Chapter 2  Literature Survey

2.1 Introduction to TAM
The way people accept and use ICTs mostly in the institution of learning has been a most important issue about the study of new technologies. Teaching and learning using ICT systems cannot get better if they aren’t used. Regrettably, resistance to customer systems by managers and professionals is a well-known problem. This work seek to have better forecast, clarity and increase user acceptance, there is need of better understanding of why people behave in the various manner either to accept or reject c ICTs system. Among the various studies, the Technology Acceptance Model (TAM) introduce by (Davis 1986), which is used to recognize the process of user acceptance of information systems, is one of the most used model for validation and is the most cited theoretical frameworks. The TAM was proposed by Davis in 1986; it states that users "acceptance or adoption of technological innovations can be predicted by the users views of the perceptions related to ease of use and usefulness of the system (Davis 1989:391-40)."

In any institution the organization is the nucleus or nub of such establishment, it has a deciding factor whether or not a given technology do exist, hence the Technology-Organization-Environment (TOE) framework reveals that the implementation of technological innovations depends on organizational environmental as well as technological factors (Tornatzky & Fleischer 1990). In summary, the TOE model is an comprehensive schema that incorporates the characteristics of the technology, dependent organizational factors, and extra essentials from the macro-environment. In (Oruan 2014 referring Ifinedo, 2011a) expressed that the used the TOE structure to examine the background of factors on e-business usage and approval in SMS elsewhere included such variables as top management support, organizational readiness, and financial resources.

To effectively comprehend the affective domain by using ICT tools in teaching and learning a unified (Hybrid) theoretical framework is adopted by this research work; the UTAUT theoretical model theorizes state four aspect that have a important willpower on user acceptance of IT innovations (Davis, Vankatesh,
Davis, Morris, & Davis, 2003). A deep review indicate that this models is some way naive in the academia, to this ends this research accept these model to view the extend the availability and impact of ICT in teaching and learning.

2.2 Related Work

1) Virtual community recommender recommends optimal virtual communities for an active user using behavioral factors suggested in TAM (Lee, et al. 2007) using a filtering function based on user needs type.

2) TAM model is used to evaluate the adoption of a recommender system in retail industry and banking sector (Asosheh et al. 2008).

3) TAM model to evaluate an existing personality based recommender system and considered that music and other factors such as emotion and mood have to be considered (R. Hu and P. Pu, 2009).

4) TAM applied in online shopping experience (D. Baier and E. Stuber, 2010.)

5) TAM and partial least squares regression are used to investigate learners' acceptance of a learning companion recommendation system [LCRS] in Facebook (H.C. Chen, 2012).

6) TAM used to review of the state-of-the-art about user experience and user acceptance research in recommender system (P. Pu, L. Chen, and R. Hu, 2012).

2.3.1 Empirical Framework [Theory of Reasoned Action (TRA)]

The term technology acceptance may seem an easy concept on paper view, but may be quite intricate proposition. An array of variables combined to institute the possible relevant to technology acceptance concept.

Theory of Reasoned Action (TRA) is basically focus with the verification of deliberate planned behaviors. TRA views person’s act of a specified behavior is a factor of his or her behavioral intention (BI) to perform the behavior.

BI is together determined by the person’s attitude (A) and subjective norm (SN) in relation to the said behavior as stated in the equation:

$$BI = A + SN$$  \hspace{1cm} (1)

**BI** evaluate the strength of one's purpose to perform a particular behavior.
A is specified as an individual's positive or negative feelings (evaluative affect) regarding the individual performance with target behavior (Fishbein and Ajzen 1975:216). Subjective norm (SN) infers to "the person's perception that most people who are important to him think he should or should not perform the behavior in question".

In referring to TRA, a person's attitude toward a behavior is predicted by his or her significant beliefs ($b_i$) relating to consequences of performing the behavior multiplied by the evaluation ($e_i$) of those consequences:

$$A = \sum b_i e_i$$  \hspace{1cm} (2)

Beliefs ($b_i$) by definition it state that persons subjective likelihood of acting the target behavior will result in result $i$. The appraisal term ($e_i$) is "an implicit evaluative response" to the outcome (Fishbein and Ajzen 1975:29). By implication the equation $A = \sum b_i e_i$ portray information-processing examination and analysis of attitude formation and external stimuli influence attitudes as a change only indirectly in the person's belief structure (Fishbein and Ajzen 1980:82-86).

In the equation SN which is the subjective norm of the individual is factor by series of task as stated above and this function depends on the individual normative beliefs ($nb_i$) which means perceived expectations of specific referent individual or collective motivation to comply ($mc_i$) with these expectations (Fishbein and Ajzen 1975:302).

$$SN = \sum nb_i mc_i$$ \hspace{1cm} (3)

(Davis et al 1989:9840) emphasized that TRA is not particular about the beliefs that
are operative of a particular behavior and stress that research adopting TRA must start to identify the beliefs that are most important for subjects regarding the behavior under examination. Suggestions support TRA eliciting five and much more relevant beliefs using free response interviews with representative members of the subject population. (Fishbein and Ajzen 1975:218, Ajzen and Fishbein 1980:68) suggest using "modal" salient beliefs for the population, gotten by taking the beliefs often generated from a delegate sample of the sample size. A substantial body of empirical data has accumulated in support of TRA. TRA has firm adoption in applied research environment across a diversity of subject matter. More wisely stimulating a great theoretical research focus at understanding the theory's restrictions, trying key assumptions and analyzing various modification and extensions (Bagozzi 1981, 1984: Warshew and Davis 1986).

In figure 1; the variables are explain as follows;

Where

\[ BI = \text{Measure one's intention to do a particular behavior} \]
\[ A = \text{The positive or negative feelings about the individual performing the target behavior (evaluative affective)} \]
\[ SN = \text{The view and perception most important people around him have about the person think he should or should not carry out the actions in question} \]
\[ b_i = \text{Is the subjective probability of the individual that performing the target behavior will result in the consequence i}. \]
\[ e_i = \text{An implicit evaluative response to the consequence} \]
\[ nb_i = \text{Person’s normative beliefs} \]
\[ mc_i = \text{Person’s motivation to comply} \]

\[ A = \sum b_i e_i \text{ and } SN = \sum nb_i mc_i \]

It is noted that TRA being a general model does not state the beliefs that are working for a exact behavior. So by implication TRA one need spot the beliefs that are outstanding for subjects concerning the behavior under investigation (Fishbein and Ajzen 1975).

### 2.3.2 Technology Acceptance Model (Tam) has Firm Base to the Theory Of TRA

Davis et al 1989 paper titled "User acceptance of computer technology: a comparison of two theoretical models" on issues of TAM states that TAM was propounded by Davis in 1986 is the adoption of TRA particularly adapted for modeling user reception of technology systems. The purpose of TAM is as follows;

- To offer details of the measures of computer acceptance that is universal, able of examining user performance across a broad range of consumers.
- To provide an explanation of the acceptance of a system and verifying both parsimonious and theoretically justified systems.
- To provide a vivid explanation or model for prediction and explanation such that scholars and developers can identify why a particular system may be intolerable and adopt an appropriate corrective steps.
- To provide a foundation for tracing and tracking the important of external variable on internal beliefs, attitude and intentions.

The understated are the purpose of TAM and to attain these aim by identifying a small number of fundamental variables recommended by earlier scholars dealing with the cognitive and affective variables of computer acceptance and using TAM as a theoretical setting for modeling the associations among these variables.

The most popular and widely used technological model is the Technology Acceptance Model (TAM). It has the power for unveiling the impacts of external variables, these variables rely on economic, utilitarian, cognitive and attitudinal grounds. A key principle of TAM is the provision of a fundamental for verifying
the impact of external process on internal beliefs attitudes, and intentions. TAM was founded with the intention of identifying a small number of fundamental variables dealing with cognitive issues of computer acceptance, and using TRA as a hypothetical backup for modeling TAM theoretical relationship among it variables. TAM accepts two particular beliefs;

- **Perceived Usefulness (U)**
- **Perceived ease of use (EOU)**

Perceived usefulness (U) is the prospective user’s subjective possibility that using a specific appliance will increase job performance within an organizational context. Perceived ease of use (EOU) is the degree to which the potential user perceive the target system to be free of effort. Factor analysis recommend that U and EOU are statistically unique scope.

Similarly TRA as relates to TAM states that system handling is determined by BI, and that BI is a factor being jointly observed by the one's attitude to enhance the system (A) and perceived usefulness (U), with relative weights anticipated by the regression equation.

\[
BI = A + U
\]  \hspace{1cm} (4)

The A-BI association represented in TAM state that provided people form intention to execute behavior towards their affect. The A-BI relationship is essential to TRA and to associated models. In the above equation the U-BI relationship is the idea that, within organizational view point, that people form intention to behavior they belief will adequately increase job performance, over and above whether positive or negative thoughts may be evoked toward the manners per se. It is clear that improved act is influential to achieving diverse rewards that are extrinsic to the content of the work itself, pay increases and promotions are inherent factors. If affective concept is not fully enhanced when deciding if not to use a particular structure.
By this U-BI relationship in TAM represents the resulting direct effect, hypothesizing that people form intentions toward using computer systems based largely on a cognitive appraisal of how it will improve their performance.

The model is exclusive of TRA's subjective norm (SN) as a yield of BI. As stated by (Fishbein and Ajzen 1975:304) it is viewed as the least understood aspect of TRA. A difficult task is to extricate direct results of SN on BI from indirect outcome via A. SN may influence BI indirectly via A, due to internalization and recognition processes, or influence BI directly via compliance (Warshaw 1980). A general view had it that system use by managers and professionals is frequently voluntary, but in some situations people use system to adhere with mandates from superior authority, without response to their own feelings and beliefs about using the system (Swanson 1987).

Information System research abounds of evaluation methods in favor of the A-BI and U-BI associations. With regard to TAM, A is jointly determined by U with EOU, regarding relative weights statistically estimated by linear regression equation:

\[ A = U + EOU \]  \hspace{1cm} (5)

The expression is stirred by TRA's observation that attitudes with behavior are factored by relevant beliefs system. And TAM posits that U has a direct effect on BI and higher than A and this signify that U influence A as stated is our discussion. Davis further state that although individual affect in the direction of a behavior need not fully integrate affect toward any rewards due to performance outcomes dependent on that behavior, it is recognize in the course of learning and affective-cognitive reliability device,
stated clearly that positively valued results often amplify one's affect toward the means to achieving those outcomes (Bagozzi 1982).

As shown in the equation $U$ is hypothesized to have a positive determined on $A$.

