COLLEGE OF HUMANITIES

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FROM FRAGMENTATION TO INTEGRATION: DEVELOPING A SUSTAINABLE TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING SYSTEM IN THE TECHNICAL COLLEGES OF THE LAGOS STATE, NIGERIA

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ABSTRACT

This thesis, titled "From Fragmentation to Integration: Developing a Sustainable Technical and Vocational Education and Training System in the Technical Colleges of Lagos State, Nigeria," explores the fragmented nature of the Technical and Vocational Education and Training system in Nigeria, with a specific focus on skills development within the Automotive Engineering sector. Focusing on Lagos State, the nation's commercial nerve center and host to the largest Automotive Engineering sector, the research addresses the pivotal question: "How can Sustainable Socio-Economic Development (SSED) be fostered through TVET systems?" The study delineates the strategic, procedural, and hands-on skills essential to initiate, enable, and deliver a sustainable TVET system.

Employing a mixed-methods strategy, the study utilised the Delphi technique to develop the research instrument. The study population comprised the Lagos State Ministry of Education / Lagos State Technical and Vocational Education Board, five technical colleges in Lagos State, and a selection of five technical colleges, and various registered automobile industries within Lagos State, with cluster sampling employed for sample acquisition.

The quantitative phase of the study involved disseminating questionnaires to 230 individuals, out of which 162 were duly completed and returned. The gathered data underwent Explanatory Factor Analysis utilising the IBM® SPSS® 28 software, implementing Principal Axis Factoring with Oblimin rotation to discern underlying factors or latent constructs among the observed variables. Conversely, the qualitative phase entailed interviews with nine stakeholders, culminating in the identification of three overarching categories, themes, and seven sub-themes.

The merging of the Integrated Intelligence framework, QHM and Porritt's five capitals framework provides us with a comprehensive framework for understanding the interplay between the quantitative and qualitative results of the study. It offered a more holistic and integrated approach to understanding the "change" factors that promote SSED through TVETs.

For the primary question, the results from the quantitative phase underscored the significance of Innovative Green Growth, emphasising the integration of sustainable and eco-conscious practices in food production. Such an approach not only fosters economic prosperity but also fortifies environmental stewardship. Concurrently, the study accentuates the necessity of Infrastructure Enhancement, advocating for the modernization of facilities and the adoption

of cutting-edge technologies in line with the new developments in the automotive sector to enrich the educational milieu and equip graduates with the requisite skills for contemporary vocations.

Regarding *Strategic Leadership Skills*, the study identifies three core factors: the fusion / amalgamation of problem-based teamwork with critical thinking, the cultivation of self-awareness, and the advancement of motivational leadership. These components are posited as pivotal in initiating and steering transformative change within the TVET landscape. Furthermore, the research casts light on *Process Skills* essential for facilitating change, pinpointing the integration of empathy with a suite of soft skills, strategic acumen, innovation quotient, and communicative prowess. Additionally, it identifies the Management of Diversity and Conflict as a critical skill set. The results for *Practical Skills* requisite for effectuating change, highlight the synergy of problem-solving and collaborative teamwork, augmented by a collaborative innovation intelligence and a spectrum of communicative, organizational, and strategic competencies. The study also acknowledges the significance of planning skills, an optimistic attitude, strategic management expertise, and the capacity to handle uncertainty.

The qualitative phase, *Category 1: Understanding TVET goals to re-evaluate them*, results revealed a consensus on the necessity for policy frameworks that are in harmony with TVET's overarching goals. The unanimous emphasis on Curriculum-Policy Alignment and Coherence underscores the criticality of synchronizing educational strategies with labour market demands. The high valuation of Curriculum Design, with an 89% importance score, accentuates the urgency for curricula that are both contemporary and pertinent, equipping the workforce with skills suited for today's dynamic economic landscape. Furthermore, the results identified Skill Development and Re-engineering, alongside Stakeholder Engagement, as significant yet moderately recognised sub-themes, with respective scores of 56% and 33%. These findings highlight the imperative for ongoing skill advancement and the active participation of all TVET stakeholders, ensuring the system's adaptability to evolving economic and societal needs.

For *Category 2: Improving public perception and awareness*, the research delved into the public’s perception of TVETs, highlighting the necessity for inventive strategies to enhance their appeal and relevance. The main theme within this domain, Provision of Incentive/Motivational Packages, received a 56% score, indicating a robust conviction in the power of incentives to transform TVETs into more enticing educational pathways.

Nonetheless, the challenges in raising public awareness and in bolstering the allure and retention rates of staff and students are evident, as reflected by the lower scores of 22% and 33% in the corresponding sub-themes.

For *Category 3: Robust Governance*, the study shed light on the pivotal role of Robust Governance in the reformation of TVETs. Innovative Leadership and Expertise, along with the management of TVETs by technically adept individuals, both garnered a 44% score, underscoring the essentiality of visionary leadership and specialized knowledge in steering the TVET agenda. However, the alarmingly low score of 22% for Adequate Funding and Infrastructure signals a critical risk area, necessitating immediate attention to ensure the sustainability of TVET systems.

The integration of the Integrated Intelligence framework, Quintuple Helix Model, and Porritt's Five Capitals framework provided a comprehensive understanding of the interplay between the results of the two phases of the study. By interfacing the Integrated Intelligence, Quintuple helix model and Porritt's Five Capitals framework, the results of the study showed that the fragmentation in Lagos State, Nigerian TVETs can be addressed by promoting a more integrated, resource-optimised, and development-oriented approach to TVET. By encouraging interaction and cooperation among the five helices and the five capitals this ultimately leads to improved skills development, reduced unemployment, and enhanced socio-economic development.

The study presents a compelling case for a holistic re-evaluation of TVET systems, emphasising the integration of curriculum design with policy, the enhancement of stakeholder engagement, the improvement of public perception, and the fortification of governance structures. These elements are deemed indispensable for the evolution of TVETs into resilient educational institutions that can effectively respond to the demands of the modern world.

These findings not only contribute to the academic discourse but also offer pragmatic insights for policymakers and educators striving to cultivate a workforce capable of thriving in and contributing to a sustainable socio-economic environment.

DECLARATION

I, **Abayomi Adegbenjo,** declare that:

(i) The research reported in this thesis, except where otherwise indicated is my original work;

(ii) This thesis has not been submitted for any degree or examination at any other university;

(iii) This thesis does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons;

(iv) This thesis does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:

(a) Their words have been re-written but the general information attributed to them has been acknowledged;

(b) Where exact words have been used, their writing has been placed within quotation marks, and referenced.

(v) The work described in this thesis was carried out in the School of Science and Technology Education, University of KwaZulu-Natal, Durban, South Africa from 2020-2024 under the supervision of Prof Busisiwe Precious Alant (Supervisor); and

(vi) The Ethical Clearance protocol reference number HSSREC/00002489/2021 was granted prior to undertaking the fieldwork.

Signed: [redacted] **Date:** August 13, 2024

As the candidate's supervisor, I, Prof Busisiwe Precious Alant, agree to the submission of this thesis.

Signed: [redacted] **Date:** 13 August 2024

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LIST OF ABBREVIATIONS

3-D	3-Dimensional
4IR	Fourth Industrial Revolution
ABS	Anti-Lock Braking System
AC	Air Conditional
ADB	African Development Bank
AE	Automotive Engineering
AICC	Autonomous Intelligent Cruise Control
ANOVA	Analysis of Variance
ANTC	Advanced National Technical Certificate
AQ	Adversity Quotient
AU	African Union
AUC	African Union Congress
APEL	Assessment of Prior Experiential Learning
CBA	Cost-Benefits Analysis
CBU	Completely Built-Up
CCA	Critical Capabilities Approach
CD	Compact Discs
Cedefop	The European Centre for the Development of Vocational Training
CKD	Completely Knocked Down
COTVET	Council for TVET
CQ	Character Quotient
CTE	Career and Technical Education
DBR	Design-Based Research

DC	Direct Current
DESD	Decade of Education for Sustainable Development
DHET	Department of Higher Education and Training
DTC	Diagnostic Trouble Codes
DVD	Digital Video Disc
EASC	European Automotive Skills Council
ECM	Engine Control Module
ECU	Electronic Control Unit
EFA	Exploratory Factor Analysis
EPAS	Electric Power Assisted Steering
EQ	Emotional Intelligence
ETF	Education Trust Fund
EU	European Union
FET	Further Education and Training
FGN	Federal Government of Nigeria
FME	Federal Ministry of Education
FRN	Federal Republic of Nigeria
G20	Group of Twenty
GDP	Gross Domestic Product
GVC	Global Value Chains
HCT	Human Capital Theory
HE	Higher Education
HND	Higher National Diploma
HoD	Heads of Department
HR	Human Resource/s
ICT	Information and Communication Technology

ILO	International Labour Organisation
ILOSTAT	International Labour Organisation Department of Statistics
Inn. IQ	Innovation Quotient
IQ	Intelligence Quotient
ITF	Industrial Trust Fund
JSS	Junior Secondary School
KMO	Kaiser-Meyer-Olkin
LASTVEB	Lagos State Technical and Vocational Education Board
LCD	Liquid-Crystal Display
LGA	Local Government Area
MDG	Millennium Development Goal
MIL	Malfunction Indicator Lamp
MIT	Massachusetts Institute of Technology
MMR	Mixed Method Research
MVM	Motor Vehicle Mechanics
MVMW	Motor Vehicle Mechanics Work
NABTEB	National Business and Technical Education Board
NBS	National Bureau of Statistics
NBTE	National Board for Technical Education
NCC	Natural Capital Coalition
NCE	Nigerian Certificate in Education
NCCE	National Commission for Colleges of Education
NDE	National Directorate of Employment
NIASE	National Institute for Automotive Service Excellence
NEEDS	National Economic Empowerment and Development Strategy
NGO	Non-Governmental Organisation

NTC	National Technical Certificate
NPE	National Policy on Education
NQF	National Qualifications Framework
NSQ	National Skills Qualifications
NSQF	Nigerian Skills Qualification Framework
NTC	Negative Temperature Coefficient
NUC	National Universities Commission
NVQF	National Vocational Qualifications Framework
NYSC	National Youth Service Corps
OBC	On-Board Computer
OBD	On-Board Diagnostic
OE	Occupational Education
OECD	Organisation for Economic Co-Operation and Development
OND	Ordinary National Diploma
OQ	Delegation Skills
PAF	Principal Axis Factoring
PE	Professional Education
PRS	Practical Skill
PS	Process Skill
ROI	Return of Investment
r.p.m.	Revolutions Per Minute
SD	Sustainable Development
SDG	Sustainable Development Goal
SED	Socio-Economic Development
SEM	Structural Equation Modelling
SIWES	Students Industrial Work Experience Scheme

SKAV	Skills, Knowledge, Attitude, and Values
SLS	Strategic and Leadership Skills
SQ	Social Intelligence
SRS	Supplementary Restraint System
SSED	Sustainable Socio-Economic Development
STEM	Science, Technology, Engineering, and Mathematics
SURE-P	Subsidy Re-Investment and Empowerment Programme
SUV	Sport Utility Vehicles
TAFE	Training and Further Education
TC	Technical College
TCS	Traction Control System
TE	Technical Education
TH	Triple Helix
THM	Triple Helix Model
THM I	Triple Helix Model I
THM II	Triple Helix Model II
THM III	Triple Helix Model III
TVET	Technical and Vocational Education and Training
UKZN	University of Kwazulu-Natal
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNESCO-UNEVOC	United Nations Educational, Scientific and Cultural Organisation – United Nations Vocational Education
USA	United States of America
VCM	Vehicle Condition Monitor
VE	Vocational Education

VFD	Vacuum Fluorescent Display
VTE	Vocational and Technical Education
VTET	Vocational and Technical Education and Training
WAEC	Western African Examinations Council
WEF	World Economic Forum

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CHAPTER 1

CONTEXTUAL BACKGROUND TO THE STUDY

> "At its core, sustainable development means investing in safe and reliable infrastructureto power our world, feed our people, and foster growth in ways that preserve and protectour environment. It is becoming clear that before infrastructure investing can successfully transition to an institutional asset class, there must be consistent methodologies for determining its sustainability" (Goal 17 Partners, 2019, n.p.).

1.0 Introduction

Technical and Vocational Education and Training (TVET) is recognized for its potential to lessen poverty and enhance social inclusion, thus fostering sustainable economic growth, as noted by Lange et al. (2020). Nevertheless, the TVET system in Lagos, similar to other regions in Nigeria and across Africa, suffers from a lack of standardization. This inconsistency obstructs TVET's role in nurturing skills pertinent to the industry, which are essential for securing gainful employment opportunities, as reported by the African Union Development Agency – The New Partnership for Africa's Development (AUDA-NEPAD) (2020) and UNESCO (2019). This issue stems in part from the diverse array of regulatory bodies and the absence of a cohesive strategic policy framework. Consequently, there is a disparity between the competencies imparted by TVET programmes and the actual requirements of the job market (AUDA-NEPAD's 2020), especially in high-tech sectors like automotive technology. As a result, TVET graduates are frequently unprepared for roles in industries that could otherwise capitalize on their training, a situation highlighted by both AUDA-NEPAD and UNESCO in their 2019 reports.

The study argues that the fragmentation of TVET systems in Lagos represents a missed opportunity for socio-economic development. This is particularly significant given the region's hosting of major car manufacturers such as Coscharis Motors Limited, Globe Motors Holdings Limited, and Toyota Nigeria Limited (Uwagwu, 2024) to name a few. The consensus among scholars and industraialists is clear: to harness this opportunity, there must be a concerted effort to align TVET systems with the demands of the industry, to foster local manufacturing, and to improve the job prospects of TVET graduates (World Bank, International Labour Organization (ILO), & United Nations Educational, Scientific and Cultural Organization (UNESCO), 2023). Achieving this would enable Lagos to utilize its auto industry as an engine

for economic expansion, job creation, and overall development, transforming an existing shortcoming into a prospective asset.

This study which is titled '*From fragmentation to integration: Developing a sustainable technical and vocational education and training system in the technical colleges of the Lagosstate, Nigeria*', seeks to draw attention to the fragmented nature of the TVET system in Nigeria, especially with regards to skills development within the Automotive Engineering (AE) sector. It focuses particularly one Lagos State – the economic hub of the country – with the largest AE sector (Banwo & Onokala, 2017). Although the study acknowledges that the fragmentation of the TVET system is a worldwide phenomenon (McGarth et al., 2022) and that many countries' TVET systems today could be described as fragmented (Allais & Wedekind, 2020), it appeals for an urgent review of this fragmentation within the context of Africa and Nigeria in particular. The study argues that due to the differences not only in geography but also in the structure, strategy (aims and orientation), provision, regulation, etc., of the TVET systems globally and regionally, the impacts of this fragmentation regionally are way too costly. This sentiment was echoed at the Africa TVET Regulators Conference 2023, held in Nairobi, Kenya. The conference flagged the effects fragmentation, regarding low-quality training and a shortage of skilled workers and advocated for the need to strengthen the TVET systems by paying particular attention to digital transformation and governance of TVET systems in the continent.

In its essence, fragmentation in TVET can be perceived as the breakdown and absence of systematic congruity within the TVET infrastructure (Allais, 2023). According to the African Union Commission - Education, Science, Technology, and Innovation Department (AUC-ESTI), 2015), several driving factors can contribute to the fragmentation in TVET. Firstly, the lack of clear policy and regulatory frameworks which could lead to inconsistencies and variations in the implementation of TVET programmes across different regions or even within a single country. Secondly, the presence of multiple stakeholders, such as government bodies, industry associations, and educational institutions, which might have different and sometimes conflicting agendas and objectives, could cause fragmentation through their divergent approaches and interests. Finally, it is the non-existence of effective collaborative pathways and coordination platforms between TVET facilitators and pertinent stakeholders which could further perpetuate the fragmentation in TVET.

In his review of the current status of TVET delivery in Nigeria, Osidipe (2017, p. 1001) makes an appeal for the "repositioning of vocational education in the country through increased funding of TVET programmes, training and re-training of teachers, and provision of targeted TVET programmes for cultivatingrelevant skills needed for access to decent work and life-long learning". This appeal is based on what the scholars see as the "fragmented" state of TVET systems in Nigeria (Igberaharha, 2021). Igberaharha (2021) rightly ascribes this fragmentation to the following key factors:

- The lack of a unified national policy;
- The lack of organization amongst the stakeholders: academia; industry and government;
- The lack of resources;
- The lack of standardisation of TVET provision.

According to Yusuff and Soyemi (2012), the lack of a unified national policy has led to the proliferation of different types of TVET institutions, each with its own curriculum and standards. As a result, a fragmented system that is not well coordinated and is unable to meet the demands of the Nigerian market has emerged. The implications thereof are detrimental, and include, amongst others:

- Inadequate access to quality TVET services. The low-quality level of TVET provisionaffects the employability of graduates and their ability to contribute to the economic development of the country (i.e., lack of quality and relevance of the training provided).

- Poorly targeted and inadequate funding for TVET institutions. This leads to inadequateinfrastructure and equipment, and a lack of qualified and experienced staff (i.e., lack of resources and infrastructure).

- Poorly coordinated policies and strategies. These can lead to a lack of clarity and direction, leading to ineffective and inefficient TVET.

- Low levels of production and competition in the Nigerian economy due to the lack ofskilled labour.

The fragmentation in TVET has significant consequences for both the graduates and the TVET system as a whole. From a learner's perspective, fragmentation leads to a lack of

clarity and transparency regarding the recognition and portability of their skills and qualifications, hindering their mobility and employability prospects. Additionally, fragmentation results in a mismatch between the skills and competencies acquired through TVET and the needs of the labour market, leading to a gap in skills supply and demand. Moreover, the duplication of efforts, inefficient utilization of resources, and limited collaboration between TVET providers hinder the overall effectiveness and quality of TVET provision. In exploring the overall index of efficiency (OIE) of TCs in Nigeria, Legg-Jack (2018) indicated that out of the 22 colleges surveyed, only about 12 TCs had their average overall index of efficiency above 50% across the selected four geopolitical zones: South-South (40%); North-Central (56%); South-West (54%) and South East (40%). According to Legg-Jack (2018) these figures point to a compromised efficiency of TVET provision in these colleges. As he rightly concludes, the quality of input influences the quality of output.

This study expands on this body of information by exploring the functions of TVET in development, particularly *sustainable development* (SD). It aligns with the principles of SD discussed at the International Conference on TVET in Seoul in 1999, which emphasised the importance of lifelong learning and the promotion of "sustainable economies and livelihoods in the context of the advent of the information age and knowledge economy" (Tikly, 2013, p. 26). However, as King (cited in Tikly, 2013, p. 27) points out, there seems to be serious tensions "between the idea of TVET for sustainability, and creating the wider macroeconomic conditions of growth under which TVET itself can become sustainable, in the current global financial context in which TVET remains underfunded". This study attempts to invigorate and contribute to the current debate on TVET and SD that addresses this tension. It explores how this might be achieved by interrogating the factors required to promote sustainable socio-economic development (SSED) through TVET systems in the technical colleges (TCs) of the Lagos State, Nigeria. It hopes to explore and chart ways in which sustainable economies and livelihoods (i.e., SSED) can be promoted through the TVET system. In this regard, the study thus seeks to understand:

- The kind of *strategic and leadership skills (SLS) required* for initiating and promoting a sustainable TVET system;
- The type of *process skills (PS) required* for enabling a sustainable TVET system; and,
- The type of *practical skills (PRS) required* for delivering a sustainable TVET system.

In order to create authentic sustainable development that can assure long-term human and environmental well-being, the study promotes the claim that the aforementioned issues can only be addressed through an integrated strategy (Giddings et al., 2002).

TVET plays a crucial role in contributing to sustainable development. TVET education provides individuals with the necessary skillset and know-how for workforce participation, advocating for economic upsurge and poverty reduction. TVET programmes, moreover, have the potential to address pressing environmental and social issues via fostering sustainable practices and boosting inclusivity within trainees. Due to this, incorporating TVET into sustainable development initiatives bears considerable weight for holistic, long-lasting development.

TVET plays a vital role in developing and promoting the skills of TC graduates and getting them ready for the world of work (Okolie et al., 2019). In this regard, the SLSs, PSs, and PRSs needed to meet the modern challenges of work and its intervention should be aligned with the needs of 21st century skills (Salleh & Sulaiman, 2020). TVET is considered key in achieving SD in Nigeria (Okwelle & Ayonmike, 2014). The concept of "sustainable development" is based on integrating socio-cultural, environmental, and economic considerations (Majumdar, 2009). According to Majumdar (2009, pp. 2–3), the skills taught in TVET institutions have a direct impact on social, economic, and environmental progressive or regressive developments worldwide. Therefore, TVET can play a significant role in preparing a new generation of individuals to address the challenges associated with achieving SSED. However, as Majumdar (2009) points out, TVET in many countries remains confined due to the common perception of it being "a mere supplier of skilled labour to industry" (p. 3), which hinders its effectiveness in responding to the needs of sustainable development strategies. To address this issue, Majumdar (2009) suggests that TVET experts should realign the curriculum to focus on sustainability. TVET programmes needs to concentrate on the economic, social, and environmental aspects of sustainability. The curriculum should be updated to reflect these changes and equip students with the skills necessary to cope with and adapt to evolving challenges (Chinedu et al., 2015).

