TVET and Nigeria's Digital Economy

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Abstract
The article reviews TVET and Digital economy in Nigeria with focus on how TVET has faredin countries such as USA, Germany, Japan, Singapore, United States of America. Additionally. the article adopted the Technology Acceptance Model (TAM) and the Theory of Planned Behaviour to dissect the topic in an attempt to discuss the Digital Economy and TVET. The study established that the major challenges to include; lack of adequate manpower, teaching and learning infrastructure driven by ICT, Nigeria's digital economy project may suffer slow actualisation because of the limited ICT infrastructure and manpower to realise same, various sectors of the Nigerian economy especially, the financial sector have embraced ICT in providing services to citizens, though the quality of these services could be improved, amongst other. The also proffered recommendations which include; Federal Government of Nigeria should increase the funding for TVET institutions, the Federal Government of Nigeria should collaborate with German Government or Singaporean Government to identify, adopt and domesticate TVET policies of these countries into the Nigerian TVET system, the Federal Civil Service of Nigeria should upskill civil servants, for a seamless adoption and implementation of the Nigeria's Digital Economy amongst others.

Keywords: ICT, TVET, Digital Economy, Technology

Introduction

The 21st century is experiencing a tremendous use of the cyberspace, thus virtually most activities are carried out in the internet. This innovation has caused a lot of positive transformation in the business world and governance all over the world with Nigeria inclusive. Yousefi (2011) averred that in order to have a competitive advantage in trade, industry and manufacturing, Information and Communication Technology should be incorporated in these sectors. Countries such as United States, United Kingdom, Germany and Japan have been able to attain its present status of development through adoption and deployment of technology.

More so Brazil, China, Russia and other Asian Tigers' digital economies are rising due to the integration of innovative technology to drive most sectors of their economy. The African Continent, most especially Nigeria has realised that global and local competitiveness relies on the adoption and integration of ICTs in various sectors of their digital economies, most especially the industrial sector. Countries such as Germany and the United States of America (USA) have been able to

use Technical and Vocational Education and Training (TVET) driven by ICT to sustain the actualization of a competitive digital economy.

ICT currently contributes (13.85%) of the Gross Domestic Product (GDP) of Nigeria (NBS, 2019) and is expected to increase with the full implementation of the project 'Digital Economy' in coming years. This indicates that if the sector is harnessed properly its potential for Nigeria's job creation and economic diversification will be achieved earlier than imagined. The Digital economy policy and strategy developed by the Nigerian government is expected to achieve 70 percent broadband penetration within 4years, improve service delivery, transparency and accountability, grow and attract digital jobs, achieve a 95% Digital Literacy rate in Nigeria within 10 years amongst others are all expected to be achieved on before 2030. Digital economy plays a major role in national development and a source of revenue for most developed nations. According to the Digital Economy Report (2019), global digital economy accounts for $11.5 trillion, which represents 15.5% of the global Gross Domestic Product (GDP). The report also stipulates that in the past 15 years, digital economy had grown two and half times faster than the global Gross Domestic Product with nations such as the United States (35%), China (13%) and Japan (8%) representing most of the values.

Technical and Vocational Education and Training (TVET) driven by Information and Communications Technology (ICT) brings a lot of opportunities and challenges. ICT has changed the process of how work is been carried out in organizations and how work in these organisations are created. The use of ICT in job delivery has necessitated workers globally to reskill themselves in order to be relevant in the present-dayhigh-tech working environment. Though, jobs are now required to be executed physically and virtually around the globe.