EOU have a significant effect on $A$ as hypothesized. TAM identifies two basic mechanisms by which EOU influences attitudes and conduct, self-efficacy and instrumentality. (Davis et al 1989 referring to Bandura 1982; Lepper 1985; Davis 1986) posits as thus the easier interaction with a system the greater results should be the user's sense of efficacy and personal control regarding the ability to carry out the sequence of performance desired to manipulate the system. Effectiveness is regarded to operate separately from influential determinants of manners and influence affect, effort persistence, and motivation due to innate drives for skill and self willpower. Efficacy is one of a major factors theorized to underlay intrinsic motivation, further state the direct EOU-A relationship is meant to capture this essentially motivating aspect of EOU.

Improvement in EOU may be instrumental in contribution by increasing outcome. Effort saved by improved EOU may be redeployed, enabling a person to get done more work for the same effort (Davis et al 1989). To this effect increased EOU tend to better performance as would be expected EOU would have a direct effect on $U$:

$$U = EOU + \text{External Variables} \quad (6)$$

The variables $U$ and $EOU$ are dissimilar but connected constructs, the equation implies that perceived usefulness ($U$) can be affected by many external variables on EOU. It has been exemplified by Davis and backup with proof that if two systems are in consideration which are likely equally simple to operate. If one output an objectively accurate forecast, then is likely to be seen as the more useful ($U$) system, despite the consequences of the EOU similarity. In the same manner, if one graphics program produces higher quality graphs than its equally easy-to-use counterparts, it should be regarded more useful. In conclusion, the objective design
behavior of a system can have a direct effect on \( U \) in accumulation to indirect effects via \( \text{EOU} \).

Perceived ease of use (EOU) is determined by external variables as expressed:

\[
\text{EOU} = \text{External variables} \quad (7)
\]

Many usable features in a system is built for enhancing usability. Also the effect of such system facial appearance on \( \text{EOU} \) is noted (Bewley et al 1983). External factors represented in equation (6) and (7) grant the bridge that relates to the internal beliefs, attitudes and intentions represented in TAM. The different individual constructs, conditional constraints and administratively handy interventions impinging on behavior, TRA state that external variables influences conduct only indirectly via \( A \) and \( \text{SN} \) with their relative weights (Davis et al 1989). TAM and TRA vary in numerous theoretical dimensions some of which desire details but both TAM and TRA put forward that \( A \) is determined by one's pertinent beliefs. One should note that understand that TRA salient beliefs are elicited anew for each new situation. The consequential beliefs are consider distinctive to the specific background, not to be global to diverse technology system and consumer populations in addition TRA sum all beliefs \( (b_i) \) multiplied by corresponding assessment weights \( (e_i) \) into a single constructs from equation (2) above. Agreed upon that modeling idea in this disaggregated manner enables one to compare the relative influence of each beliefs in shaping \( A \), rendering vital analytical information. He further posit that it enable an examiner to better evaluate methods for influencing user acceptance through controllable external interventions that have quantifiable influence on particular beliefs outcome. Some approach may center on increasing \( \text{EOU} \) which provide improved user interface or superior instruction, while others may aim at \( U \) by increasing the accuracy of information accessible through a system (Davis et al 1989).

Noting that \( U \) and \( \text{EOU} \) are dissimilar variables, and has influences on \( A \) the measure is estimated by *linear regression or conjoint measurement or structural equations*. TAM and its related variables, \( U \) and \( \text{EOU} \).
These variables do not multiplied by self-stated assessment weights, beliefs and evaluations are not ratio-scaled, the approximate bound that is correlation or regression weight are between A and the outcome of a belief and assessment is uncertain, because of its sensitive to allowable but hypothetically unrelated linear scale transformations of either the belief or appraisal (Bagozzi 1984; Davis 1989).

Several studies identify variables alike to these linked with attitude and practice study has proven that U and EOU are statistically different scope (Hauser and Shugan 1980: Swanson 1978: Oruan 2014). In distinction predicted usefulness could also have an express influence on real system use. More so, is identified that system features could determine the manner and the way people react towards the use of the system, without the consideration for the person to inhibit form of actual belief about the system (Davis 1993).

**2.3.3 Tam Evolving**

(Davis, Bagozzi and Warshaw 1989) later proposed a modified version of TAM and stated that behavioral intention is a key factor. That behavioral intention would be directly influence by the perceived usefulness of a system. They believed that situation be it when a system which was perceived useful, that an individual might generate a strong behavioral intention to use the system without forming any attitude, thus the modify version of the TAM model (Davis et al 1989).

![New relationship in TAM](image)

Figure 2.2: New relationship in TAM (Davis 1993, P.481)
TAM in the same perspective with TRA posits:

*that computer usage is determined by BI, but differs in that BI is viewed as being jointly determined by the person’s attitude toward using the system (A) and perceived usefulness (U) with relative weights estimated by regression.*

\[ \text{BI} = \text{A} + \text{U} \]

![Diagram of TAM model](image)

Figure 2.3: TAM first modified version (Davis, Bagozzi & Warshaw, 1989, P. 985)

TAM advocates perceived usefulness (U) and perceived ease of use (EOU) as the deep-seated indicator of IT adoption. TAM posits that usefulness and simplicity are the underlining factors for a person’s purpose to use a particular equipment or technology. Davis in 1993 also emphasize that TAM reveals the need that perceived usefulness is predisposed by perceived ease of use which predict attitudes. TAM has been used widely and acknowledged by its empirical justification, relevance, accolade and applied in almost all discipline, it is said that the model has a major constraints of narrowing its constructs to only U and EOU (Gounaris & Kori-tos, 2008). Base on this note, the call for to elaborate the variables and incorporate other IT models to advance the existing TAM model is a significant step. (Roger’s 1995) and (Ajzen’s 1991) diffused TAM and TPB (Theory of Planned Behaviour) add application and introduction priority on precise situation and external variables which influence a technology’s adoption process. TAM and TPB have firm base to...
TRA (Theory Reasoned Action). (Ukoha et al 2011) believed that TAM and TPB derelict influence of psychological, social, and within personal variables on IT acceptance decision, they said TPB complemented TAM’s constructs with subjective norms and perceived behavioral control to clarify perceptions of ease or difficulty of performing a task given resource constraints. TPB explanatory with it predictive utilities are good to enhance by extension in integration with TAM, (Taylor and Todd 1995).

(Park 2009), expressing his findings about the model stated thus, “One of the well-known models related to technology acceptance and use is the technology acceptance model (TAM), originally proposed by Davis in 1986. TAM has proven to be a theoretical model in helping to explain and predict user behavior of information technology (Legris et al 2003)”. TAM is an extension of theory of reasoned action (TRA), according to (Ajzen and Fishbein 1980). (Davis 1989) and (Davis et al 1989) anticipated TAM to explain why a user accepts or rejects information technology by adapting TRA. TAM spell out a basis with which to traces how external variables influence these three concepts; belief, attitude, and intention to use a given technology.

The cognitive beliefs identify by TAM are: perceived usefulness and perceived ease of use. Supporting the understated facts stated that TAM view one’s behavioral intentions, attitude, perceived usefulness of the system, and perceived ease of the system as the factors influencing the use of technology. TAM believe i like manner that external factors affect intention and actual use through mediated effects on perceived usefulness and Perceived ease of use. Study indicates that TAM is widely used to test new information system;

\[
\text{TAM appears to be able to account for 40 percent to 50 percent of user acceptance. TAM has evolved over time. TAM extended the original model to explain perceived usefulness and usage intentions including social influence (subjective norm, voluntariness, and image), cognitive instrumental processes (job relevance, output quality, and result}
\]
demonstrability) and experience. The new model was tested in both voluntary and mandatory settings. The results strongly supported TAM and explained 60 percent of user adoption using this updated version of TAM (Venkatesh & Davis, 2000). Several studies have examined TAM as a model to explain how people adopt and use e-learning.

(Park 2009) referring to (Selim 2003) stated that there was a need to investigate TAM with web-based learning. He put forward the course website acceptance model (CWAM) and tested the relationships among perceived usefulness, perceived ease of use and intention to use with university students using the structural equation modeling techniques of the LISREL program. He concluded that the model fit the collected data and that the usefulness and ease of use turned out to be good determinants of the acceptance and use of a course website as an effective and efficient learning technology.

2.3.4 The Modified Model Hybrid Model (TAM)

Figure 2.4: The Hybrid model (TAAM)
Figure 5c is a modification of 5a by the inclusion of *perceived affect* as a new proposed variable. Value based software engineering is an emphasis of unique affect design inclusive in software designs. An important prerequisite of any ICTs use is to enable the user to handle with and even gain from frequent transformation that is a progressive feature of design. To achieve this impact is a factor in consideration, the rate of technological innovation send a confrontation to academic staff for the need to continually update courses and equipment.

### 2.4 Technology Organization Environment (TOE)

(Tornatzky and Fleischer 1990) framed the TOE (Technology Organization Environment) the assumption is based on broad set of factors to predict successful implementation of IT in an organization;

- Organizational conditions
- Business and organizational reconfiguration and
- Industry environment

(Kowath and Choon 2001:227-242) said that the technological framework point out that implementation depends on the collection of technologies within and outside the organization as well as the application’s perceived relative advantage (gain), compatibility (both technical and organizational), complex (learning curve) etc. on the other hand organizational context captures firm’s;

<table>
<thead>
<tr>
<th>Hybrid Model</th>
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<tbody>
<tr>
<td>➢ Business scope</td>
</tr>
<tr>
<td>➢ Top management support</td>
</tr>
<tr>
<td>➢ Organizational culture</td>
</tr>
<tr>
<td>➢ Managerial structure</td>
</tr>
<tr>
<td>➢ Formalization and</td>
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<tr>
<td>➢ Vertical differentiation</td>
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</tbody>
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Environment circumstance relates to facilitating and inhibiting variables in areas of considerations. Such as competitive, trading competitions’ readiness, environmental factors and government encouragement, technological awareness. Notably a major snag of TOE state some of challenges in the adoption of predictors are taken to pertain more on large firm. However, it is clear however that integrating TOE with such model like TAM with each implementation predictor offering reasonable amount of constructs to understanding of adoption of behavior.

![Figure 2.5: TOE (Kuan & Chan 2000)](image)

**2.5 The Unified Theory of Acceptance and use of Technology (UTAUT)**

<table>
<thead>
<tr>
<th>Technological</th>
<th>Organization</th>
<th>Environmental</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived direct benefits</td>
<td>Perceived financial cost</td>
<td>Perceived industry pressure</td>
</tr>
<tr>
<td>Perceived indirect benefits</td>
<td>Perceived technological competence</td>
<td>Perceived government pressure</td>
</tr>
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</table>

![Figure 2.6.1 UTAUT](image)

PE- The degree an individual believes the system will assist to do their jobs better(U)

EE- The ease at which the individual believes the system is to be use (EOU)

SI- Relate to whether or not important other’s influence an individuals’ intention to use the system.

