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Test of e-Learning Related Attitudes (TeLRA) scale: Development, reliability and validity study

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ABSTRACT

The Tanzanian education system is in transition from face-to-face classroom learning to e-learning. E-learning is a new learning approach in Tanzanian Higher Learning Institutions [HLIs] and with teachers being the key stakeholders of all formal education, investigating their attitude towards e-learning is essential. So far, however, there has been little consideration given to research that examines teachers' attitudes towards e-learning in Tanzanian HLIs and consequently, there is no standard attitude scale that has been developed to measure this. This paper presents the development and validation of a scale of teachers' attitude to e-learning. Whilst being initially developed to assess the attitude of teachers in HLIs the authors belief, having piloted with pre-service trainee teachers in England that the scale transfers across national boundaries. The final instrument contains 36 items with a Cronbach alpha score of 0.857. Although the developed attitude scale was intended for use in HLIs, it can also be of interest to researchers investigating attitudes on other sectors.

Keywords: *Attitude, TeLRA scale, e-learning.*

Abbreviations: *HLIs – Higher Learning Institutions; ICT – Information and Communications Technology; TeLRA – Test of e-Learning Related Attitudes.*

INTRODUCTION

E-learning has, over recent years, become ever more popular and it is gaining wide acceptance as a "non-traditional" mode of accessing higher education (UNESCO, 2009). Researchers investigating the role of e-learning in education systems suggested it to be the best alternative to cope up with constraints to access education (Garrison & Anderson, 2003; Weller, 2007; Clarke, 2008; Garrison, 2011). E-learning improves efficiency, effectiveness, quality, time and access of education at all learning levels (COL 2003; Littlejohn and Pegler 2007; Salmon 2011).

One aspect of success of e-learning programs depends, to a considerable extent, on teachers' attitudes towards e-learning systems (van Raaij & Schepers, 2008). Teachers play a key role in the integration of e-learning in education such that their attitudes towards e-learning have significant impact not only to students' attitude formation toward e-learning (Pynoo et al., 2012) but also on the education transformation agenda as a whole. However, a willingness to change from traditional learning approaches like face-to-face to e-learning is a social phenomenon where attitude has an important role to play.

The concept of attitude has been one of the most influential phenomena of all social and psychological constructs (Fishbein & Ajzen, 1980). Throughout the history of social psychology, social scientists have used attitude to explain human actions, since they regarded attitudes as a behavioural disposition. This study defines attitude to be positive or negative evaluative judgement of an entity based on affective, cognitive or behavioural experience (Schwarz, 2007). It implies that, people's evaluative judgment of an entity depends on how they feel about it (affective evaluation), knowledge they have about the object (cognitive evaluation) and how they

have acted towards it in the past (behavioral evaluation) (Eagly & Chaiken, 2007). Early literature on teachers' attitude towards technology development, adoption and implementation define attitude toward technology as an affective or evaluative judgement about the technology in question (Davis, Bagozzi & Warshaw, 1989; Barki & Hartwick, 1994). Technology which is believed to be both important and personally relevant is more likely to generate people's positive attitude towards it (Rogers, 2003).

Examination of numerous approaches used to measure attitude reveals that *attitude scales* are the most commonly used with summated rating Likert scales (Albaum, 1997; Johns, 2010). A Likert, or Likert-like, scale employs self-reporting methods with a series of questions focused on assessing attitudes. Respondents would rate the attitudinal object by choosing the best option that reflects their level of agreement or disagreement (Likert, 1932). The response format in the Likert scale has been adopted in various attitude scales amongst which is the Test of Science Related Attitudes, TOSRA (Fraser, 1981). TOSRA is a five-point scale that requires respondents to express their degree of agreement to each statement as either *strongly agree, agree, not sure, disagree* or *strongly disagree*.

The purpose of the work presented here was to develop and validate an attitude scale to assess teachers' attitudes towards e-learning. Constructs of the TOSRA scale were modified to develop the Test of e-Learning Related Attitudes (TeLRA) scale. The TeLRA scale can be considered to be a reliable and valid measure of attitudes towards e-learning from a sample of teachers from Tanzanian HLIs. Justification for developing and using TeLRA scale as well as evidence for the reliability and validity of the scale are also discussed.

Conceptual framework

This study reports part of the research conducted in Tanzanian HLIs that investigated teachers' attitudes towards e-learning. The study was guided by Davis' (1986) Technology Acceptance Model (TAM) (see Figure 1).

