ISSN 2047-3338

ICT Integration Indexing Levels: A Study of Selected Kenyan Universities Information Technology Teaching Professionals

Abila James Onyango[1] and Anselemo Ikoha Peters[2]
[1,2]Department of Information Technology Kibabii University, Kenya
[1]abisonj@yahoo.com, [2]aneselp2004@yahoo.com

***Abstract*– The Universities Information Technology Teaching Professionals (UITTPs) with better ICT integration index can have better influence to the graduates' ICT integration level. ICT integration index levels of University ICT teaching professionals reveal that they would still not integrate ICT at transformative levels .Situational analysis of the UITTPs ICT integration index is the foundation for continuous improvement of the UITTPs ICT integration. Situational Analysis is an important technique in designing progressive systems especially social or socio technical systems. It ensures continuity and therefore improves integrations. The aim of this study was to determine current ICT integration levels, The study adopted design based mixed research approach by undertaking a desktop research and descriptive survey to identify existing metrics by purposively sampling 3 public and 3 private Kenyan universities Professionals teaching Information Technology and computing departments and chairs of departments. The surveyed findings were quantitatively and qualitatively analyzed descriptively and inferentially using Kendall's correlation coefficient. Currently UIITP integrate ICT at level III , despite the existence of essential conditions, these University ICT Expert Lecturers would still not integrate ICT at transformative levels .Therefore it is recommended that there is need to continuously support integrators and monitor them . The UITTPs current index of ICT integration can improve the graduates' ability's effective use of ICTs. The UITTPs with higher index will expose students to relevant ICT experiences during their teaching while those with low indexes can be supported more through continuous learning.**

***Index Terms*– Indexing Levels, ICT, Teaching Professionals and Integration**

I. NTRODUCTION

CURRENTLY, there is lack of sufficient knowledge about the current situation of individual university information technology teaching professionals ICT integration index (UITTP-ICT-II) at the various developing countries' universities. And with the rapidly emerging Internet of Things (IoT) resulting into big data, then the management of UITTPs ICT integration is likely to be more complex. The UITTP-ICT-indexing need to be based on metrics that can effect continuous improvement in performance level of ICT integration given the myriad and vegetating ICT innovations [1], [2], although some integration indices have been proposed, they are neither participatory nor individualized and do not focus on continuous improvement metrics and therefore lack comprehensiveness of scope. The existing indices cannot therefore be specifically used to support continuous improvement of ICT integration performance level by UITTPs. These aspects of ICT integration performance index currently lack and if they exist then they have not been evaluated empirically.

A) ICT Integration Index Levels in University Teaching

Studies shows that there is need to index ICT integration and various approaches have been adopted however institutions like UNESCO and ITU have made effort to index but they appear to face the challenge of sound basis (metric) of indexing due to dynamic nature of ICT. The details of which are discussed in this section.

B) The need for Indexing ICT integration

A study by [2] confirmed that ICT tools and practices have not improved education quality and quantity. An earlier study by [3] found out that ICT as a teaching tool is being abused in covering the curriculum, this could be worse more so in universities whereas they are expected to provide leadership to other lower level institutions and other sectors. Recent studies in Vietnam similarly found out that although lecturers recognized the potential of ICT, they will not necessarily put integration of ICT into their practice [4] ICT alone therefore cannot improve the effectiveness of teaching and learning; they need to be integrated into the curriculum through a systematic approach. A study by [5] also found out that lecturers and students in Federal University of Technology, Minna, had computers and laptops and can access the internet but, they do not use them for teaching and learning. This suggests that possession or availability of ICT resources is one thing while utilization of the resources is another.

ICT integration studies developing countries are not any different, study in Tanzania universities indicates that although majority of educators have gone through ICT training, they still lack skills in online marking and data management procedures. Despite training and positive attitude toward ICT integration, educators, regardless of their

educational background, do not integrate ICT in teaching learning processes[6] In Kenya, the status of integration of ICT by educators in higher institutions such as Kenyan teacher training colleges is largely unknown and these institutions experience low level of ICT integration into teaching in all teacher training colleges According to studies by [7] there is no concrete framework for the integration of ICT into education. [6] therefore recommended that ICTs integration be made part of undergraduate training in universities in order to equip future teacher educators with ICT skills. The study by [8] further recognizes enablers and barriers for ICT integration but none of the components has a quantifiable measure to show the extent to which it can influence or contribute towards the ICT integration process. [9] on the other hand confirms the argument that the rate at which these ICTs are transferred and integrated into the teaching and learning process is slow. New teacher graduates still have limited knowledge of how ICT can be used in their professional activities [10]. Study by [6]) recommends the retraining of teacher-educators to ensure that they have sufficient skills to integrate ICT in teaching their specific subjects. One way of improving such training is to identify what these teachers' need to be trained on. However, [11] noted that ICT integration process can be complex. This requires indexing training needs as opposed to holistic training need identification.

Universities IT teaching professionals (UITTPs) ICT integration indexing can be an important pillar for any society as they can influence the quality of graduates to the industry. The UITTPs index of ICT integration can eventually affect the graduates' ability in effective use of ICTs. The UITTPs with higher index can expose students to relevant ICT experiences during their teaching. The UITTPs with better ICT index can have better influence to the graduates' ICT integration level [12], [13].

Future of teachers depend on their preparedness to use ICTs [14].The aim has been to enable teachers integrate ICTs into mainstream classroom practice. Other studies have gone further to emphasize ICT integration in instructional processes [15]and others into specific programs like the integration of ICTs into teacher training curriculum[16], [17]. Others studies by [18] and [19] also developed measurement tools to investigate teacher attitudes towards ICTs.

Despite all these efforts,[20] found out that some institutions such as teacher training programs have not facilitated the effective integration and use of ICTs for instructional purposes. This is against [13] argument that teachers ICT knowledge is valuable in ICT integration. [13], underlines the importance of teacher training institutions to facilitate ICT integration practices in formal instructional settings. Teaching institutions like universities are therefore not exceptional.

