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Modeling the Determinants of ICTs Application in Internship in Technical and Vocational Education

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Abstract: Collaboration and information exchange are presently taking place through virtual environment using different tools, e.g. open source Web 2.0. For Technical and Vocational Education (TVE) students to get familiarity of the virtual collaboration; coupled with experiences in working environment, placements and other related industrial work experiences, the development of relevant ICTs and subsequent use for internship development are highly recommended. The purpose of this research is to model the significant determinants for ICTs integration in internship in TVE in higher institutions of learning in Nigeria. 140 respondents comprised of policy makers, administrators and lecturers drawn from five higher institutions of learning owned and controlled by Federal Government responded to a structured questionnaire. A hypothesized model was tested using Regression (SPSS) and SEM using (AMOS). The findings revealed 8 variables as very important significant determinants influencing the ICTs application in internship in TVE programmes. Based on the findings of the research, a conceptual model showing important areas in the order of priority was developed and recommended for adoption by authorities concern.

Key words: ICTs, Internship, Technical and Vocational Education

INTRODUCTION

Internship has been in existence in different fields of studies for very long time in human history. Among 19th century studies conducted was the study on "depression and suicidal thought of interns" (Valko & Clayton, 1975). Researchers in the 21st century are also not left out as internship research has found application in quite number of areas and cut across disciplines of educational specializations; surgery (Tillou, Hiatt, Leonardi, Quach, & Hines, 2008), Nursing (Lee & Fitzgerald, 2008), marketing (Alpert, Heaney, & Kuhn, 2009), teacher education (Kuter & Koç, 2009), public relations (Emma L, 2011), accounting (James, 1986) and lot of others. "Internship is seen as a student's closely monitored, paid or unpaid work experience at a corporation or non profit organization"(van 't Klooster, van Wijk, Go, & van Rekom, 2008). The experience in attending the programme influence students career choice after graduation (Chen & Shen, 2012). Organization's familiarity is going to equip students with vital opportunity for dealing with ''real world'' issues which mostly faced by agencies and organizations. During internship period, a 'student' or 'intern' will become skilled at and be prepared on the type of career or job he/she might be willing to embark on after graduation and enables him make necessary plans pertaining subjects/courses relevant to his/her area of endeavour (Polat *et al*., 2010).

Developments in Information and Communication Technologies (ICTs) and its subsequent acceptance into education among other sectors of the economy, challenged higher institutions to take advantage of the simplicity this ubiquitous environment presented in teaching, learning as well as other components covered in the curriculum. Therefore, it has become imperative for programmes such as Technical and Vocational Education offered in higher institutions of learning in a country like Nigeria to readjust their curriculum through upgrading the traditional way of preparing, placement, supervision and scoring of students on internship (Industrial Training) period. Industrial Training (IT) in Nigerian context is an internship programme offered by curriculum specified period (minimum three month) tenable usually outside schools, in industries or other organizations recognized by the higher institutions to bridge the gap between theory and practice and to further prepare student for occupations after graduation. The programme was developed courtesy of the establishment of Industrial Training Fund (ITF) in 1971 bestowed with the responsibility of administering Students Industrial Work Experience Scheme (SIWES) (Talabi, 2012).

It is very clear that internship in Nigerian higher institutions are administered without much use of ICT facilities (Aduke, 2008); ICTs can only be employed at preparatory stage, when list of students that have certified requirement to proceed on internship is being prepared. While this practice persists in Nigerian higher institutions, 'Virtual Internship' (VI) dominates the current trend in training of manpower for industrial and other economic sectors around the world. Virtual Internship supports students interaction with companies and other relevant internship organizations, in which time, space and location are not determinants in carrying out specific work-based activities (Vriens, de Beeck, De Gruyter, & Van Petegem, 2010). Virtual internship provides

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students with a basis to acquire work experiences and competencies (Lansu, Boon, Sloep, & Dam-Mieras, 2010). Despite ICT-based internship's numerous advantages in preparing students for work experience, it has not being practice in Technical and Vocational Education (TVE) programmes in Nigeria. In fact, for quite long time, students intending to embark on internship finds it very difficult to secure placement in relevant industries and organisations (Kofoworola, 2003), l*et al*one using ICTs for the administration of internship.