Yes, indeed, TVET does play a significant role in the implementation and promotion of SD by incorporating the considerations and policies that impact on the long-term future of the economy and the society (Aliyu, 2016; Pavlova & Turner, 2007). Sustainable TVET should be able to alleviate poverty and provide skills for employability, citizenship, and

conservation (Obidile, 2014). Dike (2013) observes that without skilled technical workforce produced by the TVET institutions, the national development of the Nigerian nation will be hindered. “The growing problem of youth unemployment and underemployment is one of the main socio-economic development concerns of most African governments” (African Union [AU], 2018, p. 8). In this perspective, the need to reconstruct the TVET sector to maximise the full potential by contributing not only to the achievement of the two Sustainable Development Goals (SDGs) – namely, SDG 4 and SDG 8 – but, in a broader way, all the SDGs in the context of promoting sustainable economies and societies are of crucial importance (Paryono, 2017). “Such holistic visions challenge TVET to expand quality skills provisions and ensure skills relevance not only for the world of work, but also to support lifelong learning, inclusion” and a green economy (International Labour Organization [ILO], 2003, p. 31; Paryono, 2017, p. 1).

1.1 Situating the TVET system in Nigeria

> “It is quite remarkable that in many African countries, training is already attached to theMinistry of Higher Education. This is a positive signal that cannot be ignored” (Dadi, 2015, pp. 63–64).

There are two forms of TVET systems in Nigeria, namely: (i) formal, and (ii) non-formal types (Nwachukwu, 2014; Okoro, 2006). The *formal TVET system* is being administered in the polytechnics and TCs. All these institutions are under the supervision of the National Board for Technical Education (NBTE). The entry requirement for the TCs is a pass in the Junior Secondary Certificate Examination (Grade 9). This examination is conducted by the National Business and Technical Education Board (NABTEB). The duration of the training is three years in different trades.

There are 11 clusters of trades according to the NBTE curriculum. They are Mechanical, Computer Practice, Electrical Engineering, Construction, Woodwork, Hospitality, Textile Making, Printing, Beauty Culture, Business, and Leather Goods. Motor Vehicle Mechanics Work (MVMW) is one of the trades in the Mechanical Trade cluster. Enrolment for TVET programmes is low is comparison to that of general education. According to Fakorede (2019), approximately 10% of high school students, particularly from junior secondary school classes (JSS) (Grade 9), in Lagos State, opt for TVET programmes. Figure 1.1 below illustrates the TVET in the Nigerian education system.

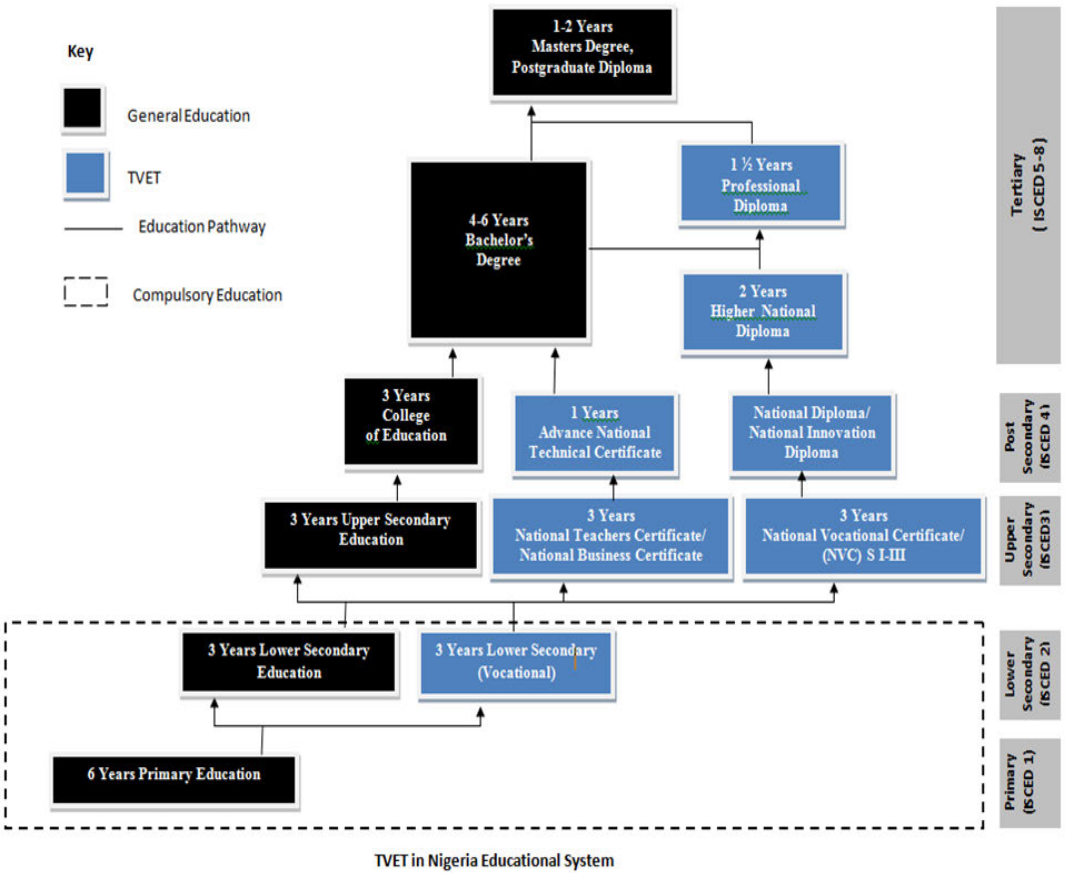

Figure 1.1: TVET in the Nigerian Education System

(Source: United Nations Educational, Scientific and Cultural Organisation – United Nations Vocational Education [UNESCO–UNEVOC], 2019).

Nationally, the *non-formal TVET system* is offered by the NBTE, the NationalCommission for Mass Literacy, Adult and Non-Formal Education (NMEC), and the National Directorate of Employment (NDE). The non-formal programme targets the vocational skills of adults, adolescents, and early school leavers in terms of motor vehicle repairs, welding, electrical wiring, construction, catering, fashion design, hair dressing, and other skills peculiarto the location of such training. The duration of the programme is one to two years. There is no admission requirement for the participants to be enrolled in the programme (UNESCO–UNEVOC, 2019). Nationally, the whole TVET system is controlled by three federal ministries:

- The Federal Ministry of Education;
- The Federal Ministry of Science and Technology; and
- The Federal Ministry of Labour and Productivity.

The Federal Ministry of Education (FME) supervises the activities of several boards and agencies under it, namely National Board for Technical Education (NBTE), National Universities Commission (NUC), National Commission for Colleges of Education (NCCE), National Business and Technical Education Board (NABTEB), and three other examination boards and research centres. The Federal Ministry of Labour and Productivity in conjunction with the FME supervises the non-formal TVET system. Jointly, these three federal ministries are responsible for financing formal and non-formal TVET through the budgetary allocations from the federal government. However, state TCs are under the Ministry of Education, which is solely responsible for financing TVET. The amount of funding allocated to TVET depends on the finances of the states, as well as the willpower and interest of the governors of the states. This fragmentation makes it difficult if not impossible to have a uniform standard in the schools.

A further critical point to note is that according to the UNESCO–UNEVOC (2019) classification, colleges of education are categorised as institutions providing general education. However, some of these colleges, which are identified as "technical" by the NCCE, do offer TVET programmes. Moreover, the supervision of these TVET programmes falls under the responsibility of the NCCE, not the NBTE. This unnecessary fragmentation affects the delivery of quality TVET and always results in inferior quality of the products of such programmes. Moreover, the products of TVET at the NCCE and degree levels are expected to teach the students at the TCs. If these sets of teachers are not well-prepared for the task of imparting skills to the students of TCs, the quality of the products at the TCs will be adversely affected.

According to Arfo (2015), this fragmentation of coordinating institutions is a contributing factor to the inferior quality of TVET programmes across Nigeria, of which TCs area part. It has been observed that there are unnecessary duplications in the roles of some of theministries, leading to a wastage of scarce resources and funds. This affects the monitoring andsupervision of the programmes, which directly impacts the quality and standard of TVET delivery. The resultant effect of such poor quality and standard as seen in the Nigerian TVETsystem includes poor funding, low national and local enrolment (10%), lack of relevance, unavailability of adequate classrooms and learning resources, low societal perception, poor capacity workshops for teachers and trainers, and inadequate deployment of Information and Communication Technology (ICT) in TVET, among others (Arfo, 2015; Okorafor & Okorafor, 2011; Akanbi,

2017; Fakorede, 2019; UNESCO–UNEVOC, 2019). It is in this regard that this study seeks to explore how SSED can be promoted through TVET systems.

TVET plays an instrumental role in the technological advancement and economic sustainability of many nations (Okoye & Chijioke, 2013). Despite its contribution on the sustainable socio-economic development, its full gains are yet to be reaped in Nigeria due to the fragmented TVET delivery. The fragmented TVET delivery has continued to plague the TVET system in Nigeria (Taiwo, & Aluko, 2023). TVET delivery is fragmented as it is offered by government ministries and agencies; universities; polytechnics; colleges of education and privately-owned institutions. It has been observed that there is no standardised system to evaluate the performance of public TVET institutions. Rating systems are limited to the agencies/bodies that control such institutions. Nigeria suffers from uncoordinated governance of the TVET system. Accreditation and quality assurance of TVET programmes are under the purview of three bodies namely the NBTE which supervises TVET system in the monotechnics, polytechnics and the technical colleges. Another body is the NCCE which supervises TVET in the colleges of education; while the NUC monitors TVET in the universities.

It has also been observed that there is lack of industry input in the curriculum design for TVET institutions which has resulted in mismatch of skills required by the industry and the skills the TVET graduates are equipped with. There is a need for a coordinated platform for collaboration industry and TVET institutions (Okon, 2019). The fragmented TVET system inhibits labour mobility for the TVET graduates (Olayele, 2021). TVET can facilitate the transition to a sustainable economy by inculcating sustainable environmental values, and the application of environmentally appropriate knowledge and skills. Sustainable development can increase productivity, competitiveness, and employment growth and living standards (Fedulova, et al, 2019). Skills form the bedrock of every country's economy. They are not only linked to aggregate economic performance but also to each individual's success in the labour market. However, having skills is not enough; to achieve growth, both for a country and for individual, skills must be put to productive use at work (OECD, 2013).

Nigeria faces significant challenges in the effort to achieve sustainable economic growth and development. Despite its strong fundamentals, oil-rich Nigeria has been hobbled by inadequate power supply and infrastructure, delays in the passage of legislative reforms, an inefficient property registration system, a slow judicial system, insecurity, and corruption

(UNIDO, 2017). A diagnostic study of Nigeria's technical colleges concluded that the colleges encounter a number of serious challenges. TCs are unable to respond to the changing labour market requirements because of its present supply-driven orientation. Its curricula, instructional equipment, teaching methods, and evaluation techniques are out-dated, leading to inappropriate low internal and external efficiencies. In cases where curricula have been updated, the equipment and teaching aids required to teach the curricula are often missing. Commonwealth Secretariat (2017) listed six features of an effective TVET system which are governance; employer engagement; occupational standards; qualifications framework; quality institutions; and delivery and assessment.

The current fragmented TVET sector could be integrated through the establishment of a single system for better coordination and monitoring of TVET system (Allais, & Wedekind, 2020). This single system will accredit TVET programmes offered by both public and private TVET institutions. In doing this, TVET curriculum will be strengthened which will result into the production of high quality TVET graduates that will meet the industry demand for skills.

Quality, demand driven TVET and skills development, both in and out of school, are potentially among the most important tools for equipping young people with the skills they will need (Brewer & Comyn, 2015). Consequently, skills renewals are assuming increased importance and significance in the TVET and skills sectors. Some of the key principles inherent in a successful TVET and skills system include relevance to the labour market; strong involvement of the private sector; good access for trainees; high quality of delivery; secure and uninterrupted financing; and inclusion of core work skills (Brewer & Comyn, 2015). These skills can be introduced into TVET and skills systems as part of on-going reform efforts. When these skills have been integrated into TVET system, the fragmentation in the TVET system would be resolved.

1.2 Key policy documents guiding the development of TVET in Nigeria

The crucial and significant role of TVET in national development has been widely recognised (Manabete & Umar, 2018). In recent years, several policies have been implemented to utilise TVET in addressing socio-economic challenges, particularly concerning unemployed youths in Nigeria (Okorafor & Nnajiofo, 2017). It is expected that these policies, when fully implemented, would be able to solve the problems associated with the modern technology by

producing skilled workforce for the country's economy (Bello & Muhammad, 2021). To create a functional technology-based education, the Nigerian Federal Government (FGN) implemented the 6-3-3-4 education policy in 1977 (FGN, 1977). In recognising TVET as an integral part of technological development, the FGN proposed that more funds should be set aside for technical and vocational education in the federal and state TVET institutions (FGN, 2004).

According to UNESCO-UNEVOC (2019), the following key documents help guide the development of TVET in Nigeria:

- The NBTE Enabling Act No. 9, 1977.

The Act established the National Board for Technical Education which is tasked with coordinating and supervising all aspects of technical and vocational education falling outside of university education. This encompasses all TVET institutions, including polytechnics and monotechnics. The Board is empowered to determine Nigeria's labour power needs in the industrial, commercial, and other relevant fields. It also advises the Federal Government on the financial needs of polytechnics and other technical institutions and receives and allocates grants from the Federal Government to polytechnics.

- National Minimum Standard and Establishment of Institutions Act - Education, 1985.

The Act establishes and maintains the minimum standards in polytechnics and other technical institutions in the country. It also sets out mechanisms for the accreditation of programmes in all technical and vocational education and training institutions.

- Establishment of institutions: Amendment Act No.9, 1993.

The Amendment Act calls on the National Board for Technical Education to recommend the establishment of private polytechnics and monotechnics in Nigeria.

- Ministerial Strategic Plan (2016-19), 1993.

This Plan is built around three result areas of access, quality, and systems strengthening and comprises of ten pillars, spanning all levels of education. The access results area includes the pillars of out-of-school children, adult literacy, and TVET.

The aspiration for Nigeria to become one of the largest economies in the 21st century is closely tied to the nation's capacity to provide extensive training for its

youth, equipping them with high-level skills and facilitating their ability to secure employment. By doing so, they can actively contribute to the nation's economy and make a meaningful impact (Sanubi & Akpotu, 2015). The year 2020 has come and gone; therefore, the year 2030 has been fixed as the year for this goal to be achieved. This reconstruction is essential to ensure that the system is aligned with the evolving needs of the economy and equipped to provide thenecessary skills and knowledge to the youth. By undertaking this reconstruction process, Nigeria can better position itself to achieve its economic aspirations by 2030 (FME, 2012).

When formulating the country's TVET policies, it is important to ensure that they are aligned with international practices while also taking into account the peculiarities of the nation. This includes recognising the value of indigenous knowledge systems, incorporating traditional practices, and addressing technological requirements. These policies should be tailored to address both global challenges and national development priorities (Union, 2018). To accomplish this goal at the national level, it is crucial to promote active participation of the private sector in the national TVET system (Legg-Jack, 2018). National bodies should be established to oversee training and be supported by policy implementation to enhance the development of the education and training system (Union, 2007). These bodies should closely collaborate with training schools and trainers to align with current skills requirements and market expectations (Ayanyemi & Oyekan, 2016; Arfo, 2015).

To establish an integrated TVET system that spans national, regional, and global levels, it is vital to recognise the significance of policy development and implementation at both national and regional levels. There should be an establishment of common quality standards that will lead to genuine standardisation in TVET (AU, 2018; Paryono, 2017). The introduction of the National Qualifications Frameworks (NQFs) was suggested to attain the acceptable qualifications and standard nationally (ILO, 2011; Keevy & Bolton, 2011; Young, 2015). These qualifications, however, should also be acceptable outside the borders of the country. Additionally, there must be mutual recognition and harmonisation of training across nations, both in the formal and informal systems within them. Finally, there should be mobility of players, especially teachers, within and outside the region (Stella, 2006).

1.3 Problem Statement

Nigeria, in acknowledgement of the potentials of TVET, had at different stages instituted diverse policy legislations, like the National Policy of Education (NPE) (FGN, 2004) in 2004, and the revised edition in 2013 (FGN, 2013), prioritising TVET institutions and training. This was to put TVET on a higher pedestal to meet the modern-day challenges. To achieve this, a national Master Plan was prepared in 2000 in collaboration with UNESCO for the development of TVET in the 21st century (Adepoju & Famade, 2010). The national Master Plan encompasses several important areas of focus. It outlines the introduction of entrepreneurial education at different levels of schooling, aiming to instil entrepreneurial skills and mindset among students and prepare them for successful entrepreneurship. Additionally, it emphasises the need to enhance the overall standard of TVET and ensure its accessibility to all individuals who require it. Another key aspect of the Master Plan involves the training and provision of more qualified TVET teachers. Furthermore, concerted efforts should be made to promote the acceptance and embrace of TVET through effective advocacy and education. It also underscores the significance of competent management of TVET institutions (Marope et al., 2015). Furthermore, improvements in funding and special interventions by some international donors and organisations should also be invested in order to tap into the dividends of this aspect of education (Dangana, 2012; FME, 2012; FGN, 2013; Dike, V.E., 2013; Okolocha & Baba, 2016; Obidile, 2014).

Conversely, despite the policy legislations, improvements, and interventions, the full potential of the Nigerian TVET system is far from being realised due to the fragmented natureof its planning, delivery, and implementation at different levels (Arfo, 2015; Zite & Deebom,2017; UNESCO–UNEVOC, 2019). The sector is still plagued with inconsistencies in the formulating procedure and the implementation of TVET policies, which has been one of the drawbacks in the improvement of TVET (Adepoju & Famade, 2010). There is a lack of monitoring the progress of the past graduates of TVET institutions and successive governments do not always follow the policies of the previous ones among the ministers and commissioners of education in the states due to corruption and political influences. According to Odo et al. (2017, p. 1880), the factors that continue to plague the TVET system stem from, amongst others, a lack of adequate training facilities and equipment, poor staff training, poor funding, acute shortage of TVET teachers, and the curriculum not being updated to meet the 21st century challenges in ICT.

In general, TVET is believed to be a means of reducing unemployment (UNESCO, 2012). However, according to the Bureau for National Statistics, the unemployment rate stood at 17% in 2019.Furthermore, the initiative ('TVET for All') to reduce the school fees in the TCs did not attract the required number of students. Fakorede (2018) puts the enrolment of students in TVET at 10% in Lagos State. Fakorede (2018) also notes the gender inequality in TVET programmes. Female participation in TVET remains low, with less than 20% of the students being female, despite the admission placement preference given to females. It is in this regard that this study sought to explore how TVET systems transition from "fragmentation to integration." It seeks to determine ways in which we can begin to think about how we shift the Nigerian TVET system from a "fragmented" to an "integrated" one. This transition is looked at from a sustainability perspective. To unpack this transition, we ask: what skills would be required to change the TVET system to gear it towards promoting SSED. The question was posed at three stakeholder groupings within the AE sector: academia, government, and industry. The skills explored were looked at from three vantage points, namely: *strategic and leadership* position, *process* position, and *practical* position. The exploration of these three skills speaks to the issue of transition in the following manner:

- *SLS* – necessary for "initiating and promoting change;"
- *PS* – necessary for "enabling change;"
- *PRS* – necessary for the "delivery of change."