World states have used continuous ICT learning and policy documents to improve low pace of ICT integration [21]. In Kenya, emphasis has been on developing of ICT policies [22].Although the policy documents mandates monitoring the ICT integration, these indices are manual, static, and therefore lack reliability and valid indicators, as they lack real time feedback and are not continuous. On the other hand, use of Continuous ICT learning approach would improve pace of ICT integration as it ensures developing additional work skills and self-satisfaction [23] This appears a more useful approach, however, given the current global crisis of preparing and supplying well-educated teachers, necessitated by fast changing technologies, globalization and rapid new demands on teachers [24]) and the need to tap the integrators (UITTPs) as source of innovation, university information technology teaching professionals need to continuously learn through cooperate and collaborative approaches and through strategic partnerships at institutional, country, regional and global levels. Little is known on effectiveness of such collaboration. Lack of collaboration indexes might have not enabled teachers to deal more effectively with the emerging complex issues integration and the continuous demands of ICT integration. Continuous learning of ICTs would therefore require dynamic management through empirically evaluated indices, automated, and mobile based. This can enable dynamic, global-localization, flexibility, and precisely able to establish current ICT Integration Indexes (C- II) as a basis for future learning needs and improvements in ICT integration.

C) ICT integration Indexing Approaches

[25] asserts that institutional ICT integration levels measurements or indexing and evaluations are necessary. [25] investigations suggested that the ICT integration levels indexing in teacher training institutions are needed, and therefore conducted investigations in the perspectives of pre-service teachers. [26] also did investigation in TIVET (Technical industrial, vocational, Entrepreneurship Training) institutions and found it necessary to integrate ICT but this had not been exploited. All these efforts can be viewed as ICT management diagnostic studies. Management diagnostics is rapidly gaining concern so as to have an overall impact or picture (index) of educational institution with regard to ICT integration levels (index [27]However, such indexes need to be based on sound basis or metrics.

D) Metrics for Indexing Current ICT Integration

As has been discussed above, integration level (index) here refers to the resultant process or practice (behavior-external) measures as portrayed by the ICT integrator. It can be viewed as the total resultant ICT integration behavior by an individual, organization or nation. Such ICT integration practice level measurement can be approached at individual level or organizational perspective. Individual level measurement studies in secondary schools, conducted by [28] found out that teachers integrated ICT at one of the four levels in their teaching. At level one (LI), the teachers behaviorally integrated ICT as a verbal resource, at level two (LII) through printed resources, at level three (LIII) as hands-on (courseware) experience and as a combination of all the above three practices at level four (LIV).

[28] further argues that at level one (LI); the teacher teaches with the aid of ICT as verbal resource, giving the website addresses or name of courseware that would help students to enhance their understanding of the topics. At level two (LII); the integrator teaches with the aid of ICT as printed resources; distributes printed downloaded information as teaching aids.

Level three (LIII) also referred to as hands on experience; teacher teaches with the aid of computer, courseware, software or internet only. At level four (LIV); the teacher teaches with the aid of computer, courseware, software or internet in delivering the lesson. She or he also gives out handouts with information printed from the Internet or courseware.

Teachers found to be in Level III and IV were perceived to be actively integrating ICT in their teaching and were very committed to the technology, they were very enthusiastic when they shared their experiences during the interviews [28]. However, these levels were influenced by the presence and absence of the conditions that facilitated the implementation of ICT integration in teaching. At institutional level analysis all schools in level III and IV had their teachers integrating ICT throughout their teaching.

[29] in an earlier study also studied levels of integration and segmented the individual ICT integrators into five segments; enthusiastic beginners, supported integrated, high school naturals, unsupported achievers, and struggling achievers. These sub groups of ICT integration performance level can be measured further on other basis such as; experience and comfort with technology, grade level taught, applications and practice used and the extent of support by colleague and others.

Synthesis of these measures therefore reveals that although all accomplished ICT integrators may be at the same level of integration, they may in addition have diverse and complex combination of factors that leads to a given performance level of success in ICT integration. This consideration may be useful in discriminating and dispersing university teaching ICT integrators within the same level of integration and or segmentation level. The ICT integration performance level (measures) therefore can be perceived as a product that is dependent on varied or complex causes or influences of conditions and processes which need to be characterized by certain few critical success factors (CSF) or metric determinants. The complexity of these socio-technical systems, require metrics and measures to determine degree or ICT integration levels at individual or organization levels. These levels can eventually be used for continuous improvement in ICT integration levels. Socio-technical system such as University teaching can have considerable metric variables which can be influenced by many and complex factors ranging from the essential ICT conditions measures to supportive measures (enablers) and barriers whose levels need to be determined before developing any metric for continuous improvement of ICT integration index.

Although, institutions, have responded to addressing the complexity in ICT integration through various approaches such as training workshops, continuous learning, and participatory approaches, most of these approaches have not significantly enhanced ICT integration to the desired performance levels. Continuous improvement in ICT integration performance levels requires metrics of the current integration levels as a basis of their improvement. There is also need to determine the cause of various observed performance measures (LI, LII, LIII, and LIV…LN) in advance so as take corrective measures at the root cause. There is therefore need to comprehensively determine the array of metrics set of measures that influence these performance levels (indexes).