Now that ICT facilities are becoming more sophisticated, handy, and relatively cheap, a possibility of reflecting ICT-based internship in the curriculum of TVE cannot be ignored. Thus, using this type of internship, students of TVE will be opportune to discover new information and facilities available for work, thereby stimulating learning mobility throughout the phases of education. In view of the foregoing, the researchers felt that, since higher institutions of learning in Nigeria have started to appreciate the relevance of ICTs and begin to integrate it in doing one thing or the other, using it to facilitate internship activities equally need to be given attention. However, in the process of integrating ICTs in internship programme, key areas for consideration that could serve as significant determinants for success should be identified too. Hence modelling the significant determinants, results in developing this research.

Objective of the Research:

The research aimed at building a model that shows the level of influence of the important areas considered to be significant determinants for ICTs integration in internship in higher institutions of learning in Nigeria. Specifically, Regression analysis and Structural Equation Modelling (SEM) were used to develop a model that shows the influence of the ten latent variables identified as determinants for ICTs integration in internship as indicated by 140 respondents that participated in the research. These areas are: schools and industry-based supervisors interaction, supervision and assessment of students performance during internship, orientation and preparation of internship, processing of student log book, processing of internship allowances, information on internship placement, searching and requesting for internship placement, accessing reports on interns general conduct, industries and institutions partnership and cross boarder collaboration.

MATERIALS AND METHODS

Research Design:

A survey research design was employed for data collection at five higher institutions comprised of Universities, Polytechnics and Colleges of Education (Technical) offering Technical and Vocational Education programme in north-eastern Nigeria. Analysis involving correlations and covariance were done on the initial model to verify significant influence of latent variables on the unobserved variable. A hypothesized initial measurement model was tested for fit indices and compared against the default model.

Research Sample and Sampling Procedure:

A sample of 140 participants (Hoyle, 1995), were selected using a purposive sampling technique from a sample of five higher institutions of learning in north-eastern Nigeria. Only institutions owned and controlled by the Federal Government of Nigeria based on their similar and harmonised characteristics in admission, curriculum and graduation requirements were involved in the selection of respondents for this research. Purposive sampling technique was employed in that, only staffs from TVE programmes/departments have participated in the research.

Instrument and Instrumentation:

A 40 items questionnaire was initially developed and modified to 24-items, 4-point scale after validation and pilot study. The questionnaire was developed out of intensive literature review on the significant areas considered determinants for integrating of ICTs in internship programme in TVE. A questionnaire was developed to collect data on the opinions of policy makers, administrators and lecturers on areas considered important for ICTs integration in internship in TVE.

Result:

The research question with corresponding hypothesis that guided the conduct of the research was answered and tested respectively. The research question reads; *what significant influence do determinants of ICTs have on the internship in TVE in Nigeria? and corresponding null hypothesis (Ho) states that no significant influence do determinants of ICTs have on internship in TVE in Nigeria*

Regression Analysis:

Step-wise criteria mode was selected in SPSS software for regression analysis. The analysis computed yielded the following result.

Table 1.0: Linear Regression Analysis Result on the Significant Determinants for integrating ICT in Internship in TVE