Globalization is prompting governments to take renewed interest in sectors of her economy that will eventually lead to national growth and economic development. Nations are beginning to drive Technical and Vocational Education and Training (TVET) with Information Technology, with the sole aim to attract and prepare its citizens and economy for digital transformation and market for potential hub of skills for the world tech industry. It is pertinent to note that TVET has fueled an impressive economic growth in some countries such as China, Republic of Korea and Brazil, though fallen short of expectation in others such as Nigeria (Williams, 2020). Unfortunately, the Nigerian government has not been able to reposition TVET to respond to the needs and demands of the of the industry where soft and hard skills are needed, this has resulted to major ICT driven technical works outsourced or contracted to foreign nationals who simply come in to the country execute these jobs and return to their countries of origin/residence. TVET is that part of the education system that provides courses and training programmes related to employments with a view to enable the transition from secondary education to work for young trainees/students (social objective) and

supply the labour market with competent apprentices (economic objective).

World Bank (2011), research shows that the level of skills in a workforce predicts economic growth rates far better than average schooling levels. The questions remain why is Nigeria the most populous nation with youth bulge not grooming these youths with the requisite digital skills that will not only create jobs but also serve as a means enhancing economic growth. The first World Bank loan for education, was granted in 1963 for TVET, which accounted for about 40 percent of all educational loans in Sub-Saharan Africa up till early 1980s.Since the World Bank loans dried in the 1990's, Botswana, Ghana and Kenya have shouldered the burden and 'vocationalized' secondary education (UNESCO, 2016).

In Nigeria, TVET institutions are responsible for implementing programmes that equip students with the relevant skills and competencies to meet the needs of the labour markets. Nigeria has a total number of 171 technical colleges and 108 polytechnics, 61 monotechnic, 98 Vocational Enterprise Institutions (VEIS) and 150 Innovation Enterprise Institutions (IEIS) equipping learners with technical and vocational skills through formal and non-formal channels(NBTE, 2019).Enrolment into technical and vocational education course in Nigeria have remained low because of low public perception of the subsector as a veritable education pathway to success. As obtained in other climes, if the government can use ICT to drive TVET programme in Nigeria and also train graduates of such institutions on specific skills (hard and soft) for the actualisation and sustenance of the Nigeria Digital economy. Digital economy is perceived as internet economy where businesses are performed in the cyberspace. Although the availability of ICT infrastructure and the availability of soft and hard skills are major determinants that drives the digital economy.It is against this backdrop that there is need to investigate on how digital economy can promote TVET in Nigeria and also how TVET can provide the requisite skills and manpower to actualise and sustain the Nigeria digital economy project by 2030.

Globally, the knowledge and skills of workers available in the labour supply is a key factor in determining both business and economic growth. Skills in science, Technology, Engineering and Mathematics (STEM), are currently been promoted as the answer to staying competitive in the modern global workforce. Digital economy has become the latest global competitive advantage tool for accessing a country's global economic might. The trade, industrial and manufacturing sectors of Nigeria are yet to fully integrate technology into its operations. TVET plays a major role in the attainment and sustenance of a digital economy, thus the need for the use of ICTs to promote TVET practically and professionally thereby promoting the learning by doing approach and preparing graduates for the skilled(hard and soft) digital economy. Economies with a significant supply of skilled labour brought on through formal education as well as vocational training are often able to capitalise on this through, the development of more value-added industries, such as high-tech manufacturing. Nigeria need to ensure

through legislation and jobs programmes that all her citizens have access to education and training that can lift workers, companies and the entire economy. Hence as the digital world unfolds, we realise that job security cannot be dependent upon a corporate identity, but rests on the skills and knowledge one carries(employability).With Nigeria's growing population and a lot youth being challenged with employment opportunities, TIVET could play a major role in engaging these youths and preparing them for jobs in the skilled(soft and hard) labour market and for self-employment. For a developing country like Nigeria that recently created a Ministry for Communication and Digital Economy urgently needs to promote and use TIVET to sustain the technology thrives that comes along with the digitisation of an economy thus promoting a smart Nigeria. This article seeks to explore TVET in nations where its being practiced, Nigeria inclusive, with aim of trying establish if it could serve as a driver to digital economy in Nigeria The study further proffers recommendations on how TVET could enhance Digital economy in Nigeria.