E) Theoretical Framework

- The study extends the [28] proposed four performance levels index of ICT integration in teaching specified as level (LI, LII, LIII, and LIV). This extension is necessary because presence of these indexes alone are not enough as these indices requires continuous improvement and especially at individual integrator level.
- None of these previous studies has developed metrics for individualized continuous improvement index.
- Such indices would provide a basis for identifying simple steps that developing countries could undertake to build vibrant, efficient and effective UITTPs knowledge based system.
- This research will be based on two theories; Earls' theory of multiple methodologies (Earl, 1989) and organization learning theory as proposed by Argyris (1978). Earl suggests three elements of any information systems strategy:
  - Understanding the current circumstances,
  - an appreciation of what opportunities exist in the environment
  - and a vision for future

It involves identifying and agreeing on business objectives through interview, debates and existing policies - gap (process); defining critical success factors (necessary for survival and growth); finding Information Technology that support or enable these CSF. The Earl theory is suitable for large, complex and complicated situations. It will provide a basis for the process of deriving metrics. This makes it suit ICT integration in university teaching, which is a broad complex system. The Earl strategy here will guide the process used to derive effective metric that is necessary to continuously improve ICT integration index (LI**)**, where university teachers integrate ICT as verbal resource, level two (LII), where a university teacher integrates ICT as printed resources, level three (LIII) as hands-on experience and a combination of all the approaches at level IV (Wan et al., 2009). The improvement of ICT integration performance levels from LI to LV and to LN, are dependent on a continuous improvement of ICT integration Index for UITTP. This view borrows from Argyris (1978) organization learning theory, where improvements in ICT integration need to be characterized by an individual or group learning, an effective UITP indexing need to be based on learning metrics. The university ICT integration index also need to be based on some scope (comprehensiveness) of the current ICT integration index, barriers and enablers of collaborative indices of the teaching process such as attitude levels of university teachers in using ICT, the supporting conditions for ICT integration and as moderated by the basic essential conditions of ICT integration such as hardware and software resources and policy that govern the people ware. This is as conceptually represented below in. The purpose of this study

was to examine the current ICT integration situation in Kenyan universities. The specific objectives were:

i). Determine current ICT integration level by the UITTP of the Kenyan universities

ii). To determine the extent of contribution by the various metrics towards the current integration levels

II. RESEARCH METHODOLOGY

The study adopted design based mixed research approach by undertaking a desktop research and descriptive survey, Purposively sampled 2 public and 2 private Kenyan UITTPs populace practicing in Information Technology and computing departments this was done Based on intensity of IT related programme. Interviews were done to 24 University IT teaching professionals and heads of departments. Findings were quantitatively and qualitatively analyzed. Rank correlation analysis, using chi square, and Kendall coefficient of concordance of correlation.

A) Data Analysis

Data analysis is the process for obtaining raw data and converting it into information for useful decision making [30]. In this study, the raw data was collected using five point likert ordinal ranked data interview schedule. The data was converted to useful information based on descriptive and correlational analysis and inferential statistics. Descriptive analysis entails a brief quantitative summary of the data rather than use the data to learn from it as it is inferential statistics [31], the summaries can be presented using measures of central tendencies and variability or dispersion from mean. The measure of central tendency used in this study was mean based on the three main constructs of this study as represented by the objective and this was done based on demographic factors such as department, public, private universities in relation to the three objectives, current ICT integration index based on [28] model, The means within each main construct were compared based on their frequency in the index frequency scale which was equivalent to the five point likert scale in the interview items. These descriptive were graphically shown and formed the basis of further analysis. Due to the weakness of the descriptive statistics to enable decision making; then it was necessary to perform correlation analysis of UITTPs opinion on relationship between ranks they provided for the constructs.

Correlation analysis was done within the constructs. Inferential analysis was done to establish concordance on the view of the UITTPs and COD on the various constructs. An appropriate rank correlations test was done for the three objectives using Kendalls concordance of correlation. Inferential statistics (chi square) was used to test significance level of these categories so as to determine which metric and groups that do not significantly affect integration levels and need to be avoided in the metric design modeling.

III. RESULTS AND DISCUSSIONS

A) Introduction

The study aimed at establishing current ICT integration index levels, for indexing University Information Technology professionals' improvement in ICT integration. The ICT integration levels by the UITTPs was the objective and was investigated using four metric constructs that is; the extent with which various methods of ICT integration was used during teaching, extent of presence of essential conditions of ICT integration during teaching, extent of ICT support got from and given to colleagues, and extent of collaboration levels using various ICT technologies. The findings are shown and discussed below. To enable capturing data about the ICT integration levels, the study involved 24 personnel who were interviewed, this included the UITTPs and COD for IT related courses from six selected universities (3 private and 3 public). Their distribution is a shown in the Table I:

Table I: Interviewees Bio data for Current ICT index levels

		Total number	Sample%	Sample size
IT teaching professional	private	(at least from all of the 5 grades)	Convenience - 9	9
	public	(at least from all of the 5 grades)	Convenience - 9	9
Chairperson of the department (COD)	private	3	100	3
	public	3	100	3
Total				24

Equal numbers of interviewees were used for data collection from both public and private universities. The interview was done to UITTP and COD who had 10 years and above experience with ICT integration and who had frequently taught degree students. The findings of the UITTPs and COD opinion are as discussed in the next subsection.

B) Extent with which various methods of ICT integration was used during teaching

In this study, opinion of the COD and UIITPs was sought based on frequency in use ten (10) variables or constructs on methods used by UITTP to integrate ICT. Their opinions were rated on a scale of 1 to 5 depicting an increasing level of frequency of integration from; no integration at all (1), rarely (2), moderately (3), frequently (4), to very frequently (5). Findings are as shown in the Table II.

C) Descriptive Analysis

Frequency with which various methods of ICT integration was used during teaching period was rare to moderate with a mean rank of (51%).

Table II: Frequency with which various methods of ICT integration was used during teaching

Method of ICT integration used	N	Mean	% mean	Std. Deviation	Mean Rank
frequency of presenting lesson using courseware	24	4.25	16.7	1.03209	8.33
frequency of presenting lesson from Desktop computer	24	3.5833	14.1	1.58572	7.04
How frequently did you refer students to courseware that can enhance their understanding of the topics?	24	3.5	13.7	1.06322	7
frequency of presenting lesson in an online environment	24	2.9167	11.4	1.69184	5.96
How frequently did you refer students to website addresses?	24	2.8333	11.1	1.16718	6.67
frequency of presenting lesson from Laptop	24	2.5	9.8	1.69398	5.58
frequency of Distributing print downloaded teaching aids	24	1.8333	7.2	1.09014	4.54
frequency of presenting lesson from Tablet	24	1.6667	6.5	1.52277	3.71
frequency of presenting lesson from smartphone	24	1.25	4.9	0.44233	3
frequency of Teaching with Printed Resources	24	1.1667	4.6	0.38069	3.17
mean methods of integration use	24	2.55	100	1.167	5.5

Kendall's W[a]			0.449
Chi-Square			97.016
df			9
Asymp. Sig.			0
Monte Carlo Sig.	Sig.		.000[b]
	90% Confidence Interval	Lower Bound	0
		Upper Bound	0.091

a. Kendall's Coefficient of Concordance

b. Based on 24 sampled tables with starting seed 1314643744.