FC- This relate to personal knowledge and institutional resources available to use the system.
The UTAUT model is based on four construct that are significant determination on user acceptance of IT innovations (David, 1986; Venkatesh, Morris, & Davis, 2003). The model highlights the differences that verify the acceptance and use of technology. The link among U, EOU and usability can be expressed by age, gender and experience. A clear illustration is that U and their is clear variation with intention to use, age and gender more significant for male and young workers. Likewise EOU about intention also moderated by gender and age are more noteworthy for female and older workers, with decrease effect with experiences.

Recalling N.D. Oye in his paper titled “A Model of ICT Acceptance and Use for Teachers in Higher Education Institutions” posits that in the use of new technology it is appropriate to adopt TAM and UTAUT to comprehend people acceptance or rejection of new information or communication technology. The study considered both models as an adoption methodology to understanding instructors behavioral objective on the acceptance and technology use. The study using both models carried in the Jos university Nigeria reveals as stated;

*This implies that the university ICT make task more easily accomplished, thereby making them more productive. Hence result from the survey shows that 86.5% agree. Therefore this determines the level of expected adoption of ICT by the respondents. Among*
the four UTAUT Constructs, performance expectancy exerted the strongest effect. Therefore Performance expectancy is the most influential factor for the acceptance and use of ICT by the respondents. Recommendations made were that, all employed teachers in Federal, State and Private universities should undertake mandatory training and retraining on ICT programs (N.D. Oye et al 2011).

Park in his paper “An Analysis of the Technology Acceptance Model in Understanding University Students’ Behavioral Intention to Use e-Learning”. Have this to say, that a lot of universities implement e-learning for various reasons. The good news about Korea is the continues growth of e-learning applications in higher institutions of learning and is a result of the adequate provision of such facilities. TAM as a model with the general structural model has been insignificantly applied to verify the impact of behavioral intention to use e-learning. The outcome proved TAM to be a relevant theoretical tool to express understand user's acceptance of technology (Park 2009:150-162).

Viewing the importance of ICT in educational development (Park 2009) referring to (Kim & Santisgo 2005) stated that Korea seize benefit of ICT in sustaining all levels of learning and human-resource development which e-learning is measured one of the significant alternative for modern knowledge-based society. Despite quantitative growth based on ICT, it is noted that quality appraisal for e-learning in higher education in Korea and barrier in term of e-learning utilization in university and colleges exist. To support these claims a theoretical model was developed from the existing TAM model to verify the arguments. The model represent a theoretically interesting model with linking constructs indicated with arrows (latent variables) specifying hypothesized causal relationships in the direction of arrows, while the linking constructs indicates (observed variables). More so perceived ease of use with perceived usefulness are regarded as cognitive constructs.
Affective concept is engulf in attitude while intention of applying an technology could be considered a behavioral construct. The model expresses x and y as exogenous and endogenous indicators respectively.

Based on the reviewed literature a comprehensive technology acceptance model variables will be x-ray to select the most important variables needed for this research work. User and technology traits influence individual acceptance will with regard to attitude, behavior and intention as vital proposition. The purpose of and benefits of the general qualitative model make room to enhance and comprehends differential relevant measures.
Figure 2.8: A Qualitative Model of Technology Acceptance
2.6 Conceptual Framework

ICTs resource has been viewed in different perceptive; as computer resources, network as while as standalone systems, hardware and software inclusive readily available for instructional resources (E-media). Duru viewed this as multimedia, packages for instruction, resources from the internet, database tools for management etc. The resources outline integrate to improve learners ability, adoption will in no means increase learners’ motivation and engagement through the use of ICT instructional packages. Instructional package is related to the way ICTs packaging of knowledge for effective delivery of instructions in the classroom. Packaging portray process of structuring knowledge in a set-up crucial for transmission and usage. ICT materials used in packing instructions include among others audio tape, recorder/cassette, video tape recorder/cassette CD-ROM etc. ICT is a key player, deriving and vital tool for nation building in view to educational development. In a publication by (Oruan 2014) referring to the "Nigerian National Information Policy vision statement" state as thus;

To make Nigeria an IT capable country in Africa and a key player in the information society…using IT as the engine for sustainable development and global competitiveness. The mission statement expresses that; To Use IT for Education, Creation of Wealth, Poverty Eradication, Job Creation and Global Competitiveness. On this premises the general objective of the Government is to integrate IT or ICT into the mainstream of education and training and restructure the education system at all levels to respond effectively to the challenges and imagined impact of the information age and in particular, the allocation of a special IT development fund to education at all levels (National Information Technology Policy, 2000).

Nigeria like many developing counties is still initiating fully the stages of integration of ICT in the teaching-learning process. (Oviawe and Oshio 2011) posit
that the National Policy on "Information and Communication Technology" at all sphere of the country's education system. The fact is the realization of the educations goals as expressed in the national policy;

- Manpower training to enhance national development basically through ICT.
- Individual capacity building for better understanding of their immediate environment.
- Development of physical and intellectual ability for self-reliant and useful members of the society to which they belong.

Information and Communication technology as stated by the "National Policy on Information Technology (Federal Republic of Nigeria, 2004)" sees ICT as the foundation of nation building and advancement in fast changing world.

Education no doubt is a universal practice for self and societal progress. Education stand as a process of mankind knowledge is inculcated, facilities training, skills develop the individual and contribute adequately to him/herself to the society at large. Governments through the years strives in developing pedagogy and technology making education important and appealing to the child and society. Maybe ICTs would be a breaking ground and proffer some innovative solutions to the drop of acquisition of knowledge in our society.

Communication and information technology is an off-shoot of communication revolution according to (Okojie 2007:7-17), ICT according to him is the use of macro computers and telecommunication technologies to advance learning course. This facilitate huge amount of information to be accessed quickly and cost-effectively, in elaboration he mentioned that ICT consisting of the basic components computer system. ICT is a comprehensive glossary, according to (Ogunsola 2000) pinpoint that;

"ICT is basically an electronic based system of informal transmission, reception, processing and retrieval, which has drastically changed the way we think, the way we live and the environment in which we live. It is an umbrella term that includes the communication derives or applications"
encompassing: radio, television, cellular phone, computer network, hardware and software, satellites systems and so on, as the various services and application associated with them, such as video conferencing and distance learning”.

Technology accept state of the act scientific knowledge application and principles as production, processes and operation of tools, and various methods to improve living. Technology is the application of scientific principles, methods and knowledge to solve human problems. (Olaitan and Ekong, 2001:13-16)

There is a great deal of research being carried out in 21st century with regard to impact as well as important of ICT in instruction. Various results have been subjected to this founding. The impact of ICT technology on teaching and learning in higher education has been spotted by various researchers (Mijares and Chan 2012). Prospects, problems and barriers are among factors identified by researchers in the integration of ICT facilities for teaching and learning (Muhammad et al 2013 referring Bingimlas, 2009 & Chan et al 2012). More studies are on the main stream but among such focus is on the application of ICT in teaching and learning in higher education institution in Nigeria are conceptual model comprising four key areas; perception, integration, motivation and challenges. No doubt this has given aspiration to this research work. However, this work seek an in depth awareness of the impact of affective concepts and the improvement of the use of ICT facilities in teaching and learning in higher educational institutions.

ICTs integration in the academia has been proven very effective, despite some challenges. ICTs found application in the teaching of most of the courses in higher education institution of learning. In the science discipline ICTs found a specific application especially in engineering. The deployment of ICTs in the field of chemical engineering discipline is evident and well documented (Muhammad et al 2013:81-88 referring Perry & Balatov, 2010).

**Characteristics of Users of ICTs**

Relevant literatures revealed the characteristics of users based on ICTs or IT need be classified basically in two groups relating to the technology being used;
1. Individual users
2. Organizational users

The individual users apply the technology for personal purposes other than work-related purposes ranging from gaming, movies, leisure etc, while organizational users basically use the technology for work-related task, it is further classified into two sphere: employee features and organizational features. The individual users and the related impact on acceptance of any technology is further subgroup into demographics and psychographics. Demographics variables are easy to measure and identify demographic characteristics. According to (Koert et al 2006) the projecting strength of demographic variables remains restricted and they often do not accept a technology. They further argue on the other hand that psychographic concepts relate to personality or psychological traits and determines why people accept or reject technologies but difficult to measure than demographic variables.

**Demographic Characteristics**

Records reveals that (Karaca-Mandic 2004; Morris 2005) demographic characteristic reveal that does persuade acceptance of technologies. In the literature age, gender, education and income are regarded as commonly studied demographics. For the purpose of this research the demographic characteristics will focused on education characteristics. In general terms personal skills, educational increase is a factor of knowledge and. Easily implies that it is assumed that educational level increases the acceptance of technologies. In relation (Dickerson & Gentry 1983) note the healthy relationship that exist between computers users and attainment of higher levels of education. This states that the ability, usability of new technologies and appreciation of its impact is adequately improved by the user with the levels of higher education as perceived by the user relating to ease of use (Aganwal & Prasad, 1999).

**Income:** No doubt that new ideas, new innovations (technologies) come with a price mostly elevated tag at the preamble stage. However, there is a decrease of price tag as the product goes through its life cycle. The income rate of a new product or technology is a major predictor of its acceptance. A new technological innovation may deem effectively useful or potentially important to user but may not
perceived it as a "need" because of its high cost. The conclusion lay that cost or income level increase the acceptance of new technologies.

**Psychographic characteristics:** Relating to technology readiness according to (Koert et al 2006) referring to (Parasuraman, 2000:308) stated thus "people's propensity to embrace and use new technologies for accomplishing goals in home life and at work".

Parasuraman (2000) thus classified in four folds the user willingness or readiness of accepting technology in four folds;

1. **Optimism**- a strong and affirmative belief that technology offers people better, flexibility, and efficiency control of activities in their lives.
2. **Innovativeness**- The idea of being a pioneer and thought leader as technology user.
3. **Discomfort**- The feeling of inability of control and technophobia; and
4. **Insecurity**- disbelief of technology and uncertainty regarding its ability to function adequately.

(Parasuraman 2000) Referring to the categorization optimism and innovativeness are factors of technology readiness or acceptance while discomfort with insecurity are inhibitors.

**Technophobia:** According to (Weil & Rosen, 1995) evaluation of technological fear can be through anxiety, cognitions and attitudes toward it. Technophobia is the fear of or dislike for new technology. It is viewed as a concept that negatively influences acceptance of technology.

**Self-efficacy:** It influences acceptance both directly and indirectly in the course of other variables. Self-efficacy is defined as "judgment of one's ability to use a technology to accomplish a particular job or task", it can also be regarded as individuals' beliefs, they can also be regarded as persons beliefs with ability and
motivation to achieve precise tasks. Generally self-efficacy positively influences acceptance. "Self-efficacy influences acceptance directly as well as indirectly through other variables and it relate positively to perceived ease of use" (Davis 2003:432).