Significant determinants for integrating ICTs in Internship Programme in TVE		U C		S C			95%B	
		B	S. E.	Beta	t	Sig.	L B	U B
1	a) Interaction bw sch and industry- based supv.	.700	.015	.982	37.845	.000	.671	.729
2	b) Interaction bw sch and industry- based supv	.423	.032	.593	11.114	.000	.359	.487
	b) Supervision, assessment and scoring students performance in internship	.318	.035	.411	9.077	.000	.248	.388
3	a) Interaction bw sch and industry- based supv	.291	.038	.409	7.624	.000	.215	.367
	b) Supervision, assessment and scoring students performance in internship	.281	.032	.363	8.904	.000	.218	.343
	c) Orientation and preparations of internship prog.	.200	.039	.239	5.110	.000	.122	.279
4	a) Interaction bw sch and industry- based supv	.246	.036	.345	6.828	.000	.174	.318
	b) Supervision, assessment and scoring students	.177	.037	.229	4.796	.000	.104	.251
	c) Orientation and preparations of internship prog.	.182	.036	.218	5.109	.000	.111	.254
	d) Processing, filling and retrieving log book	.173	.039	.221	4.384	.000	.094	.252
5	a) Interaction bw sch and industry- based supv	.190	.037	.266	5.140	.000	.116	.263
	b) Supervision, assessment and scoring students	.153	.035	.197	4.351	.000	.083	.223
	c) Orientation and preparations of internship prog.	.162	.034	.194	4.806	.000	.095	.229
	d) Processing, filling and retrieving log book	.151	.037	.193	4.043	.000	.076	.225
	e) Processing of internship allowances payment	.133	.036	.166	3.668	.000	.061	.206
6	a) Interaction bw sch and industry- based supv	.156	.036	.216	4.307	.000	.084	.229
	b) Supervision, assessment and scoring students	.133	.034	.219	3.939	.000	.066	.200
	c) Orientation and preparations of internship prog.	.140	.033	.189	4.303	.000	.075	.205
	d) Processing, filling and retrieving log book	.142	.035	.182	4.041	.000	.072	.213
	e) Processing of internship allowances payment	.120	.035	.179	3.458	.001	.051	.188
	f) Information on Internship placement	.142	.035	.168	4.041	.000	.072	.213
	g) Access to reports by industries on students	.120	.035	.149	3.458	.001	.051	.188
	h) Schools and industries partnership	.102	.031	.139	3.283	.002	.040	.163

Table 1.0 presents the result of Linear Regression Analysis sing the 'Stepwise Criteria', though a significant regression model emerged with $F_{8, 85} = 1345.543$ $p < 0.05$, $R^2 = .989$, 7 Variables (Interaction between school and industrial based supervisors, Supervision, assessment and scoring students performance in internship, Orientation and preparations of internship, Processing, filling and retrieving students log book, Processing of internship allowances payment, Information on Internship placement, Access to reports by industries on students conduct during internship and Schools and industries partnership) with B = .216, .211, .189, .182, .179, .168, .149 and .139, $p < 0.05$ are significant determinants considered important, in integrating ICT in internship in TVE. Other variables (Cross boarder collaboration, and searching, requesting and securing placement by school authorities) were not significant determinants for integrating ICTs in internship programme in TVE, and the items were automatically excluded from the table by the software. This is to say; they are not considered as important areas for consideration in integrating ICT in internship programme of TVE in Nigeria.

Table 1.1: Model Summary on areas considered important in integrating ICT in Internship Programme in TVE

Most Significant Determinants	R	R^2	Adj. R^2	S. E.
1. Interaction b/w sch. and industrial based sup.	.982[a]	.965	.964	.47283
2. Sup., ass., and scoring students in internship	.991[c]	.982	.982	.33678
3. Orientation and preparations of internship	.993[d]	.987	.986	.29509
4. Processing, of students log book	.995[e]	.989	.989	.26692
5. Processing of internship allowances payment	.995[f]	.991	.990	.24850
6. Information on Internship placement	.995g	.991	.982	.28950
7. Reports by industries on students conduct	.996h	.992	.986	.25673
8 Schools and industries partnership	.997[i]	.993	.993	.23458

The value of Adjusted R^2 of .993 in table 1.1 indicates that the regression model account for 99.3% variance in the areas considered being important in integrating ICT in Internship Programme in TVE. It has also further reveals that 8 out of 10 items are most significant determinants for integrating ICTs in internship programme in TVE in Nigeria.

Structural Equation Modelling using AMOS:

Regression Analysis computed earlier revealed the contribution of each of the significant determinant to the model; it has not indicated the influence and relationship that exist between the determinants, variables and the latent variable. This necessitated the use of AMOS to enable us come up with the structure of the model and how observed variables (factor determinants) relates within and between them and major variable (latent variable). The distinct feature between Regression Analysis and Structural Equation Modelling (SEM) with latent variables is that, the observed variables in later give room for measurement error to be estimated randomly. Thus factor loadings between observed variables and latent variables are presented. Several indicators, (observed variables) measures one latent variable in Structural Equation Modelling (SEM).