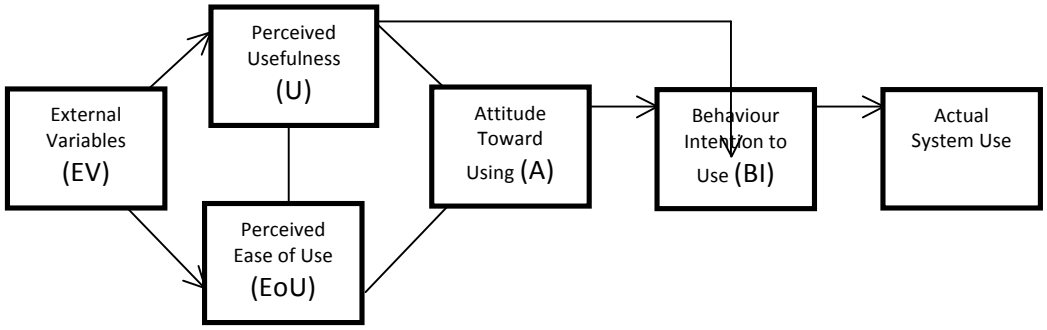

Figure 1: *TAM Model Source: Davis et al., (1989).*

TAM is an information systems theory that predicts how the user comes to accept and use technology. The model consists of four constructs: external variables (EV), teachers' perceived usefulness (U), teachers' perceived ease of use (EoU) and the teachers' attitude (A) toward e-learning. Two constructs from TAM namely, behaviour intention and actual system use were not included in the conceptual framework because usage of e-learning in Tanzanian HLIs is still in its infancy (Hooker et al., 2011; Sanga et al., 2013), and therefore, attitude (A) was selected to be a dependent variable. In this model, EV was suggested to mediate the impact of the two constructs

U and EoU on A with single directional arrows representing one way impact. TAM is helpful for both prediction and explanation in the sense that through user's internal beliefs and different significant variables, the researcher can identify reasons that lead to adoption or rejection of e-learning and find appropriate corrective measures or explanations for that decision (Davis et al., 1989; Turner et al., 2010). The TAM is easy to extend and validate whilst results from applying the extended TAM are often accepted as being accurate predictors of adoption as well as usage (Davis 1989; Legris et al., 2003).

LITERATURE REVIEW

Trends over the past two decades on attitude scales on ICT shows development of attitude measures towards computers (Nickell & Pinto, 1986; Francis, 1993; Richter, Naumann & Groeben, 2000) and towards e-learning (Bernard, Brauer, Abrami & Surkes, 2004; Wilkinson, Roberts & While, 2010; Teo, 2010b; Morse, Gullekson, Morris & Popovich, 2011; Hernandez-Ramos, Martinez-Abad, Penalvo, Garcia & Rodriguez-Conde, 2014). In this study, e-learning is defined as all kinds of electronically supported learning (whether in networked/non-networked environments) where the learner interacts with teachers, content and other learners regardless of place and time (Sangra et al., 2012).

Although use of attitude scales in e-learning has provided rich data for analysis and interpretation of research findings, the literature has identified weaknesses with many existing scales (Garland & Noyes, 2008; Teo, 2010b; Hernandez-Ramos, Martinez-Abad, Penalvo, Garcia & Rodriguez-Conde, 2014). For example, in their analysis of previous computer attitude scales developed in 1980s and 1990s, Garland & Noyes (2008) discovered that the *stability* of most of these scales has been declined from when they were first developed. Although the examined scales were all reliable, Garland & Noyes (2008, p. 563) argue that, "the traditional style of computer attitude scale is no longer as relevant as when first developed." Wilkinson, Roberts & While, (2010, p. 1369) refer such scales to be "dated with technological developments". It implies that, with individuals' cultural and ICT experiences as well as new technological developments, educators need scales that demonstrate predictive validity (Garland & Noyes, 2008) as well as reflecting such developments.

A further weakness of attitude scales is their inability to be used in diverse populations. Literature reveals various validated attitude scales towards e-learning with different constructs each applicable to a particular context. For example, Bernard et al., (2004, p. 31) utilise factor analysis to test their development and validation of a 38-item attitude scale to predict achievements on online learning. This analysis revealed four themes that included "general beliefs about distance education, confidence in prerequisite skills, self-direction and initiative, and desire for interaction." This scale did not meet authors' requirements that aimed at investigating teachers' attitudes towards e-learning rather than online learning in particular.

The attitude scale presented by Wilkinson, Roberts & While (2010) measures students' attitudes towards e-learning across five themes: IT skills, IT experience, IT use, IT access, Attitude to computers and Attitude to computers in education. Further analysis of this scale revealed that its items concentrated mainly on the measuring of skills and experience with computers and the Internet, thus in the authors' opinion it lacked the diversity of attitudinal aspects geared to the concept attitudes towards e-learning. Although the scale demonstrated both external and internal reliability, it demanded more improvement to produce a useful scale (Wilkinson, Roberts & While, 2010).

