayumba, D., & Strigel, C. (2016). Does technology improve reading outcomes? Comparing the effectiveness and cost-effectiveness of ICT interventions for early grade reading in Kenya. *International Journal of Educational Development*. <https://doi.org/10.1016/j.ijedudev.2016.03.006>

- Sampath Kumar, B. T., & Biradar, B. S. (2010). Use of ICT in college libraries in Karnataka, India: A survey. *Program*. <https://doi.org/10.1108/00330331011064267>
- Sarikakis, K., & Winter, L. (2017). Social Media Users' Legal Consciousness About Privacy. *Social Media and Society*. <https://doi.org/10.1177/2056305117695325>
- Sarkar, S. (2012). The role of information and communication technology (ICT) in higher education for the 21st century. *Science*.
- Sekaran, U. (2003). *Research and Markets: Research Methods for Business - A Skill Building Approach*. John Wiley & Sons. <https://doi.org/http://dx.doi.org/10.1108/17506200710779521>
- Shelly, G. B., & Vermaat, M. E. (2011). *Gain Access to the Discovering Computers 2011*.
- Singh, A., & Teng, J. T. C. (2016). Enhancing supply chain outcomes through Information Technology and Trust. *Computers in Human Behavior*. <https://doi.org/10.1016/j.chb.2015.07.051>
- Sinn, J. S. (1997). The Predictive and Discriminant Validity of Masculinity Ideology. *Journal of Research in Personality*. <https://doi.org/10.1006/jrpe.1997.2172>
- Sparkman, R. M., Hair, J. F., Anderson, R. E., Tatham, R. L., & Grablovsky, B. J. (1979). Multivariate Data Analysis with Readings. *Journal of Marketing Research*. <https://doi.org/10.2307/3150726>
- Steven, E. J., & Peterson, G. (n.d.). Cost-Effective Security, 64–66.
- Studies, H. I. for P. (2013). The State of Higher Education in Somalia : Privatization , rapid growth , and the need for regulation. *Heritage Institute for Policy Studies*, (August), 1–26.
- Susarla, A., Barua, A., & Whinston, A. (2009). A transaction cost perspective of the “software as a service” business model. *Journal of Management Information Systems*. <https://doi.org/10.2753/MIS0742-1222260209>

- Tadelis, S., & Williamson, O. E. (2012). Transaction cost economics. In *The Handbook of Organizational Economics*. <https://doi.org/10.4337/9781781001318.00010>
- Taherdoost, H., & Group, H. (2016). Sampling Methods in Research Methodology ; How to Choose a Sampling Sampling Methods in Research Methodology ; How to Choose a Sampling Technique for. *International Journal of Academic Research in Management (IJARM)*. <https://doi.org/10.2139/ssrn.3205035>
- Tcheeko, L., & Ntah, M. N. (2005). Information and Communication Technologies and poverty reduction in developing countries : the case of Sub Saharan Africa countries. *3rd International Conference on Politics and Information Systems: Technologies and Applications, Proceedings*.
- Teo, T., & Noyes, J. (2011). An assessment of the influence of perceived enjoyment and attitude on the intention to use technology among pre-service teachers: A structural equation modeling approach. *Computers and Education*. <https://doi.org/10.1016/j.compedu.2011.03.002>
- Terzis, V., & Economides, A. A. (2011). The acceptance and use of computer based assessment. *Computers and Education*. <https://doi.org/10.1016/j.compedu.2010.11.017>
- Umar, I. N., & Jalil, N. A. (2012). ICT Skills, Practices and Barriers of Its Use Among Secondary School Students. *Procedia - Social and Behavioral Sciences*. <https://doi.org/10.1016/j.sbspro.2012.06.494>
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly: Management Information Systems*. <https://doi.org/10.2307/30036540>
- Whiting, A., & Williams, D. (2013). Why people use social media. *Qualitative Market Research An International Journal*, 16(4), 362–369. <https://doi.org/10.1108/QMR-06-2013-0041>
- Williamson, O. E. (2019). Transaction-cost economics: The governance of contractual relations. In *Corporate Governance: Values, Ethics and Leadership*. <https://doi.org/10.1086/466942>

- Yang, X., Li, X., & Lu, T. (2015). Using mobile phones in college classroom settings: Effects of presentation mode and interest on concentration and achievement. *Computers and Education*. <https://doi.org/10.1016/j.compedu.2015.06.007>
- Yunus, M. M. (2007). Malaysian ESL teachers' use of ICT in their classrooms: Expectations and realities. *ReCALL*. <https://doi.org/10.1017/S0958344007000614>
- Zhang, X., Wang, W., de Pablos, P. O., Tang, J., & Yan, X. (2015). Mapping development of social media research through different disciplines: Collaborative learning in management and computer science. *Computers in Human Behavior*. <https://doi.org/10.1016/j.chb.2015.02.034>
- Zikmund, W. G. (2006). Basic Data Analysis: Descriptive Statistics. *Expert Review of Anticancer Therapy*. <https://doi.org/10.1586/14737140.6.3.427>