AMOS is the most powerful and user friendly structural equation modelling (SEM) software that enables the user to support their research and theories by extending standard multivariate analysis methods, factor analysis, regression, correlation, as well as analysis of variance (Arbuckle & Wothke, 1999). It is therefore imperative to use AMOS in order to identify the items that are not contributing positively and be eliminated from the final model.

Model Evaluation:

The model was evaluated using chi-square (x^2), degree of freedom (df), significance level ($p < 0.05$), and covariance statistics. Other parameters such as Goodness of Fit Index (GFI), Tuker Lewis Index (TLI), and Comparative Fit Index (CFI) are shown to explain the variance. Root Mean Square Residual (RMR) and Root Mean Square Error of Approximation (RMSEA) were provided to describe mean covariance residual and fit index precision respectively.

Internal consistency of the major areas considered important for ICT integration in TVE was determined using cronbach's alpha statistics. The areas are: schools and industry-based supervisors interaction (0.89), supervision and assessment of students performance during internship (0.78), orientation and preparation of internship (0.82), processing of student log book (0.85), (processing of internship allowances 0.76), information on internship placement (0.84), searching and requesting for internship placement (0.87), accessing reports on interns general conduct (0.75), industries and institutions partnership (0.82) and cross boarder collaboration (0.76). From the results, all items under major areas for consideration were found to be reliable. In that no values below 0.50 (unreliable) and also all the variables are above adequate of 0.70 which is classified as conventional. Table 1.2 shows the cronbach's alpha reliability results.

Table 1.2: Cronbach's α Reliability Results on Major Areas for ICT integration in TVE

Major Areas (Latent Variables) in the Model	Cronbach's α	No. of Items
a) schools and industry-based supervisors interaction	0.89	3
b) supervision and assessment of students during internship	0.78	3
c) orientation and preparation of internship	0.82	3
d) processing of internship allowances	0.85	3
e) information on internship placement	0.76	3
f) searching and requesting for internship placement	0.84	3
g) accessing reports on interns general conduct	0.87	3
d) processing of internship allowances	0.75	3
i) industries and institutions partnership	0.82	3
j) cross boarder collaboration	0.76	3

After the reliability coefficients of the major variables were obtained, measurement model was then tested using SPSS-AMOS version 18. Chi-square ($\square^2$), df, GFI, CFI, RMSEA, TLI and P standard values (see table 1.3) were used for comparison to determine the fitness or other wise of both the measurement model and a modified model.

Table 1.3: Default Model Fit Indices

Model Fit Indices	Range Values
1. Chi-square ($\square^2$)/df	< 3.00
2. Goodness of Fit (GFI)	≥ 0.9
3. Tukers-Lewis Index (TFI)	≥ 0.9
4. Comparative Fix Index (CFI)	≥ 0.9
5. Incremental Fit Index (IFI)	≥ 0.9
6. Root Mean Square Residual (RMR)	≤ 0.05
7. Root Mean Square Error of Approximation (RMSEA)	≥ 0.9

Table 1.4: Initial Measurement Model for ICTs in Internship in TVE

Model Fit Indices	Computed values	Range Values	p
1. Chi-square ($\square^2$)/df	3.51	< 3.00	
2. Goodness of Fit (GFI)	0.64	≥ 0.9	
3. Tukers-Lewis Index (TFI)	0.75	≥ 0.9	
4. Comparative Fix Index (CFI)	0.54	≥ 0.9	.000
5. Incremental Fit Index (IFI)	0.66	≥ 0.9	
6. Root Mean Square Residual (RMR)	0.24	≤ 0.05	
7. Root Mean Square Error of Approximation (RMSEA)	0.09	≤ 0.05	

Integration of ICTs in internship in TVE is of high significance importance as identified in the literature, and for the purpose of developing a model on the basis of the items formulated in the questionnaire. After AMOS analysis, SEM model results in table 1.4 were obtained. The model was initially tested for fit indices as summarized: 3.51 for ($\square^2$)/df which is slightly greater than the default model value (< 3.00), also GFI (0. 64), TFI (0.75), CFI (0.54), IFI (0.66), RMR (0.24) and RMSEA (0.09) at P < .05, were all found not to fit the default model, hence, modified model was re-run after eliminating insignificant variables thereby yielding a structure in figure 1.2.