![Figure 2.9: Direct and indirect effects of self-efficacy on acceptance](image)

**Knowledge and Involvement:** Knowledge being the awareness of concepts and adaptation of stimulus would be regarded to have positively related to acceptance of technology. (Moreau et al 2001) discovered and reported a complex association among knowledge levels and technology acceptance. A report states that knowledge induce variety of factors that affect acceptance, (Agarwal and Prasad 1999) that partaking in training improve perceived usefulness and in another study knowledge has a optimistic association with perceived ease of use (Hong et al 2001).
Prior experience: A survey conducted reveals that experience influences acceptance positively (Liaw 2003). There is a strong correlation ship with experience and perceived usefulness with regard to acceptance of internet usage. Expressed know-how absolutely enhance trust, perceived usefulness, and perceived ease of use, with acceptance (Gefen, Karahanna, & Straub, 2003). Prior experience reveals experience being influenced by perceived ease of use affirmatively, as it also positively influences perceived usefulness (Irani 2000). The conceptual view summarizes some interaction of the distinctiveness of individual users and technology acceptance. Each variables have a intricate dealings with other variables and portray both direct and indirect special effects on acceptance.
2.7.1 Teaching/Learning ICT Impact Comparative Analysis (An Overview)

Teaching by definition (Oruan 2014 referring Onwuka 1996) state thus; “various activities undertaken by a more experience and more knowledgeable person in order to enable the other learn” he pointed out unique traits in teaching as; "explaining, deducing, questioning, motivating, taking attendance, keeping record of works, students' progress and students' background information". Clark highlight that teaching is the interface among teachers and learners in an ordered and controlled manner within conducive setting to comprehend expected change in the learner’s
behavior”. It can be viewed as a defined logical and tactical acts denoting communication between teacher and the students as they deliberates on some kind of subject matter.

It is a general acceptance that the world is in the age information, time characterized by electronic transmission of information. ICT has boast new innovations in educational ideas such as (Clark 1995):

- Flexible lecture delivery process
- More open learning
- Lifelong learning
- Virtual classroom
- Wall less Institution

ICTs as key player to improve teaching and learning, utilization means such as interactive board, video and multimedia, tapes, learning packages etc are often applied in institution of higher learning in developed countries for teaching and learning.

The facts stands that in developing countries the adoption of ICT in teaching and learning is farfetched, teacher’s adoption level is still far from appreciation not of mentioning application, backup with irregular power supply.

Change is a constant variable in life, in everything and for everyone the law of growth is through change. Information and communication technology ICT induces change and change for better teaching and learning. Notably, it is not the technology that is critical, but the understanding concept of such means in time and place of learning it and its application. ICT gives new pedagogy of teaching and learning, these innovation can enhanced effective and reliable outcome. The methodology and approach of using ICTs in teaching and learning for both the teacher and learner will change. New technology may alter our approach of ease or effective and convince means of doing it our way, technology will change our work ethics, relations and the future work codes. Keeping track and holding on our past may not play a satisfactory role as developing nations, forgetting the present, which holds more promises for us as a group and a country to reap the benefits of mass adoption of the computing technologies. Technology is the key to the development
of any nation, is not just applied in the manufacturing industries but more so in the servicing industries. If there is one sector that its effectiveness is to be noticed is the one industry that builds other industries which is the teaching and learning.

Okoronkwo observed that the non-academia seems to know the products of our tertiary institutions better than the teachers. He noted that the performances of these graduates are far from satisfactory, and they are forced to invest much in retraining. The way out is to integrate ICT and better planning into our curricula. Teaching and learning we know is changing in its dynamics, the table below gives a classical view of its dynamic shift (Okoronkwo 2005:14-16).

The teaching pedagogy is shifting drastically from the traditional classroom to a classroom without walls, the approach and methodology is changing with space. Instruction is no longer from the view of the instructors, no longer teacher centered,
instruction based, passive learning modes but focused mostly on the learner with all approach to instill **affection and appreciation** that aids a firm knowledge base. Teaching and learning process should be interesting and passion deriving, teaching learner with new innovation need be appealing and requires instilling learners with the right attitudes in promoting progressive study in the pursuit of their career. To achieve the underline curriculum that is ICT based must endeavor to uphold the challenges:

- Learner based instruction rather than passive isolated students instructions.
- Allocate demanding and creative drills that support student inventiveness.
- Sustainable education with sound framework and theory.
- Innovative technology and materials that will enhance teaching.
- Update learners of information and adequate strategies the various domain.
- Group learning and ICTs to increase interaction.
- Persuade learners about continuing professional growth to support lasting learning (Okoronkwo 2005:14).

Noted clearly that instructors require to instill the willingness to use and learn sufficient about ICT for it effectiveness in the classroom, as stated that the role of school as a dispenser of information no longer holds as thought before. Teaching and learning now need to incorporate ICTs affluent environment. The National Council for Educational Technology (NCET, 1994) identifies the possible output of ICTs application as thus:

- Increase students flexibility in the learning environment;
- Reduce of risk of failure at school;
- Availability of rich body of materials;
- Readily available new, relevant on hand information in the respective domains of learning for students;
- Inspire and motivate learning;
- Increase learning for students with special needs;
- Prompt risk taking and innovative ideas;
- Persuade systematic and broad thinking;
Encourage teachers to take a fresh look at how they teach and ways in which students learn;
Help students learn when used in well designed, meaning tasks and activities; and
Encourage potential for enhanced group (NCET, 1994).

In reference of the Traditional versus Information Society (Use of ICTs) (Fisseha 2011 as adapted by Voogt 2003)

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Traditional pedagogy</th>
<th>Emerging pedagogy for the information society</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Activities prescribed by teacher</td>
<td>Activities determined by learners</td>
</tr>
<tr>
<td></td>
<td>Whole class instruction</td>
<td>Small group</td>
</tr>
<tr>
<td></td>
<td>Little variation activities</td>
<td>Many different activities</td>
</tr>
<tr>
<td></td>
<td>Pace determined by the programme</td>
<td>Pace determined by learners</td>
</tr>
<tr>
<td>Collaborative</td>
<td>Individual</td>
<td>Working in teams</td>
</tr>
<tr>
<td></td>
<td>Homogenous groups</td>
<td>Heterogeneous groups</td>
</tr>
<tr>
<td></td>
<td>Every one for him/herself</td>
<td>Supporting each other</td>
</tr>
<tr>
<td>Creative</td>
<td>Reproductive learning</td>
<td>Productive learning</td>
</tr>
<tr>
<td></td>
<td>Apply known solutions to problems</td>
<td>Find new solutions to problems</td>
</tr>
<tr>
<td>Integrative</td>
<td>No link between theory and practice</td>
<td>Integrating theory and practice</td>
</tr>
<tr>
<td></td>
<td>Separate subjects</td>
<td>Integration between subjects</td>
</tr>
<tr>
<td></td>
<td>Discipline based</td>
<td>Thematic</td>
</tr>
<tr>
<td></td>
<td>Individual teachers</td>
<td>Teams of teachers</td>
</tr>
<tr>
<td>Evaluative</td>
<td>Traditional pedagogy</td>
<td>Emerging pedagogy for the information society</td>
</tr>
</tbody>
</table>

Table 2.2 : Traditional Vs Information Society

It is obvious that the role of ICTs facilitates the pedagogy of schools in the information age. ICT is a medium for effective instruction, the means whereby teachers learn, teach and learners also learn through different processes: intensive training and apply training, in simulations and educational networks. Research findings indicate that developed countries has successfully adept ICT use in the educational system and has yield remarkable results. The developed countries have a clear knowledge that a new society requires a new skill to enhance innovative ideas that will improve teaching and learning. Interestingly, ICT is increasingly pervade every aspect of human endeavor be it work, learning, leisure, and in health.
The simple reason is that ICTs are reliably, excellent tools for information processing. Teachers and students should not be ignorance of such powerful tool to aid learning. Kok (2007) states that "the new generation needs to become competent in their use, should acquire the necessary skills, and therefore must have access to computers and networks while at school".

The paradigm drift in education in recent years envision innovative approach learning civilization that deems ICT incorporation. ICTs need be fused into the methodology to yield impact and improvement learning environment. ICT have revolutionized our thought patterns, our society. The recent past decades has witness a dramatic change in the technological revolution, it has entered all areas of our civilization, social and cultural lives. World over the formal or traditional way of working has changed, the fast growth of information and the access method has changed rapidly, immense quantity of information to be made instantaneously obtain and adapted with a keystroke. Furthermore, it reveals that institutions are rooted in our culture and reflect its values. Technology as an agent of change reflected in our society has not been applied to display such change in the academia. Changing dynamics of the society through technology opened rift between the process of instruction in the educational system and mode of assessing knowledge in the society at large. The institutions of learning are still locked in the past methodology, the traditional approach of teaching and learning.

Technologies innovation pose challenges with traditional concepts of transmitting educational ideas, by reconfiguring how teachers and learners obtain access to knowledge, have the potential to transform instruction processes. Information and communication technologies spell out variety of powerful tools that may aid in transforming the isolated ideology of teacher-centered text bound to a rich student-based comprehensive and interactive knowledge based. The achievements can only be attained if schools wholly appreciate and embrace the new technologies in teaching and learning.

Instruction or teaching takes verifiable facts and beliefs; it improve students' involvement and self expression. The quality of education and processes of delivery
is noted to be increased by the introduction of ICT, this approach is seen as an indispensable instrument for uplifting the education system. ICT is essential for the training of students in line with the new ideas in the world (Oruan 2014).

The trend in teaching is the interface among the teacher, the pupil and the subject matter this result in learning. Skills and values are obtained through a worthwhile deliberate and systematic activities. These norms are transmitted by intended skills acquired by the teacher to induce learning which is the aim of teaching. The teaching concept as established involves deployment of different methodologies, ICTs inclusive and the operation of these ICTs facilities to facilitate learning.

The internet (www) no doubt has create a possible for anyone to have contact to faster primary sources of information. As one of the tools to enhance ICT if mastered is an essential in acquiring access to on growing body of recent and up to date bank of knowledge available to everyone that seeks it. The question is how many academia mostly in the developing countries accesses it to smooth the progress of teaching and learning, how do many teachers understand this bank of knowledge as a tool and benefit of immense resources?

ICT has really re-structure instruction process and methodology in institutions of educations in general. Agreed upon that ICT offers influential learning atmosphere and can change the teaching and learning processes so students can deal with knowledge in an active, self-directed and constructive way. ICT facilities itself alone cannot transform effective teaching and learning environment without the right mix and attitudes of implementing such technology (Sara H, et al 2010).

The digital age have tremendously impacted almost all sphere of human endeavors. Such fields as medicine, tourism, travel, business law, banking to mention but few, the impact within the pass two to three decades has been worthwhile or remarkable. ICT has made tremendous improvement presently than the former decades. But vividly these impacts are not noticeably conspicuously in the education sector compared to other sectors.