Conceptual Clarification

There exist varying definitions of digital economy, such as a definition by Pratt (2017), who described digital economy as the global network of economic activity, commercial transactions, and professional relationships facilitated by information and communication technologies (ICT). Rumana & Richard (2017) opined that the digital economy is a type of economy that is built on digital computing technologies, but it is most commonly associated with conducting business through internet or World Wide Web markets. It's also referred to as the Web Economy, New Economy, or Internet Economy. Deliotte (n.d) suggests that digital economy is defined as the economic activity generated by billions of daily online interactions between individuals, businesses, devices, data, and processes. Hyperconnectivity, or the increased interconnectivity of people, organizations, and machines as a result of the Internet, mobile technologies, and the internet of things, is the backbone of the digital economy (IoT).

For the purpose of this article, the definition of Pratt will be adopted.

Theoretical framework

The Technology Acceptance Model (TAM) and the Theory of Planned Behavior are two theories proposed and adopted in the article (TPB). TAM is a widely used model for assessing how people make judgments about new technology adoption, and it's a good fit for dealing with consumer acceptance of various technologies (Koul & Eydgahi, 2017). TAM and TAB are also sufficient for researching the potential adoption of an emerging technology.

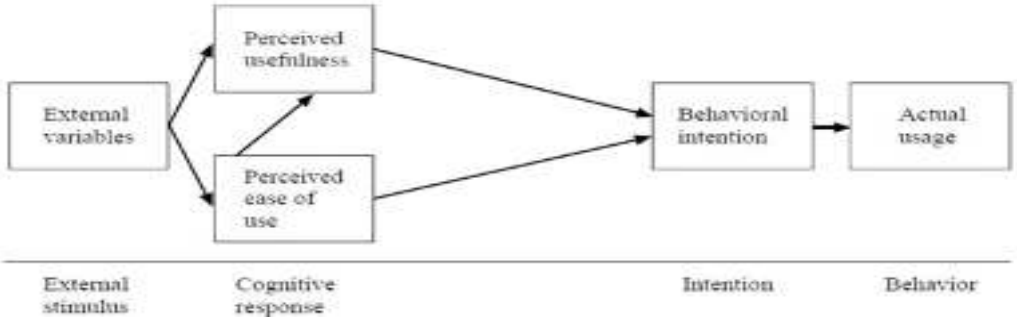

Figure 1: Technology Acceptance Model Source (Koul & Eydgahi, 2017)

Theory of Planned Behaviour, TPB, focuses essentially on envisaging organised human behaviour and includes the concept of perceived behavioural control. The knowledge domain has presented abundant proof that TPB has a superior capability offorecasting behavioural purpose by including the observed behavioural control construct(Montano and Kasprzyk, 2015).

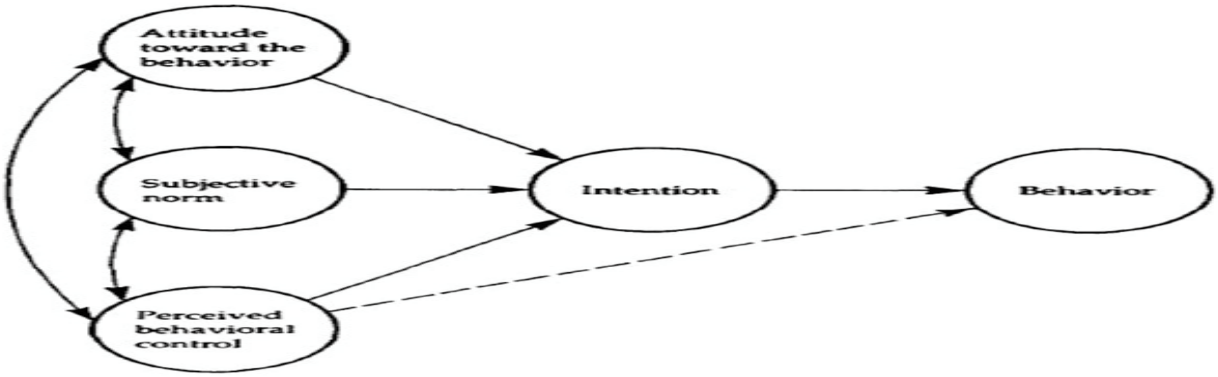

Figure 2: Theory of Planned Behaviour model
Source: (Koul and Eydgahi, 2017)