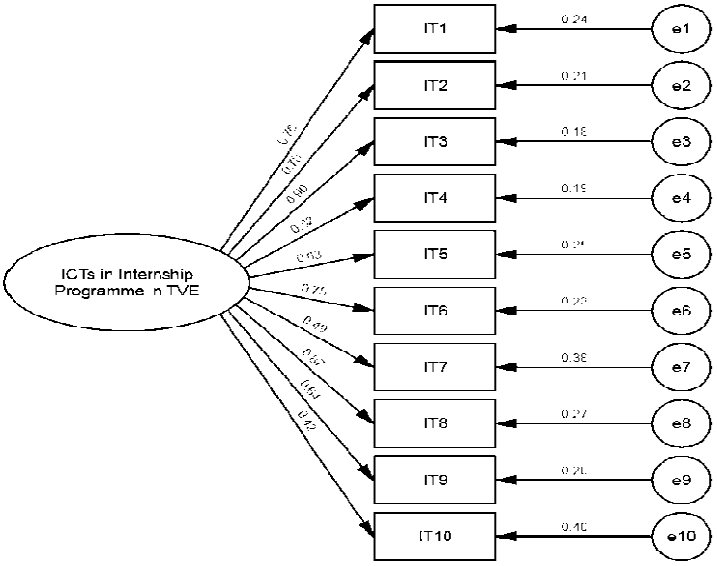

Fig. 1.1: Initial Measurement Model for ICTs application in Internship in TVE

Figure 1.1 shows the measurement (initial model) for ICTs in internship in TVE. This model presents a causal link of variables (items) addressing the major variable (latent variable) areas to be considered in integration of ICTs in 'internship" in TVE. The variables are items in the questionnaire which refers to IT1 – (Interaction between school and industrial based supervisors), IT2 – (supervision, assessment and scoring students performance in internship), IT3 – (Orientation and preparations of internship program), IT4 – (Processing, filling and retrieving students log book), IT5 – (Processing of internship allowances payment), IT6 – (Information on Internship placement), IT7 – (Searching, requesting and securing placement by school authorities), IT8 – (Access to reports by industries on students conduct during internship), IT9 – (Schools and industries partnership) and IT10 – (Cross boarder collaboration). Based on the result presented in table 1.4, model fit indices are below the default model values considered for fitness, and from the model itself, 2 observed variables had low factor loadings, low correlation coefficients and therefore, not significant determinants to the ICTs integration in internship. Therefore, for the model to fit well those 2 variables were eliminated while the model was re-run for fitness. Modified model generated, is shown in figure 1.5 below.

Table 1.5: Modified Measurement Model for ICTs application in Internship in TVE

Model Fit Indices	Computed values	Range Values	p
1. Chi-square ($\square^2$)/df	1.75	< 3.00	
2. Goodness of Fit (GFI)	0.93	≥ 0.9	
3. Tukers-Lewis Index (TFI)	0.94	≥ 0.9	
4. Comparative Fix Index (CFI)	0.94	≥ 0.9	.000
5. Incremental Fit Index (IFI)	0.93	≥ 0.9	
6. Root Mean Square Residual (RMR)	0.042	≤ 0.05	
7. Root Mean Square Error of Approximation (RMSEA)	0.032	≤ 0.05	

Table 1.5 shows the computed values for model fit indices on a modified model for ICTs in internship. Based on the result above, the model fit well. Hence, its fit indices are 1.75 for ($\square^2$)/df compared to the default value (< 3.00), also GFI (0. 93), TFI (0.94), CFI (0.94), IFI (0.93), RMR (0.042) and RMSEA (0.032) at P < .05, are within the accepted region of default model values for a model fit indices. Therefore, a modified model yielded good fit indices and is therefore accepted. Figure 1.2 below shows the structure of a modified model of ICTs integration in internship for higher institutions offering TVE in Nigeria.