1.4 Rationale of the Study

In order to provide an in-depth understanding of the rationale of this study, it is important to explain my personal experience and motivation for conducting the study, which is also supported by the review of the literature. Firstly, as a TVET practitioner who specialised in teaching automobile technology, and having taught automobile courses at the college of education (technical) and the affiliated universities for about 29 years, I have observed that the programmeme suffers from fragmented policies that are poorly implemented (Kagara, 2017). For example, the admission policy of the TVET institutions is that 70% of the placements should be for TVET programmes while 30% should be for all other courses (Akanbi, 2017). Unfortunately, the reverse is the case since many students shun TVET programmes (Ayonmike, 2015). It is also noted that teaching and learning facilities are inadequate (Okoye& Arimonu, 2016). The machines and equipment are obsolete, in that they

do not match whatis available in the industries. Even when new machines or equipment are procured for the institutions by the ministries or agencies, the end users (teachers) are rarely consulted in the process (Umar & Ma'aji, 2010). Consequently, many of these machines and their equipment are poorly functioning, have incomplete accessories, or they lack operational manuals (Oviawe et al., 2017). Ugwoke et al. (2016) assert that the machinery and equipment utilised in TVET institutions should be a replica of that in the industries. This will enable students to become aware of the techniques required to handle the machinery which makes the transitionfrom learning institutions to industry much smoother. However, the reality is the converse, and for this reason many graduates end up unemployed (Jwasshaka & Fadila, 2020). There isalso a lack of tracer studies to track the graduates of TVET programmes and obtain their input concerning the challenges that they experience when transitioning to the labour market (Zite & Deebom, 2016).

Moreover, other scholarly studies have affirmed the lack of skills graduates require to enter the modern workforce (Ayonmike & Okeke, 2016). This is also supported by Akpoyibo (2015) who asserted that the high unemployment rate of TVET graduates in Nigeria is due to the inadequate impartation of the modern skills by the training institutions. Okoye and Arimonu (2016) and Sarimah and Dahiru (2014) thus recommend that employability skills should be incorporated into the TVET curriculum to make the graduates fit for industry or self-employment. Therefore, this study aims to explore how SSED can be promoted through TVET system in TCs in Lagos State, Nigeria.

1.5 Significance of the Study

A study such as ours which seeks to determine the factors that promote sustainable and integrated TVET system in Nigeria is significant for several reasons. First, it can contribute to the development of human capital and skills that are relevant for the socio-economic needs of the country. Second, it can enhance the quality and efficiency of TVET provision and delivery, by identifying the best practices and challenges in the current system. Third, it can foster the collaboration and coordination among different stakeholders, such as government, industry, education and training providers, and civil society, to ensure a coherent and holistic approach to TVET. Fourth, it can support the implementation of the national TVET policy and strategy, which aim to promote TVET as a key driver of inclusive growth and development.

Furthermore, the outcomes of thestudy can also be of great importance to scholars alike as it will contribute to the discourse, contentions, and debates in the field of TVET for SSED.

1.6 Location of the Study

The study was conducted in Lagos State of Nigeria. Lagos State is one of the six states in the south-western part of Nigeria. Lagos State has a land mass area of 3,671 km^2 and a population of 19,013,534 people; it also has a more developed economy than other parts of Nigeria (Hambolu et al., 2014). The latter has allowed it to invest more in its TVET. As the economic hub of the country, Lagos boasts the largest automotive sector in Nigeria (Banwo et al., 2017). With its status as a prominent business centre, the city has a substantial number of vehicles that require the expertise of skilled motor mechanics and technicians for their repair and maintenance. It is in this regard, that the TVET system in Lagos state is generally considered to be better than the rest of the country. This is not farfetched from the fact that the first technical institution and best polytechnic was founded in Lagos in 1947. Then, it was named Yaba Higher College but now Yaba College of Technology. The institution supplied the needed workforce for the take-off of the technical colleges and polytechnics in the state. In addition, being the former country's capital, the need for the skilled workforce in the industry pivoted the TVET system into a higher pedestal.

The five technical colleges selected for the study are state-owned and run. They are strategically located to cater for the five divisions of the state namely Ikeja, Badagry, Ikorodu, Lagos Island and Epe. The map below (Figure 1.2) indicates where each of the five TCs are based within the Lagos State, which represents the first sector of our study: **Academia**. The other two sectors; **Government** and **Industry** are located within the local government areas (LGAs), with Government being largely in Ikeja and the Industry being highly concentrated in Eti Osa, Lagos Island, Apapa, Amuwo Odofin, Ikeja, and Oshodi- Isolo.

- Government Technical College, Agidingbi, Ikeja
- Government Technical College, Ado Soba, Badagry
- Government Technical College, Epe
- Government Technical College, Ikotun, Alimosho
- Government Technical College, Ikorodu

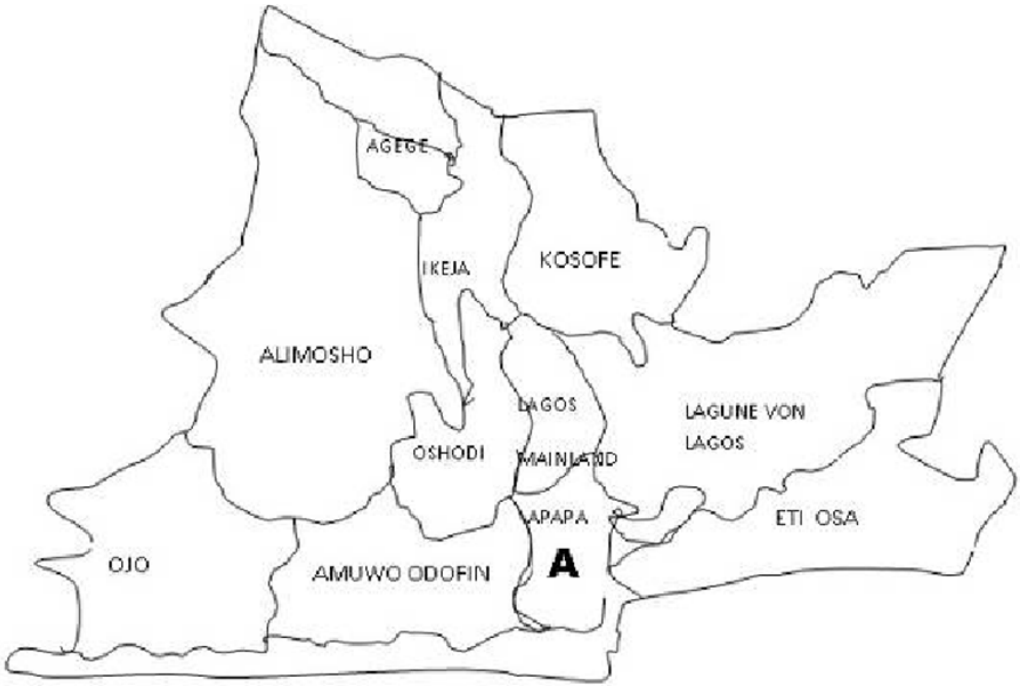

Figure 1.2: Map of Lagos State with its Sixteen Local Government Areas (Source: Lawson et al., 2010).

The TVET system in Lagos state is poised to create a system that provides the workforce to drive the Lagos economy and to reduce dependence on imported labour in the industry. In addition, it should attract investment and become a net exporter of technical and vocational skills. Although the TVET system in Lagos could be argued to be similar to that of the whole of Nigeria, there are, however, some differences. The British Council (n.d.) report defines these key aspects as follows:

- **TVET strategy and vision**: Lagos State has a vision to be the third largest economy in Africa by 2025, and to achieve this, it focuses on developing a workforce with skillsets to meet industry demand and positioning Lagos for a tech-driven future.
- **TVET projects and initiatives:** Lagos State has launched several projects and initiatives to improve the quality and access of TVET, such as the LASU Business School, the University of Education, the Open and Distance Learning University, the TVET CodeLagos, and the ReadySetWork;
- **TVET market opportunity**: Lagos State has a growing middle class and a high demand for tertiary education with a growing youthful populace (British Council, n.d.).

In other words, Lagos State has a vision to create a TVET system that provides the workforce to drive the Lagos economy, reduce dependence on imported labour, attract investment and become a net exporter of technical and vocational skills. Furthermore, the Britis Council highlights some of the TVET projects and initiatives in Lagos State, which include:

- **Extensive review of the TVET system in Lagos State**, engaging with key stakeholders, reviewing existing private sector players and government facilities, and studying several models from Germany, Brazil, and United Kingdom.
- **Approval by EXCO to commence restructuring of TVET**, which involves upgrading the existing five Government Technical Colleges, establishing new TVET centres in strategic locations, and developing a robust curriculum and quality assurance framework.
- **Building Construction, Garment Making, Automobile Mechanics, Technology (Cybersecurity & Call Centre), and Tourism & Hospitality as the priority sectors** for TVET intervention, based on the market demand and growth potential.
- **Partnership areas for private sector and international collaborators**, such as content, faculty support, international certification, and technical support (British Council, n.d).

1.7 Aim and Objectives

The aim of the study was to explore how SSED can be promoted through TVET systems. The objectives of the study were to understand:

- The kind of *strategic and leadership skills* that are required for initiating and promoting a sustainable TVET system.
- The type of *process skills* that are required for enabling a sustainable TVET system.
- The type of *practical skills* that are required for delivering a sustainable TVET system.

1.8 Research Questions

Creswell and Miller (2010) explain that research questions serve as statements that researchers use to highlight the objective of a study, which is to offer precise solutions to an investigation. The main research question of this study was:

"How can SSED be promoted through TVET systems?"

The sub-research questions were:

- What *strategic and leadership skills* are required to promote SSED through TVET systems?
- What *process skills* are required to promote SSED through TVET systems?
- What *practical skills* are required to promote SSED through TVET systems?

1.9 Conceptual Frameworks

This study utilised the Triple Helix Model (THM), Quintuple Helix Model (QHM), Integrated Intelligence and the Five Capitals framework, with an enhanced focus on the latter three. These are described in more detail below. The merging of the Integrated Intelligence framework, QHM and Porritt's (2005) five capitals framework provides us with a comprehensive framework for understanding the interplay between the quantitative and qualitative results of the study. It offered a more holistic and integrated approach to understanding the "change" factors that promote SSED through TVETs.

1.9.1 Triple Helix Model (THM)

The THM denotes the evolution of the interrelationships between industry, academia, and government, as well as within each of these sectors (Etzkowitz, 2008). These three spheres of the sector encourage collaboration within the spheres while any of the of the institutions can assume the role of another while still maintaining its original identity. This collaboration will stimulate innovation and thus bring sustainability. According to Etzkowitz (2008), the THM (Figure 1.3) constitutes three basic elements: government, university, and industry.

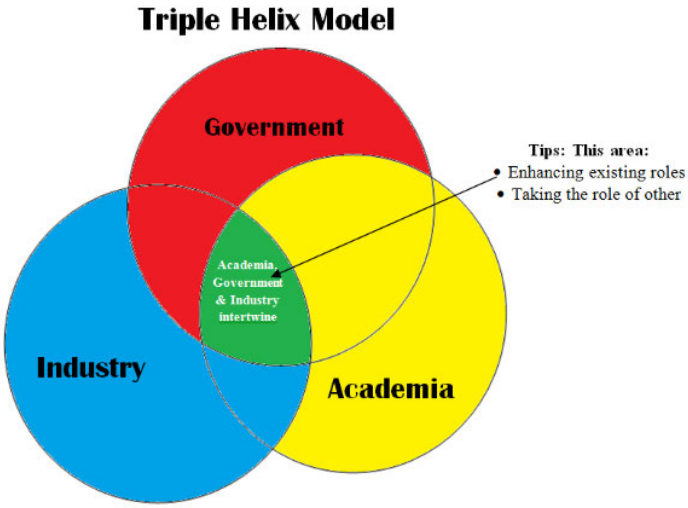

Figure 1.3: The Triple Helix lll Model

(Source: Metcalfe, 2010)

The THM tries to picture the change of the roles and relationships that happen whenthe university, government and industry are merged together. In this model, the university, the industry, and the government are conceptualised as interconnected spirals, each with distinct relationships to one another within the framework of classical innovation (Ivanova & Leydesdorff, 2014). Aside each triple helix performing its main tasks, each triple helix sphere can also serve an essential role in other spheres. The university is tasked with the preservation and transmission of knowledge as its primary job as well as takes on some business and governmental duties. The industry generates goods and services and engages in research, while the government ultimately guarantees societal rules of the game and capital (Vaivode, 2015).

The THM, consisting of the university – industry – government spheres, was regarded as the most appropriate framework for this study because it encompasses the three institutions – academia, industry, and government (Yang et al., 2019) – which are relevant to this study. The THM is used to look at the type of relationship that exists between the TCs, the industries, and the government in preparing an integrated and sustainable TVET system in the TCs of Lagos State. The government (state) is represented by the personnel of the Lagos State Ministry of Education and the Lagos State Technical and Vocational Education Board (LASTVEB). Academia includes the principals and teachers at TCs in Lagos State in the selected trade. And finally, the industry comprises of the workshop managers and the workshop supervisors of selected automobile companies in Lagos State.

The THM could be extended beyond academia to inform policy-making and support innovative activities. It serves as a source of inspiration for local policy formulations and innovations. The university, being the cornerstone of a knowledge-based society, can play an enhanced role in driving innovation (Vali, 2013). The partnership between the government, academic, and industry spheres is generally seen as a critical pillar when pursuing SD. The THM thesis is that the university plays a significant role in the new inventions and economic development in a society. This is achieved with the coming together of the university, industry, and government to produce new knowledge and information needed (Ranga & Etzkowitz, 2013, p. 238). Therefore, for the influence of knowledge and innovation on economic growth, institution and learning processes are of great importance. This study focuses on examining the roles of academia, industry, and government stakeholders in establishing an integrated and sustainable TVET system in the Lagos State TCs. The research aims to explore the collaboration among these three entities, particularly in relation to human capital development. Additionally, the study recognises the pivotal role of academia in driving the necessary changes to achieve the desired outcomes (Lee, 2014).

1.9.2 The Quintuple Helix Model

The Quintuple Helix model, as conceptualized by Carayannis and Campbell (2009), is a framework for knowledge exchange that incorporates five key societal dimensions, as illustrated in Figure 1.4. It builds upon the triple helix model of collaboration between universities, the private sector, and the public sector by integrating a media and culture-driven public, as well as the natural environment, thus emphasizing the role of higher education in fostering innovation and advocating for a socio-ecological shift in society and the economy for the 21st century. Within this model, knowledge and expertise are dynamically produced, exchanged, and applied, influencing the natural environment in the process.

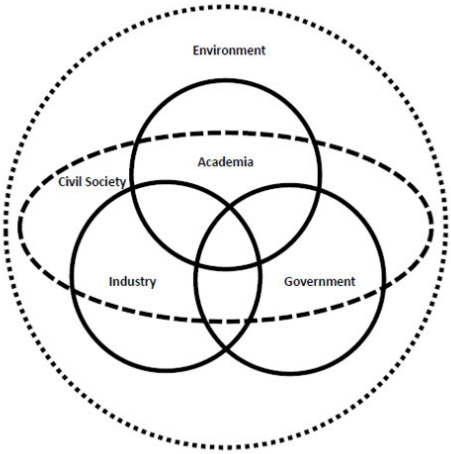

Fig. 1.4: Five Helices of the Quintuple Helix
Source: Carayannis-Carayannis et al. (2012)

This model was applied in the current study to explore how aligning Technical and Vocational Education and Training (TVET) with global Sustainable Socio-Economic Development (SSED) challenges in the environmental sector can provide opportunities to mitigate skill shortages. This is achieved through the development of curricula that are both relevant and responsive within the TVET Academia sector in Lagos State. The implementation of skill-enhancing programs by the government sector is expected to yield competent graduates, thereby improving the perception of TVET, spurring innovation, and reducing unemployment. Such initiatives must be supported by strong industry partnerships and underpinned by effective governance and infrastructure within the government sector.

1.9.3 Integrated Intelligance

Anthony's work (2005, 2008) on integrated intelligence introduces a comprehensive view of intelligence that goes beyond the usual cognitive limits. This approach includes transpersonal elements like creativity, wisdom, and emotional intelligence. Within TVET, this has significant implications, promoting a curriculum that not only covers technical skills but also cultivates intuitive and expansive cognitive skills. Such an educational model meets the demands of a changing global economy that prizes adaptability and advanced problem-solving. Integrating this form of intelligence into TVET can help create a dynamic and creative workforce, ready with technical expertise, critical thinking, teamwork, and lifelong learning

skills. This educational shift can revolutionize skill development and application, preparing individuals for the modern knowledge economy's challenges and contributing to the mindful and sustainable growth of human capital.

1.9.4 The Five Capitals Model

The “Five Capitals” model was developed in 2003 by the Natural Capital Coalition (NCC), under the leadership of a British environmentalist and former Director of Friends of the Earth, Jonathan Porritt. NCC is a coalition of businesses, governments, and other organisations that work to protect and restore the world’s natural capital. The Five Capitals model can be seen as a holistic approach to sustainability that focuses on five key areas:

1) Financial Capital: TVETs in Lagos could seek to increase their financial capital through various means such as government funding, industry partnerships, or tuition fees. This capital can then be invested in improving the quality of education and training provided.

2) Manufactured Capital: This refers to the physical infrastructure and technology. TVETs could focus on upgrading their facilities and equipment to ensure students are learning with industry-standard tools.

3) Human Capital: This is the skills, knowledge, and abilities of individuals. TVETs play a crucial role in enhancing human capital by providing relevant skills training. They could align their programmes with the needs of the local job market to ensure graduates are employable.

4) Social Capital: This involves relationships, networks, and social interactions. TVETs could work on building strong relationships with industry partners for internships, job placements, and curriculum development. They could also foster a strong alumni network to support new graduates.

5) Natural Capital: This refers to natural resources and ecosystems. TVETs could incorporate sustainable practices in their operations and curriculum to contribute to environmental sustainability.

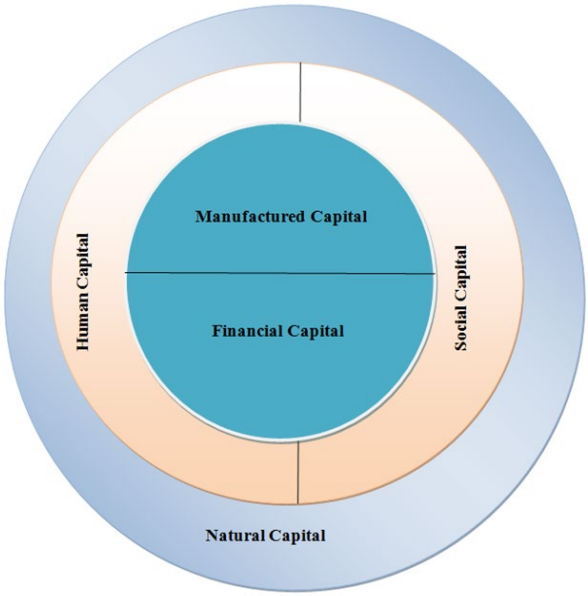

Figure 1.5: The Five Capitals Model
(Source: Forum for the Future, 2020)

The 'Five Capitals' concept may be used to help organisations create a vision for sustainability in their own operations to produce goods and services. The vision is formulated by taking into account the actions necessary for an organisation to maximise the value of each capital. Employing an integrated approach with the model, in order to minimise trade-offs during decision-making, can result in more sustainable outcomes (Porritt, 2005). Like investors, as argued by Porritt (2005, p. 11), this study uses the Five Capitals model as an analytical tool to measure "factors that would ensure sustainable socio-economic development (SSED) through TVET systems". It is hoped that through its use, the analysis will allow us to develop a model or vision of what it *means to promote SSED through TVET systems.*

1.10 Research Methods and Design

An explanatory sequential mixed methods approach was carefully selected for the study. It is characterized by the collection and analysis of quantitative data in the first phase of research followed by the collection and analysis qualitative data in a second phase that builds on the results of the initial quantitative results (Creswell, 2008, p. 211). The mixing of the data in this study first happened within Phase I, which collected and analysed both quantitative and qualitative data (i.e. the factors and the reasons thereof) and then with Phase II, which collected

and analysed qualitative data. Thus, the initial quantitative and qualitative results informed the secondary qualitative data collection. The latter phase allowed for the exploration of the identified factors in detail. This study's focus is on understanding the factors that promote SSED through TVET systems via three different sectors: Academia, Government, and Industry. Cluster sampling was used in this regard. The questionnaire protocol used in the study for Phase 0 was co-developed witha select group of experts who formulated the list of items for each question, via the Delphi method. The latter experts exchanged views, independent of each other (working with a facilitator), and provided a list of skills sets from most relevant to least relevant for eachresearch question. It is from this list that the questionnaire protocol for each research questionwas developed. The questionnaire protocol was subjected to content validity and construct validity by the experts involved in the construction of the instrument. Furthermore, it was alsosubjected to a pilot test to determine the reliability of the instrument. Pilot testing wasconducted to establish the content reliability of the instrument. Cronbach's alpha was used todetermine the reliability coefficient of the instrument for data collection.