As noted that the factors hampering the comprehensive uptake of ICT in the educational sectors include;

- Inadequate fund in the purchase of the technology.
- Lack of manpower training among teaching professionals.
- Affective apprehension and motivation among teachers to adopt ICT as teaching tools (Oliver 2002 referring to Stair 2001).

These factors listed in turn are acting as catalyst in bring relevant forces to accept on the implementation of ICTs in teaching. ICT adoption in educational settings by itself stand as a catalyst for transformation. ICT promotes, encourage and support learners learning independently, ICT as a tool for effective learning will upwardly increase and influence the way learner acquires knowledge. This upward trend will manifest if the right attitude and motivation are laid upon to be adopted by the learner.

Former educational theories of learning had firm foundation on constructivism principles, there is a paradigm shift from learning achieved by the vigorous building of knowledge supported by various perspectives within meaningful contexts. In constructivism theory social interaction have an outstanding role to play (Vygotsky, 1978). This method of instruction is the conformist process of instruction centered on the instructor planning and leading the learners through succession of sequence of instructions to achieve preferred learning outcome.

Duffy and Cunnigham (1999) agreed that constructivism form of teaching have revolved about the deliberate transmission of desired wealth of knowledge followed by purposeful forms of interaction with the content as to strengthen knowledge acquisition. On the contrary a contemporary learning theory is based on the notion that learning is an active process of constructing knowledge rather than acquiring knowledge and that instruction is supported rather a process of knowledge transmission. ICT in teaching and learning wholly support the constructivism theory. The theory holds that learning is a process of personal understanding and development of significance in manner that are active and interpretative. Construction of meaning is derived from learning rather than memorization of facts.
Findings have showed that ICTs present numerous opportunities for constructivism knowledge through the rich provision and support for resource based, student centered environment and by enabling learning to be related to context and practice. ICT in the information age does not determine when and where students learn. ICT application make room for many options in learning, choices of acquiring knowledge, many institution are now generating competitive edges for themselves through the choices they are offering students. When and where the students learn is now a determinant factor in students learning ability.

ICT is a determining factor and a facilitator in the improvement of a lot of disciplines. In vocabulary development in primary schools, vocabulary instruction focuses on building the learners expanding the breadth and depth of vocabulary for a clear understanding of concepts and building a clear picture of world they live. Studies indicate of the use of ICT to teach and learning of vocabulary indeed improved learning (Anyachebelu et al 2011:17 referring to Jones et al 1987:126) comparing direct instruction and software application in teaching vocabulary shows that children who work with software application did better than those on direct instruction. Those on software instruction learn faster and better strategies for identifying new words that do not appear in the programme indicating that children obtain word learning strategies not just the meaning of the specific word taught. In the summary and recommendation of the work government advised to provide computers and integrate computer literacy curriculum and that teachers be trained by government on the use of computer.

The emergence of information revolution and ICT instruction introduction has given room to profound effect on subject improvement and the way teaching-learning are conducted. ICT has proffered answers to the issues inherent in education by adopting systematic and diagnostic pedagogical approaches in making learning more effective. Educational Technology as a new discipline in the teaching-learning sector has thus adopted ICT in unveiling superior outcome in teaching-learning. Many has viewed a change of fashion in teaching, learning and evaluation processes changing dramatically in accordance with the world order of
Duru in his publication referring ICT and its resources identify its relevant in effectiveness and efficiency of teaching and learning. Graphing the progress in teaching and learning when ICT are rightly integrated has shown a steady increase (Duru 2011:47). The relevance of ICTs to education is greatly felt in enhancing "motivation, creativity, active engagement, acquisition of skills, production of instructional packages, and exchange of ideas and globalization of knowledge" etc. (Duru 2011 referring to Akude 1995) observed ICT instructional package enhances instruction. It consist of technical accessories hardware, software, network that aid communication, therefore ICT consist of the under listed; "Information Technology (IT) as well as telephony, broadcast media, and all types of audio and video processing and transmission". ICT is frequently used interchangeably with Information Technology (IT) but in a more general term that stresses the responsibility of telecommunications (telephone lines and wireless signals) in modern Information Technology.

Countries educational policies portray education enablement geared towards eradication of poverty and means of enabling progress in the society, although more critical is development of knowledge based societies and economies. Suggestions and researchers are of the opinion that ICT can play a number of roles in education. More specific lessons learnt from best practices world over reveals that there is no specific or best modus operandi to determine the best height of ICTs incorporation in education sector. A major problem of using ICT in education is based on the choice laid on technological possibilities rather than educational needs. It is conceived that the educational efficiency of ICTs depends on how and for what purpose, similar to other educational tools or mode of education delivery, ICTs do not work for everyone, everywhere in the same way, factors like;
➢ Affordability
➢ Availability and
➢ Access to Technology; plays a major role in its adoption and use (Munienge et al 2013).

2.7.2 Stages of ICT Development

ICT can only flourish if humans and instructors in the educational system adopt and apply it, its infusion into the methodology to enable learning. Models can be developed for the new concept to enhance this, H.K. Senapty states that;

“The proposed model is derived from international and national studies on ICT development that have identified a series of broad stages that educational system and institutions typically proceed through in the adoption and the use of ICT. These broad stages have been termed as

Emerging, Applying, Infusing and Transforming stages of ICT development (UNESCO, 2005) the model is then mapped on the basis of: (a) stages of ICT usage and (b) pedagogical usages of ICT.

Studies of ICT development in both developed and developing countries identify at least four broad approaches through which educational systems and individual institutions typically proceed in their adoption and use of ICT. Sometimes, the number of stages identified varies. However, there is a general consensus that the introduction and use of ICT in education proceeds in broad stages that may be conceived as a continuum or series of steps. These steps, termed Emerging, Applying, Infusing, and Transforming, (SOURCE: UNESCO, 2005)”
Emerging Stage

The adoption of ICT by institutions at the initial stages demonstrates the emerging approach. The emerging stage indicates a startup of an institutions drive in the ICT domain with little and few computing infrastructure. At this stage it deals with infrastructure exploitation, it possible adoption and outcome. The emerging stage is characterized by the institution standing on its old tradition of teacher centered instruction delivery. The basic curriculum requirement at this stage portray increase in learning acquisition of ICT basic skills.

Applying Stage

UNESCO 2005 reports states that this stage uses ICT tools to integrate categories subject areas. Instructors adopt ICT for deploying institutional management and in the curriculum related task. Teachers activities are conspicuous in this stage and the curriculum implementation help increase the application of ICT in the school disciplines and using specific instructional tools and software to aid instruction. This stage mark teachers' ICT use for professional to increase in subject mastery. The stage is extraordinarily essential in impacting instruction, teachers uses ICT for professional purpose, focusing on knowledge development, help teachers to restructure their teaching approach to instruction delivery. This built rapid
confidence in the use ICTs in the classroom. However, the chance of the relevant of ICT in instruction is limited mainly by lack of ready access to ICT amenities and resources.

**Infusing Stage**

The infusing stage marks the third stage, it "involves integrating or embedding ICT across the curriculum and is seen in those institutions that now employ a range of computer-based technologies in laboratories, classrooms, and administrative offices". Here instructor adjust their new lifestyle of productivity and professionalism. The curriculum and ICT application showcase real-world applications. ICT infuses all aspect of teachers’ ICT professional style to enhance learning ability of the learner.

**Transforming Stage**

The transforming stage focuses on ICT as a tool for integration and the resultant effect in this phase is not visible but contribute to daily productivity and ethical practices. The curriculum is learner centered with practical learning applications. ICT is incorporated as a discipline at the professional level and part of all learner subjects. ICT is seen as a natural day to day endeavor and new approach is utilized and designed to improve individual learning outcome objectives.

### 2.7.3 Affective Computing and Affective Education

Bloom's Taxonomy of educational objectives was created by Benjamin S. Bloom and his group during the 1950s. The concept deals with the levels of reasoning skills required in effective teaching and learning in the classroom environment. Specifically, Bloom recognize six levels in the taxonomy, each requiring a higher level of abstraction from the students. During this period there were serious challenges on the task of classification of educational goals and objectives, the intention was to develop a scheme of classification for thinking behaviors that were believe to be important in the process of learning. During the 1948 discussions held at a Convention of the American Psychology Association motivated Bloom to lead
a group of educators who systematically took up the challenge of classifying educational goals and objectives, the framework now becomes the taxonomy of three domains:

- The Cognitive-Knowledge based domain
- The Affective-Attitudinal based domain
- The Psychomotor-Skills based domain

Among the domains the cognitive and the psychomotor has been widely adapted in the education setting as Bloom's Taxonomy of education has been tested with time, its has an outstanding history and popularity, it has been measured in variety of ways (condensed, expanded and reinterpreted). Educational researchers, theorist and practitioners attempt a separation approach between affective and cognitive into two distinct domains. The aim of the separation is to clarify the behaviors in each domain and effect research and study of the behaviors. A school of thought believed that both domains interact in actual learning, each domain according to this school of thought has been studied and taught with little attention to its counterpart. One reason why integration of the affective domain in teaching and learning is that affective behaviors are difficult to conceptualize and to evaluate, the reason has extended more efforts and time into thinking about studying, evaluating and teaching the cognitive aspects of behavior, particularly cognitive behaviors are easier to specify, operationalize and measure than are affective behaviors.

In highlight (Martin 1986) stated as thus, the affective domain poses a unique set of problems for educators. The challenges ranges from it very definition of the domain and the concepts that comprise it are so broad and often unfocused that all aspects of behavior not clearly cognitive or psychomotor are lumped together in a category called the affective domain. In a way of getting a keywords and proactive concepts relating to the affective domain words are used: "Self-concept, Motivation, Interest, Attitudes, Beliefs, Values, Self esteem, Morality, Ego development, Feelings, Need achievement, Locus of control, curiosity, Creativity, Independence,
Personal growth, Mental health, Group dynamics, mental imagery, personality” etc.

As further noted by (Martin 1986 in Bills, 1976) the adaption of the affective domain has been further compounded by its very own definition terminology within and between discipline for clarification. Psychologist deviations define affect as a psychologist or biological state; while educators and other psychologist interest in behavior changes define affect as a cognitive type process.

These definitional issues as stated by various groups and scholars has generated more challenges and problems related to affective behaviors. More so, the lack of appropriate definition and focus has made measurement of and research related to the domain difficult; and it has made translation of affective behavior into classroom practices inadequate.

As stated by (Martin 1989 in Bills 1976) in his comprehensive and compound statements state as thus:

"We are not close to an agreement about what affect is or what to call it, are not close to an agreement about what affect is or what to call it. What we are trying to measure is so unclear to us that we cannot develop instruments with acceptable psychometric qualities and ... I have concluded that unless we can achieve a better concept of affect, we will never be able to deal with it in our classroom or research"

More than just definition constraints are identified from various research work but the issue of measurement problem also as stated above. There are other challenging fact which are associated with affective domain itself, probably trivial in nature:

- Educators view affective goals as long range and intangible that regular classroom time restrictions (e.g. periods semesters, years) prohibits development and measurement of affective outcomes (Bloom et al 1971).
• Fear that discussions of values, attitudes, morals, and other aspects of the domain may be viewed as indoctrination or "brainwashing" (Bloom et al 1971)

• Recognition that in the affective domain the absence of behavior is often as important, if not more so, than the presence of behaviors.