Courseware integration method had the highest rank contribution to ICT integration at (85 %) followed by desktop computer use at (71.6%) and then referring students to courseware at (70 %). while the least ranked methods of ICT integration use were teaching using print media (23.4%), smartphone (25%) and tablet (33.3 %).

Frequency Contribution of method metric constructs to ICT Integration current Integration index levels:

Frequency with which various methods of ICT integration was used during teaching period was rare to moderate with a mean rank of (2.55).The details on the individual constructs contributions are shown in Fig. 2 and discussed as below:

Courseware based teaching had the highest rank contribution to ICT integration levels at (16.7 %) next was desktop computer use at (14.1%) and then referring students to courseware at (13.1 %). The least ranked methods of ICT integration used were teaching using print media (4.9%), smartphone (6.5%) and tablet (7.2 %) and their use frequency was generally below average.

Inference Analysis on use of methods of integration:

Kendall's Correlational of Concordance analysis was done for the ranked values of the observations made by the 24 UITTPs. This was done against a null Ho : *that the ranking by the UITTPs on the frequency in use of various methods ICT integration do not agree significantly at 90% confidence level and df of 9.*

The analysis indicates that there exist a moderate relationship of (W =0.449) .This depicts an agreement in ranking provided by the various interviewed UITTP including COD. The Ho is rejected implying that mean frequency of integration methods at 2.55 is a significant moderate pointer on the frequency in using the various methods of integration. While on the other hand, the most and the least frequently used method of integration is inferred to be Courseware teaching with (85 %) and teaching using print media (23.4%), smartphone (25%) and tablet (33.3%) respectively. Based on the rejection of the null hypothesis, it can be inferred that the use of these methods of integration is "moderately present". However, it is still further apparent that the UITTPs integration methods appear to be at the two extremes away from this mean (2.55) in use of ICT integration methods, meaning some of the UITTPs are still using very old integration methods as well as new methods. It implies that both the legacy and new methods of integration are not being integrated well since most users are the extremes. The UITTPs are who are experts are only using the new technologies and they ignore the need to integrate them with the legacy ones. The novice UITTPs are also still more engaged with the traditional technologies and have not adopted the new technologies. This implies that the learners are disadvantaged ,as learners in university environment in Kenya has a purely mixed as the university admission is currently done by random distribution of students from high schools of all over the country and the high schools are at

varied levels of ICT integration ,this argument is based on the view that Kenya has not introduced ICT as a compulsory subject in high school and also to the fact that taking an ICT related course is not pegged on the previous course taken in IT nor computer as a subject. So none at all or rare use of legacy methods of ICT integration by the UITTPs impacts negatively on students with poor ICT based learning backgrounds while none or rare use of new methods impacts negatively on the students with rich ICT based learning backgrounds. Therefore there is need for continuous improvement leading to transformative integration index levels. But the indexing levels must not only depend on methods of integration used during teaching as discussed above. It must be dependent on other variables like essential conditions as discussed below.

D) Extent of presence of essential conditions of ICT integration during teaching

In this study, opinion of the COD and UIITPs was sought based on frequency in use ten (4) variables or constructs on extent of presence of essential conditions that facilitated UITTPs to integrate ICT. Their opinions were rated on a scale of 1 to 5 depicting an increasing level of frequency of presence of essential integration conditions raging from; total absence (1), rarely present (2), moderately present (3), frequently present (4), to ever present (5). Findings are as shown in the Table III.

Three essential conditions ICT policy documents, computer hardware facilities, appropriate software, support from technicians and support from colleagues as suggested by (Wan et al,2009) formed the basis of this investigation on the extent of their presence. 22 UITTP members were interviewed and ranked the presence of these conditions in a scale of 1to 5 depicting Total absence, rarely, moderately, satisfactory present, and fifthly ever present in that order.