Technical and Vocational Education and Training (TVET) is education and training, which provides knowledge and skills for employment, however with the advent of digital economy, the digital age will require the workforces to specialise in a bid to adept to technological innovations and advancement in order to distinguish themselves from the ever increasing competitive international and national labour market. Countries such as Singapore, Japan, USA and the UK already have structured TVET in their countries to enable employees upgrade and suit the demanding skills of a workplace. However, it is argued that employees who have the knowledge of Science, Technology, Engineering and Mathematics (STEM) have the advantage of thriving in TVET cum digital economy. According to the Digital Economy Report (2019), global digital economy accounts for $11.5 trillion, which represents 15.5% of the global Gross Domestic Product (GDP). The report also stipulates that in the past 15 years, digital economy had grown two and half times faster than the global Gross

Domestic Product with nations such as the United States (35%), China (13%) and Japan (8%) representing most of the values.

The rapid penetration of ICTs and digital economies in some countries has translated to good governance (USA and China). Government's ability to implement and deliver on its functions has certainly been enhanced by digital revolution; and, people are now more able to participate in public decision-making processes, connect and mobilize, influence government, and hold government accountable for their actions.

TVET in Selected Countries

a. TVET in Germany

Despite being a federal State like the US, in which individual state have autonomy over education matters, Germany has established a fairly uniform and highly regulated Vocational Educational Training (VET) system nation-wide. There are a number of different training programs in place including full-time school programs that do not include a practical training component, but most vocational sector student enrol in the dual system (Duale Berufsausbidung), this system straddles upper secondary and post-secondary education: students typically enter vocational school (Berufsschule) after system straddle upper- secondary and post-secondary education student typically enter vocational school (Berufsschule) after they complete lower-secondary education and continue in vocational program lasting two to four years, depending on the specialization.

During their studies, trainees spend three to four days a week at a company to learn the practical foundation of their occupation on the other one and two days they study theoretical subject in school in full-time block of up to eight weeks in what are colloquially called sandwich programs, participating companies are obligated to provide training in accordance with national regulations and pay students a modest salary. VET is regulated and funded by both the federal government and the German states; and is closely coordinated with German industry employers and trade. Unions play an important role in decision making processes and in the development of curricula and competency standards school (Bundeslander), but the final graduation examination are uniform throughout the country and lead to formal vocational qualification.

In their classes, student learn job specific as well as general education subject (German, policy, religion, physical education etc.), programmes are usually concluded with examinations administered either by the government or by industry associations like regional chambers of commerce or chambers of craft.

Graduates earn a state-examined or state-recognized vocational tittle (staatlichanerkannteberufsbezeichaung) or a journeyman certificate, all of which are official certification recognized vocational occupations ranging from carpenter to industrial electrician, tax specialist, dental technician, film and video editor and product designer. More so, German VET is a more integrated and a cooperative system with a long tradition of private sectors buy in like the US, it is the

companies involved rather than the government that are typically responsible for paying for the trainees' education, apprenticeship training is a costly proposition for many companies.

Supervisory and training requirement for apprentices are also higher than for regular employees. As the German Bertelsman foundation has noted, German system can serve as a model for other countries, not a blue print for any country wishing to import a foreign system of vocational training, which must take existing conditions into consideration and implement vocational training in line with the country's own educational social and economic objectives, thus the objective should be to prudently import adapted elements of any other country system, but not an exact copy of it.