• The inability to identify and specify affective behaviors because our language does not always lead itself to clarity.

• Uneasiness about some of the methods associated with attitude change

• Disagreement and confusion about whether affective behavior are ends (outcomes) or means to ends.

It is clear that affective goals and learning outcomes are very significant in many educational settings in the progress and success of its application is reduced due to the associated problems. Not only is the domain hard to define, in terms of its operational and measure, but educators wishes to reduce about it influencing affective behaviors without indoctrinating learners or compromising their own professional ethics. Irrespective of all these setback affective domain is only possible when we have:

• Developing some clearer notions of the scope and boundaries of the affective domain.

• Developing some way to differentiate between abstract and poorly defined concepts.

Information technology development is vital and is the bedrock for a valuable contributor to the processing functionality and vital services rendered by any organization. World over, technological acquisition account for all global capital funds. The effectiveness of information systems has become an progressively popular information technology initiative as noted by D. Ozag at al.

TAM is widely and strong hypothetical model for analysis information system use. Known as a model valuable for determining and predicting the adoption of new information systems. Davis in his earlier works empirically investigations reveals the model may predict information system usage in various spectrum of settings,
persons, and times. TAM was initialize to clarify user acceptance or rejection of technology as follows:

- TAM application is broad in its usage, generation of feedback from system designer by obtaining user feedback of different system features or design approaches
- The issues of how a certain technology may be implemented
- TAM adopted to enlighten variables that influences the use of technology.

Davis Technology Acceptance Model derived its basic principles from TRA Theory of Reasoned Action. As will be later highlighted in the subsequent chapters, the theory hypothesizes that an individual's behavior depends on two factors "intention to perform a function, the individual's evaluation with respect to the act, and the person's subjective norm or perception of the normative" pressure with respect to the behavior. TAM as a derivative of TRA provide an explanation of wide ranging information system acceptance model and behavioral intention with respect to broad perspectives as well parsimonious and theoretical justified.

Many studies regarding TAM evaluating the psychometric variables of TAM involving the perceived ease of use and perceived usefulness scales:

1. The variables has been confirmed with relevant convergent and discriminate validity.
2. Technology significance use has been confirmed by both variables.
3. TAM results tends to differ in different cultural background.

TAM applied to different cultures reveals that the model may not be suitable for predicting information system utilization across all cultures. The study was based on advance economies of the world (American, Swiss, and Japanese) airline employees that uses e-mail. According to the report the model support for American and Swiss employees but negate for the Japanese employees. With increasing analysis and evaluation computing is rapidly drafting from just a machine to a social agents. Recently psychologist expert are building a strong efforts in incorporating emotion into computers (Picard 1997, Darwin 1872). Computers logical operation computing ability is now conceived as controversial and challenging notion as opposed to rapidly changing computing power of velocity,
verity and volume of its ability. System and computer communication deemed that
to be more flexible, friendlier and natural in nature than a chiefly relying hand
driven devices like the mouse and keyboard. "Efforts are underway to improve the
interface with more intrinsic medium through voice, face expression or gesture and
computers are getting human-like" (Marsic et al 2000:1354-66).
The very foundation of mankind is built on constant improvement and vital
instructions that has built-up the very existence of human innovations and
technology. In recent years the drive of the this existence of our values and way of
life is rapidly eroding. Computer are moving from just ordinary machines to
human-life abilities with emotions as the underlying concept. It is right time one
key concept of emotion which is affect be re-emphasis in our learning processes to
enable the drive and passion be rekindled. It is a clear picture, about emotion being
a natural phenomenon in our day in day out life activities, it is the very existence of
human nature. The existence of mankind as a child initial interaction to the external
environment or world are expressed through emotions through smiling, crying,
indicates various scenarios. Emotions affects many different aspects of our
behavior. No doubt mechanical, intelligent and more further emotional computer
are challenging to build to serve mankind. But the good news is that affective
computer are effective exploits to enhance learning. According to (Curran & Casay
2006) emotional status in email or SMS with so-called emotions are appreciated
with its user likewise, emotion acknowledgment has a vital part to play in tutoring,
remote education (Nasoz & Lisetti, 2006) and computer entertainment such as
games.
Emotion as noted by various authors is not a simple phenomenon. As frequently
applied in our daily life, the concept of emotion is controversial in academia
(Forgas, 1989). As stated in the previous paragraph with respect to computer
science application the word emotion more related to involuntary acknowledgment
of the expressed emotion or feelings.
Relatively, emotion in affective computing terminology include both affect and
mood. (Beedie et al 2005:847-78) in view defines emotion and mood being
connected but different phenomena in terms of cause, duration, control, experience,
and consequence. Another author relate to refer it to "a relatively intense state that has been induced for a short duration and involves a definite cause "(Forgas 1992:227-75). It has been researched upon and revealed that "emotion impacts upon human behavior and decision processes in a variety of ways and its effects can occur in the perception, storage and use of information" (Mincheol, W & Joasang Lim).

A group of affective computing of the MIT media lab is recognized to be the first affective computing technology applications in teaching. The technology was deployed in distance education setting. The teaching that was develop collect data through the camera recording facial expressions and biosensor connecting in human body. The device detect confusion for a piece of content on TV talk and will be later replayed or give more elaboration. Researchers has put forward an affective computing learning system that evaluate students learning processes, evaluates and adjust placement as recommended by the system. The user is real-time monitored in the process by affective computing terminal, and collected dataset about the facial expression speech emotion passed to the affective computing server. The dataset is then evaluated at the end of the period based on the emotional results and other processes are evaluated that enables students adjust the learning progress timely according to their level and provide materials that suits their learning level.

2.7.4 Mapping the ICT Model to Enhance Teaching and Learning

A continuum model has been proposed to help function as a building block for teachers' capacity development to actively involve ICT in education. The two interwoven concepts include: Stage of ICT application and Pedagogical application of ICT.

The first stage regarding stages of ICT usage identify four broad stages which are correlated with respect to (awareness, learning, understanding how and when) ICTs should be adequately applied.

**Becoming aware of ICT application** is the initial phase, ICT tools and its related function are mapped out for use, the stress is on computer literacy and basic skills.
Learning how to use ICT in the various disciplines in the use of general or particular application and incorporating it with the formal stage in the ICT development model. Understanding how and when to apply ICT focuses on how to achieve a particular purpose. Recognizing stages of ICT usefulness and adopting the appropriate technology to achieve the task. The final stage is the specialization in the use of ICT is marked by creativity and transformation with the aid of ICTs.

Pedagogical application of ICT is subdivided into four stages; support work performance, improving traditional teaching, facilitating learning and developing innovative learning atmosphere.

“More than three decades ago, computers and related information technology were introduced to educators for direct teaching and learning purposes. ICT started its journey primarily with productivity tools, proceeded to self-learning courseware and multi-modal instruction, and finally progressed to web-based learning management system”.

2.7.5 ICTS in Teaching and Learning Process, the University System
Technology innovation is changing and redefining not only how we communicate, more so redefining our education attainment. The more or ocean of information available the less need and impact of learning as noticed, but is raising new subject of effective probing and the adequate improvement of skill to evaluate the appropriate information.

Sadiq (2005) noted progress of systematic skills and higher order thinking is gradually more an significant focus. To achieve this many stakeholders and interest group are mounting effect on reformation and reforms brought from the society.

In the academia ICT facilities and application packages such as Information and Communication Technology Assisted Academic Counseling (ICTAAC) which is
designed to assist the Teacher to give guidance to learners with inhibiting behaviors through it rich databank and the ICT Assisted Instruction (ICTAI) acts as a tutor, providing best guess and explanation to the leaner. ICTAI tests, monitors answered students' questions and generate projects. While Computer Managed Learning (CML) focuses on teaching management.

In viewing the importance of ICT in the academia (Bassey 2009) shortlist the importance of ICT in education

1. Improve higher order of thinking in education through problem solving communication skills and deep understanding of concepts.
2. ICT create for a broad learning communities of learner with variety of tools especially those with special needs
3. It brings to real life scenario typical illustration of dynamic processes in graphical forms.
4. Time saving means of learning and improved quality of instruction.
5. ICT focus on learner centered interactive learning situation and energizing the learner.
6. It focuses and promote collective learning (Bassey 2009).

Ikwuegbu (2011) have their take on ICT in teaching and learning; from the perception of scholars that ICT is a building blocks of modern society in many developed and developing countries. Understanding ICT indicate mastery of basic skills and concepts of the technology. ICT is now part and parcel of education (Ikwuegbu et al 2011).

ICT is enriching teaching and learning processes, more so in terms of organizing and restructuring learning institutions. It is clear that when infusing ICT to enhance instruction, various people are involved teachers’ professional life, students learning and managing learning processes. Stimulating, managing and the integrating learner behavior can be easily achieve through innovative technology. Pedagogical innovations are the rising practices that engage changes in what teachers and students do and learn in the classroom. For example the learning process is moving from a static environment to dynamic learning. This practice can be series of events
that encourage active and independent learning in which students taking accountability for their own learning. Educational innovations is said to be embedded in teachers’ experience of drifting from teacher–centered approach to one that is more student-centered.

In (Ikwuegbu et al 2011) citing (Osuji 2004) express the benefits of ICT to the Nigerian education system as thus; Offering quality education that is not compromised through wider reach to learners. Education delivery process improved through it tools that will aid learner gain mastery in their subject area and optimal utilization of the resources. ICTs will enable global competitive education framework and reduce of social vices.

ICTs present numerous opportunities in education. It is a tool for making ready the modern age group of students for future work place that is providing search for the future practices. As viewed this era portrays students that exist in a universal knowledge based age and opt teachers practice produce the best that technology can bring to learning. He submitted that both teachers and learners in the use of technology (ICTs), would be partakers of the knowledge base and skills with the ever progressively more complex world, (Yusuf 2005).

Academicians productivity of tomorrow’s labour force requires ICTs and students that will suit in the future work place, ICTs makes teaching productive, efficient with varieties of tools at instructors disposal. Reforms, innovation that stimulate learning are feature of ICTs which makes the learner to learn actively, independently in a self-directed way and in collaboration with others (Tyler, 1998:147).

The significant of ICTs to increase teaching and learning is highly felt, but getting information and communication technology fulfilling it vital role by appropriate assimilation in the delivery of worthy instruction is a key factor in consideration. Notably, even in advance technologies community, there is no guarantee of the competencies and bank of ICT potentials knowledge at students use. Study has revealed that there is a differentiation to what faculties members know at ICTs and
how in reality apply in their instruction. The finding states clearly how technology awareness and experience does not match with what is ought to deliver.