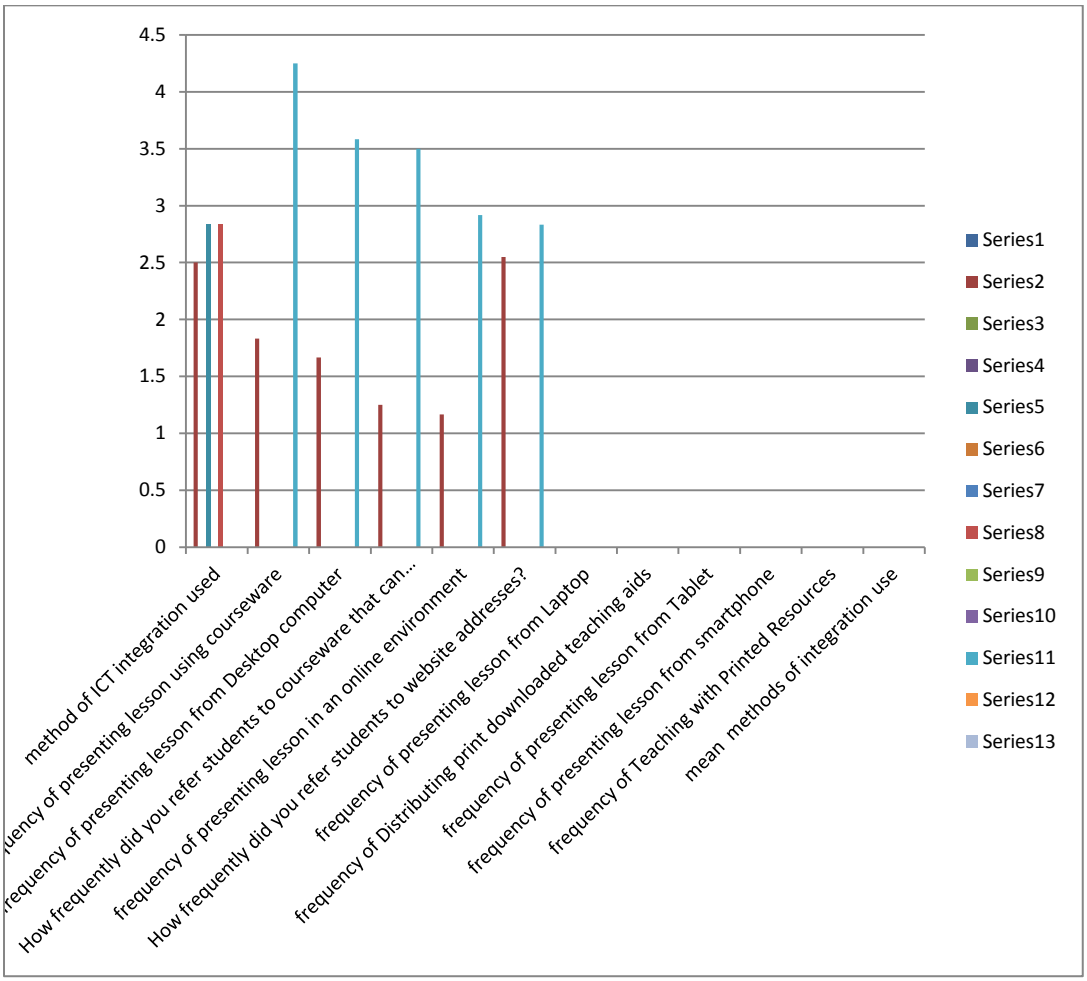

Fig. 1: Frequency with which various methods of ICT integration was used during teaching

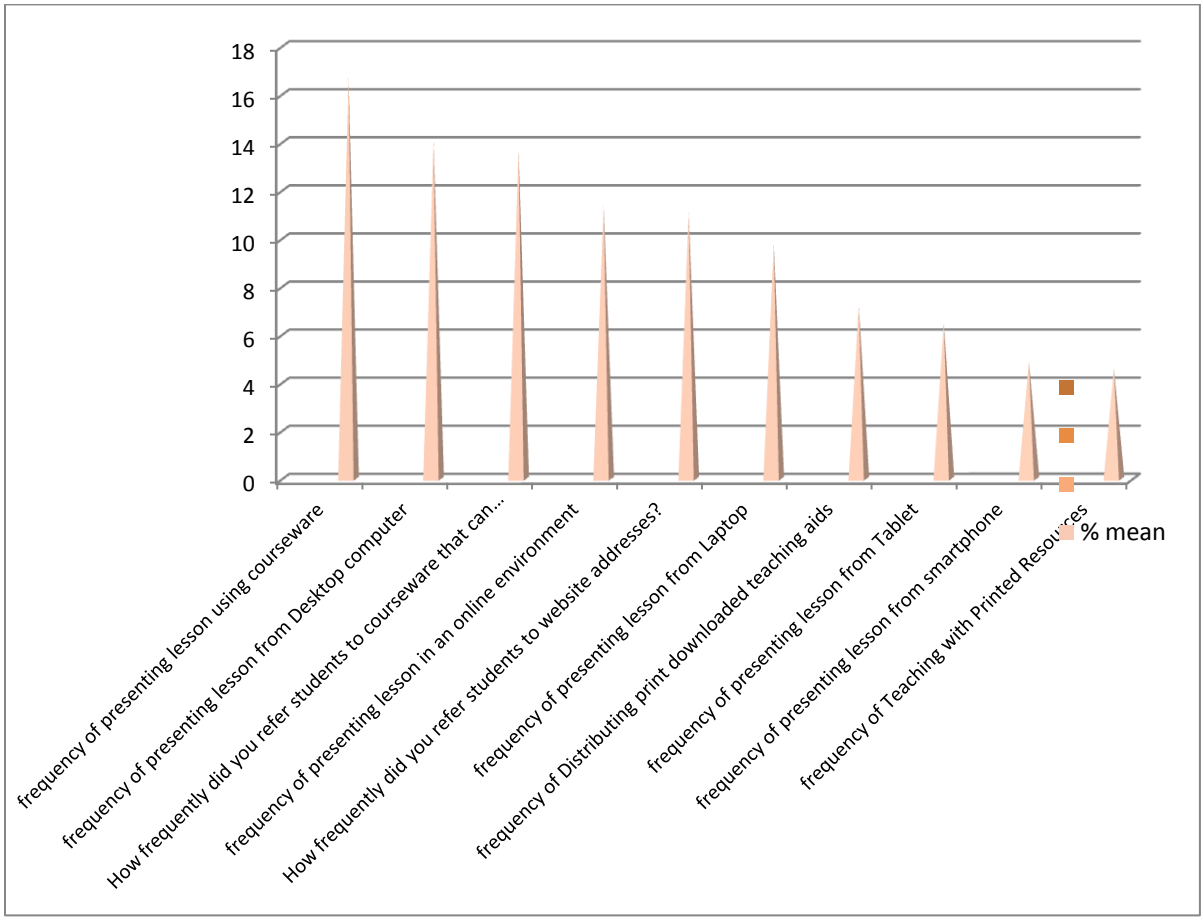

Fig. 2: Frequency Contribution of method metric constructs to ICT Integration index levels

Table III: Extent of Presence of Essential Conditions of ICT Integration

Essential Condition metrics	N	Mean	%Mean	Std. Deviation	Mean Rank
Support from ICT technicians	22	4.64	21.97	0.79	3.59
Computer Hardware facilities	22	4.55	21.54	0.8	3.45
Appropriate Software	22	4.36	20.68	0.79	3.05
ICT Policy documents	22	4.09	19.39	1.02	2.86
Support from colleagues	22	3.55	16.8	0.91	2.05
group mean		4.24			
N					22
Kendall's W[a]					0.341
Chi-Square					30.00
df					4
Asymp. Sig.					0.000
Monte Carlo Sig.			Sig.		
			90% Confidence Interval	Lower Bound	0.000
				Upper Bound	0.090
a. Kendall's Coefficient of Concordance					
b. Based on 24 sampled tables with starting seed 624387341.					