Exploratory factor analysis (EFA) was conducted on the items using principal axis factoring (PAF) as an extraction method and Oblimin rotation. Sequential steps, as suggested by Taherdoost (2016), were followed in the development of the theoretical factors for each research question. Four hypotheses were formulated in this regard:

- **Ho1**. There is no significant difference in the selection of the factors needed to ensure the promotion of SSED through TVET systems by the participants.
- **Ho2**. There is no significant difference in the selection of the SLSs needed to ensure the promotion of SSED through TVET systems by the participants.
- **Ho3**. There is no significant difference in the selection of the PSs needed to ensure the promotion of SSED through TVET systems by the participants.
- **Ho4.** There is no significant difference in the selection of the PRSs needed to ensure the promotion of SSED through TVET systems by the participants.

For Phase II, semi-structured interviews were conducted in stages accordingto the clusters. Non-probability sampling was employed in this phase. Purposive sampling enabled me to select suitable participants for the interviews. In total, nine participants were involved in this phase. Due to the Covid-19 pandemic, the interviews took place telephonicallyand via Zoom or

MS Teams. Thematic analysis was used to analyse the data collected during the qualitative phase.

1.11 Ethical Considerations

To ensure that ethical considerations were adhered to throughout the study, the ethical process as outlined by the University of KwaZulu-Natal (UKZN) for postgraduate research was followed. The gatekeeper's permission was obtained from the Executive Secretary of the LASTVEB, Lagos, to carry out the study in the State's TCs. This was forwarded to the UKZN Ethics Committee for approval to carry out the study (Appendix G).

The participants were provided with a clear explanation of the study's purpose and nature, as well as their rights and level of involvement. As argued by Bless (2006, p. 140), it is essential for individuals participating in research to fully understand the research objectives and to be informed if their participation might have any implications for them. Informed consent is crucial in the collection of data. It involves respect for autonomy and affording participants freedom to participate in the research. Once the participants gave consent, they were asked to sign a consent form to formalise the agreement. Participation was also voluntary. Confidentiality and anonymity to protect the privacy of the participants was also maintained. Information collected will be for research purposes only. The identities of theparticipants will not be disclosed to anyone outside of the research team. Consent was alsoobtained before audio-recording the interviews. In this regard, the participants were informedof their right to object to being audio-recorded. Additionally, field notes were used in case any participants objected to being recorded. Transcriptions were not labelled in any way that could reveal the identities of the participants and compromise anonymity.

Furthermore, the interviews were conducted mainly in English, as this is the official language of the State under study. The data were stored on a password protected computer accessible to me only. Data will be disposed of in an appropriate manner after the number of years as per the university's requirements. Face-to-face interviews were avoided due to the Covid-19 protocols.

1.12 Limitations of the Study

Due to the Covid-19 pandemic, face-to-face interaction was not possible. We had to settle for virtual correspondence and communication. These conditions are not ideal, particularly, when it comes to availability and willingness of potential participants to take part in research activities, due to factors such costs of being online, connectivity / internet costs / whatsApp calls etc. Data saturation could not be reached due to the use of telephonic interviews only. Each interview, however, was detailed. The interviews were recorded with the consent of the participants.

Some of the key actors in the THM III did not possess the capability and power to playtheir role effectively.

1.13 Definition of Key Concepts

This section defines the key concepts used in this study.

Fragmented TVET system

A 'fragmented TVET system' is characterised by a lack of coordination and collaboration between different stakeholders, such as government, employers, and educational institutions. It is seen as a system that has limited access to quality training and education and is characterised by a lack of resources and inadequate funding. Additionally, a fragmented TVET system is seen as one that is unable to meet the needs of the labour market and is unable to respond to the changes in the economy.

Sustainable Development (SD)

'SD' encourages economic growth while protecting the environment and meeting the needs of the present and future generations. It is based on the principles of environmental protection, social equity, and economic efficiency.

Sustainable Socio-Economic Development (SSED)

'SSED' is an approach to economic development that seeks to ensure that economic growth and development of a region or country is sustainable in the long term. It focuses on creating economic opportunities that are environmentally friendly, socially equitable, and economically viable. Furthermore, it emphasises the importance of investing in human capital and creating an enabling environment for businesses to thrive.

Sustainable TVET Systems

'Sustainable TVET systems' are designed to be resilient, adaptive, and able to meet SSED needs. In addition to emphasising the importance of life-long learning, and the need to continuously update skills and knowledge in order to remain competitive, they also ensure that all learners have access to quality education and training opportunities, regardless of their socio-economic background.

Skills

According to the existing literature, 'skills' are commonly divided into two primary categories: hard skills and soft skills. It is worth noting that some scholars have raised concerns about this categorisation. Hard skills encompass the job-specific knowledge and technical abilities that workers require to perform their tasks effectively. On the other hand, soft skills refer to the personal attributes and interpersonal abilities that individuals need to succeed in the workplace (Kramarenko, 2022).

TVET skills

'TVET skills' are the skills, knowledge, attitudes, and values (SKAV) needed to perform a specific job or tasks. They include technical and practical skills as well as problem solving, communication, teamwork, and other soft skills. These are said to be developed through formal training and on-the-job experience.

Gainful employment

'Gainful employment' is defined as any type of employment that provides a steady income and benefits. It can include full-time and part-time jobs, self-employment, freelance work, and contract work. In addition, it can include work done on a voluntary basis.

Employability skills

'Employability skills' are skills and abilities that make an individual suitable for the workplace. They include communication, problem-solving, teamwork, self-management, digital skills, and critical thinking. These are skills that are regarded as essential for success in any job and are transferrable across different industries and roles.

Twenty-first century skills

'Twenty-first century skills' (or 21st century skills) are skills regarded as a vital skill needed to succeed in today's world. They include critical thinking and problem solving, collaboration and communication, creativity and innovation, flexibility and adaptability, digital literacy, leadership, information literacy, intercultural competence, global awareness, financial literacy, entrepreneurship, data analysis, scientific literacy, ethical reasoning, and self-direction, etc.

Decent work

'Decent work' is regarded as the ability to work productively by men and women in freedom, equity in treatment and salary, security, and human dignity (Di Fabio & Maree, 2016; Cieslik et al., 2022; American Public Health Association, 2023).

1.14 Outline of Chapters

The study consists of the following seven chapters:

Chapter 1

Chapter 1 introduced the topic under investigation as well as provided the contextual background of the study. The main sections discussed included situating the TVET system in Nigeria; policies that have informed the development of TVET in Nigeria; the problem statement; rationale and significance of the study; location of the study; aim and objectives of the study; the research questions; theoretical framework; research method and design; ethical issues; limitations of the study; definition of key concepts; and outline of the chapters.

Chapter 2

Chapter 2 presents the literature review which explores the dynamic and complex relationship between skills development and the development of SSED.

Chapter 3

Chapter 3 unpacks the conceptual framework that underpins the study. The Integrated Intelligence, THM, QHM and Five Capitals framework models are used as analytical tools to help measure and better understand the "factors"that will ensure SSED through TVET systems.

Chapter 4

Chapter 4 describes the methodology and research design employed in the study. It delineates the three phases of the study: Phase 0 (the co-development of the research instrument using the Deplhi technique), Phase I (the quantitative phase) and Phase II (the qualitative phase), highlighting both the constitution and analyses of data in these three phases.

Chapter 5

Chapter 5 presents the results of Phase I, the quantitative phase of the study. It addresses three aims. First, to determine the skills (as represented by factors) that are deemed necessary to promote SSED through TVET systems. Second, to critically look at the reasons given by the 162 participants who participated in this study regarding the skills that promote SSED through TVET systems. Both the first and the second aims are explored with reference to the following three skills: strategic and leadership skills (SLS); process skills (SL); and practical skills (PRS). Third, to interrogate whether the skills explored correlate with the three employment sectors identified and selected in the study: academia, government, and industry.

Chapter 6

Chapter 6 presents the results of Phase II, the qualitative analysis phase. It revisits the question on the kind skills (as represented by factors) that are deemed necessary to promote SSED through TVET systems, with a group of purposively selected participants. It delves into the purposefully selected group of participants' (n=9) perceptions of the "change" that would be required to gear TVET systems towards promoting sustainable socio-economic development.

Chapter 7

Chapter 7, the concluding chapter, discusses the study's results and relates them to the reviewed literature. It explores the implications of the findings for research, policy, and practice, while also providing recommendations for future research endeavours.

1.15 Conclusion

This introductory chapter described the focus, aim, and purpose of this study, as well as explained the main elements of the research process. A review of relevant literature on TVET, the employability of TC graduates, and SD is presented in the next chapter.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter reviews existing literature, with a focus on the enhancement of SSED via the TVET system. Conducting literature reviews is crucial as they pinpoint past advancements and highlight areas that require additional research (Hecker & Kalpokas, 2024; Hart, 2018). The study utilizes the definition of TVET from the continental strategy, which views TVET as an integral component spanning from primary education to higher education (HE). Thus, TVET is comprehensively defined to encompass all facets of training and skill acquisition across formal, non-formal, and informal settings. It also considers the dynamics of skill demand and supply, employability, capacity enhancement, self-employment, retraining, adaptability, and lifelong learning (African Union, p. 10)

The introduction to the literature review examines TVET's pivotal and evolving role in the educational and economic frameworks of developing nations, with a particular focus on Africa and Nigeria. The discussion then transitions to skill development in the context of TVET reforms, examining the contributions of the National Board for Technical Education (NBET), the National Vocational Qualifications Framework, and the Industrial Training Fund in Nigeria. Subsequently, the narrative shifts to the field of Motor Vehicle Mechanics Work (MVMW) or Automotive Engineering (AE) in Nigerian technical colleges, delving into recent innovations and their current status within these institutions. The discourse on innovation, the requisite technical skills in the MVMW or AE sector, alongside anticipated future demands and skill enhancement, sets the stage for discussing TVET's role in Sustainable Development (SD) and Education for Sustainable Development (EfSD), highlighting Sustainable Development Goals (SDG) 4 and 8. The chapter concludes with a brief reflection on the significance of TVET in the rapidly changing domain of automotive engineering.

2.1 The unique and dynamic position that TVET occupies in developing countries

In Africa, TVET is seen as essential for the continent's economic development as it provides the necessary skills and knowledge for the youth to enter the workforce, contribute to their communities, and ultimately drive the continent's growth and prosperity (African Union, 2023). However, TVET systems in many African countries are facing significant challenges in meeting the demand of the labour market and the aspirations of people (ILO, 2023). According to ILO (2023) a major cause is the lack of effective linkages between TVET systems and institutions and stakeholders in the labour market. It has to be pointed out from the outset that TVET occupies a unique and dynamic position within the educational and economic landscapes of developing countries (UNESCO-UNEVOC, 2018). Despite its potential to empower individuals with practical skills and improve employability, TVET often suffers from a lack of recognition and support, which undermines its role in societal advancement. The paradox lies in the simultaneous undervaluation of TVET by the public and its critical importance as acknowledged by experts and policymakers for economic transformation and sustainable development.

Several scholars and organizations have written on this topic. For instance, Wahba (2024), in his report "*TVET Challenges and Priorities in Developing Countries*," foregrounds the need for reforming the TVET systems in different developing countries by highlighting the crucial roles TVET is expected to play in national sustainable development and the challenges it faces (social, economic & environmental development)1. The first role is to provide training opportunities and career advancement avenues for the increased school leavers. The second role is to provide skilled manpower that is needed at all levels of the economy.

Wahba (2024) argues, despite the significant role of TVET, it has been left to the periphery and its significance has not really been embraced. Developing countries have a large cheap unskilled labour force, as a result of lack of education and training, however, the core role of TVET in enhancing the informal sector and in offering skills and knowledge to the unskilled has not been keenly appreciated in most of the developing countries. The second point Wahba (2024) discusses is the administration of TVET in most of the developing countries. He draws our attention to the fact that administration is now increasingly being moved from the jurisdiction of the Ministries of Labour or Manpower Development to the

Ministry of Industry and Ministry of Education. He argues for a TVET System to be able to play its role effectively, it is important to ensure that there exists an enabling and TVET friendly environment nationwide. Such an enabling environment can be achieved by putting in place harmonized national TVET policies, provision of adequate funds, developing positive social attitudes towards training, and enhanced management.

Sigdel (2021), in his article "*The Paradoxes of Inclusion in TVET in Developing Countries with Reference to Nepal*," discusses the complex challenges of implementing TVET in developing countries, using Nepal as a case study. Sigdel (2023) argues that TVET programmes often face paradoxical situations where the intended inclusive educational opportunities do not align with the actual needs and resources of local communities. By advocating for rural industrialization over urbanization, Sigdel argues that TVET should focus on developing industries within rural areas to create jobs and educational opportunities that are accessible to the local population. This approach would utilize local resources and cater to the specific economic and social contexts of these areas, rather than concentrating development and opportunities in urban centers, which can lead to increased migration, social stratification, and the exclusion of rural populations. Rural industrialization is argued could provide a more sustainable and inclusive path for development, ensuring that the benefits of TVET reach the communities that need them most, and helping to bridge the gap between urban and rural areas.

The article. McGrath and Akoojee (2009) on "Vocational Education and Training for Sustainability in South Africa: The Role of Public and Private Provision" discusses the role of skills development in the sustainability of the South African political-economic project. It highlights the intricate balance between public and private sectors in the realm of TVET for sustainability in South Africa. It underscores the disjunctions in public policy that not only hinder public sector delivery but also create niches for private entities to address national development challenges more effectively. The authors advocate for a more intelligent collaboration between the state and both sectors, which necessitates an internal enhancement of state operations. Reflecting on the global resurgence of interest in skills development, the article posits this as a strategic response to globalisation's pressures and prospects. However, it casts doubt on the likelihood of other African nations achieving sustainable development through skills development alone, given South Africa's modest success. The conclusion drawn is that while skills development is limited in its capacity to tackle sustainability challenges, there is room for governmental action to bolster the resilience of TVET systems, emphasizing

the need for attention to both public and private provisions.

The joint study by the World Bank, ILO, and UNESCO (2023), titled "*Building Better Formal TVET Systems: Principles and Practice in Low- and Middle-Income Countries*," highlights a critical challenge facing the global workforce. It underscores the pressing need for TVET systems to evolve in response to the dynamic demands of the labour market, influenced by factors such as globalisation, technological progress, demographic shifts, and climate change. The study provides a comprehensive analysis of the current state of TVET systems in low- and middle-income countries, revealing a significant disconnect between the skills imparted by these systems and the actual needs of the labour market. This gap is particularly concerning given the anticipated surge in demand for vocational training in the near future.

The report emphasises that effective TVET systems are essential for facilitating smooth job transitions, especially for the youth, who face a global unemployment rate of 16% as of 2022, with even higher disparities in low- and middle-income countries. The study also sheds light on the shortcomings of existing TVET systems, such as inadequate support for learners, underprepared teachers, and lackluster incentives for providers. These issues contribute to the underperformance of TVET programmes and their inability to deliver the expected outcomes in terms of employment and productivity.

The publication by Ansu and Tan (2011) on "*Skills Development for Economic Growth in Sub-Saharan Africa: A Pragmatic Perspective*" emphasises the critical role of a skilled workforce in the economic transformation of Sub-Saharan Africa. It highlights the paradox that, while a skilled workforce is necessary for economic growth, the high costs associated with skills development often exceed the financial capabilities of governments in the region. This creates a vicious cycle where limited resources hinder the investment in skills, which in turn impedes economic growth and further limits available resources for such investments. The authors propose a two-pronged approach to break this cycle. The first prong suggests integrating skills development into economic development plans and establishing flexible arrangements to meet immediate skills demands, especially in growth sectors. The second prong focuses on long-term system-wide improvements, including enhancing literacy and numeracy, orienting the education system towards science and technology, and strengthening connections between education and the workforce, particularly at the tertiary level. Indeed, this requires visionary and pragmatic leadership to navigate policy trade-offs

and foster an environment conducive to skills development and economic growth.

These scholars and organizations argue for the need for reforming TVET systems to foster a culture of sustainable development, emphasising the importance of harmonised national TVET policies, adequate funding, and positive social attitudes towards training. Studies such as the joint effort by the World Bank, the ILO, and UNESCO (2023) have also underscored the need for TVET to adapt to global changes like technological progress and climate change, suggesting that strong TVET systems can help countries meet Sustainable Development Goals by supporting employment and productivity.

These institutions recognise that robust TVET systems can play a pivotal role in helping countries achieve the Sustainable Development Goals (SDGs), particularly those related to decent work and economic growth. By aligning TVET curricula with the demands of the labour market and the challenges posed by a rapidly changing environment, countries can foster a workforce that is not only skilled but also resilient and adaptable.

The integration of sustainable practices and green technologies into TVET programmes, it's argued, can contribute to the SDGs by promoting environmental sustainability and combating climate change. This approach ensures that the workforce is prepared for jobs in emerging green industries, which are critical for a sustainable future. Additionally, by focusing on inclusivity and access, TVET systems can help reduce inequalities and support lifelong learning opportunities for all, regardless of gender, socioeconomic status, or geographical location.

The World Bank, ILO, and UNESCO (2023) advocate for TVET systems that are dynamic and responsive to global trends. Such systems can empower individuals with the skills needed for the jobs of today and tomorrow, thereby supporting employment, productivity, and the broader objectives of the SDGs. The insights from MacGarth and Akoojee (2009) regarding the South Africa's experience serve as a valuable reference point for other African countries aiming to harness TVET as a tool for sustainable development. The dual approach advocated by Ansu and Tan (2011) to skills development: addressing immediate skill shortages through targeted interventions while simultaneously undertaking systemic reforms to enhance the quality and relevance of TVET programmes has great implications for African TVET systems. This strategy is vital for equipping the African workforce with the necessary skills to meet the evolving demands of the global economy.

It requires a concerted effort from policymakers, educators, and industry stakeholders

to create a robust framework that not only responds to current labour market needs but also anticipates future trends. By doing so, TVET can become a cornerstone of sustainable development, helping to reduce unemployment, drive innovation, and improve the competitiveness of African economies on the international stage.

2.2 TVET in Africa

It is important to note that traditionally, TVET in Africa has not been widely recognised or valued in society (Winch, 2013; UNESCO-UNEVOC, 2018). Furthermore, as Frommberger (2022, p. 7) argues, the enrolment as well as policy and research fields of TVET are relatively insignificant, compared to general and higher education and investment in TVET is relatively low. Legg-Jack (2018, p. 112) points out that the ratio of distribution across Nigeria's six geopolitical zones in terms of the general education and TVET institutions varies from 1:138 to 1:70, which is a very large margin. The growing problem of youth unemployment and underemployment is one of the main socio-economic development concerns of most African governments (AU, 2018, p. 8). According to current estimates by the World Bank, more than 10 million young Africans, many of whom are unskilled, allegedly drop out of school each year in pursuit of employmentin local labour markets that are not expanding rapidly enough to create jobs. Many of these job seekers are lacking in the abilities that businesses find important. Schools' dropouts cannot take advantage of even the smallest work chances that might be accessible to job seekers without employment-related skills. Due to the need for qualified workers in Africa, TVET is therefore promoted as the most practical way to acquire these abilities. Particularly, capable craftsmen and technicians are required to close the skills shortages in a number of economic areas. Furthermore, the transformation of the economy of African nations through the addition of value to their core commodities and natural resources requires highly qualified technical staff. The most effectiveway to prepare the skilled labour force that Africa needs to handle its socioeconomic development difficulties is through effective TVET systems.

However, until recently, TVET has not received the level of attention and recognition it deserves in many countries' human resource development strategies. Insufficient funding has been a common issue, with national education and training budgets frequently allocating inadequate funds to the TVET sector. Although the proportion of the national education budgetallocated to the TVET subsector varies across nations, it rarely

exceeds 11% in the case of Mali. The allotment in Togo is under 1%. In Ghana, the senior secondary education subsectorreceived 22% of the education budget in 2014, compared to the TVET subsector's allocation of just 3%. Such meagre support for TVET is insufficient to provide learners with the degreeof competency that is sought.

In recent years, there has been a growing recognition among African governments of the pivotal role that TVET plays in national development. Increasingly, nations worldwide are implementing policies, jurisdictions, and strategies aimed at restructuring and strengthening their domestic TVET systems. Countries such as Rwanda have created a Workforce Development programmeme, while Ghana's Council for TVET (COTVET) is authorised by lawto monitor, coordinate, and match skill development across the country. Therefore, it is widelyrecognised that acquiring relevant skills plays a significant role in eradicating poverty at the individual level, particularly within the broader context of national development. Furthermore,this acquisition of key skills serves as a vital instrument for driving economic growth. This isdemonstrated by the implementation of the African Union (AU) policy, which has recently introduced a Continental TVET strategy aimed at addressing youth employment challenges. Additionally, the establishment of a TVET Expert Group has been initiated to provide supportto member states in adopting and implementing the TVET strategy.