Tyler (1998) x-ray ways of ICT application mostly for learning; (i) Assisted learning through learners and computer interactive system enhance by drills, practice and virtual realities. (ii) Computer aided research and library assisted instruction by the aid of the internet. As means of telecommunicating, e-mail, web sites, audio/video teleconferencing as a way of enhancing distance learning (Tyler 1998:147).

Hardware and software are inseparable part of technological tools; word processors, graphic packages, digital camera, presentation, applications, database and spreadsheets etc. The components do not have restricted educational goals, but are timely in this era to help extend their abilities to do work. Knowledge modeling as a societal norm can be impacted using ICT as a powerful pedagogically tool for the instruction.

ICT is becoming the basement of knowledge system enhancing acquisition, incubation, amplification and dissemination. Information stands as a valuable resource permeates the three key lifeline in academia teaching, learning and dissemination of the information to the society through publications. In realization (Jene and L.E.Oshio 2011 in Okeh & Opone 2007) express the use of innovative technology (ICT) as national building block.

ICT sufficiency and used in education as stated by (Jene and Oshio 2011 in Ikelegbe et al 2006) include:

i. Supporting conventional classroom work; the teacher could ask his/her students to use ICT approach;

ii. Helping in the design and development of learning materials. A lot of materials can be downloaded from the Internet. Such materials must however be adapted to suit the specific instructional objectives;

iii. Accessing electronic teaching materials such as books, journals. These can be accessed, stored and analyzed by the use of ICT;
iv. Accessing virtual library “stocks” electronic versions of books’ journals;
v. Giving or providing access to the world of resources especially in electronic form;
vi. Playing a key role in educational administration. Students’ data, personnel administration, purchasing and supplies, advertisement, etc can be handled with ease using ICT;

Governments world over rely on the potentials of ICT to develop education, economic and wealth generation (Jene 2011 in Okonta, 2006).

Jene and Oshio (2011) in a research conducted in Edo State University in Nigeria reveals the following:

<table>
<thead>
<tr>
<th>S/N</th>
<th>Item</th>
<th>Available</th>
<th>Not Available</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Frequency</td>
<td>Frequency</td>
<td>Frequency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>1</td>
<td>Computer</td>
<td>10</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>On-line Electronic Library</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Internet facilities in the offices</td>
<td>3</td>
<td>97</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>Telephone</td>
<td>100</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>Video Recorder</td>
<td>4</td>
<td>96</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>Multimedia projector</td>
<td>2</td>
<td>98</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>CD MP3</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Television</td>
<td>5</td>
<td>95</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2.3: Availability of ICT facilities in Edo State Universities Nigeria. International Review of social science and humanities Vol.2 P.130

display the percentage of frequencies of ICTs used in the said University in Nigeria. Among the items telephone is widely acquired and used, other facilities are underutilized.

More so, ICT facilities adequately utilized and materials used in developing lecture note in the teaching of teacher education programs in the said university reveals thus;
Table 2.4.1: Use of ICT facilities for teaching. International Review of social science and humanities Vol. 2 P.130

<table>
<thead>
<tr>
<th>Use of ICT</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seldomly</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Often</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>Very Often</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2.4.2: Materials used in developing lecture notes. International Review of social science and humanities Vol. 2 P.130

<table>
<thead>
<tr>
<th>Materials</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous notes</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Textbooks</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Journals</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Materials from the internet</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2.4.1 & 2.4.2 above reveals the strength of both ICTs facilities for teaching and materials used in developing lecture notes. Table 3 indicate above average (53%) of ICTs in instructional development and 52% of materials from internet in used for lecture notes materials.

(Jene and Oshio 2011) in conclusion recommend thus;

1. a lot of scientific information is now available in electronic formats (e.g. CD-ROM database). University authorities should acquire these ICT facilities and new technologies so as to empower and meet the information needs of teacher educators and their students.

2. a functioning cyber café should be made available for the faculty use and all the lecturers and students should have easy access.

3. the knowledge of science and technology is indispensable to the development of any nation and teacher educators play active roles in imparting such knowledge. Thus, the government should make efforts in
assisting the universities to provide for the information needs of teacher educators so that they can give quality teaching to students.

2.8.1 Analysis of ICT Policy (Nigeria a Case Study)

The Nigeria ministry of education is ensuring that no sector of its educational segment is behind in the global innovational concept of adopting ICTs in educational facilitator. Studies reveal both the public and private education system are geared to this aim and goals. The progress so far is a gradual one progressing relatively in complete integration of ICT in the various sphere of the educational system, however in a slow pace.

The stipulation of policy involving national issues especially in education is solely the task of the Federal or Central Government. A suitable structure for the complete incorporation of ICT into the education system was established by the Federal Government of Nigeria as the case may be. For ICT to play a vital role there is the need for a appropriate assimilation of computer literacy and other ICT elements into the education system, hence the requirement for proper and all-inclusive policy manuscript to serve as a guide for stakeholders in the education sector.

However, to achieve these loudly policy the Federal Government of Nigeria in 2001, published the National Policy on Information Technology, and established the National Information Technology Development Agency (NITDA) to serve as a supervisor to implementation of the policy. Within it operational period in review a shortfall has been noticed due to;

- The issue of lack of embracement of ICT in the educational system.
- The policy statement on ICT education was vague
- The education sector was not given a preferential treatment like other sectors.

The policy express some potential process for realizing the objectives of applying Information Technology (IT) in human resources growth; Making the use of IT compulsory at all levels of educational institutions through sufficient financial provision for equipment and manpower resources.
Yusuf (2005) while applauding the ideas note that inadequacies still holds as a major constraints in the possession of IT facilities by educationist in the country. This is a general problem with developing countries world over, fine-tuned policies with zero implementation.

Oyelekan in reference to National University Commission (NUC) states as thus;

The strategies proposed are: policy enactment, capacity building, advocacy, and curriculum review. While reflecting on the Nigeria situation on e-education, the Federal Ministry of Education reported in the ministerial initiative on e-education that a pilot study conducted by the National University Commission (NUC) showed that the average number of computers per school increased between 1998 and 2001, and that it witnessed a greater increase between 2000 and 2004. So also it was reported that there was a considerable increase in the percentage of schools connected to the internet, and there was an increase in the percentage of teachers that feel confident on the use of the computer in 2003, (Oyelekan 2008).

The changes recorded in the educational system in application of ICT to improve teaching and learning is a brainchild of Federal Ministry of Education and its agencies through its initiative ICT-driven programs:

- School Net Nigeria
- The National Open University of Nigeria (NOUN)
- The Virtual Library Project
- Nigeria Universities Management Information system (NUMIS)
- Nigeria University Network
- Virtual Institute for Higher Education Pedagogy (VIHEP)
The Virtual Institute for Higher Education in Africa (VIHEAF) (Oyelekan 2008) referring to (Cirfat et al 2003) in a paper relating to issues ICTs sufficiency, significance, and utilization model in two institutions in Plateau state. Survey proposal adopted through the mechanism of questionnaires, oral interviews, and personal assessment of visible ICT facilities. The result indicated that the status of ICT in the two colleges of education was under average.

Oruan (2014) in his paper titled “Availability and Impact of ICT on Teaching and Learning ability on Students in Federal College of Education (Technical) Omoku-Nigeria” reveals thus:

*ICT facilities for learning by students reveals* that 40% uses computer to acquire learning less than half of the population in consideration. 51% admits not using it while 9% plan or intend to use. Usage of internet to enhance learning revealed that 23% actually adopt it for learning, while 62% and 15% says No and plan to use. Website use for learning also portrays 17% for use while 63% and 20% do not use and intend to use.

*Furthermore, Tablets/Handsets/Ipads revealed 54% usage for learning,* while 40% and 6% responded in the contrary. To what extend does this result deeply aid learning for effective result is dependent on the variables in the questionnaire item, (Oruan 2014).
Table 2.5: Students use of ICT facilities for learning (Oruan M.K 2014)

The availability and impacting factors are mostly motivation is a key factor that aids the adoption and effective use of ICT in higher institution of learning. (Egomo et al 2012) a research conducted in three higher institutions in Cross Rivers State Nigeria reveals the following results:

<table>
<thead>
<tr>
<th></th>
<th>Computer</th>
<th>Internet</th>
<th>Website</th>
<th>Tablets/Handsets/Ipad</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq. %</td>
<td>Freq. %</td>
<td>Freq. %</td>
<td>Freq. %</td>
</tr>
<tr>
<td>Yes</td>
<td>70 40</td>
<td>40 23</td>
<td>30 17</td>
<td>95 54</td>
</tr>
<tr>
<td>No</td>
<td>90 51</td>
<td>110 62</td>
<td>112 63</td>
<td>70 40</td>
</tr>
<tr>
<td>Plan to Use</td>
<td>17 9</td>
<td>27 15</td>
<td>35 20</td>
<td>12 6</td>
</tr>
</tbody>
</table>

Table 2.6: Availability of ICT tools (Egomo JE 2012)

From table 2.6 it showed that data-base and cyber Café availability is 50% respectively, multimedia projector, laptops, up to e-mail access are low and not adequately available tools used in the higher institutions to promote distribution of information. The bottom line is ICTs lacks adequate yield for instruction delivery with little awareness to multimedia, laptop and internet use.
Table 2.7: Degree of utilization of ICT tools (Egomo JE 2012)

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>Very frequently</th>
<th></th>
<th>Frequently</th>
<th></th>
<th>Not at all</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lecturer %</td>
<td></td>
<td>Lecturer %</td>
<td></td>
<td>Lecturer %</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Database</td>
<td>50 16.7</td>
<td></td>
<td>150 50.0</td>
<td></td>
<td>100 33.3</td>
<td>100</td>
</tr>
<tr>
<td>2.</td>
<td>Cyber Cafes</td>
<td>100 33.3</td>
<td></td>
<td>150 50.0</td>
<td></td>
<td>50 16.7</td>
<td>100</td>
</tr>
<tr>
<td>3.</td>
<td>Multimedia projector</td>
<td>30 10.0</td>
<td></td>
<td>80 26.7</td>
<td></td>
<td>190 63.3</td>
<td>100</td>
</tr>
<tr>
<td>4.</td>
<td>Laptop Computer</td>
<td>50 16.7</td>
<td></td>
<td>100 33.3</td>
<td></td>
<td>150 50.0</td>
<td>100</td>
</tr>
<tr>
<td>5.</td>
<td>TV/Radio projector</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>6.</td>
<td>E-library</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>7.</td>
<td>Still/Digital Camera</td>
<td>50 16.7</td>
<td></td>
<td>100 33.3</td>
<td></td>
<td>150 50.0</td>
<td>100</td>
</tr>
<tr>
<td>8.</td>
<td>VCR/machine</td>
<td>30 10.0</td>
<td></td>
<td>70 23.3</td>
<td></td>
<td>200 66.7</td>
<td>100</td>
</tr>
<tr>
<td>9.</td>
<td>Internet facility</td>
<td>100 33.3</td>
<td></td>
<td>80 26.7</td>
<td></td>
<td>120 40.0</td>
<td>100</td>
</tr>
<tr>
<td>10.</td>
<td>E-Mail</td>
<td>90 30.0</td>
<td></td>
<td>100 33.3</td>
<td></td>
<td>110 36.7</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2.7: Degree of utilization of ICT tools (Egomo JE 2012)

Table 2.6 as presented by (Egomo et al 2012) indicates relative use of such ICT items as Laptop, cyber cafes and internet facility slowly improving but still calls for urgent attention, noting the vital role of the significant of ICT in instructional building.