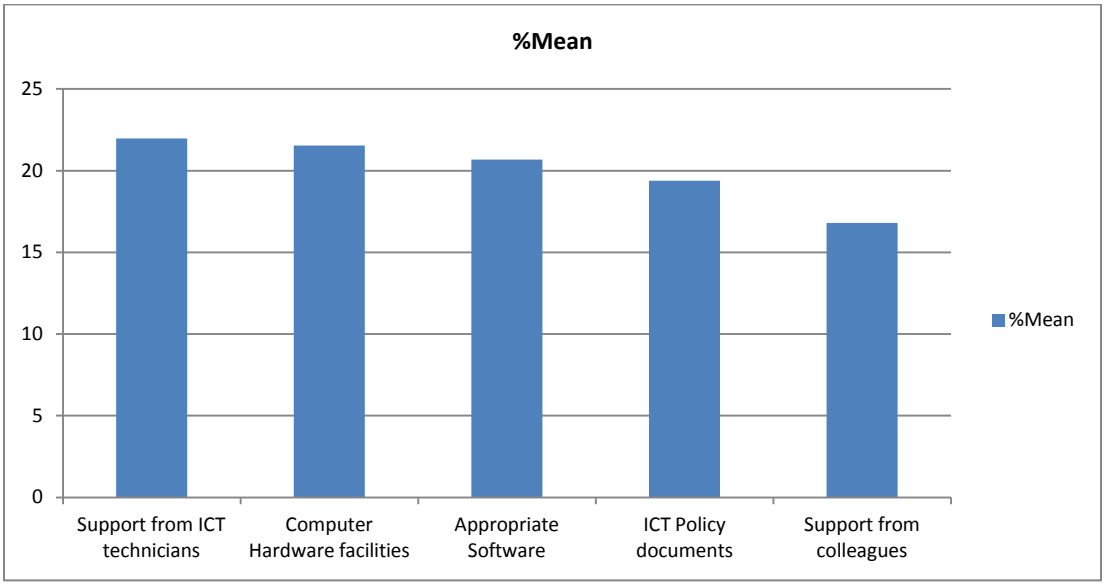

Fig. 3: Extent of presence of essential conditions of ICT integration

Descriptive Analysis

The findings depicted in Table III indicate that presence of essential conditions were either ever present or satisfactory present with a mean presence of essential condition of ICT integration of 4.2 or 84.7% presence of ICT integration essentials. This implied satisfactory presence of the essential conditions of integration.

The support from ICT technicians had the highest mean frequency of 92.7%, followed by computer hardware facilities (90.9%) implying ever present essential conditions of integration, even though appropriate software (87.2%) had a mean above group mean it had a satisfactory presence. However, ICT policy documents (81.8%) and support from colleagues (70.9%) were below the mean implying the least but fell in satisfactory presence bracket.

Variation of presence of essential conditions:

ICT policy documents had the highest variation of presence of 1.01 then support from colleagues (0.911).Meaning they had the worst presence.

Inference for Essential Condition metrics:

From the Table III above, there is a moderate relationship (0.341) and this relationship is significant at Chi square of tabulated value of X^2=7.78 and calculated value of X^2=30.00 at a df =4, the null Ho is therefore rejected implying that there is significant agreement in the ranking of the presence of the various essential conditions of ICT integration. Implying that all the above values can be taken to be valid, in that that essential conditions are generally satisfactorily present for the UITTPs and that ICT policy documents and support from colleagues even though satisfactorily present, they are still lagging behind in provision of essential conditions for integration and therefore need improvement in their availability as compared to support from ICT technician and computer hardware facilities which in the opinion of the experts are ever present.

In conclusion, computer hardware and support from ICT are ever present while ICT document policy and support from colleagues are at satisfactory presence levels. These findings are significant therefore would be useful as base values in deriving continuous improvement or chain indexes.

E) Extent of ICT support got from and given to colleagues

The extent of support got or given to colleagues was ranked by 24 UITTPs on a 1 to 5 rating scale of 1 depicting "no support at all" to "rare support", "moderate" , "frequent" and 5th being "very frequent support". The findings indicated in Table IV.

Descriptive Analysis:

The mean support was frequent with a mean value (71.6%). Both supports given to and got from colleagues were frequent with means 73.3% and 70.0% respectively. It is apparent that support to colleagues is slightly higher by 3.3% a value not significantly higher anyway.

Inference Analysis:

Inference on level of support and support given was tested against the null hypothesis *Ho: that there is no significant agreement among the UITTPs opinion on ranks they provided on the influence of support on level of integration*. Findings in Table IV indicates that there is a very weak concordance relationship (W^a =0.083) in the ranking of the ICT support got or given as observed by the UITTPs. The Ho is accepted at calculated X^2=2.0 against tabulated X^2=2.71 at df=1 .Implying that there no agreement in the ranking by the 24 UITTPs over the ranking values given above. This implies that these rankings may not be relied on to determine the extent of support got or given to colleagues. This can probably be attributed to the fact that the support activities may have not been structured or not viewed as an important formal activity, thus may have not been easy for the UITTPs to rank objectively.

In conclusion, extent of ICT support given to colleagues and got from colleagues is not structured and is currently unknown among university Information Teaching professionals (UITTPs).From these findings therefore may not be useful to use support as an essential condition for integration nor use support as a base value for continuous improvement or chain indexing of ICT integration but can only be taken as an instantaneous index.