Notwithstanding the strides made regarding the provision of TVET in Africa, there arecountless reports on this having failed in many countries. Forje (2013) observed that in Cameroon, TVET is often neglected, and those who decide to pursue TVET are regarded as dropouts. The sector is neglected and suffers inadequate teaching and learning facilities, trained technical teachers/instructors, and there is a shortage of machines and equipment. Thesituation is said to be similar in Uganda, Kenya, Zambia, and Zimbabwe (O'dama, 2013; Matafwali, 2013; Amayo, 2013).

The failure of some of the TVET systems in Africa has been attributed to African TVET systems having sought to copy the TVET systems in the industrialised world (Lotz-Sisitka & McGarth, 2023). McGrath et al. (2004) noted that many African countries dependedon a "tool-kit" imported from the developed countries like Britain and Australia in building African skills policies. However, McGrath et al. (2004) affirmed that these imported toolkits have damaged the skills systems in those countries that adopted them, and it has failed to deliver on its promises across Africa.

We need to understand the above criticism against the backdrop of history. As pointedout by Frommberger (2022), the development of formal vocational education and training in Europe and Africa has had different trajectories. In most European countries, this developmentbegan in the 19th century in line with the industrial revolution. Furthermore, the informal qualification practices in companies, especially in the skilled trades, Frommberger argues, were increasingly linked to general standards over time. And where there were no further developments of in company qualification approaches for various social and political considerations or economic reasons, vocational training increasingly took place in special schools (Frommberger, 2022, p. 12). All these developments took place in parallel.

Maldonado (1985) aptly reminds us that Africa had its own long tradition of informal apprenticeships, which were largely based on the traditional practice in the communities. During colonialism these were based on the needs of the colonial masters (McGrath et al., 2020). Their further development to formalised vocational training could only begin with theend of the colonial era. However, most countries tried to emulate European models in the further development of their TVET systems. Many African countries depended on a "tool-kit"imported from the developed countries like Britain and Australia in building African skills policies. McGrath et al. (2004) affirmed that these imported toolkits have damaged the skills systems in those countries that adopted them, and it has failed to deliver on its promises acrossAfrica. The authors argue that these TVET systems often lack a solid foundation in the specificneeds and realities of developing countries. Consequently, they assert that the current organisation of TVET is disconnected from the modern job experiences and the significance of employment for many young individuals and communities in Africa and other regions today(McGrath et al., 2023). In the current TVET system, attention is on the Fourth Industrial Revolution (4IR), with little or no attention being paid to the global change (Langthaler & Bazafkan, 2020).

According to McGrath et al. (2023), the TVET system in Africa has undergone three distinct phases since gaining independence. The first phase focused on the new economics ofeducation and aimed to expand access to education. The second phase emerged with the rise of the basic needs agenda, aiming to provide relevant skills for both rural and urban sectors. The third phase is characterised by the neo-liberation approach. There is a growing theoretical framework for TVET and development that is based on the human development and capabilityapproach (McGrath et al., 2022). The critical capacities approach

(CCA) deals with both disparities in skill development and how to shift away from a limited focus on immediate employability and production (McGrath et al., 2020). Under the auspices of the UNESCO International Commission on the Futures of Education, a project called Skills Futures in Africaput out a vision of a promising future in which the SDGs may be achieved while also using skill development for the benefit of people (UNESCO, 2022). TVET institutions are widely believed to play important roles and partnership in economic development, and they are expected to deliver responsive curricula and engage relationally with employers and work environment (Lotz-Sisitka & McGrath, 2023).

The TVET system is expected to fulfil these goals; however, it is characterised by fragmentation, as evidenced by the shortcomings in policy and theory.

2.3 TVET in Nigeria

In Nigeria, TVET is provided in the formal, non-formal, and informal systems. Formal education involves training that takes place in a structured and certified programmeme that occurswithin a school setting. It is school-based and available in formal institutions at various levelsof education. Non-formal structured education, on the other hand, occurs outside of organisedschool settings. Examples of non-formal education include life skills programmes, adult literacy, continuing education, and programmes for out-of-school children. Informal educationtakes place outside the classroom, at home, in after-school programmes, and through daily lifeexperiences (Briggs et al., 2012). According to the FRN (2004), the term "TVET" refers to a broad range of educational components, including general education, the study of technologiesand related sciences, as well as the development of practical skills, attitudes, and knowledge relevant to careers in various spheres of economic and social life. It further conceptualised TVET as:

- A crucial component of the general education;
- A strategy for preparing for certain occupations and for successful involvement in theworkforce;
- A component of lifelong learning and training for civic responsibility;
- A tool for encouraging sustainable development SD; and

- A strategy for alleviating poverty (FRN, 2004, p. 30).

In order to achieve these goals, the main features of the curricular activities for TCs are structured in foundation and trade modules for respective trades. The TVET programmes are run by the federal and state governments. However, someprivate institutions also provide this form of education in Nigeria. TVET programmes are offered at various levels of education. The polytechnics, mono-technics, and TCs provide TVET which are supervised by the NBTE. A *polytechnic* is a technical institution offering post senior secondary technical education programmes leading to the award of diplomas at Ordinary National Diploma (OND) and Higher National Diploma (HND), while the *mono- technic* is similar to the polytechnic but provides instruction in a single technical subject/area.As discussed in Chapter 1, section 1.1, Nigeria operates the 6-3-3-4 education system (FRN 2004). This comprises six (6) years of primary and three (3) years of junior secondary school.The pre-vocational courses are provided at the junior secondary level. Six pre-vocational subjects are provided in which introductory technology (Basic Technology) is the core subject;the five other electives include agriculture, business studies, home economics, computer education, and local crafts. Transition to the TVET programmeme takes place after completion of the JSS. Sixty percent (60%) of learners are expected to proceed to the senior secondary schools, 20% to TCs, 10% to vocational training centres, and 10% to apprenticeships (FRN, 2004). However, the proportion going to the TCs is far lower than projected (Oviawe et al., 2017). This is because of the poor perception of TVET institutions held by society. However,Osidipe (2017) also noted that the dismal enrolment of students in technical and vocational programmes has been linked to inadequate teaching and learning resources.

TVET in Nigeria is included in the NPE (Okoye & Okwelle, 2013). The TVET policyis incorporated in the broader NPE and is applicable to all sectors of education and training inthe policy. The philosophical foundation of the policy is committed to provide equal access to educational opportunities for individuals and developing individuals to become useful members of the society who will contribute to the development of the community and nation (Adeyemi, 2012). The philosophy of education in Nigeria is based on three principles: full community integration; the development of the individual into an effective citizen; and the provision of equal access to educational opportunities for all citizens of the nation at the primary, secondary, and tertiary levels both inside and outside of formal school system (FRN, 2004). The supply of suitable information, skills, and competences would be necessary for theprocess of developing and integrating persons into

the community (Rieckmann, 2018). The development of marketable skills, which could be learned through TVET, individuals shouldbe incorporated into the community and the labour force (Maigida, et al., 2013).

The philosophy guiding TVET is to impart knowledge, skills, and competencies beneficial for individuals to become productive members of society (Oviawe et al., 2017). In addition to being understood as an integral part of general education, TVET is also projected as a means of preparing individuals for occupational fields and for effective participation in the community and the world of work. Additionally, it is a component of lifelong learning; citizenship training; an instrument for encouraging ecologically sound SD, and a strategy for reducing poverty (FRN, 2004). In this way, it is intended that TVET would provide people theknowledge and abilities they need to succeed throughout their lives.

To achieve the objectives of the national policy, it is recommended that theory and practice be integrated in TVET delivery. However, challenges such as unqualified teachers and insufficient teaching and learning facilities contribute to the poor quality of training. Thesechallenges hinder the realisation of the TVET philosophy, which aims to equip individuals with employable skills (Oviawe et al., 2017). The NPE acknowledges that acquiring scientificknowledge and its applications should be a part of TVET. The policy notes that acquisition ofPRS and competencies should be an aspect of TVET; this will produce individuals with employable skills and competencies. TVET is meant to foster a positive work environment among employees in a variety of vocational vocations in addition to providing them with the necessary skills and abilities.

However, despite the numerous advantages of TVET, practitioners in Nigeria report that it is negatively perceived by the general public, often seen as a sector exclusively for academically inept students. This perception is contrary to the vision and objectives of the sector (Oviawe, 2018). In other words, the public believes that they are academically challenged pupils' programmes (Oviawe, 2018). The public's misunderstanding leads to the misrepresentation of TVET as programmes tailored solely for academically struggling students.

The TVET sector faces challenges due to the perception that it primarily caters to low-status students with poor academic performance (Oviawe, 2018). This negative perception contributes to the fragmentation within the provision of TVET education and training (Papier, 2017). The sector's structures are fragmented, and there is an unregulated conventional

apprenticeship system, as well as a growing significance of private TVET centres. TVET systems are supply oriented, and there is an imbalance between the availability and demand for skills (AU, 2007). The AU cited further issues as well, such as the poor prestige and appeal of TVET, gender-based opportunity inequalities, as well as regional and economic disparities. The training offered is of such low quality that it is ineffective; despite potential national-level efforts, policies, and laws, there is nevertheless insufficient money and ineffective policy implementation systems (Arfo, 2015).

2.3.1 Issues and Challenges of TVET in Nigeria

As observed in the previous section, the NPE highlights the goals of establishing a TVET system that would yield a skilled workforce capable of applying scientific knowledge and developing practical applications. Additionally, the structure of the TVET system aims to produce individuals who can effectively utilise theoretical knowledge to solve practical problems (Oviawe et al., 2017). The goal of TVET would be to create a workforce that is effective on the job market and has the knowledge and abilities necessary to meet market demands (Arfo, 2015). The supply and delivery of high-quality and responsive TVET in the nation are now hampered by problems surrounding TVET practice in Nigeria (Osidipe, 2019). The following sub-sections list and discuss the challenges surrounding TVET practiceand provision in the country as identified by TVET practitioners and stakeholders in Nigeria.

2.3.1.1 Governance in TCs

The governance of TVET in Nigeria not only varies from one level of education to the other, but is also fragmented from one level to the other (Legg-Jack, 2018). Based on levels and institutions, the sector is governed differently notably at the universities. In Nigeria, TVET provision is governed/coordinated and overseen by the NBTE, while each university oversees and coordinates its TVET programmes and provision (Olayele, 2021). The universities where the programmes are associated manage the undergraduate TVET programmes in the colleges of education (technical) that provide degree programmes, while TVET programmes at Nigeria Certification in Education (NCE) level are coordinated by the National Commission for Colleges of Education (NCCE). The TVET programmes offered in some colleges of education (technical) that run degree courses are coordinated and supervised by both the universities and

the NCCE for the NCE programmes.

Another challenge of governance in TVET, as identified by Omonijo et al. (2019), is the differences in the period of time spent during student industrial work experience scheme (SIWES) from one institution to the other. Ayonmike et al. (2015) made it a known fact that TVET programmes are solely supervised by the NBTE. The running of the TCs in each stateis governed by each state. The quality of service and provision of the necessary enabling environment is solely left to the state government.

2.3.1.2 Inadequate funding

TVET in the public TCs is solely funded by the government. The NPE stated that TVET is expensive and therefore requires adequate funding. Due to the training facilities required for the programmeme's successful execution, TVET requires a significant investment in capital (Ziderman, 2003). Recognising this reality, the government reaffirmed its efforts to provide money for the efficient execution of TVET programmes in the many institutions that provide them. The reality, though, has been the opposite. Akanbi (2017) noted that TVET programmeshave been affected due to insufficient funds. The problem of poor funding of TVET programmes by the government and donor agencies has been a major issue (Ogbuanya & Izuoba, 2015). The provision and the use of modern training facilities depends on the capacityof the allocated budget by the government.

Another shortcoming of TVET practice in Nigeria is inadequate teaching and learningfacilities (Ayonmike et al., 2015). Many of the TVET institutions lack adequate facilities necessary for effective teaching and learning (Okoye & Arimonu, 2016). However, most of the departments lack adequate teaching materials due to insufficient funds. And where funds are allocated, they not enough to carter for the needs of the sector for the provision and deliveryof quality and responsive TVET programmes (Akanbi, 2017). The problem is that the lack ofteaching and learning facilities affect the quality of TVET programmes and provision in the TCs. Modern training materials and equipment are thus needed in the TCs to meet the changing technologies in the industries (Audu et al., 2013).

2.3.1.3 Lack of adequate TVET tools, facilities, and equipment

The achievement of maximum efficiency in the TCs depends on the availability of adequate and modern training facilities and equipment (Hassan et al, 2019). This depends on the adequate provision of modern facilities, in terms of infrastructure and equipment, to ensure quality training. Insufficient and inadequate funds to run the TCs contributed to the lack of adequate tools, machines, and equipment, which has affected the quality of training. Studies by various TVET experts have shown that the major challenge to the implementation of TVET programmes in Nigeria is the inadequacy of training facilities, and non-functional tools and equipment; this is traceable to inadequate funds (Ayonmike et al., 2015; Ezekoye, 2017; Legg-Jack, 2018).

Additionally, it was discovered that the effectiveness of TCs in Nigeria is hampered by lack of proper workshop tools, equipment, and library facilities, among other things (Godstime & Joseph, 2019). Legg-Jack (2018) argued that a good number of TCs experience the challenge of inadequacy in terms of modern workshops tools, machines, and equipment. Therefore, proper availability of training facilities and suitable workshop tools and equipment is required if TVET programmes are to be as effective as possible. This will guarantee excellent training in the TCs (Manabete & Umar, 2018).

2.3.1.4 Public perception of TVET

In Nigeria, the general public has a negative perception of TVET. According to Eze and Okorafor (2016), TVET is regarded as a career path for the less academically endowed rather than effective training to produce skilled workers for employment and sustained livelihoods. The programmeme thus suffers from poor enrolment. This is not far-fetched from the poor socialperceptions of students that enrol in the TVET programmeme. A common societal conception isthat only academically inept students opt for TVET courses, since the courses involve more practical work than having to read or make use of the brain. Such negative perception has positioned TVET as a field for intellectually disabled people; a low-status industry and one that society misperceives. Furthermore, the African Union Congress (AUC) also cited that TVET graduates have few options for furthering their studies and developing their careers.

2.3.1.5 Youth unemployment and underemployment

Okorafor and Okorafor (2011) stated that TVET is geared towards the production of the educated man/woman who can effectively use his/her head, heart, and hands for the purpose of economic development. “The growing problem of youth unemployment and underemployment is one of the main socio-economic development concerns of most African governments” (AU, 2018, p. 8). The high rate of youth unemployment serves as a clear indication of the pressing need for TVET to assume an active role in society. Uwaifo and Uddin (2009) explained that TVET is aimed at developing not only practical skills but also attitude and habits that make the products of such training to be creative, innovative, and resourceful. Economic development and the desire for self-reliance and self-sustainability are the driving forces for acquiring the skills needed for modern industries.

2.3.1.6 Skills mismatch

The ILO (2018) indicated that 677 million people are undereducated for their jobs, while the remaining 28% (258 million) are overeducated. This new data by the International Labour Organisation Department of Statistics (ILOSTAT) covers 114 countries. The ILO report mentioned that the level of education required in a job does not always match the workers’ level of education, in that worker are either overeducated or undereducated for their jobs. Thecreation of new jobs in the formal sector of even quickly emerging countries has not kept up with the rising number of new job seekers, according to Afeti and Adubra (2014), which theyclaim is paradoxical. Employers are requesting for more qualified individuals with strong technical and soft skills, according to Salleh and Sulaiman (2020); however, the skills gap is an arising issue for the global workforce. Similarly, Pitan and Adedeji (2012) too identified amismatch between supply and demand for skills. Mismatch is also noted in the training and labour market demand for skills. Therefore, there is a need for TVET that prepares the youthswith skills that will make them employable, and thereby contribute to the national development of the country.

2.3.1.7 Out-dated TVET curriculum

According to Amadi and Ememe (2013), the practical and occupational components of the TVET curriculum are based on the occupational and cognitive abilities. In addition to this,

there should be the integration of traditional school subjects which would provide a strong foundation for the development and understanding of practical skills (Kelley & Knowles, 2016). The academic curriculum in Nigeria's educational institutions has been adjudged to be out-dated (Okoye & Arimonu, 2016). Nigeria's underdevelopment has often been linked to the lack of modern curricula in the schools that reflect the emerging changes in the society, especially the technological changes (Bandele & Faremi, 2012).

2.3.1.8 Poor quality of training

The quality of the training of TCs' teachers is greatly affected by the poor or lack of essential materials needed for training (Eze & Okorafor, 2016). Okorafor and Okorafor (2011) affirmed that inadequate training, along with a lack of up-to-date teaching and learning materials, affected the quality of training or re-training of teachers. They further attested that the use of out-dated tools and equipment, inadequate qualified competent and motivated teaching staff, and lack of innovative strategies contribute to low quality training. This poor quality of training adversely affects the quality of training and instruction the students will receive from the teachers.

2.3.1.9 Inadequacy of qualified technical teachers

There is a gap between the number of expected qualified technical teachers and the actual number of available qualified technical teachers (Iwuanyanwu, 2019). This is one of the challenges of TVET in achieving the stated objectives of TVET in the TCs (Oviawe, 2018). Any educational programmeme's success or failure will depend on the calibre of the teachers and technical instructors it employs, according to Fafunwa (2018). Additionally, it was maintainedthat having an appropriate cadre of technical instructors is the cornerstone of a robust, high quality educational system. In order to achieve the expected results of the needed developmentthrough TVET, there is the need to supply the system with an adequate number of qualified teachers. Bandele and Faremi (2012) further revealed that TC instructors face issues related toa lack of in-service training and poor working conditions.

2.3.1.10 Poor utilisation of information and communication technology (ICT)

One of the current challenges facing TVET is the poor utilisation of ICT in the delivery of teaching and learning activities in the TCs (Onwusa, 2021). The number of computers available for teaching-learning activities is inadequate in TCs in Nigeria. Their use is usually impaired by the inadequate skills of the teachers who use the system (Olelewe et al., 2020). Another problem affecting the utilisation of ICT is poor power supply from the national grid. Frequent outages affect the use of computers for teaching activities when alternative sources of power are not provided (Anene et al., 2014). UNESCO (2008) affirmed that the integration of ICT in TVET would benefit the teachers and students in the sense that it will be used as tools that support and help to improve teaching and learning activities.

2.3.1.11 Lack of monitoring and evaluation

The government at various levels established the inspectorate units to oversee the day to day running of the various institutions. Usman and Chinyere (2021) pointed out that the reason forthe establishment of the inspectorate services is to ensure that standards are strictly regulatedand maintained. However, it has been noted that this purpose seems defeated, as it has been found that poor quality control affects the implementation of quality TVET programmes in the TCs (Ayonmike et al., 2015).

Another important point that forms part of the discussion and literature review in this chapter is a scrutiny of major policies and initiatives implemented in the country. This is the focus of the next section.

2.3.2 TVET Major Policies and Initiatives in Nigeria

The Western education that was introduced in 1842 in Nigeria did not emphasise the acquisition of practical skills to make citizens self-reliant; but instead, it compelled the recipients to serve the purpose of the missionaries (Akanbi, 2017). TVET has been adjudged by many scholars to play a critical role in the national development of the country. In order to achieve this goal, many policies have been formulated to reform TVET so that it can address the socio-economic challenges in Nigeria (Okorafor & Nnajiofo, 2017). The modern economy of any nation is technology-driven. This form of economy could only be driven by skilled

technicians and workers in order to attain sustainable economic development. Chukwumerije (2011) affirmed that this could only be achieved with an effective policy-driven TVET system. Many developing countries are faced with youth unemployment, underemployment, and poverty (Aiyedogbon & Ohwofasa, 2012). This has led many countries to refocus TVETand recognise it as the main thrust to attain SSED (Paryono, 2017). In Nigeria, TVET has been recognised and adopted as the pillar for the national economic development strategy (Johnson & Folahan, 2020). The form of educational system handed over to the country by the colonial masters did not meet the modern-day challenges. This informed the 6-3-3-4 educational system that was introduced, namely: six years of compulsory primary education; three years of junior secondary school; three years of senior secondary school; and four years of university education. The policy sought to introduce a functional technology-based education that could sustain the nation's economic activities for rapid socio-economic development (SED) (Okorafor & Nnajiofor, 2017).

It has for a long time now been acknowledged that TVET is essential to Nigeria's national growth. In order to solve the socioeconomic difficulties in Nigeria, many strategies have been developed with regard to reforming TVET (Okorafor & Nnajiofor, 2017). This is seen as very important in meeting the challenges of a technology-driven economy by producing skilled manpower for the country's economy. In 1977, the FGN introduced the 6- 3-3-4 Education Policy with the aim of establishing a functional, technology-based educationsystem for the nation's citizens. Recognising the pivotal role of TVET in technological development, a significant proportion of education expenditure at both federal and state levelsshall continue to be dedicated to vocational education (FRN, 2004, p. 35).