Table 2.8: Motivation (Egomo JE 2012)

<table>
<thead>
<tr>
<th>No.</th>
<th>Motivators</th>
<th>Yes</th>
<th>%</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Personal motivation to use ICT tools</td>
<td>180</td>
<td>60</td>
<td>120</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>Opportunities to develop new ideas</td>
<td>200</td>
<td>66.7</td>
<td>100</td>
<td>33.3</td>
</tr>
<tr>
<td>3</td>
<td>Opportunities to improve teaching/learning</td>
<td>260</td>
<td>86.7</td>
<td>40</td>
<td>13.3</td>
</tr>
<tr>
<td>4</td>
<td>Intellectual challenges</td>
<td>250</td>
<td>83.3</td>
<td>50</td>
<td>15.7</td>
</tr>
<tr>
<td>5</td>
<td>Technical support provided by institutions</td>
<td>60</td>
<td>20.0</td>
<td>240</td>
<td>80.0</td>
</tr>
<tr>
<td>6</td>
<td>Over all job satisfaction/professional prestige</td>
<td>200</td>
<td>66.7</td>
<td>100</td>
<td>33.3</td>
</tr>
</tbody>
</table>
Table 2.9: Inhibitors (Egomo JE 2012)

<table>
<thead>
<tr>
<th>No.</th>
<th>Inhibitors</th>
<th>Yes</th>
<th>%</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lack of technical support</td>
<td>280</td>
<td>93.3</td>
<td>20</td>
<td>6.7</td>
</tr>
<tr>
<td>2</td>
<td>Lack of interest</td>
<td>150</td>
<td>50</td>
<td>150</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>Lack of grant for ICT</td>
<td>285</td>
<td>95</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Lack of technical background</td>
<td>180</td>
<td>60</td>
<td>120</td>
<td>40</td>
</tr>
<tr>
<td>5</td>
<td>Concern about work load</td>
<td>50</td>
<td>16.7</td>
<td>150</td>
<td>83.3</td>
</tr>
<tr>
<td>6</td>
<td>Lack of awareness</td>
<td>60</td>
<td>20</td>
<td>240</td>
<td>80</td>
</tr>
</tbody>
</table>

Table 2.8; reveals that personal motivation which is a major factor use in ICT to enhance instruction is considerably average this is a good signal for ICT adoption. The table signify 60% acceptance that personal motivation to use ICT tools against 40%. The role of education in any nation is very critical hence the figure as shown need an improvement to increase the impact ratio. Item 1, 2, 3, 4 and 6 has the highest percentage, while item 5 has only 20%, lecturers are motivated to use ICT tools based on item 1, 2, 3, 4, and 6.

Table above shows at the peak of the inhibitors, is lack of grant for ICT take off to enhance adequate teaching and learning, followed by lack of technical support. Supposed there be grant and technical support without interest there is the tendency that the impact ratio with respect to enhancing knowledge through ICT will still be inadequate, so therefore interest, passion and affect plays a vital role in the use of ICT for effective teaching and learning. Lack of technical support, lack of interest, lack of grant for ICT, and lack of technical background are some of the factors inhibiting use of ICT in the higher institutions. (Egomo et al 2012) noted thus:

*The findings of the study have clearly revealed that the availability and utilization of ICT tools for effective instructional delivery in tertiary institutions in Cross River State is low. This phenomenon will definitely affect the quality of graduates (learners) from these institutions. Inspire of the awareness of the*
place of ICT tools in instructional delivery it is yet to record same impression among lecturers and institutions in Cross River State.

And recommended that:

a. ICT mandatory by institutions.

b. ICT a must for lecturers since it is an integral part of instruction.

c. Government obligation for ICT provision at all levels of education for enhancement of instruction.

d. ICT facilitation through training and workshop among teachers of all level of education (Egomo et al 2012).

2.8.2 ICT Benefits to Universities System

ICT adoption in the universities to improve teaching and learning cannot be over ruled, the innovative technology is strongly understood as a game changer that can significantly strength the educational system. The adoption of ICT is to facilitate:

- Change the dynamics of education through online education.
- Distance education more efficient and enhanced.
- Build intelligibility and strengthen higher education's goals.
- Using ICT tools for precision evaluation of students outcome etc.

In conclusion, there is a clear vision, mission and goals established by both countries in the use ICT to advance teaching and learning environment for the next generation drifting from the traditional concept of acquiring knowledge to an advance and learner oriented approach. The is question is who far has this been achieved from both countries?, well its progress is still far from its mission statement, the rate is slow and the progress is slow.

2.8.3 Challenges of the use of ICT in the University System

A clear indicator points that in the modern era it is obvious to say that any profession or industry that ignores ICT is simply heading and looking towards extinction. ICT offers strong knowledge base to all disciplines and human endeavors. A school of taught arguments that the main purpose of the integration of
ICTs in education is to provide extra approaches that can be used to address the serious environmental, cultural and educational challenges faced by policymakers, educators, educational administrators and students in higher education.

Noted that ICT in its capacity and developmental ability has its faults or limitations. There is a high acceptance of ICT as the ultimate solution to many educational problems. The challenges of ICT can be viewed in these perspectives (Fisseha 2011):

- Teacher stimulated or related
- Student stimulated
- Technology stimulated

**Teacher related**: - The application of ICT in teaching and learning has an implication with regards to the teachers’ attitude towards use. The use of ICT by teachers’ is unquestionable and vital for education attainment, but observation and research reveal the naive position of teachers not having clear cut information and knowledge about the significant of the technology and its implication to education. Instructors may enclose clear cut goals and positive attitude towards use of the technology, but may avoid it because of squat self-efficacy, tendency to consider oneself not qualified to teach with such an innovative technology.

In (Fisseha 2011) referring to (Bandura 1986, Brosnan 2001) posit self-efficacy as “individual’s opinion of capabilities to organize and perform courses of actions to achieve particular types of performance”. Attitude, motivation, computer anxiety and computer self-efficacy are factors affecting teachers’ use of computer in their lessons.

> A retiring teacher once made this remark, am very pleased with the rate of technological advancement and ICT tools in the classroom, but jokingly blamed the school authorities for ganging up to create redundancy for the aged teachers that have no self-efficacy on these technologies and was grateful that his retirement is due (Fisseha 2011).
Teachers’ disagreement and lack of eagerness are double effect of some ICT shortfall in the education implementation, the skill to operate such equipment may be another factor in consideration. ICT campaign to use for effective teaching and learning may be fruitless except teachers build up some fundamental skills and enthusiasm to use it in the classroom setting.

**Student related:** Students behavior can hamper the effective use of ICT for learning, there exist a positive correlation between computer and internet application on learners achievement and attitude. Students tend to abuse the technology for leisure use rather than effective learning use.

Yousef and Dahmani (2008) described "online gaming, use of Facebook, chat rooms, and other communication channels as perceived drawbacks of ICT use in education", students love spending time on these sites (the social media syndrome) than educational once.

The impropriate use of ICT by students its disadvantage may overweight the advantage, unguided of the internet by student may be misleading and multiplicity of information to choose from. There is the need to guide them from unrelated websites both at school and home by the parents.

**Technology related:** Hardware and software should be value based, motivationally appealing. The high cost, maintenance, high cost of spare parts, high cost of training, virus attack of software and inadequate electricity supply are among the technology related limitations.

In contrary developed world higher education institutions handle challenges as interdisciplinary issues of technologies, departments, goal responsibility and sustainable development. While developing countries constantly troubled with huge growth rate in enrolment, institutional underdevelopment, horrific governance, soaring cost, poor and irregular distribution of ICT resources and infrastructure, inappropriately recognizing ICT as an inhibitor for organizational transformation, rather than a vision and mission tool for organizational development, (Munieniege et al 2013). But irrespective of these shortlisted shortfalls the potential impact of the used of ICTs in the development of teaching and learning is priceless.
ICTs potentials to teaching and learning cannot be overemphasis, however it fulfillment is determined by teachers’ awareness, know-how and keenness to incorporate ICT in their teaching. (Nnanna and Nzeako 2011), referring to (Goshit 2006), states that competence or keenness does not account for teachers integration of ICT in the teaching environment.

The fact of knowing the important and the relevance of ICT in our society with its current level of development in the nation at large, there is the need for continuous awareness and proper training of ICT in all level of our educational system. One way to ensure this is high level of practical performance in the ICT industry so as to enhance manpower development in the country. This can be achieved by proper designing and implementation of ICT curriculum.

(Okoronkwo 2005) in his paper stating some inhibiting factors stress that even with the obvious benefits of ICT, the question which any concerned person would not fail to ask is "why haven’t these new and powerful technologies permeated our institution a greater extent?". An array of inhibitors may be responsible, as listed below;

- **Leadership**

Many educational leaders have little or no experience about the growth impact of ICT in the educational system. (Schofield 1995) acknowledge the deficient of models for accepting ICT into the curriculum. A definite pattern and a way of institutional lifestyle has been an adoptive way, a change from traditional approach is a constant trait of redefining values and a drift of existing culture of the organizations (Middlehurst 1995; Farmer 1990). Other institution may have a mismatch issues relating to the available technology with the manpower available. Gilbert (1996) pointed to uneven institutional scheduling where institutions fall short to equal the technology investment with an investment in people. (Okoronkwo 2005) referring to (Brown et al 1998) stated that lack of uniformity in both computer hardware and software within the one organization is another factor noted hindering the adoption of ICT.
➢ **Attitude to change**

Change in the positive direction is desirable but adopting to new behavior not just ICT is the entrenched attitudes of the teaching staff along with an associated resisting change.

➢ **Resources**

A major inhibitor for institutions is the lack of resources and adequate funding. Funds is the backbone for any organization, institutions cannot accept and promote ICT without adequate support through funding. The increase rate of admissions in our higher institutions of learning implies ICT supports need increase. (Bates 2000) advocate the ratio of a technical support person (1:25 staff utilizing ICT for teaching) and one generalist educationalist technologist (1:50 academic staff).