Moreover, Teo (2010b) developed a 21-item E-learning Accepted Measure (ElAM) scale with three sub-scales: Tutor Quality, Perceived Usefulness and Facilitating Conditions. Similarly, ElAM

did not meet our specifications in that it was aimed at measuring users' acceptance of e-learning instead of user's attitude towards e-learning. Although the scale was developed and validated in two different studies, its validity remained limited to the sample used (Teo, 2010b).

In recent years, Morse, Gullekson, Morris & Popovich, (2011, p. 482) developed a 17-item Attitudes Towards the Internet Scale (ATIS) with three themes: General Internet Usage, Negative Internet Attitudes and Task Facilitation. Contrary to the aim of the current study, ATIS focused only on one aspect, which was attitude towards the Internet. In line with Teo (2010b), it was suggested that ATIS needs to be validated in other domains to enhance its reliability (Morse, Gullekson, Morris & Popovich, 2011). A more recent study by Hernandez-Ramos et al., (2014) developed a 15-item single construct attitude scale to examine teachers' attitudes towards the use of ICT. The scale demonstrated acceptable internal consistency but focused only on measuring attitudes towards use and was validated among teachers of a single university (Ibid.). Findings from analysis of above studies show that all scales demonstrated psychometric properties but, they lack utility to different cultural domain and/or items lack diversity of aspects or themes geared to the measurement of attitudes towards e-learning.

Consequently, Fraser's (1981) Test of Science Related Attitudes (TOSRA) scale was adapted in this study to develop Test of e-Learning Related Attitudes (TeLRA). TOSRA was developed to measure attitude towards science among secondary school students and it had seven, ten-item themes, which include Social Implications of Science, Normality of Scientists, Attitude to Scientific Inquiry, Adoption of Scientific Attitudes, Enjoyment of Science Lessons, Leisure Interest in Science and Career Interest in Science (Fraser, 1981). TOSRA uses a five-point Likert style response format with response categories ranging from *Strongly Agree* to *Strongly Disagree* (Ibid.). TOSRA has accepted internal reliability, discriminating validity and has undergone test-retest to 238 students administered in two-week period between the two studies (Fraser, 1981).

TOSRA was adapted in this study because of its cross-cultural validity. It has been tested in Australia and the United States (Fraser, 1981), Indonesia (Fraser, Aldridge & Adolphe, 2010), Turkey (Telli, den Brok & Cakiroglu, 2010), as well as Pakistan (Anwer, Iqbal & Harriso, 2012). Most recently, one sub-scale, named, *Enjoyment of Science Lessons* has been validated in Albania, Kosovo, Romania, Poland and Austria (Emilov, 2013). Moreover, each theme has conceptually-similar items and through factor analysis all themes revealed unidimensionality property (Fraser, Aldridge & Adolphe, 2010). Furthermore, TOSRA has been modified and applied to measure attitudes towards Mathematics through a Test of Mathematics Related Attitudes, TOMRA (Taylor, 2004; Hoang, 2008; Chow, 2011).

Although TOSRA was originally designed for measuring secondary school students' attitudes towards science, literature shows that with a careful review and modification of themes, TOSRA can also be used among teachers. For example, Chin (2005) adopted TOSRA in measuring teachers' attitudes towards science in Taiwan. Similarly, Santiboon (2013) adopted TOSRA and developed Test of Administrator-Related Attitudes (TOARA) to measure teachers' attitudes towards school's administration in Thailand. Other applications of TOSRA are also possible to find in local sources.

To date, however, little consideration has been given to conduct research that examines teachers' attitudes towards e-learning at Tanzanian HLIs. In due regard, there is no standard attitude scale that has been developed to measure teachers' attitudes towards e-learning. Ndume, Tilya & Twaakyondo, (2008) conducted a survey to establish the acceptance and challenges of e-learning as well as design an assistive tool for people with disability at Tanzanian HLIs. However, in their research, no particular scale was developed to measure teachers' acceptance of e-learning for which validity and reliability could be established. They suggested future research to focus on investigating individuals' perceptions about e-learning and factors

contributing to those perceptions. Therefore, knowledge based on teachers' attitudes towards e-learning in Tanzania is limited by lack of valid and reliable measures. The majority of scales discussed in this study were developed for different contexts. Thus, the aim of this study was to develop and validate an attitude response scale that measured teachers' attitudes towards e-learning in Tanzanian HLIs.

METHOD

Development of TeLRA scale had four stages. Stage one included item development through review of literature and assessment of TOSRA scale items guided by the conceptual framework adapted from TAM (see Figure 1). Stage two composed of face and content validity from experts. Stage three was reliabilty testing and stage four involved the pilot study. The main study describing results of reliability and the factor analysis of the TeLRA scale are presented in the Result section.