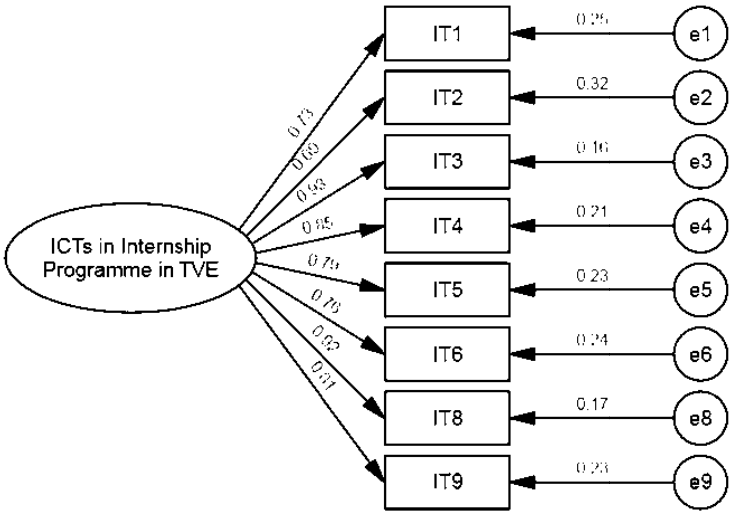

Fig. 1.2: Modified Model for ICTs integration in Internship in TVE

Figure 1.2, shows structural model of 8 observed variables (IT1, IT2, IT3, IT4, IT5, IT6, IT8 and IT9) and their correlation with construct (latent variable). The model was a modified version of the initial measurement model shown in figure 1.1 that was having 10 observed variables. It can be observe from the model that 2 observed variables (IT7 and IT10) were dropped from the initial model due to insignificant correlation with the main construct and which as a result yielded model that did not satisfied fit indices. From a modified model (figure 1.2) it can be deduced that for ICTs to be successfully integrated in internship, areas such as interaction between school and industrial based supervisors, supervision, assessment and scoring of students performance during internship, orientation and preparations of internship program, processing, filling and retrieving students log book, processing of internship allowances payment, information on internship placement, access to reports by industries on students conduct during internship, and schools and industries partnership and should be given highest priority as these variables have much significance correlation with ICTs application in internship in higher institutions offering TVE in Nigeria. The hierarchical representation of areas with respect to application of ICTs in internship is shown in fig 1.3.

Fig. 1.3 above shows the conceptual model of ICTs application in internship in TVE programme for higher institutions of learning in Nigeria. Closely observing the figure, it revealed 8 areas of consideration identified and arranged in order of priority, that is, areas to be considered in application of ICTs depending on the policy provisions, budget and financial capability of the institutions. Therefore, the first area identified as very important for consideration in the process of application of ICTs in TVE internship is "orientation and preparations of internship".