F) Extent of collaboration levels using various technologies

Descriptive Analysis for Frequency in using ICT Collaboration Technologies

Frequency in using various collaboration technologies was generally moderate (3.32) with highest contributors being other collaborative environment e.g., email and instagram (4.0); followed by twitter (3.81), then flickr (3.81), whatsapp (3.81) skype (3.81) facebook (3.6) shared design (3.5) and least was the authoring tools at (3.4),

Table IV: Extent of ICT Support got from and given to colleagues

Support from or to colleagues	N	Mean	%mean	Std. Deviation	Minimum	Maximum	Mean Rank
How frequently were you consulted by your colleagues? (to)	24	3.6667	73.3333	.48154	3.00	4.00	1.58
How frequently did you consult your colleagues (from)	24	3.5000	70.0000	.51075	3.00	4.00	1.42
		3.5833	71.6667				

N			24
Kendall's W[a]			.083
Chi-Square			2.000
df			1
Asymp. Sig.			.157
Monte Carlo Sig.	Sig.		.364[b]
	90% Confidence Interval	Lower Bound	.195
		Upper Bound	.532

a. Kendall's Coefficient of Concordance

b. Based on 22 sampled tables with starting seed 334431365.

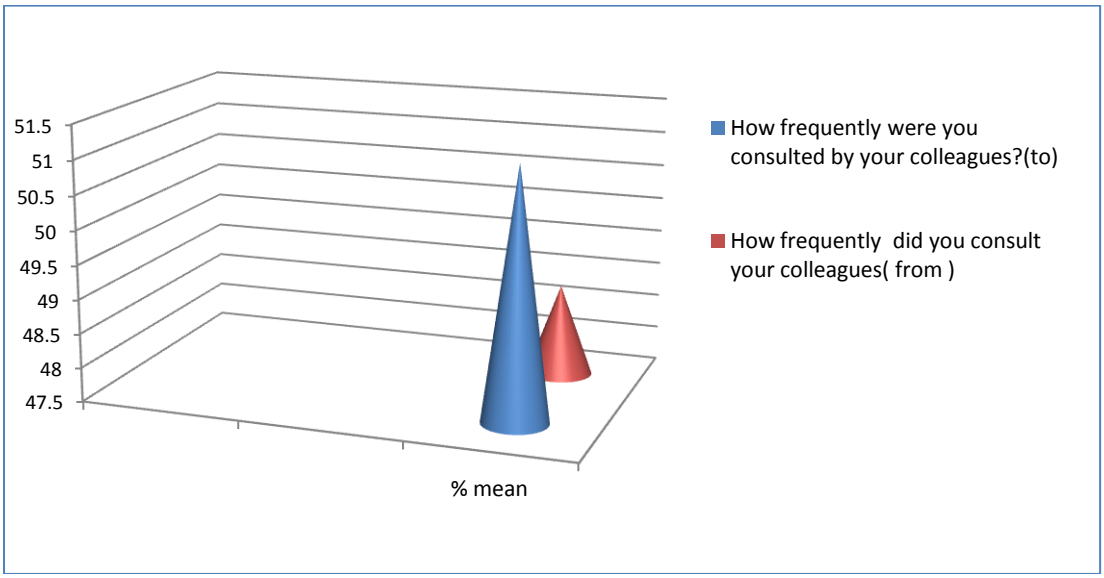

Fig. 4: Extent of ICT Support got from and given to colleagues

Table V: Frequency in using various collaboration technologies

Collaboration metric	N	Mean	% mean	Std. Deviation	Mean Rank
Other collaborative tools e.g., instagram	22	4.0909	13.67773	1.38639	4.45
twitter	22	3.8182	12.76597	1.47122	3.82
Flickr	22	3.8182	12.76597	1.405	3.5
whatsapp	22	3.8182	12.76597	1.43548	4.77
skype	22	3.7273	12.46205	1.43548	4.77
facebook	22	3.6364	12.15813	1.39882	4.32
Shared Design environment	22	3.5455	11.85421	1.54023	5.59
Shared Authoring tools	22	3.4545	11.54996	1.43548	4.77
total		29.9092	100		

N			22
Kendall's W[a]			.254
Chi-Square			39.167
df			7
Asymp. Sig.			.000
Monte Carlo Sig.	Sig.		.000[b]
	90% Confidence Interval	Lower Bound	0.000
		Upper Bound	.099

IV. CONCLUSION AND RECOMMENDATION

Table VI: Summary of current ICT integration levels

Position	Integration Metric	Mean Integration Metric	Hypothesis Rejection or Acceptance	Correlation Wa
1	essential conditions	4.23	1	0.34
2	support condition	3.58	0	0.08
3	collaboration	3.32	1	0.25
4	methods	2.55	1	0.45
	Mean	3.42	1	0.28

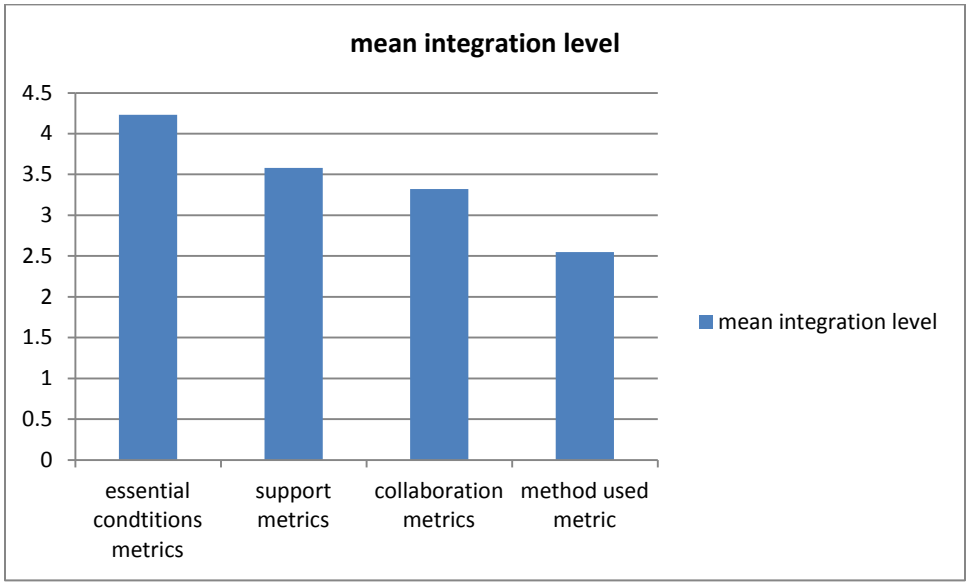

Fig. 5: Summary of ICT integration levels index

From the above findings on Current level of ICT integration it can be summarized as shown in Fig. 5.