Stage 1: Items development

TeLRA scale's items development were guided by the four constructs of the conceptual framework, (see Figure 1); Rogers' (2003) five characteristics of innovations, (which are, relative advantage, compatibility, complexity, triability as well as observability of a technology), that help to explain their different rates of adoption, as well as the TOSRA scale. In addition, two questions, "I believe using e-learning will improve my job performance" and "Using computer systems requires a lot of mental efforts," which had previously been extensively experimented, were adapted from journal articles of Davis (1989), Legris et al., (2003), Turner et al., (2010) and Teo (2010a).

Six separate themes were constructed. For the purpose of this study six themes were found relevant and they included Social implication of e-learning (13 items), Attitude toward e-learning (13 items), Benefits from e-learning (15 items), Enjoyment of computer experiences (13 items), Leisure interest in e-learning affairs (11 items) and Interest in teaching through e-learning technologies (13 items). Thus, the purpose of starting with many items in our scale was to include as many aspects as possible related to attitudes towards e-learning, consequently maximizing its face and content validity as well as other analysis.

The first theme was intended to measure teachers' general belief about e-learning. The second theme aimed to measure teachers' affective and cognitive evaluation towards e-learning. The third construct aimed to measure teachers' cognitive information about e-learning. That is, knowledge they have about value of e-learning to education and their career as a whole. The last three constructs were intended to examine teachers' affective evaluation about e-learning in terms of their interaction with computers, interest in e-learning innovations as well as their future participation in e-learning. Variation of themes in the TeLRA scale development aimed at including different items that may not only influence attitudes towards e-learning, but also their scores could be used to predict future teachers' attitudes towards e-learning. Moreover, the selected items of the TeLRA scale are free from cultural differences. They can be responded by participants from a range of different national, social and cultural contexts. In order to avoid no commitment among respondents, TeLRA scale consisted of four-point Likert's response format with degrees of agreement ranging from 1- *strongly disagree*, 2- *disagree*, 3- *agree* to 4- *strongly agree*.

Stage 2: Face and content validity

The 78-items TeLRA scale was submitted to experts so as to determine their face and content validity. Evaluation was conducted in terms of language clarity, adequacy as well as representative coverage of the domain, readability and complexity level of the items including appropriate time taken to complete the questions (Cohen, Manion & Morrison, 2011). Eighteen items were found to be either ambiguous, a repetition of another item or to measure a different concept, these items were deleted. Three items were slightly revised leaving a sixty item test. The new 60-items were re-evaluated and all three experts reported back with the judgment that the scale appeared to be measuring the intended construct.

Stage 3: Reliability testing

The 60-items TeLRA scale went through a field test among 30 pre-service teachers at the Nottingham Trent University in England so as to establish its reliability before it was adopted in the pilot study. Reliability of the scale was measured by computing Cronbach's alpha, which indicates the extent to which all items in the scale measure the same underlying attribute (Cronbach, 1951; Pallant, 2010; Bryman & Cramer, 2011). The Cronbach alpha score obtained was 0.877.

However, 24 items were found to have low item-total correlation value (less than 0.25) indicating that they were measuring different concept from the scale (Bryman & Cramer, 2004) and therefore, they were removed. Further removal of items with item-total correlation less than 0.25 enhanced the reliability to 0.888. The refined TeLRA scale had 36 items (see Table 1).

Stage 4: Pilot study

The 36-items TeLRA scale was used in the pilot study conducted at the University Computing Center, University of Dar es Salaam, in Tanzania. The institution has similar characteristics to those involved in the main study. Twenty six teachers out of thirty participated in the study. The TeLRA scale returned a Cronbach alpha score of 0.871. No ambiguities were reported in the test items. A small change in coefficient from that obtained at the Nottingham Trent University can be attributed to participants being from two different cultural backgrounds. However, it was still highly reliable. Therefore, all items were retained for the main study so as to measure a possible change that would be brought about by an impact from a bigger sample.

The main study

A cross-sectional survey was used to collect data from 258 teachers randomly selected from four HLIs, which were not engaged in e-learning programmes. Data were collected using paper questionnaires. Prior to the analysis, all responses were coded as 1= Strongly disagree, 2 = Disagree, 3 = Agree and 4 = Strongly agree for positive worded items. Subsequently, responses were reversed coded as 1= Strongly agree, 2 = Agree, 3 = Disagree and 4 = Strongly disagree for all negative worded items.

***Table 1**: The 36-item TeLRA scale*

Test of e-Learning Related Attitudes (TeLRA) Scale

Information about teachers' understanding and attitudes about e-learning.

Instructions

- There is no wrong answer; each response will be treated as a correct one. Your opinion is what is required in this study.
- Do not think too long about each statement. It should take you around 10 minutes to complete.
- For each statement, put a tick (✓) to show your level of agreement; **Strongly Disagree**, **Disagree**, **Agree,** and **Strongly Agree**. Do not tick across two boxes.