The Current dual work initiatives at the state level is one of such example, where the dual training system that the German companies BMW, Siemens, and Volkswagen imported to North Carolina, South Carolina, and Tennessee to programmes of Siemens and BMW, these systems were established in the late 2000s and early 2010srespectively. Trainees in these programs receive super training at industrial plants, learning skills in areas such as mechatronics mechanical and electrical engineering or computer software trainees study in regard for associate degrees at local community colleges that have partnered with the companies. The German companies' financial investment are sizable, they usually pay salaries and tuition or at least provide tuition assistance to graduates to typically continue their studies in bachelor's program while being employed at the companies.

b. TVET in Japan

Technical Vocational Education Training is provided in TVET institutions as well as in high schools (upper secondary) and higher education. A broader classification of TVET institutions in Japan consists of Public Vocational training centres, Schools and Private organisations.

In Japan, parents and students traditionally place higher value on academic education, hence vocational education is actually considered as second option after finishing university for students with lower grades or students from lower socioeconomic backgrounds, this has been the practice since the 1980s. The number of Universities in Japan has grown dramatically to almost 800. Enrolments have grown over that period, but many Universities (particularly private institutions and those in regional areas) now face serious financial and demographic pressures.

Most recently, due to changes in industry and in the skills required for work, vocational education and training institutions especially the specialized courses at professional training colleges (SenmonGakko) have been gaining in popularity, enrolments in these courses are now growing after a period of continuous decline. Vocational schools are attracting not only senior secondary graduates but also university graduates who were not successful in securing employment upon graduation.

Japanese Vocational schools are now also attracting more international

students. In 2014 about (16%) of the total number of students studying at vocational schools were from overseas, mainly from the Asian region and the other number of VET students were from Japan. The responsibility for provision and supervision of Japan's VET sector mostly rests with two ministries, namely the Ministry of Education, Sports, Science and Technology (MEXT) and the ministry of Health Labour and Welfare (WHLW). MEXT has responsibility for general comprehensive school education, which includes some vocational schools such as college of technology and specialised upper secondary schools.

c. TVET Ghana

TVET in Ghana is provided through several ministries with the Ministry of Education(MOE) and the Ministry of Employment and Social Welfare(MOESW) being the most prominent, the Ghanaian government established a legal framework for TVET and a Council for Technical and Vocational Education and Training (COTVET), which has the objective of overseeing all aspects of TVET in the country. The council for technical and vocational education and training is the most significant government body responsible for TVET coordination. The council has formed three different committees which are focused on industry, advisory, qualifications and quality assurance. Following a request, the traditional apprenticeship has been put into place. The main responsibility of the council is to formulate national policies on skills development (pre-tertiary, tertiary and informally), whereas the different ministries are responsible for implementing the policies within their TVET institutions.

d. TVET in the United States of America

In the United States (US), its digital economy has grossly contributed the to the world production, investment, international trade and consumption. More so, formal TVET programs have been a part of the US educational landscape for almost 100 years since the first US Federal legislation, the Smith-Hughes Act was passed in 1917 to approve funding for the program. It is an elective form of education that students are not required to participate to earn a high school diploma or a College/University degree (Association for Career and Technical Education, 2011). Historically TVET has focused on job preparation for entry-level positions and is defined as education courses and programs offered less than the bureaucratic level. Though currently referred to as Career and Technical Education (CTE) but perceived negatively among students, educators and policy makers (Balderama, 2011).

e. TVET in Singapore

Singapore value vocational and technical economic development this was not always the case, however prior to the early 1990s vocational education was viewed as a las resort for student who could not achieve in academic setting and Singapore five polytechnics found in the 1960s ware not considered particularly desirable educational options.

In 1992, the government created the institute for technical education (ITE) which was intended to revolutionize

vocational education and be world-class example of how vocational and technology skills could be translated to a knowledge based economy the result was state of the art set of campuses devoted technology and closely tied to international corporations vocational education was rebranded as hands-on, minds-on, heart-on education to combat the perception that these schools were for low achievers since 1995,enrolment in vocational education has doubled and now makes up 65% of the cohort who go on to post -secondary education (age16-18)with 25% accepted into the ITE and another 40%attending polytechnics they are able to offer such a high level of learning because student entering them have received a strong academic foundation in literacy, problems, -solving math and science salaries for ITE graduates who receives a national ITE certification (NITEC) have become quite high in recent years as of 2014, 87% of ITE graduates are hired in their field within six months of graduation leading more student to see vocational education a strong choice for future success.