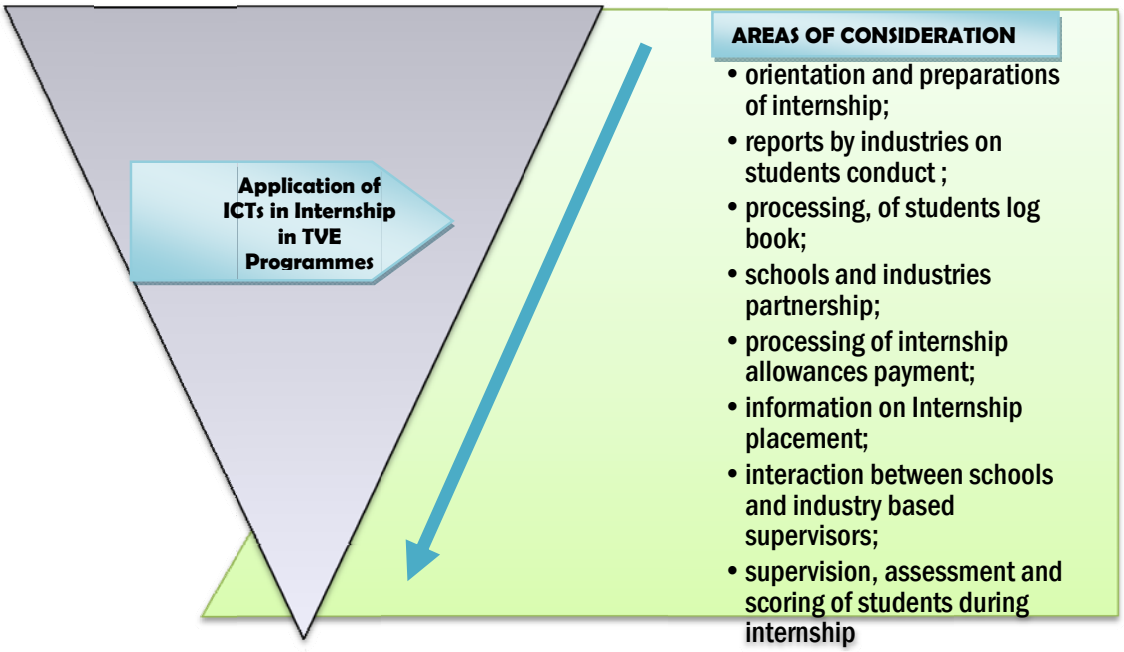

Fig. 1.3 Conceptual model of ICTs applications in internship in TVE programmes.

Discussion:

This research found several areas of internship suitable for ICTs integration in higher institutions offering TVE in Nigeria. These areas are: a) interaction between schools and industry based supervisors; b) supervision, assessment and scoring of students during internship; c) orientation and preparations of internship; d) processing, of students log book; e) processing of payment for internship allowances; f) information on Internship placement; g) reports by industries on students conduct and h) schools and industries partnership**.** Finding of this research on the need to integrate ICTs internship for creating interaction between schools and industry based supervisors is in line with the findings of a recent research carried out to find out the benefit of internship supervision using "Computer-Supported Collaborative Learning (CSCL)", the result of that study revealed that, though objectives of internship differs from schools to industries, CSCL will play "substantial" role in ensuring communication and collaboration between students, industries and institutions (Gerken, Rienties, Giesbers, & Könings, 2012)

Another study involving one of the largest sample (6998) of students teachers in North America on the impact of ICT on motivating student that are undertaking an internship programme found that ICTs impacted on the students motivation during internship training, which according the researchers would have implication to teacher training institutions, policy makers/administrators and lecturers (Karsenti, Villeneuve, & Goyer, 2006). This study has implication to this research too, considering the findings on the areas considered important for ICTs integration that were revealed by policy makers, administrators and lecturers.

The finding of this research that supervision and assessment of interns be done using ICTs, supports a study on the acceptance and preferences of students on internship on the use of ICT facilities for assessment of the internship programme (Wilkinson, 2008). The progress of students during internship programme will also be monitored with the help of ICTs by their supervisors, as revealed by Karsenti, (2002) in (Karsenti & Collin, 2010). In related development, learners motivation, accessing teaching resources, communicating with stakeholders, creation of learning activities were simplified to teachers on internship thorough the use of ICTs during internships (Karsenti & Collin, 2010). Supervisor felt that e-portfolio gives them better understanding of the performance of the students undergoing internship programme (de la Serna, 2011). This further reinforced the position of respondents to this research on the emphasis made for considering the use of ICTs in supervision of interns, in VTE.

With the development of e-payment and e-banking, the possibility of using electronic means to pay allowance to interns is on the high rise, for example some universities among the ones that participated in this research have started liaising with Industrial Training Fund (ITF) and banks for paying students on internship. This was equally advocated in the findings of this research, where respondents felt that internship allowances payment should hence forth be done online.

Conclusion:

This research identified 8 areas that according to policy makers, administrators and lecturers of TVE should be considered in the process of integration of ICTs in internship preparation and implementation. A conceptual model that emanated out of the findings, shows the direction which the integration of ICTs in internship requires to give priority. Using ICTs in preparation of internship including students' orientation exercise down to using it for supervision, assessment and scoring students during internship has been emphasized.

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