	Statement	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
1	E-learning is very economical for educational institutions to adopt.				
2	I believe using e-learning will improve the quality of my work.				
3	Computers make work more interesting.				
4	I prefer reading articles in e-learning.				
5	It is easier to revise electronic educational materials than printed material				
6	I prefer using a computer to prepare my lessons.				
7	I feel uncomfortable reading a text book on a computer screen than a physical text book.				
8	I enjoy teaching using computers.				
9	Delivering a lecture through electronic technologies is very difficult.				
10	E-learning requires expensive technical support.				
11	E-learning reduces quality of knowledge attained.				
12	Interacting with the computer system is often frustrating.				
13	A face-to-face method is more learner-centred than E-learning methods.				
14	I believe using e-learning technologies will improve my job performance.				
15	Communicating through social networks is fun.				
16	I like reading magazines on new technology innovations.				
17	Teaching through e-learning is tiresome.				
18	E-learning increases learners' social isolation.				

	Statement	Strongly Disagree	Disagree	Agree	Strongly Agree
19	E-learning technologies are difficult to use.				
20	Using computer systems requires a lot of mental effort.				
21	Discussions on e-learning technologies are uninteresting.				
22	My institution has enough teaching-learning resources to carry out e-learning.				
23	E-learning will increase teachers' efficiency.				
24	Working with computers is exciting.				
25	I like discussing about new e-learning innovations.				
26	Supporting learners in an e-learning environment is very difficult.				
27	E-learning infrastructure is very expensive for the government to afford.				
28	It will be difficult for me to become skilful in the use of e-learning tools.				
29	I make errors frequently when using a Computer.				
30	Using a computer at home is very frustrating.				
31	Using e-learning technologies will allow me to accomplish more work than would otherwise be possible.				
32	I enjoy computer games very much.				
33	E-learning is a threat to teachers' employment.				
34	E-learning will provide me with better learning opportunities than traditional means of learning.				
35	I find computer online interaction unexciting.				
36	Communicating through electronic mails is annoying.				

RESULTS

In order to obtain conceptually small and significant number of themes, all 36 items of the TeLRA scale were subjected to Principal Component Analysis (PCA) using SPSS version 21. Prior to performing the PCA, suitability of data for analysis was assessed. This involved Kaiser-Meyer-Olkin's measure of sampling adequacy, which requires a value greater than 0.6 and a Bartlett's test of sphericity to be significant at a significant value $\rho < 0.05$ (Tabachnick & Fidell 2013, p. 619). In this study the Kaiser-Meyer-Olkin value was 0.82, exceeding the recommended value of 0.6 and Bartlett's Test of Sphericity was statistically significant at ρ=0.000, which verified suitability of data for the PCA. The PCA revealed the presence of 10 factors with eigenvalue exceeding 1. Examination of a scree plot revealed a clear break after the third component (see Figure 2).

Using only the scree plot to determine number of factors to retain can be subjective (Bryman & Cramer, 2004). Therefore, a Parallel Analysis was conducted. Parallel analysis compares the size of eigenvalues obtained by the SPSS output with eigenvalue obtained from a randomly generated

data set of the same number of attitude scale variables and sample size (Pallant, 2010). Five factors, which explained a total of 42.6% of the variance, were obtained.