The capability to develop Nigeria's youths into highly trained and capable citizens will play a significant role in the country's ability to realise its aim of ranking among the 20 greatest economies in the world by the year 2020 (Ebenechi & Oguche, 2012; Dalubi, 2009). Because of this, there has been a stronger commitment to TVET (FME, 2012, p. 54). TVET national policies and strategies should be firmly rooted in indigenous knowledge and learning systems that reflect cultural practices and local values, technological preferences, the challenges of globalisation, and national development in addition to being based on related international best practices (AU, 2018, p. 7).

In order to achieve this at the national level, Legg-Jack (2018) affirmed that there should be an active participation of the private sector in the national TVET system. National

bodies to monitor and supervise should be created with an oversight function of training; passing legislation to improve the education and training system, as well as collaborating closely with training facilities and instructors to formulate the current skill requirements in connection to buyer (AU, 2018; Adepoju & Famade, 2010; Arfo, 2015). To achieve an integrated TVET system at national, regional, and global levels, they should go through the development and implementation of national and regional plans. There should be an establishment of common quality standards which will lead to genuine standardisation in TVET (AU, 2018; Paryono, 2017). The introduction of the NQFs was suggested to attain the acceptable qualifications and standard nationally (ILO, 2011; Young & Muller, 2015). These qualifications, however, should also be acceptable outside the shores of the country. In addition, there must be a mutual recognition and harmonisation of training among countries and across formal and informal systems. Finally, there should be mobility of players, especially teachers, within and outside the region.

TVET in Nigeria aims to assist the federal and state education authorities in their effort to revitalize reform and expand the provision of skills, vocations, science and technology to meet the nation's present and future socio-economic needs (Bello, & Muhammad, 2021). The following key documents help guide the development of TVET in Nigeria: National Policy on Education

Nigeria's TVET policy is incorporated in the National Policy on Education. Nigeria's philosophy of education is based on the development of the individual into a sound and effective citizen; the full integration of the individual into the community; and the provision of equal access to educational opportunities for all citizens of the country at the primary, secondary and tertiary levels both inside and outside the formal school system (FRN, 2004, p. 7). In addition, in developing and integrating individuals into the community would require the provision of appropriate knowledge, skills and competencies, individuals should be integrated into the community and the labour force through acquisition of employable skills, which would be acquired through TVET (Afor, 2015). TVET should be geared toward the provision of knowledge, skills, and competencies that would develop individuals to become useful members of the society. The main goal of TVET is to equip individuals with relevant knowledge, skills, competencies and attitude that would integrate them into the labour market and thereby make them contribute to the SSED of the nation. TVET is further seen as an integral part of general education; a means of preparing for occupational fields and for effective participation in the world of work; an aspect of lifelong learning and a preparation

for responsible citizenship; an instrument for promoting environmentally sound sustainable development; a method of alleviating poverty (FRN, 2004, p. 29-30). Furthermore, TVET is seen as a basis for facilitating technological development and improving individual's standard of living.

To create a functional technology-based education, the Nigerian Federal Government (FGN) implemented the 6-3-3-4 education policy in 1977 (FGN, 1977). In recognising TVET as an integral part of technological development, the FGN proposed that more funds should be set aside for technical and vocational education in the federal and state TVET institutions (FGN,2004).

In recognition of the important roles that TVET plays for economic growth and in providing skills for self-sufficiency, the federal government established some boards and agencies to oversee and support TVET in the country. These boards and agencies have impacted positively on the Nigerian TVET system.

In the Third National Development Plan, 1975-80, the objectives for education were stated as follows:

- To expand facilities for education aimed at equalizing individual access to education throughout the country;
- To reform the content of general education to make it more responsive to the socio-economic needs of the country;
- To make an impact in the areas of technological education so as to meet the growing needs of the economy;
- To consolidate and develop the nation's system of higher education in response to the economy's manpower needs;
- To streamline and strengthen the machinery for educational development in the country; and
- To rationalize the financing of education with a view to making the educational system more adequate and efficient.

The Federal Government also identified the acute shortage of technical manpower as a major constraint towards the execution of the development plan (Onuegbu & Aniefiok, 2016). In

response to this, government in 1972 established the then National Science and Technology Development Agency (which later metamorphosed to Federal Ministry of Science and Technology) which set up a Working Committee on Scientific and Technical Manpower and Science Education. The Committee produced a report on middle-level technical manpower and their training. Some of the Committee's recommendations included the following:

- in order to have a nationally accepted standard in technical education, there should be a harmonization of the entry qualifications and diploma standards throughout the nation;

- in order to eliminate the non-uniformity in terminal diplomas issued by existing colleges of technology, there should be a national certificate in technical education;

- in order to attract the right kind of staff to the technical colleges (now polytechnics) there should be a harmonization of technical staff standards including staff structure, remuneration and conditions of service;

- in view of the fact that courses in many technical fields from which the Development Plans need to draw manpower at the middle-level are not provided for in our existing colleges, there should be expansion of the courses and facilities in these colleges; and new colleges should take into account the required courses in planning their programmes;

- in view of the gaps in the admission capacity and actual enrolment for the existing courses in the technical colleges (now polytechnics) there should be full utilization of these facilities through a review of the admissions policy, including part-time admissions, and massive awards of technical scholarships;

- in order to encourage more enrolment in technical courses, more avenues for practical experience for newly qualified trainees, should be created; this can be achieved through immediate employment of the trainees in public and private industries using, if necessary, the facilities of the Industrial Training Fund.

The Committee further recommended that a National Board for Technical Education be created which should be charged with the implementation of its recommendations.

The Federal Government established the National Board for Technical Education by Act 9 of January 1977.

- National Board for Technical Education

The NBTE Enabling Act No. 9, 1977 established the National Board for Technical Education which is tasked with coordinating and supervising all aspects of technical and vocational education falling outside of university education. This encompasses all TVET institutions, including polytechnics, monotechnics and technical colleges. The Board is empowered to determine Nigeria's labour power needs in the industrial, commercial and other relevant fields. It also advises the Federal Government on the financial needs of polytechnics and other technical institutions, and receives and allocates grants from the Federal Government to polytechnics.

The Federal Ministry of Education has the overall responsibility of formulating national policies and guidelines for the standardization of education at all levels in Nigeria. This is enshrined in the Constitution of the Federal Republic of Nigeria, 1999. The Federal Ministry of Education is in charge of the activities of the sector in Nigeria. The vision of NBTE is to be a world class regulatory body for the promotion of TVET in Nigeria and the mission is to promote the production of skilled technical and professional manpower for the development and sustenance of the national economy.

- National Minimum Standards and Establishment of Institutions Act 16
- National Minimum Standards and Establishment of Institutions (Amendment) Act 9.

In August, 1985 and January 1993 respectively, the Federal Government enacted Act 16 (Education (National Minimum Standards and Establishment of Institutions) Act) and Act 9 (Education (National Minimum Standards and Establishment of Institutions) (Amendment) Act). With these Acts, the functions of the Board were extended to include accreditation of academic programmes in all Technical and Vocational Education (TVE) institutions. Act No.9 of 1st January 1993 further empowered the Board to recommend the establishment of private Polytechnics and Monotechnics in Nigeria.

The functions of the Board are derived from:

- Act No. 9 of 11th January, 1977
- Education/National Minimum Standard and Establishment of Institution Act No. 16 of August 1985 and
- Amendments Act No. 9 of 1993.

- The functions of the Board as contained in its enabling Decree 9 of 1977 are as follows:
- advise the Federal Government on, and co-ordinate all aspects of technical and vocational education falling outside the universities;
- determine, after consultation with such other bodies, the skilled manpower needs of the country in the industrial, commercial and other relevant fields;.in particular to prepare periodic master plans for the balanced and coordinated development of polytechnics and such plans shall include; the general programmes to be pursued by polytechnics in order to maximize the use of available facilities and avoid unnecessary duplication; recommendations for the establishment and location of new polytechnics; inquire into and advise the Federal Government on the financial needs, both recurrent and capital, of polytechnics and other technical institutions; receive block grants from the Federal Government and allocate them to polytechnics in accordance with such formula as may be laid down by the Federal Executive Council; act as the agency for channelling all external aid to polytechnics in Nigeria;
- advise on, and take steps to harmonise entry requirements and duration of courses at technical institutions;
- The recent acts extended the functions of NBTE to include:
- the establishment and maintenance of minimum standards in polytechnics and other technical institutions in the Federation,
- accreditation of academic programmes in all technical and vocational education (TVE) institutions for the purpose of award of national certificates and diplomas and other similar awards.
- Ministerial Strategic Plan (2016-19), 1993.

This Plan is built around three result areas of access, quality, and systems strengthening and comprises of ten pillars, spanning all levels of education. The access results area includes the pillars of out-of-school children, adult literacy, and TVET. The Ministerial Strategic Plan (MSP) 2016-2019 is built around the three results areas of access, quality, and systems strengthening. The plan is comprised of ten pillars and covers all levels of education which starts with early childhood through tertiary education. The access results area includes the pillar TVET which is pillar 7. The outcome statement for the access results area is for the

enhanced capacity of Nigeria's formal and non-formal education systems that provide qualitative access to 100 percent of out-of-school and school-age children, boys and girls, in basic education; 70 percent of eligible youths to TVET and tertiary education; and 75 percent of adults to non-formal education and lifelong learning opportunities. The quality results area includes the pillars of basic education (Pillar 2); teacher education (Pillar 3); basic and secondary curriculum (Pillar 6); and tertiary education (Pillar 8). The outcome statement for the quality results area is to strengthened human capacity for child-centred interactive teaching and quality assurance at all levels of educational development in Nigeria; enhance innovativeness, functionality, relevance, market-driven knowledge and skills acquisition and transitioning into formal and non-formal education. The final systems strengthening results area includes the pillars of Nigeria Education Management Information System (NEMIS, Pillar 5); information and communication technologies (ICT) in education (Pillar 9); and library services in education (Pillar 10). The outcome statement for the systems strengthening results area is for improved evidence-based decision making that will assist transparency, governance, accountability, and innovation in education delivery. Each of the ten MSP pillars includes a series of activities to be completed and associated targets to be achieved over the 2016-2019 period. The MSP is a strategy document that defines activities to be implemented by various federal as well as state-level actors and programmes, notably the UBE programme when it comes to basic education reforms. The MSP was adopted by the National Council on Education, but its national goals have not yet been translated to state-level goals and activities. In addition, costing of foreseen interventions has only been completed for federal activities – and to date, no budgetary allocations have been made towards these activities. But as a strategy, the MSP makes an important contribution towards alleviating constraints on achieving education sector outcomes by including a focus on system strengthening, and in particular on evidence-based decision making and improved transparency and accountability.

With the above background in mind, the relationship between policy and practice is unpacked next.

2.3.2.1 Relationship Between Policy and Practice in Nigeria

The provision of a good policy has the potential to translate into good practice by TVET practitioners and managers. Mosse (2004) stated that a policy is characterised by a plan, decision, and intentions. Practice is characterised by implementation, actualisation, and action.

A sound policy is expected to generate good practice that will lead to and support sound programmes and practices (Paufler et al., 2020). A policy, on the one hand, is concerned with a written statement about what is to be done, while practice, on the other hand, is concerned with how it is done. The AU (2007) asserted that the NQF is one of the best practices in the TVET system in several countries; if it is established and well-implemented, it will bring integration in the system.

The TVET policy paper in Nigeria is considered sub-standard since it is incomplete, disjointed, and devoid of specifics. A TVET quality assurance system is one of the basic TVET policy areas that are missing from the larger national policy on education, which is suggested by UNESCO and the ILO. Along with insufficient money, substandard training facilities and a lack of competent personnel, the absence of these fundamental policy areas result in poor and weak execution, which ultimately adds to the neglect of the TVET sector. Negative development in technical education, as noted by Kozik (2015) in Slovakian schools, led to many problems for the country later in the years. The early 21st century had adverse consequences for society; large companies began to lack qualified specialists for manufacturing, construction, and services because few students opted to pursue technical education. The government finally understood that competitive individuals who are educated, competent, inventive, and flexible are what makes Slovakia competitive. The government then set up the necessary framework for enhancing engineering and science.

2.3.2.2 Gaps Between Policy Document and Implementation of TVET in Nigeria

Akanbi (2017) opined that for any policy to be successful there must be some inbuilt mechanism for implementation, monitoring, supervision, feedback, improvement, effectiveness, and evaluation. However, the TVET policy in Nigeria does not always conform to some of these guidelines. It has been argued that the gap between policy and implementation of TVET is not confined to Nigeria alone. Akanbi (2017) remarked that some African countries also experience similar issues. Forje (2013) observed that in Cameroon, TVET is often neglected, and those who decide to pursue TVET are regarded as dropouts. The sector is no doubt neglected and suffers inadequate teaching and learning facilities, trained technical teachers/instructors, and there is a shortage of machines and equipment. The situation is similar in Uganda, Kenya, Zambia, and Zimbabwe (O'dama, 2013; Matafwali, 2013; Amayo, 2013).

2.3.2.3 Bridging the Gap Between Policy and Implementation in Nigeria

The gap between the policy and its implementation needs to be addressed accurately. There is a need to bridge the gap between the policy and implementation. The creation of the Department of Higher Education and Training (DHET) in 2009 in South Africa represents a major step forward in integrating vocational education and training policy in Africa, thereby setting a pacesetter for other African countries (Organisation for Economic Co-operation and Development [OECD], 2015).

In Nigeria, the NBTE was established in 1977 to address the shortage of technical manpower by a decree. In 1985, another decree was set in place to replace the 1977 educational policy (National Minimum Standards and Establishment of Institutions) Decree. In 1993, the NBTE was amended; however, in the same year, another amendment took place which initiated the establishment of more institutions (Chukwumerije, 2011). In 2009, the 9-3-4 education system was to replace the 6-3-3-4 system (Uwaifo & Uddin, 2009; Orluwene & Igwe, 2015). With all of the above policies, it is expected that they would propel Nigeria into a technologically advanced nation in the area of skills provision. Nevertheless, there are numerous shortcomings observed in the policies. It has been pointed out that there is a difference between policy formulation and policy practice. The NPE proposes a ratio of 3:1 between the secondary and vocational education, but this is not so (Jammeh et al., 2018). Nigeria has not been able to achieve the national policy on education ratio based on the general apathy to TVET in the country.

Furthermore, it has also been observed that poor perception of the society towards TVET has an effect on the low self-esteem of TVET students. This has limited their opportunities to pursue higher studies. Funding of TVET is also a major problem in the country which has been a recurring issue of discussion (Hussaini & Jumba, 2018). According to Okorafor and Nnajiofo (2017), Nigerians spend an average of 2.3% of their gross domestic product (GDP) on education. This is about 6% of the total budget, which is very low. UNESCO (2015) recommends that at least 26% of the national budget should be devoted to education. Chukwumerije (2011) affirmed that when it comes to the allocation of funds to institutions, TVET institutions are the least prioritised. In the 2011 and 2012 FGN budget, TVET was allocated 0.13% and 0.05% of the total proposed FGN budget.

The FRN (2004, p. 35) suggested that each TC develop and run a production

unit for on – the- job training and commercial operations to support the TC operation and to promotecollaboration with the industries. This goal is far from being achieved due to the lack of adequate teaching and learning facilities in the TCs. It has been observed that the Nigerian government is efficient in the formulation of good policies, but the problem lies in the implementation thereof. This poor implementation of the policies is not farfetched from the fragmentation in policy, faulty institutional framework, and lack of political will to implement the policies. Eze and Okorafor (2012) noted that education in developing countries in Africa is still designed after the Western models and paradigms that have little connection to life in Africa. Political instability, as noted by Okorafor and Nnajiofo (2017), has a negativeinfluence in the policy implementation in education and other sectors of the economy. The instability of the political environment where insufficient time is given to the implementationof the policies before a change of government often leads to policy inconsistency. Different political parties tend to design their own educational agenda without considering the continuation of the existing agenda by the previous government. The policy implementation has also been affected by corruption in Nigeria and other African countries (Makinde, 2005).Funds allocated for the implementation of TVET programmes have been diverted to other sectors which has resulted in inadequate provision of funds for teaching/learning facilities in TCs (Okoye & Arimonu, 2016).

As this chapter has identified so far, skills development is pivotal in advancing the nation, and remedying much of the poverty and unemployment challenges experienced in the country, particularly among the youth. This is discussed further in the sections below.

2.4 Skills Development

2.4.1 Reforming TVET on Workplace Learning and Skills Development

TVET plays a major role in developing and promoting the skills of TC graduates and getting them ready for the world of work. In order to meet the modern challenges of work, TVET and its interventions should be aligned with the needs of 21st century skills or 'new economy' skills (Salleh & Sulaiman, 2020). The employers of labour need more competent workers who have good technical and soft skills. However, it has been noted that the skills gap is a growing problem for the global workforce (Laboissiere & Mourshed, 2017). Modern workers must be competent in their areas of specialisation. The OECD (2015) defined 'competency' asworkers'

capability of applying skills in specific contexts. The competency of workersinvolves the ability to perform some functions using skills, knowledge, and attitudes. TVET should be geared towards meeting the expectations of the workers by reducing skills mismatch and improving demand and supply needs of the workers in the labour market (Salleh & Sulaiman, 2020).

TVET is considered key in achieving SD in Nigeria. The country is persistently faced with the youth employment and inadequate skills to meet the present world of work. The main goal of TVET is to offer a platform for the development of social and work-related skills as well as marketable skills for the workforce or for job creation (Osidipe, 2017). Despite the formulation of different policies and programmes like the National Economic Empowerment and Development Strategy (NEEDS), Subsidy Re-Investment and Empowerment Programmeme (SURE-P), National Directorate of Employment (NDE), and the National Youth Service Corps (NYSC), they did not help in reducing the unemployment rate (Afolabi, 2015).According to the National Bureau of Statistics (NBS), the 2022 unemployment rate is projected to be about 33.3%. However, underemployment is 22.8%; youth unemployment is 42.5%; and youth underemployment is 21.0% National Bureau of Statistics, (NBS, 2022). The acquisition of skills and knowledge are the engines that power the economic growth and social development of any nation (Osidipe, 2017). The Nigerian youths need the required skills in the industry to secure their desired jobs so that they can contribute their quota to the economy. The constant technological changes in the work environment are led by technological advancement which needs to be matched with the demand in labour and supply. Hence, the investment in education for skills acquisition is set to empower people; this in turn enables individuals to be self-sufficient and to contribute to the advancement of the economy.

2.4.2 National Board for Technical Education

The NBTE was established through the National Board for Technical Education Act, No. 9 of 1977 (NBTE, 2001; Ademiluyi & Okwuanaso, 2018). Some of the functions of the Board include:

- Advising the FGN on and co-ordinating all aspects of technical and vocational education falling outside the universities, and making recommendations on the national policy necessary for the full development of technical and vocational

education for the training of technicians, craftsmen, and other middle-level and skilledmanpower.

- Determining after consultation with the National Manpower Board, the Industrial Training Fund, and such bodies as it considers appropriate, the skilled and middle levelmanpower needs of the country in the industrial, commercial, and other relevant fieldsfor the purpose of planning training facilities and, in particular, to prepare periodic master plans for the balance and co-ordinated development of polytechnics andcolleges of technology.

Such plans shall include:

- The general programmes that polytechnics and colleges of technology should undertake in order to make the best use possible of the facilities that are already in place, minimise needless duplication, and make sure that they are sufficient for the nation's manpower demands.

- Recommendations for the development and location of new polytechnics and collegesof technology, if and when deemed required.

- Examining and advising the FGN on the budgetary requirements, both ongoing and capital, of polytechnics, colleges of technology, and other technical institutions to allow them to achieve the goal of generating the skilled labour the nation requires.

- Block funds from the FGN and distributing them to polytechnics and schools of technology in line with whatever formula the president may establish.

- Serving as the intermediary for the distribution of all foreign funds to Nigeria's polytechnics and technical institutes.

- Making recommendations and taking action to unify the prerequisites for admission and the length of courses at technical institutes.

- Determining minimum skill requirements and re-evaluating them as needed to meet technology and societal requirements.

- Reviewing student and trainee evaluation techniques and creating a national certification plan for technicians, artisans, and other skilled workers in coordination with ministries and entities that offer technical training programmes.

- Conducting routine evaluations of the terms and conditions of employment for staff members at polytechnics and colleges of technology and presenting suggestions to theFGN.

- Gathering, evaluating, and releasing data on technical and vocational education.