The average integration is moderately frequent towards satisfactorily frequent (3.42) i.e., level III integrators, an equivalent of courseware level of integration (wan et al., 2009).The various university had an agreement on this ICT integration level III though it was a weak agreement with a correlation coefficient of 0.28. Universities were best integrators through provision of essential conditions whose contribution was satisfactory (4.23), while the other metrics made an overall moderate contribution in which worst contribution was through poor of ICT in methods used during teaching poor utilization of ICT policy documents. However, there was no concordance among the UITTPs on the index levels of integrations, therefore its index levels can't be used as a loading factor for metrics modeling.

This study recommends the need to continuously support integrators, monitor them through application of IT governance frameworks. There is also need for Software based metrics for determining ICT integration levels and further research on non –UITTPs view on suitability of the existing metrics.

REFERENCES

[1]. Akbulut, Odabasi, Abdullah & Anadolu. (2011). Perceptions of preservice teachers regarding the integration of ICT in Turkish Education faculties. The Turkish Journal of Educational Technology, 10 (3), 175-184.

[2]. United nation Economic and Social Council (2011). Report of the Partnership on Measuring Information and Communication Technology for Development. 11-62457 (E) 050112, Olson, (1981)

[3]. Liu, Y. & Huang, C. (2005). Concerns of teachers about technology integration in the USA. European Journal of Teacher Education, 28(1), 35-47.

[4]. Atsumbe, B. N; Raymond, E; Enoch, E. B and Duhu, P (2014). Availability and Utilization of e-Learning Infrastructures in Federal University of Technology, Minna. Journal of Education and Practice

[5]. Bernard Chemwei, Kageni Njagi and Sharon Jerotich Koech. (2014). Assessment of Information and Communication technology (ICT) Integration in Instruction in Teacher Education Institutions in Kenya. International Journal of Social Science and Humanities, Vo. 3, No. 3, pp. 071-076.

[6]. Kyalo Josphat Kisuo; and David M. Nzuki, (2014), Determinants of Information and Communication Technology (ICT). International Journal of Education and Research, Vol. 2 No. 3.

[7]. Migwi, C.N. 2009. An assessment of public secondary school teachers' preparedness in integrating ICT for instruction: A case of Ruiru Division, Thika district. Masters project. Kenyatta University, (Kinuthia, 2009)

[8]. Burke (2008)

[9]. Mueller, J., Wood, E., Willoughby, T., Ross, C., & Specht, J. (2008). Identifying discriminating variables between teachers who fully integrate computers and teachers with limited integration. Computers & Education, 51(4), 1523–1537.

[10]. Yucel, C., Acun, I., Tarman, B., and Mete, T. (2010). A model to explore Turkish teachers' ICT integration stages. The Turkish Online Journal of Educational Technology, 9(4), 1-9.

[11]. Smith, S. J., & Robinson, S. (2003). Technology integration through collaborative cohorts: Preparing future teachers to use technology. Remedial and Special Education, 24 (3), 154-160.

[12]. Shafiei, M. (2005). Factors contributing to participation in faculty development and integration of computer technology in the community college. Unpublished Ph.D. Thesis. University of Houston, TX, USA.

[13]. Toledo, C. (2005). A five-stage model of computer technology integration into teacher education curriculum. Contemporary Issues in Technology and Teacher Education, 5(2), 177-191.

[14]. Lin, L. J. C. (2005). Development of a questionnaire for determining the factors in technology integration among teachers. Journal of Instructional Psychology, 32(4), 287-292.

[15]. Ly Thanh Hue and Habibah Ab Jalil. (2013). Attitudes towards ICT Integration into Curriculum and usage among, International Journal of Instruction e-ISSN: 1308-1470.

[16]. Gulbahar, Y. (2008). ICT usage in higher education: A case study on preservice teachers and instructors. The Turkish Online Journal of Educational Technology, 7(1), 32-37

[17]. Wetzel. R, (2010) .10 Secrets to Lifelong Learning for Everyone. The Benefits of Minister of Education, Malaysia. (2006). A speech at monthly assembly of Ministry of Education Malaysia, 2 April 2006, Putrajaya.

[18]. United Nations Economic Commission for Africa (UNECA), ICT, Science and Technology Division (ISTD), Addis Ababa, Ethiopia. Thematic Study .Science and Technology and the Knowledge Society in Africa1 Prepared for: GeSCI African leadership in ICT Program, 2010.

[19]. Swarts (2006), Teacher Professional Development Workshop Report. The multi-country Teacher Professional Development workshop organized by GeSCI washeld at Heja Lodge, Windhoek, Namibia, from 11 – 13 September 2006.

[20]. Akbulut, Y. (2010). A Structural Model Proposal for Turkish Faculties of Education Regarding ICT Integration Indicators, the 10th International Educational Technology Conference, and published in the conference proceedings, pp. 322-334, Anadolu University, Turkey: contemporary educational technology, 2010, 1(4), 322-334.

[21]. Akbulut, Y., Kesim, M., & Odabasi, H. F. (2007). Construct validation of ICT indicators measurement scale (ICTIMS). The International Journal of Education and Development Using Information and Communication Technology (IJEDICT), 3(3), 60-77.

[22]. Wan Z, W.;Hajar M R .; Azimi H and Hayati A (2009).International journal of education and development using ICT. Vol. 5. The conditions and level of ICT.

[23]. Mann, Prem S. (1995).Introductory statistics (2nd ed.), Wiley ISBN 0-47-31009-3