Polytechnics today offer approximately 150 diploma programs and, like ITE, have worked hard to maintain a close relationship with industry, developing and changing in tandem with Singapore's economy. Students receive a combination of experimental and classroom-based learning. Many choose to continue into a job in their field after receiving the NITEC qualification, although in recent years, as many as 40% of graduates of post-secondary vocational education go on to purse a university degree and are often times to complete a bachelor's degree in two years because they are able to transfer credits depending on their focus reducing post sedentary education.

Vocational education can often continue far beyond post-secondary or higher education lifelong learning is considered too an important part of the education system in Singapore and as having a large impact on Singapore's role in the global economy lifelong learning in considered to be an important of the education system in Singapore's role in the global economy lifelong learning opportunities are diverse and the workforce development agency encourages professional development in all sectors of the economy.

Current, reforms in Singapore has sought to further strengthen its vocation education programs. Recognising that the demands for state-of-the-art skills and technological proficiency will continue to rise as the workforce becomes more high tech an globalised. Polytechnics now offer nearly 150 department programs and like the ITE, have worked to remain closely connected with industry, growing and changing alongside Singapore's economy. students receive a combination of experiential and classroom-based learning. Many choose to continue inti a job in their field after receiving the NITEC qualifications although, in recent years as many as 40% of graduates of post-secondary vocational education go on to pursue a university degree and are often able to complete a bachelors degree in two years because they are able to transfer credits depending on their focus during post-secondary education.

Vocational education can often continue far beyond post-secondary and higher education. Lifelong learning is considered to be an important part of the education system in Singapore, and as having a large impact in Singapore's role in the global economy, lifelong learning opportunities are diverse and the work force development agency encourages professional development in all sectors of the economy.

Recently, the Singaporean government has sought to further strengthen its vocational education programs. Recognising that the demand for state-of-the-art skills and technological proficiency would continue to rise as the work force becomes more high tech and globalized, Singapore's prime minister Lee Hsian Loong appointed an applied study in polytechnics and the ITE reviews (ASPIRE) committee in November 2013. The prime minister charged the ASPIRE committee with reviewing the current ITE system and recommending changes in order to strengthen the alignment between the ITE offerings and industry needs and better serve on the increasingly diverse student body. In order to develop a set of recommendations for the reform, the committee conducted focus groups and interviews with over 17000 students, 3000 parents and 400 school staff, as well as benchmarking visits to Germany, Switzerland, New Zealand and Australia. The ASPIRE committee released its recommendations included; coordinating and improving education and career guidance systems, strengthening workplace partnerships, articulating specific skill framework and career pathway and expanding apprenticeship and continuing education opportunities. The Singaporean government has accepted all the recommendations and is currently putting together an action plan to address all of them.

3. Challenges of Achieving an Efficient TVET for Nigeria's Emerging Digital Economy

Technical and Vocational Education and Training (TVET) driven by Information and Communications Technology (ICT) brings a lot of opportunities and challenges. ICT has changed the process of how work is been carried out in organizations and how work in these organisations are created. The use of ICT in job delivery has necessitated workers globally to reskill themselves in order to be relevant in the present-day high-tech working environment. Though, jobs are now required to be delivered physically and virtually around the globe.