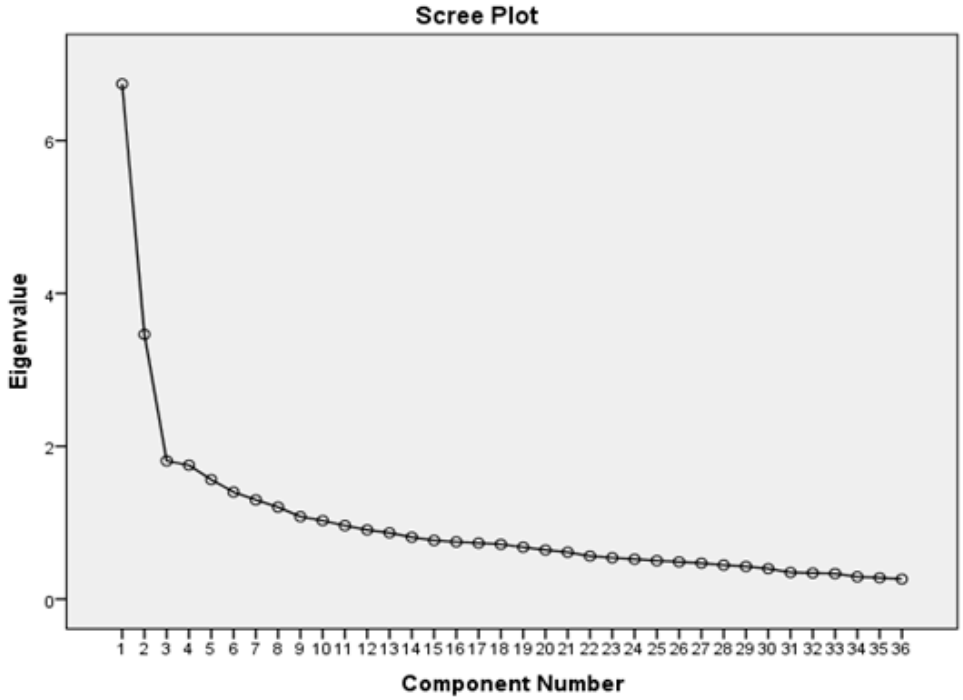

Figure 2*: A scree plot*

To enhance interpretation of factors, only items with factor loadings 0.5 or higher in both pattern and structure matrix were selected for inclusion because "the greater the loading, the more the variable is pure measure of the factor" (Tabachnick & Fidell, 2013, p. 654). The theme, *Interest in teaching using e-learning technologies* emerged with one item, *att9_rev* (see Table 2) and ideally the authors would like three or more items loading on each factor therefore, it was excluded. Consequently, four factors were obtained with 22 items (see Table 2). The factors are, named, respectively: *Challenges of e-learning (7 items); Benefits from e-learning (7 items)*; *Attitude on using computer systems (3 items)* as well as *Leisure interest on e-learning innovations and use of computers (5 items),* maintaining half of the themes introduced at the beginning of the study.

In order to examine unidimensionality of the established factors, each factor was separately subjected to PCA. Only one factor was extracted in each case justifying that items in each case were measuring the same underlying concept. We further conducted reliability test of each factor and obtained Cronbach alpha scores from 0.641 to 0.788. However, we observed that item number *Att32,* "I enjoy computer games very much" (see Table 2) in the fourth factor had a corrected item-total correlation less than 0.3 indicating that the item was measuring something different from the themes as a whole. The omission of this item boosted reliability of the theme from 0.641 to 0.651 (see Table 3).