- Recommending to the visitor of a polytechnic that a visitation be made to the polytechnic as and when it is considered necessary; and

- Examining any issue relating to technical or technological education-related issue thatthe Minister may from time to time refer to it.

The decree that established the Board indicated that the Board should also collaboratewith other agencies to determine the human resource needs with a view to develop responsive programmes that would meet their skills needs (Ikpe, 2010). In order to achieve this, the Board established the National Vocational Qualifications Framework (NVQF), subsequently approved by the Federal Executive Council (Abubakar et al., 2013).

2.4.3 Establishment of National Vocational Qualifications Framework

The NBTE (2011) stated that "the national vocational qualifications framework (NVQF) is a system for the development, classification and recognition of skills, knowledge and competencies acquired by individuals regardless of how and where the training or skills was acquired". The framework clearly shows how one qualification can be compared with another. Opoola (2020) explained the imperative of the NVQF to include:

- Providing the crucial common ground on which requirements for graduation, job entrance, career advancement and compensation might be simply and fairly assessed.
- Standardising learning objectives, competence to be reached and shown, and the technologies used in the creation of skilled labour at both the formal and informallevels.
- Strengthening the connection between the industry and the field of vocational training.
- Providing practical tools for APEL achievement evaluation.
- Promoting lifelong learning and increasing access to education.

- Offering a framework for working adults and young people to retrain and upgradetheir skills. The NVOF makes it easier to move through the formal education required for economic, commercial, and agricultural growth.
- Giving informal and formal training as the TVET involve teaching and providingtrainings.

The Nigerian Skills Qualification Framework (NSQF) formerly National Vocational Qualification Framework (NVQF) is a system for the development, classification and recognition of skills, knowledge and competencies acquired by individuals, irrespective of where and how the training or skill was acquired (NBTE, 2021). The system gives a clear statement of what the learner must know or be able to do whether the learning took place in a classroom, on-the-job, or less formally. The framework indicates the comparability of different qualifications and how one can progress from one level to another. The framework is the structure within which the National Skills Qualifications (NSQs) operate.

The framework aims at promoting lifelong learning and providing quality assurance and recognition. Lifelong learning is necessary to enhance an individual's employability in a rapidly changing world of work. People should have opportunities for training to meet needs arising from technological and economic development and changing career paths (Wilson, 2013). National Vocational Qualifications Framework can offer Nigeria an instrument for promoting the development of new qualifications, making delivery more flexible and widening the range of providers.

The framework is used to increase the influence of stakeholders in the development of qualifications so that the system is more responsive to the needs of the labour market (Comyn, 2018). Employers and workers' organisations have an important role to play in developing competency standards for qualifications. Validation of qualifications/standards is important in ensuring that the qualification is designed to meet certain agreed criteria and ensuring that the standards meet the specific sector requirements (NBTE, 2021).

The main objective of NSQF is to ensure the quality, status, relevance, provision and availability of TVET (Bello, & Muhammad, 2021). The complexity and ambiguity of selecting a competent person by industry is reduced. The framework establishes pathways and progression from informal short courses provided by various government agencies, NGOs and industry, to formal TVET programmes by narrowing the gaps between what TVET graduates know and can do and the skills and knowledge that employers say they need. This helps to

overcome limited progression possibilities and demand for TVET that far exceeds supply (NBTE, 2021). NSQF is based on NSQs. The National Skills Qualifications (NSQ) **is** work related, competence based qualification with skills assessed at both the training centre and workplace. NSQs are qualifications that show an understanding of the theory of the work in progress and also the competency of the individual as evidenced in their specific job role issued by a recognised awarding body. NSQs reflect the skills and knowledge needed to do the job effectively and reward for the skills already possessed (NBTE, 2021). Automobile Mechanic has been assigned NSQ levels 1, 2 and 3; and the qualifications have been validated by the NBTE (NBTE, 2021, p. 12).

2.4.4 The Industrial Training Fund

The Industrial Trust Fund (ITF) was established by Decree No. 47 of 1971. The vision for theestablishment of the body is to promote and encourage the acquisition of skills necessary for industrial, commercial, and national economic development (Ikpesu, 2016). The funds contributed to ITF by various companies and industries shall be utilised to provide, promote, and encourage the acquisition of skills in industry and commerce (Aroge, 2012). By providingthe essential training for management skills for technical and entrepreneurial growth in these sectors, this is anticipated to create a pool of indigenously trained people that would be adequate to satisfy the demands of the private and public sectors of the economy (Obi et al., 2021). The ITF manages the Students Industrial Work Experience Scheme (SIWES) for the TVET students in the various institutions in Nigeria (Ogwo, 2019). The agency also assists inthe placement of the students in the industry for practical work or experiences. The ITF's sources of funds to run its activities are the budgetary allocation from the FGN, levy, and contributions from the companies. Johanson (2009) pointed out that employers were initially made to contribute 3% of their turnover, which was reduced to 2% by the Amendment DecreeNo. 37 of 1973, which was further reduced to 1% in 1975. This reduction in the revenue for ITF grossly affects its effective operation (Aroge, 2012).

2.4.5 Curriculum and TVET

'Curriculum' can be described as the template of the learners' experience in the school environment that will guide the teaching-learning process. Nevertheless, the term curriculum

has been defined in various was by diverse authors. Tyler (1949), for instance, defined curriculum as all the learning of students which is planned by and directed by the school to obtain its educational goals. Similarly, according to Hicks (2007), the term 'curriculum' refers to all the prearranged learning opportunities provided to students by the educational setting as well as the experiences they have when the curriculum is put into practice. The definition of curriculum, however, has evolved over time through the provision of particular kinds of experiences to support the achievement of these goals. Billet (2011) highlighted that through time, people have come to understand the necessity to think about implementation concerns, such as teaching and ultimately, the people who will be teaching in addition to such aims.

Moreover, the curriculum is frequently equated with the syllabus. The syllabus, as pointed out by Billet (2011), is usually nothing more or less than a list of content areas which are to be assessed – sometimes extended to include a number of objectives and learning activities. The syllabus stands as just one element or dimension of the curriculum. However, there are four key distinctions that limit the role of the syllabus to being a dimension or element in the curriculum (Brady, 1995). Firstly, an association between curriculum and syllabus is often based on subjects. Secondly, when the curriculum is associated with the syllabus, some vital details of the curriculum are hidden and ignored. These are those experiences not explicitly stated in the syllabus that arise through the enactment of experiences. Thirdly, the idea of an effective curriculum that takes into account the characteristics of the instructors, the learning environment, and the learning experiences is refuted by the link of the curriculum with the syllabus. The students would experience the curriculum, which brings us to our fourth point. Students never encounter a paper or syllabus.

From these different conceptions and characteristics of the curriculum by these authors, it is evident that there would be different bases for planning, organising, and evaluating curriculums. Therefore, in planning the curriculum, such preparation might be undertaken by the TVET teachers in the TCs, and it would be based on their experiences, understanding, and specific localised requirements (Billet, 2011). The curriculum is more than a document. In addition to the document (syllabus), the curriculum comprises the experiences that are provided by the teachers for the students.

These conceptions have been advanced in different ways and categories by curriculum theorists. For instance, Glatthorn (1987) classified different conceptions of curriculum as follows:

- Ideal curriculum – It is the curriculum is that proposed by scholars asappropriate to meet particular needs.
- Entitlement curriculum – This is the societal views of what should betaught.
- Intended or written curriculum – It is what is to be taught usually stated inthe form of a syllabus document.
- Available curriculum – It is the curriculum which can be taught through theresource of schools.
- Implemented curriculum – This is what is actually taught by teachers.
- Achieved curriculum – This is what students learn as a result of what hasbeen implemented.
- Attained curriculum – This is the measurement of student learning.

Similarly, Su (2012) offers an equally diverse set of curriculum concepts, comprising:

- Curriculum as subject matter – a body of content to be taught.
- Curriculum as experience – a set of experiences students encounter ineducational contexts.
- Curriculum as intention – what it is intended students should learn from thecurriculum.
- Curriculum as cultural reproduction – as reflecting and reproducing theculture of society.
- Curriculum as 'currere' – 'running the race', the process of providingcontinuous personal meaning for individuals.

2.5 Technical Colleges in Nigeria

MVMW, which is the focus of this study, is one of the mechanical trades offered in the TCs in Nigeria. The main aim of the MVMW trade in TCs is to create capable vehicle mechanics with solid theoretical knowledge who should be able to identify problems with and perform maintenance or repairs on all kinds of both petrol and diesel engines (NBTE, 2001). The programmeme for MVMW in the TCs is designed to produce competent maintenance craftsmen for all types of motor vehicles. These craftsmen may also wish to take the opportunity for further technical education or set up their own enterprise upon the completion

of their training(NBTE, 2001).

A national curriculum designed by the NBTE is adopted in all the TCs and accredited by the NBTE. The programmeme is offered at two levels leading to the award of National Technical Certificate (NTC) for craftsmen and Advanced National Technical Certificate (ANTC) for master craftsmen. The trainees on completion of the programmeme for MVMW, likeany other courses or trades in the TC (FGN, 2004), shall:

- Securing a job at the completion of the whole programmeme or after completing one or more marketable skill course.
- Start their own business, become freelance and be able to hire others.
- Pursue further educational qualification in advanced trade, or degree programmes at polytechnics, universities, or technical colleges of education.

In the pursuit of attaining the aims and goals of setting up the TCs, the NPE (FGN, 2004) pointed out that the main features of the curricular activities for TCs shall be structured in two modules: foundation and trade modules. The curriculum for each trade shall consist of the following five components.

- General education
- Theory and related courses
- Workshop practice
- Industrial training/production work
- Small business management and entrepreneurial training

TVET institutions stimulate technological and industrial development by producing competent workers who are capable of developing and utilising technologies for industrial and economic development; therefore, for the attainment of technological advancement of this nation, TCs are expected to provide the trainees with the requisite skills needed to enter into the world of work in all the vocational programmes, including MVMWs (Oviawe et al., 2017). However, Olaitan et al. (2009) observed that in contemporary Nigeria there are many graduates of TCs and other vocational technical institutions roaming the streets without jobs because their training is inadequate/irrelevant to meet the demands of the industries and society. Concurring with the above view, Audu et al. (2013) too identified irrelevance as one of the factors militating against the partnership or collaboration between the industry and the

TCs. These authors further explained that the industries blamed the institutions for the lack of relevance because the graduates of the TCs were missing the requisite skills needed in the changing world of work characterised by technological advancement. Nkechi et al. (2012) asserted that Nigeria has a high unemployment rate because of recent graduates of TCs do not have the knowledge and skills that will enable them take up the available jobs. Okoro (2006) echoed that although there are no jobs for the unskilled, there are many for those who are skilled in various other industries.

Conversely, Okoye and Arimonu (2016) opined that the TCs equip trainees with the necessary skills for the workplace, and that at graduation, these trainees will have the necessary abilities to be self-sufficient in the absence of paid employment in the industries. Inaddition, the industries would find these items valuable to them since the sector faces a struggle in obtaining talented individuals who can learn, develop, and adapt to the changing global market.

Olaitan et al. (2009) observed that the industries are too busy in production of goods and services and all they require are skilled personnel who can easily and within a very short time join the production line and start work immediately. This gap has made many of these industries to establish training schools to train and get these fresh graduates quickly into the production lines. The industries see this option very expensive and time consuming. Therefore,they prefer the employees who are willing to start the job immediately. Manyika (2017) statedthat since the workplace is a technological environment and that businesses are constantly looking for new technologies to help them boost their profit margin more quickly and effectively. However, the products must be trained for positions in the evolving workplace if the TCs are to give their trainees the skills necessary for the sector (Okorie, 2000).

The recent advancement in technology has rendered traditional skills inadequate for the world of work. This has created the need for new and modern skills. Modern automobiles now come with new devices resulting from technological advancement. According to Hillier and Pittuck (1994)) the assembly of conventional automobiles consists of the following main units and systems:

- The chassis
- The body
- The suspension and steering systems

- The power unit and its essential systems such as the fuel system, cooling system,ignition system, and lubrication system
- The transmission system
- Braking system, and
- The electrical system

The skills needed by TC graduates in MVMWs to diagnose and effect repairs in all these systems and units have changed as a result of the technological advancement of the 21st century. Hillier and Pittuck (1994) pointed out that petrol engine automobiles manufactured in the USA before 1990 came with carburettors. However, after 1990, the following year's models employed an injection system in the fuel system (Amey, 1995). Nowadays, the automobiles that run on petrol engines employ an electronic injection system which iscontrolled by the microprocessor called the Electronic Control Unit (ECU).

According to Hillier and Pittuck (1994), in subsequent years the automobiles became more and more complicated and sophisticated, having as many as fifty microprocessors in them, as is the case today. Microprocessors are computer processors where the data processinglogic and control are included on a single integrated circuit (Le-Huy, 1994). Computers havea significant role in the field of automobile innovations. Today computers are used to controlmost of the operations in automobiles (Coppola & Morisio, 2016). In addition to the carburettor that has been replaced by the electronic injection system in the fuel system of an automobile, the ignition system has also changed from a conventional contact point type witha magnetic pick-up coil to an electronic ignition system (Beever, 2015). Erjavec (2004) explains that the new electronic ignition system is controlled by the ECU.

The modern technology advancement in the use of computers in vehicles have led to the creation of computer-controlled brakes known as the 'anti-lock braking system' (ABS). ABS, according to Erjavec (2004), prevents the wheels from locking and skidding during heavy braking in all driving conditions. Recent technological advancement has brought aboutseveral changes and modifications in the automobile system, especially the modern vehicles that are imported or assembled in the country.

The application of scientific knowledge in the design, material selection, construction,operation, and maintenance of automobiles is essential for the development of contemporary skills in auto mechanics (Fakorede & Lemo, 2015). One of the mechanical

trades offered as an MVMW trade in Nigerian TCs is auto mechanics (FRN, 2004). The MVMW programmeme in the TCs is specifically designed to produce competent auto mechanic craftsmen in variousautomobile trades. The programmeme aims to equip students with the knowledge and skills necessary to diagnose faults in all types of vehicles and carry out the required repairs efficiently. According to Gilles (2019), MVMW is the training in basic knowledge and skillsnecessary to diagnose repairs and maintain mechanical defects in light and heavy automobiles.Automobile trades involve repairs and maintenance of engines, transmission, fuel, brakes, cooling, starting, steering, suspension, the lubrication system, and charging system on a motorvehicle (Erjavec & Thompson, 2014). According to the NBTE (2001), an auto mechanics craftsman is responsible for conducting tests, diagnosing faults, servicing, and performing comprehensive repairs on various main units and systems within conventional automobile assemblies. These tasks should be carried out in accordance with the manufacturers' specifications and standards.

A ‘craftsman’ is a person who practices a craft with great skill and is a member of a skilled trade (Epstein, 1998). A ‘skilled worker’ is the one who practices a trade or handicraft.Such a person is skilled in a particular craft or art. Craftsmen can also be referred to as those who create or perform with skill or dexterity, especially in the manual arts. Craftsmen in automobiles are skilled persons with good knowledge of the working principles of motor vehicles, and techniques and safety practices associated or involved in motor vehicle maintenance (Audu et al., 2014). Craftsmen are low level manpower who possess qualifications such as the NCT, the Western African Examinations Council (WAEC) Technical, and Federal Government Trade Test Grades III, II and I. Auto mechanics craftsmen are taught in the TCs and are responsible for the effective maintenance of automobile cars andlorries (Matthew & Ede, 2010). They are graduates of TCs and fed into the automobile industries. Therefore, the years of experience of automobile master craftsmen increases the competency of skills acquired by them and prepares them for positions such as industry-basedsupervisors.

TCs are geared towards producing craftsmen in various occupations. The establishment of the TCs, as cited by Obadara and Oyebolu (2013), is to stimulate technological and industrial development by advancing and utilising technologies for industrial and economic growth. As an integral part of the total educational process, TCs facilitate good citizenship by enhancing the physical, social, civic, cultural, and economic competencies of craftsmen (Olubodun & Elesin, 2018). TCs are institutions where students

are trained to acquire relevant knowledge and skills in different occupations for employment in the world of work. According to the FGN (2004), a TC is a segment of TVET designed to produce craftsmen at the secondary school level of education.

According to the NPE, the objectives of TCs are to supply skilled labour in the business, technology, and applies sciences domains, notably at the craft, advanced craft, and technician levels. They also aim to teach and transmit the essential skills to people who will be economically independent and up to date with the newest technology, as well as to supply the technical knowledge and vocational skills required for agricultural, commercial, and economic growth (FGN, 2004).

The modern technological advancement is highly noticeable in the automobile industries because of the incorporation of sophisticated electrical/electronic components in the modern-day automobiles. The automobile is a very sophisticated group of technologies that are assembled together in a unit. This technological development in the vehicles brought in the design and the use of mechatronics (Bradley et al., 2018). Mechatronics is the intersection of mechanics, electronics, computers, and controls that are used to operate the various systems and units in automobiles. The implication of this is that employers currently prefer hiring automobile craftsmen who are familiar with the existing realities in the automobile field. It should also be noted that automobile craftsmen who are competent at graduation may still lack the requisite skills. This is because of changes in technology and the fact that the automobile is complex and consists of many components, among which are engine details, fuel injection and ignition systems, which are linked. Therefore, the craftsmen should be subjected to regular training or retraining.

The acquisition of up-to-date skills in the automobile technology industry requires functional tools, machines, and equipment/facilities. Provision of modern equipment and facilities in the TCs assists students to acquire the expertise, knowledge, and skills required in the maintenance and repair of modern automobiles. With the innovation of the use of computers and the computerisation of automobile training equipment, there is greater need for TCs to equip their workshops with modern equipment, such as a hand scanner, multi testers, launch machine OBD II, among others, and facilities that can keep students abreast with the innovative skills that will contribute to their future employment.

To be productive in the world of work as a skilled automobile craftsman depends largely on the ability of the craftsman to promptly diagnose and fix faults reported by the

customer. Most of the time, the customers leave these workshop garages with vehicles taken for repairs in a worse condition than it was dropped off in. This affects the relationship between the automobile craftsmen and the vehicle owners because of the extra cost incurred by having to fix the problem elsewhere. Incompetent craftsmen often cause damage to the customer`s vehicle. Not only could this endanger the life of the owner, for instance, while travelling on the highway, but it may also result in the vehicle breaking down in a dangerous place at an odd hour. The uncertainty related to the fixing of a vehicle has caused much anxiety for motorists who are then apprehensive when taking their vehicles for repairs (Chatterjee, 2013). Car upkeep and repairs should not involve a lot of trial and error. Thus, it is crucial that artisans possess the necessary knowledge, skills, competences, and abilities to effectively execute the repair process (Rosenberg et al., 2004). The emerging workforce should have the requisite skills in their area of specialisation (automobile) that will enhance the acquisition of relevant skills which will favourably match the latest innovation in the automobile industry.

The dynamic requirements of the modern industrial skills demand and the curriculum contents in the various TCs in Nigeria, especially in Lagos State, no longer correspond with the modern vehicles in use. This is due to the changing nature of the society with regards to the dynamic technical skills and curriculum contents (Oluwale et al., 2013). The trend in the technological developments taking place in the world today has also made job-specific skills readily obsolete. The function of industries in the training the craftsmen in Nigeria is very important. The industries should provide responsible assistance to TC students with exceptional needs in facilitation of the transition from school to the work environment (Luecking, 2009).

2.5.1 MVMW in Nigerian Technical Colleges

The use of scientific knowledge in the design, material selection, building operation and maintenance of automobile is known as automotive technology (Education, 2009). MVMW isone of the mechanical trades that are offered in the TCs which are geared towards the production of craftsmen for the automobile industry (Audu et al., 2014). The craftsman must possess the knowledge, abilities, and attitudes necessary to satisfy the demands and advancement in the automotive sectors. The auto mechanic trade in the TCs in Nigeria has toreceive the attention it needs in order for the production to be able to keep up with the automotive sector if this is to be accomplished.

Halili (2020) made it known that it is important for the automobile industry to adapt astrategic method in any nation's economy. The United Nations (UN) recommended ratios of 1:4:30 (Engineer, Master Craftsmen, and Craftsmen) (Jellison, 2012); manpower at the craft level, is a crucial component of the solid base required for the nation's intended technologicaladvancement (Oyenuga, 2010). For the auto mechanic trade programmeme at TCs to make a significant contribution to the economy of a country like Nigeria, it is vital for teachers to employ an effective approach in imparting the essential knowledge, attitude, and skills to theirstudents (Chinwe, 2018). Sarfo and Elen (2007) observed that the syllabus for automobile technology in TCs is designed to provide students with a deeper understanding of the motor mechanic profession and foster positive attitudes towards automobiles and their maintenance. This approach aims to help students appreciate the intrinsic connection between science and technology in the automotive field. Automobile technology is thus an aspect of TVET. Therefore, the aims and objective of automobile technology are also similar to the aims and objectives of TVET, which, according to the FRN (2004), includes: To –

- Provide trained workers especially at the craft, advanced craft, and technical levels, inthe fields of business, technology, and applied science.
- Assist in the development of technical knowledge and practical skills essential for commercial purposes.
- Give them the instructions and skills they need to become economically independent.