Globalization is prompting governments to take renewed interest in sectors of her economy that will eventually lead to national growth and economic development. Nations are beginning to drive Technical and Vocational Education and Training (TVET) with Information Technology, with the sole aim to attract and prepare its citizens and economy for digital transformation and market for potential hub of skills for the world tech industry. It is pertinent to note that TVET has fueled an impressive economic growth in some countries such as China, Republic of Korea and Brazil, though fallen short of expectation in others such as Nigeria (Williams, 2020). Unfortunately, the Nigerian government has not been able to reposition TVET to respond to the needs

and demands of the of the modern technological driven industry where soft and hard skills are needed, this has resulted to major ICT driven technical works outsourced or contracted to foreign nationals who simply come in to the country execute these jobs and return to their countries of origin. TVET is that part of the education system that provides courses and training programmes related to employments with a view to enable the transition from secondary education to work for young trainees/students (social objective) and supply the labour market with competent apprentices (economic objective).

The current level of digital skills in the country may slow down the digital process the Federal government has established, thus slow down processes in the country. More so, the ICT infrastructure, which is required for an efficient and effective digital economy to drive digital activities/services is yet to be fully achieved by Government. Finally, accessibility and affordability of internet to citizens of the country has posed a great challenge in making the actualization of the digital process feasible. Other challenges include poor quality of service to existing digital services and poor monitoring and evaluation framework for the digital economy project.

4. Key Findings

i. The present state of TVET institutions in Nigeria is worrisome as most of these institutions lack adequate manpower, teaching and learning infrastructure driven by ICT, which also affects the quality of graduates from these institutions.

ii. Nigeria's' digital economy project may suffer slow actualisation because of the limited infrastructure and manpower to realise same.

iii. The sectors of the Nigerian economy especially, the financial sector have embraced ICT in providing services to citizens, though the quality of these services could be improved.

iv. Workers in the Nigerian work environment need to be upskilled in order to embrace the Digital economy and assist in driving digital processes.

v. It was further revealed that they exist low level synergy between the coordinating ministry executing the Digital economy project and sister ministries in achieving the project in a timely date.

5. Policy Options

There exists a deteriorating state of facilities in most TVET institutions in Nigeria cum its ICT facilities as a result of inadequate funding and manpower to assist these institutions actualise their mandate. Thus, public policy makers should as a matter of urgency perceive TVET institutions as the backbone that will sustain the project digital Nigeria. It is expected that if these institutions are driven with ICT, in the short and long run, graduands from such institutions will be able provide the required soft and hard skills needed to sustain Nigeria's Digital Economy.

Recommendations And Implementation Strategies

With Nigeria's increasing rate of unemployment, Nigeria's Digital economy will be able to provide jobs for skilled workers with the requisite soft and hard skills. Hence, the government should embrace the following recommendations and implementation strategies.

Recommendations

1. Federal Government of Nigeria should increase the funding for TVET institutions.
2. The National Assembly in conjunction with the Federal Ministry of Finance to increase the budget allocation to TVET institutions.
3. The Federal Government of Nigeria should collaborate with the Germany Government or Singaporean Government to identify, adopt and domesticate TVET policies of these countries into Nigeria.
4. The Federal Civil Service of Nigeria should upskill civil servants, for a seamless adoption and implementation of the Nigeria's Digital Economy.
5. The Federal Government of Nigeria to setup a monitoring and evaluation framework
6. The ministry and Communication and Digital Economy to setup evaluation an framework team that will set timelines for accomplishing the Digital Nigeria Project.
7. A Public Private Partnership mechanism to be set in place for funding and paying of stipends to students in TVET institution

Implementation Strategy

1. The Ministry of Foreign affairs in conjunction with the Ministry of Education to collaborate the governments of Germany and Singaporean to work out modalities on how the model of TVET implement in those countries can be adopted and domesticated in Nigeria.
2. Federal Civil Service of Nigeria to immediately train and retrain civil servants in soft and hard skills as the best options to easily blend into the Digital Nigeria Project.
3. Companies to identify skills they require and employ students while in training.

Conclusions

The study explored TVET cum digital economy in Nigeria. Some countries where TVET has been successful were also reviewed. The study established that TVET could serve as a driver to digital economy in Nigeria if some proffered recommendations were implemented.

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