Table 2: *Pattern and structure matrix for PCA of a 36-item TeLRA scale*

Item No.	Item	Pattern Matrix Component 1	2	3	4	5	Structure Matrix Component 1	2	3	4	5	Communalities Extraction
Challenges of e-learning												
att26_rev	Supporting learners in an e-learning environment is very difficult.	**0.699**	0.067	-0.057	0.020	0.117	**0.704**	0.177	-0.223	0.059	-0.019	0.516
att10_rev	E-learning requires expensive technical support.	**0.610**	-0.180	0.035	0.052	-0.012	**0.575**	-0.070	-0.093	0.024	-0.091	0.362
att21_rev	Discussions on e-learning technologies are uninteresting.	**0.609**	0.056	-0.055	-0.002	0.088	**0.616**	0.150	-0.198	0.032	-0.030	0.392
att20_rev	Using computer systems requires a lot of mental effort.	**0.605**	-0.122	-0.186	0.121	-0.061	**0.643**	0.036	-0.329	0.124	-0.167	0.471
att27_rev	E-learning infrastructure is very expensive for the government to afford.	**0.582**	-0.016	-0.299	0.074	0.146	**0.627**	0.113	-0.429	0.107	0.021	0.503
att18_rev	E-learning increases learners' social isolation.	**0.527**	0.081	-0.051	-0.125	-0.167	**0.578**	0.166	-0.191	-0.084	-0.271	0.384
att19_rev	E-learning technologies are difficult to use.	**0.527**	-0.041	-0.164	0.289	-0.183	**0.599**	0.158	-0.321	0.309	-0.287	0.503
att12_rev	Interacting with the computer system is often frustrating.	0.478	-0.082	-0.067	0.157	-0.336	0.543	0.088	-0.211	0.162	-0.416	0.432
att11_rev	E-learning reduces quality of knowledge attained.	0.457	0.269	0.084	-0.121	-0.200	0.512	0.332	-0.064	-0.046	-0.306	0.384
att33_rev	E-learning is a threat to teachers' employment.	0.400	-0.001	-0.334	-0.080	0.305	0.424	0.044	-0.398	-0.049	0.209	0.37
att13_rev	A face-to-face method is more learner-centred than E-learning methods.	0.377	0.343	0.099	-0.291	-0.144	0.426	0.343	-0.021	-0.203	-0.242	0.37
att7_rev	I feel uncomfortable reading a text book on a computer screen than a physical text book.	0.300	0.060	0.094	-0.153	-0.275	0.331	0.099	0.004	-0.132	-0.325	0.215
Benefits from e-learning												
Att2	I believe using e-learning will improve the quality of my work.	-0.131	**0.735**	-0.016	-0.104	0.111	-0.029	**0.675**	-0.055	0.068	0.035	0.498
Att14	I believe using e-learning technologies will improve my job performance.	0.000	**0.624**	-0.136	0.118	-0.132	0.161	**0.686**	-0.230	0.280	-0.230	0.522
Att23	E-learning will increase teachers' efficiency.	0.107	**0.553**	-0.146	0.257	0.298	0.188	**0.609**	-0.230	0.398	0.188	0.548
Att1	E-learning is very economical for educational institutions to adopt	-0.024	**0.552**	-0.046	-0.014	0.125	0.055	**0.533**	-0.094	0.119	0.051	0.302
Att5	It is easier to revise electronic educational materials than printed material	-0.193	**0.552**	-0.049	0.020	-0.206	-0.054	**0.559**	-0.087	0.154	-0.252	0.378
Att3	Computers make work more interesting.	0.080	**0.546**	-0.042	0.088	0.112	0.163	**0.570**	-0.123	0.223	0.019	0.351
Att4	I prefer reading articles in e-learning	0.031	**0.508**	0.135	0.093	-0.072	0.098	**0.529**	0.055	0.207	-0.136	0.308
Att34	E-learning will provide me with better learning opportunities than traditional means of learning.	0.109	0.475	-0.063	0.122	-0.134	0.229	0.548	-0.166	0.246	-0.225	0.356
Att6	I prefer using a computer to prepare my lessons.	0.060	0.412	-0.121	0.245	-0.295	0.215	0.534	-0.226	0.360	-0.376	0.459
Attitude on using computer systems												
att28_rev	It will be difficult for me to become skilful in the use of e-learning tools.	0.061	0.183	**-0.677**	-0.067	-0.124	0.271	0.274	**-0.719**	0.031	-0.215	0.578
att30_rev	Using a computer at home is very frustrating.	0.051	0.004	**-0.655**	0.090	-0.043	0.217	0.117	**-0.678**	0.142	-0.109	0.473
att29_rev	I make errors frequently when using a Computer.	0.120	-0.069	**-0.572**	0.227	0.001	0.251	0.073	**-0.609**	0.257	-0.063	0.432
att35_rev	I find computer online interaction unexciting.	0.083	0.110	-0.492	-0.034	-0.116	0.237	0.189	-0.532	0.034	-0.186	0.323
att36_rev	Communicating through electronic mails is annoying.	0.232	0.049	-0.472	-0.185	0.104	0.328	0.085	-0.511	-0.133	0.021	0.348
Att31	Using e-learning technologies will allow me to accomplish more work than would otherwise be possible.	0.004	0.278	-0.337	0.195	-0.159	0.163	0.387	-0.399	0.290	-0.229	0.336
Leisure interst on e-learning innovations and use of computers												
Att25	I like discussing about new e-learning innovations.	0.106	0.042	-0.014	**0.707**	0.019	0.134	0.229	-0.095	**0.721**	-0.019	0.535
Att16	I like reading magazines on new technology innovations.	-0.084	0.204	0.077	**0.583**	0.030	-0.057	0.316	0.033	**0.623**	0.013	0.435
Att24	Working with computers is exciting.	0.063	0.243	-0.170	**0.553**	0.069	0.147	0.396	-0.249	**0.624**	0.001	0.493
Att32	I enjoy computer games very much.	0.230	-0.006	0.380	**0.536**	-0.006	0.156	0.116	0.286	**0.513**	-0.022	0.419
Att15	Communicating through social networks is fun.	-0.215	0.026	-0.257	**0.504**	-0.017	-0.132	0.144	-0.248	**0.523**	-0.014	0.36
att9_rev	Delivering a lecture through electronic technologies is very difficult.	0.173	0.047	-0.077	0.053	**-0.689**	0.320	0.191	-0.186	0.087	**-0.733**	0.589
Att22	My institution has enough teaching-learning resources to carry out e-learning.	0.135	0.281	0.299	0.116	0.509	0.025	0.227	0.269	0.156	0.471	0.405
Att8	I enjoy teaching using computers.	0.045	0.268	0.192	0.401	-0.453	0.134	0.411	0.082	0.461	-0.488	0.538
att17_rev	Teaching through e-learning is tiresome.	0.132	0.105	-0.349	-0.117	-0.444	0.305	0.200	-0.421	-0.054	-0.508	0.44

Table 3: *Mean inter-item correlations and Cronbach's alpha values for each factor*

Factor	No. of items	Mean inter-item correlations	Cronbach's alpha
1 Challenges of e-learning	7	0.348	0.788
2 Benefits from e-learning	7	0.300	0.731
3 Attitude on using computer systems	3	0.416	0.680
4 Leisure interest on e-learning innovations and use of computers	4	0.318	0.651

We further conducted the PCA after deleting items with factor loadings less than 0.5. Results show that all items loaded perfectly well in the same factors except *att13,* "A face-to-face method is more learner-centered than E-learning methods." On rechecking the reliability of a scale, only *att13* was found to have a higher *alpha value if item deleted* than the rest of the items. Removal of this item yielded a Cronbach's alpha coefficient of 0.806.

We finally repeated the PCA with 22 items and fixing the number of factors to 4. Again all items loaded perfectly well in the same factors. However, Factor 1 became *Benefits from e-learning (7 items)*; Factor 2, *Challenges of e-learning (7 items);* Factor 3, *Leisure interest on e-learning innovations and use of computers (5 items)* and the last factor was *Attitude on using computer systems (3 items).* The four-factor solution explained a total of 47% of the variance with Factor 1 contributing 20.9%, Factor 2 contributing 12.7%, Factor 3 contributing 6.8% and Factor 4 contributing 6.6%.

DISCUSSION

The purpose of this study was to develop and validate a Test of e-Learning Related Attitudes (TeLRA) scale. TeLRA scale offers an alternative to existing e-learning measures which focus on teachers' attitudes towards e-learning in HLIs. Most of the existing measures have been developed in highly technological advanced countries where e-learning are in full operation in education settings and many lacks cross-cultural validity. Moreover, their wording structure could not meet our specific requirements in using them. Thus, to address these limitations, constructs of TeLRA scale was initially defined through adapting a cross-cultural validated TOSRA scale. Items were developed based on literature review guided by the conceptual framework adapted from the TAM theory. We described reliability and validation process and finally, conducted a factorial validity.

The factor analysis identified four distinct factors (see Table 2) with factor loadings greater than the absolute value 0.5, supporting half of our initial constructs of the scale. The cut-off point of 0.5 was aimed at having a scale with strong, distinct and limited number of themes that describe teachers' attitudes towards e-learning. The mean inter-Item correlations in each factor were greater than 0.3 indicating unidimensionality in each factor.

The themes of TeLRA scale after PCA have also conformed to a conceptual framework adapted from the TAM theory. The conceptual framework consisted of four constructs: external variables, teachers' perceived usefulness, teachers' perceived ease of use and teachers' attitude toward e-learning which depends on the first three constructs. Themes such as Challenges of e-learning, Benefits from e-learning, Leisure interest on e-learning innovations and use of computers are respectively conformed to external variables, teachers' perceived usefulness and teachers'

perceived ease of use of computers. In addition, half of the emerged themes matched with the initially predicted themes adapted from the TOSRA scale. This further enhanced its construct validity.

Furthermore, results displayed in Table 2 proposed that the evaluation process of e-learning could also be controlled by affective components (Bodur et al., 2000; van den Berg et al., 2006; Dempsey & Mitchell 2010) and cognitive links between e-learning and its associated attributes (Fazio 2007). Fazio (2007, p. 608) claims that individuals' evaluative judgment about an entity can be constructed out of "attributes that characterize the entity and their favourability." It implies that teachers could construct positive or negative attitudes towards e-learning through feelings and emotions they use to associate with e-learning and/or on the basis of its salient attributes existing at that time (ibid.).

As raised earlier, diversity of aspects to measure attitudes has been demonstrated by the behaviour of individual items. Most of items concentrated to the themes challenges of e-learning, benefits from e-learning and leisure interest on e-learning innovations and use of computers. This suggests that issues concerning teachers' attitudes towards e-learning need to be addressed particularly in these areas. Teachers may be supportive to e-learning if they believe that it can be implemented with minimum challenges, it is beneficial to their career and education and it is easy to implement.

Despite the fact that TeLRA scale has demonstrated an acceptable internal reliability, we have not examined, at this stage, either external reliability or predictive validity. Demonstrating external reliability would have further informed researchers its reliability over time. In addition, through test-retest examination would have made possible to compute Confirmatory Factor Analysis (CFA), which its results would have establish an empirical confirmation of the themes derived by the PCA further enhancing its validity. It is the authors' view that, conducting CFA with the same data set does not significantly add to the analysis since both techniques are so closely related such that a factor structure derived from a PCA would almost always fit well in a CFA when using the same data set (Hurley et al., 1997; Matsunaga 2010). Similarly, predictive validity would have established how well the results from the TeLRA scale can be used to predict future teachers' attitudes towards e-learning. These are issues to be addressed in the future studies.

However, the extracted four factors solution with established factorial validity could be described as highly representative of the whole concept of attitude measure towards e-learning. With education transformation from face-to-face learning to e-learning (URT, 2003; URT, 2007) happening throughout Tanzania, initiatives for adopting e-learning are also emerging in many HLIs. Thus, through the use of the TeLRA scale, education institutions can identify particular opportunities as well as threats that can influence teachers' attitudes towards e-learning. Being the key stakeholders in all formal education, successful adoption and implementation of e-learning in HLIs will highly depend on teachers' perceptions and readiness to use e-learning in their classrooms. With a slight difference in Cronbach's alpha of the TeLRA scale when used in England and Tanzania, the authors do not expect significant variations in results when used in other countries.

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