Other goals of technical education, as listed by Osuala (1999), are to:

- Assist in preparing learners for employment and professional growth.
- Provide a work force that the society needs.
- Expand the range of alternatives available to each student.
- Act as an inspiration to improve all forms of learning.
- Help the student make a sensible career decision.

Since the car sector plays a significant role in Nigeria's economic structure, the significance of automotive technology to the nation's technical and economic growth cannot be overstated (Izediuno et al., 2018). The study of automobile technology is essential to the technological

growth of the nation as any other technical subject. Elom (1998) indicates that there is a great need for automobile technicians to maintain, repair and service automobiles, as this is the most common and convenient means of transport for people and their goods fromone place to the other. In addition to being a convenient and reliable means for people to provide several types of economic and leisure activities, the automobile industry also offers boundless employment opportunities for many of our youths. However, the need for more TC trained automobile technicians and auto mechanics is imperative considering that modern automobiles are made using the latest technology, which most roadside mechanics, who are trained through the traditional apprenticeship method, are unfamiliar with (Bamigbade, 2010).Bamigbade (2010) further maintains that automobile owners are at risk of handing over their vehicles to the care of informal sector mechanics who do not possess the necessary knowledgeto make the repairs.

An auto mechanic craftsman evaluates a vehicle's issues, does all required diagnostictests, and skilfully fixes or replaces components (MacQuarrie, 2005). The abilities required for this position are based on a solid grasp of automotive technology, practical work experience, and education in technologies as they are released by the car industry (Awolola &Olayiwola, 2021). The National Institute for Automotive Service Excellence (NIASE) definedan auto mechanic as one who inspects, maintains, and repairs automobiles and light trucks with gasoline/diesel/petrol engines, such as pick-ups, sport utility vehicles (SUVs), and vans (Yemaneab,1997). Their functions also include such tasks as routine automobile servicing, inspecting and lubricating engines and other components, and also repairing and replacing parts before they cause the vehicle to break down (Banz, 2004). They also carry out tasks suchas major engine overhauls, tune ups, relining and adjustment of brakes, wheel aligning, as wellas transmission and differential replacements. Moreover, an auto mechanic carries out functions such as repairing, operating, and maintaining automotive shop equipment, advises on the selection and storage of automotive parts and equipment, estimates the cost of repairs,instructs, and supervises unskilled assistants, and test drives vehicles on the road.

The auto mechanic may work on all systems of the cars, or may be specialised, that is,concentrating on servicing one system of the automobile, such as engine details, the ignition system, fuel injection, electrical brakes, or transmissions (Denton, 2016). In order to be relevant in the service and maintenance of modern automobiles, these specialties require advanced and continuous training in that particular field (Erjavec, 2005). The number of yearsof training and the period that the auto mechanic has been on the job will determine

the levelof experience acquired on the job (Jacobs, 2003). Olaitan et al. (1999) provided a basis for thecategorisation of auto mechanics based on their years of experience, stating that there are less experienced auto mechanics, i.e., those with a minimum of 1-10 years of experience, and thosewith 11+ years on the job. These categories of auto mechanics are found in Lagos State in themaintaining and servicing of automobiles.

Effective maintenance of modern automobiles by the skilled auto mechanics has become a major challenge (Audu et al., 2019). The life span or useful life of the automobile depends to a very large extent on effective maintenance of the vehicle. Stenström et al. (2016) defined 'maintenance' as a set of preventive, corrective, or breakdown rectification activities.Olaitan et al. (1999) made further clarifications by stating that maintenance is the process of providing a piece of equipment, machinery, or facility with specialised approved care to guarantee that it reaches its full usable life. Therefore, effective maintenance is taking steps and safeguards to take care of an automobile so that it lasts as long as possible.

For auto mechanics to effectively maintain modern automobiles, improvement in technical skills is needed. However, one of the major setbacks in this regard is in their mode of training (Onyilo et al., 2020). Most craftsmen produced by the TCs are not well equipped with the modern-day innovations in the automobile world, which poses a challenge when it comes to the employment of graduates (Olayinka & Oyenuga, 2010). The development of a sustainable TVET system in the Lagos State TCs as intended by this study aimed at correcting the skills gap that exists in the curriculum and teaching-learning facilities used for training thecraftsmen.

2.5.2 Innovations in Automobile Technology Curriculum

The word "automobile" refers to a variety of self-propelled, trackless, non-articulated, four-wheeled vehicles, which includes passenger cars, off-road vehicles, taxis, and buses that are used to for transportation purposes (Dagala et al., 2018). Undoubtedly, the invention of the vehicle contributed significantly to the spectacular reduction in travel time and distance, which is a key component of what is now known as the impact of globalisation (Matthew & Ede, 2010). Today, contemporary society cannot function without automobiles as a form of mobility.

There were several experimental automobiles during the early stages of development,

but the work of German mechanic Karl Benz in 1885 was considered as the first useful and trustworthy automobile (Guarnieri, 2012). Matthew and Ede (2010) noted that the Benz vehicles and many other early automobiles were unsophisticated, unreliable, constrained in speed and range, and not comfortable. Modern vehicles have been substantially impacted by the technological dynamism with the introduction of new technology (Geels, 2005).

The design of automobiles is constantly evolving to enhance their speed, reliability, aerodynamics, cleanliness, safety, comfort, fuel efficiency, and durability (Dagala et al., 2018). Therefore, harnessing new technologies into modern vehicles has made them an assemblage of a group of sophisticated technologies (Matthew & Ede, 2010). The introduction of electronic controls has particularly brought even greater changes in the designs and operations of many of their sub-systems. Since the collapse of the rail transportation infrastructure in the midst of underdeveloped inland waterways and a relatively high cost of air travel, the demand for and importation of vehicles used for personal transportation in Nigeria has continued to rise.

Moreover, there are different brands and models of automobiles today on Nigerian roads. These are used for either public or private transportation. However, most of these automobiles were imported Completely Built-Up (CBU) either as new vehicles or as fairly used ones popularly called 'Tokunbo' (Matthew & Ede, 2010; Nnaemeka et al., 2021). Others were imported as Completely Knocked Down (CKD) parts, which are then assembled in the country with a collection of spare parts (Agbo, 2019). Therefore, the cars have a variety of designs and modern technology. However, a recent national regulation restricting their import to largely those that have new technologies built into them has limited their importation to those that are more than eight years old from their dates of manufacturing. To maintain the imported automobiles in Nigeria in a roadworthy has declare that they need to have the required service and maintenance. For these goals, personnel must be prepared with the necessary knowledge and abilities (Dagala et al., 2018).

Programmes for the education and training of craftsmen and master craftsmen for the repair of all types of motor vehicles are conducted at TCs at the NTC and ANTC levels, respectively, in the Nigerian educational system (NBTE, 1985; Ogbonna et al., 2021). However, several studies have revealed that the graduates of these TCs lack the basic skills needed for gainful employment in today's automobile industry (Nwabufo & Mamman, 2015). The curriculum was frequently cited as being inadequate and irrelevant, and as not providing

the skills needed to meet the challenges of maintaining modern automobiles on Nigerian roads (Audu et al., 2019). Thus, the curriculum is old and outdated and does not meet the 2^{1st} century technological challenges (Amadi & Ememe, 2013).

Modern vehicles now have different configurations and require additional maintenance work due to the adoption of new technologies with new subsystems and components, even though some of the new systems make maintenance easier (Matthew & Ede, 2010). The curriculum of TC programmes that train the service personnel for maintaining these vehicles has, however, remained rigid since 1985, and is thus far removed from the recent technological innovations in the automobile industry (NBTE, 1985; Ikpe, 2010). The gaps created between the curriculum and the new technological innovations have hindered the graduates' acquisition of the much-needed skills to effectively maintain these modern automobiles (Matthew & Ede, 2010). It has been observed that the graduates of these programmes are not suitable for the available jobs, therefore, this makes them unsuitable for employment, while most vehicles equipped with these new innovations either fall into disrepair or have the new systems replaced with the traditional replacement systems that the new ones were intended to replace. Yet some of the graduates are even completely grounded barely into their expected service life because of the lack of competent personnel for their effective maintenance.

2.5.3 The Status of Automobile Technology Teaching in the Technical Colleges

The curriculum of automobile technology is divided into four major sections. According to Elom (1998), these sections are:

- Workshop technology – which focuses on the examination of the safety measures,equipment, materials, and tools used in the automotive technology workshop.
- Related science and calculations – which focuses on the fundamental scientific mathematical concepts used in automotive technology.
- Components and the function – which ensures the identification of the various parts ofthe motor vehicles and their separate functions and principle of operations.
- Trouble shooting, diagnosis and repairs – entails locating certain flaws and consideringpotential repairs or replacements.

The above views supported Osuala's (1998) understanding that vocational education programmes at all levels in the formal education system include general studies in diverse areas, practical training for the development of skills required in the chosen field, and relevant theories. Osuala (1998) noted that although the proportional percentage of these factors may differ significantly between institutions and disciplines. However, the focus is often on practical training. Osuala's (1998) stance, as stated above, substantiates two important principles of vocational education, namely:

- The effectiveness of vocational training will depend on the workplace setting in which the graduate will eventually work.
- Effective vocational education can only be rendered where the training jobs tally with the operations, tools, and machine required for the occupation itself. In the majority of Nigerian technical institutions, the topic on automobile technology is not effectively taught and learned.

In correlation with the above assertion, Elom (1998) stated that technology teachers are not technically competent. Other problems this author identified include the unavailability of materials and equipment for practical work, poor interest of the learners, poor conducive learning environment, and ineffective administration. The new design of a sustainable TVET system will enable both the teacher and TC students to solve the problem of incompetency in the automobile trade.

2.6 Innovation and Technical Skills in Automobile Technology

There are generally three main classifications of automobiles/vehicles. These, according to Nooshin and Norang (2016), are (1) single-unit vehicles or load carriers, (2) articulated vehicles, and (3) heavy tractor vehicles. There have been tremendous changes in the technology of modern cars, e.g., sophisticated computer technology, advanced wiring, intricate wiring, intricate circuitry, and complex engineering, which are now incorporated andused in modern cars making them computer like. These days, sophisticated components are incorporated into modern automobiles (Oluwatimilehin et al., 2021). According to Oluwatimilehin et al. (2021), the fusion of the mechanical and electrical worlds has led to thedevelopment of sophisticated fuel injection systems, hydrogen and hybrid technologies, and other vehicle systems that can only be successfully repaired by qualified auto mechanics.

Several decades ago in Nigeria, people were familiar with the brand of cars on the road. It was easy then to recognise the brand of a car and differentiate between Peugeot and Volkswagen. But nowadays it is more difficult, if not impossible, to differentiate cars becauseof their design. There has also been an increase in the number of automobiles sold in the country. Recent technologies in automobiles are focused on ensuring improved safety and comfort of the driver and the passengers (Coppola & Morisio, 2016). Vehicles today now possess complex computer and electronic systems also known as body electronic systems. Thebody electronic systems are those systems that are fitted within the passenger compartment ofthe vehicle which enhances the comfort and safety of the occupants. Chowanietz (1995) observed that the body electronic system on most cars was limited to the heater, and some instrumentation such as fuel and temperature gauges until early 1970s. The enormous growthin the use of engine electronics caused expansion in the use of body electronic systems and many vehicles are now fitted with numerous luxury and safety features (Denton, 2017). Commonly encountered systems include electronic instrumentation, central door locking, anti-theft systems, cruise control, air conditioning, and supplementary restraint systems (SRS) or airbag (Long, 2016).

Furthermore, Chowanietz (1995) noted that as the manufacturers and sale of cars become more competitive, it is likely that vehicle designers will specify even more sophisticated features such as collision-avoidance radar and satellite-based navigation. Technical skills, according to Jatawa and Mohammed (2021), are the aptitude or dexterity required to operate tools successfully and efficiently. In terms of automotive technology, this can entail the capacity to perform daily tasks like brake repair, engine overhauls, gearbox rebuilds, and the capacity to identify issues related to auto repairs. The flexibility and productivity of a nation's labour force are heavily influenced by the level of auto mechanical proficiency among its skilled workers and technicians. The skilled workers and technicians, increase the efficiency of product development, usage, maintenance and theysupervise and train other workers with less skills. Bahh-Boateng (2013) signifies that developing a skilled labour makes a greater contribution to a country’s development only whenthe science and technological advancement are used for the transformation of raw materials into goods and services. A proficient technician or tradesman should be able to operate a variety of new equipment types and comprehend the characteristics of novel materials.

Inspecting, maintaining, and repairing cars and light trucks that operate on gasoline, ethanol, and other alternative fuels, including electricity, the automotive service experts

employ their high-tech abilities. The employees of today must be able to handle computerised shop equipment and electrical components while keeping their competence with traditional hand tools due to the intricacy of automotive technology. The concept of 'skill' has received increasing attention in recent years from scholars in diverse disciplines. From the technical perspective, a skill refers to expertness, practiced ability, dexterity, and tact. It is an organised sequence of actions and temporal patterning (Okorie, 2000). It is a manual dexterity through repetitive performance of an operation. It can be regarded as the capacity to carry out simple or difficult manipulative tasks of any job which will result in the desired performance. A skill is an organised and coordinated pattern of mental or physical activities in relation to an object or other display of information.

Ogundola (2016) explained that most jobs require some special manipulative skills, the extent which varies from one occupation to another. The auto mechanic trade is one such occupation that requires updating one's skill in order to meet the challenges of recent technologies in the automobile industry. The ability to apply expertise relating to a method, a process, or products is known as a 'technical skill'. Most occupations, therefore, have a technical skill component in them, including the auto mechanic trade. Okoye and Okwelle (2014) also asserted that a technical skill is the performance of specialised tasks based on the demand of the specific aspect of technology, for example, automobile technology. Technical skills in automobile technology are therefore those skills applied by the technician in the performance of such tasks as checking, detecting, servicing, maintenance, and repair of automobile components. The skills of an auto mechanic will vary greatly. Some mechanics develop the skills to work on all parts of a vehicle, while others choose to specialise in a particular field or system.

Auto Mechanics are responsible for diagnosing, repairing and maintaining automobile problems, as well as tuning up an automobile engine to improve its overall performance. The auto-mechanics perform such task as routine automobile servicing, inspect and lubricate engines and other components. The auto mechanics also repair and replace parts before they cause breakdown. In addition, the auto-mechanics also carry out such task as major engine overhauls, tune-ups, relining and adjusting brakes, wheel aligning, transmission and differential replacement and repair, electrical replacement and repair, minor body repair, operate and maintain automotive shop equipment, and estimate the cost of repairs. Erjavec and Thompson, (2014) pointed out that these modern systems render the conventional auto mechanics ineffective in carrying out repairs on the modern vehicles. Unfortunately, majority

of the Auto mechanics were trained in the operation of the conventional vehicle which have simplified electrical systems. The instructors or the teachers with varying years of experiences, who trained these mechanics in the formal sector, were also trained on the old conventional vehicle system with simplified electrical systems.

Modern vehicles incorporate many electrical and electronic components and systems. They are audio, lights, navigation, engine control, transmission control braking and traction control. The auto mechanics need to possess the requisite skill essential in electrical concepts to effectively troubleshoot the modern electrical circuit. Electrical and electronic system troubleshooting can be straight forward if the mechanic knows what to look for and how to select and use the appropriate tools and test equipment, used for diagnosis on vehicles.

The On-Board Diagnostic system regulations referred to as OBD which apply to almost all 1998 and newer cars require that the Engine Control Module (ECM) monitors critical emission related components for proper operation and illuminates a Malfunction Indicator Lamp (MIL) on the instrument panel when a malfunction is detected. Erjavec and Thompson (2014) mentioned that the OBD system also provides for a system of Diagnostic Trouble Codes (DTC) and fault isolation logic charts in the repair manual, to assist technicians in determining the likely cause of engine control and emissions system malfunctions. The basic objectives of the OBD regulation as two folds: to improve in-use emission compliance by alerting the vehicle operator when a malfunction exists and to aid automobile repair technicians in identifying and repairing malfunctioning circuit in the emission control system.

In recent years, the scan tool, as it becomes faster and more powerful, has become the equipment of choice for many technicians. It is by far the first tool employed at the start of the diagnostics process and with good reason. Winner, et al, (2018) affirmed that the scanner is versatile, with many built in features that no other piece of equipment can match. They further described the OBD as the only tool that can provide a window into the Engine Control Module (ECM) inner operation and memory functions. In essence, it tells what the ECM is seeing, regardless of whether it is true or not. With the scan tool, a whole array of convenient and fast techniques can be employed to quickly analyse and diagnose a particular problem.

TVET institutions stimulate technological and industrial development by producing competent workers who are capable of developing and utilizing technologies for industrial and economic development Therefore, for the attainment of technological advancement of this nation, technical colleges in the light of the essence of their establishment are expected to

provide the trainees with the requisite skill needed to enter into the world of work in all the vocational programmes including motor vehicle mechanic works. However, Adetola, (2021) observed that in Nigeria, today many products of technical colleges and other vocational technical institutions are found in the streets of town and cities without job because their training is inadequate and irrelevant to the need of industries and society. Oviawe, et al, (2017) identified lack of relevance as one of the factors militating against cooperation between industry and technical institutions; he explained further that the industries blamed the institutions for lack of relevance because the product of technical institutions lack the skill needed to work in the changing world of work occasioned by technological advancement. In essence, if technical institutions provide trainees with the requisite skills needed in the world of work, such trainees after graduation will possess the requisite skills required to be self-reliant in the absence of paid employment in the industries. Besides, the industries would find these products useful to them since the challenge for the industry to succeed in an increasingly competitive world market is contingent upon skilled personnel who learn, grow and adapt to the changing market and technologies. The industries are too busy in production of goods and services and all they require are technical personnel who can easily and within a very short period join the production line. The world of work is a world of technology; the industries are on the outlook for technological advances that could increase their profit margin in less time and with greater efficiency. However, if the technical institutions are to provide their trainees with the skill relevant to the need of the industry, the products have to be trained for jobs in the changing world of work (Oviawe, 2018).

The influence of technology has rendered traditional skill inadequate for the world of work while creating need for new and often sophisticated skills. The automobiles vehicles imported or assembled in this country come with new devices as a result of technological advancement. The skills required by technical institution graduates in motor vehicle mechanic works to diagnose and carryout repairs in all these systems and units have changed as a result of technological advancement. Amey, (1995) pointed out that petrol engine automobiles manufactured in United States of America with carburetor was in 1990, the following years models employed injection system. Nowadays, the petrol engine automobiles employed electronic injection system controlled by microprocessor called the Electronic Control Unit (ECU). According to him, automobiles seem to get more and more complicated because automobiles today might have as many as fifty microprocessors on them. Microprocessors are computers. Computer today are playing significant role in the field of automobiles.

Nowadays, computers are used to control virtually, most operations in automobiles. Apart from the carburetor that has been replaced by Electronic Injection System, in the power unit of an automobile, the ignition system has also changed from conventional point type with a magnetic pick up coil to electronic ignition system. Erjavec and Thompson (2014) pointed out that the new Electronic Ignition System introduced is control by the Electronic Control Unit (ECU).

Technological innovation in the application of computer to automobile has brought about the development of computer-controlled brakes known as Anti-Lock Braking system. This kind of braking system prevents wheel skid during heavy braking in all roads driving condition. Technological advancement has brought about several changes and modifications in automobile system that is imported or assembled in this country. The modern motor mechanic needs to have some skills in mechatronics which are essential skills needed to diagnose and carry out repairs on the modern vehicles (Bishop, 2017). These skills are still missing among the graduates of TCs and it is not farfetched from the inability of the technical teachers and instructors to effectively pass on the skill to the students. This is where a good collaboration between the academia and industry is important and urgently needed to enable the teachers, instructors and the students to learn these skills from the industry. Some of these skills are highlighted below.

2.6.1 Specialised Skills of Mechanics

2.6.1.1 Diagnostic abilities

Automotive mechanics and service technicians should be given opportunities if they possess mechanical skills, diagnostic, problem-solving abilities, and understanding of electronics andmathematics (Maughan, 2007). When mechanical or electrical issues arise, technicians first obtain a description of the issue from the owner or, in a large booming shop from the repair service estimator or service adviser who drafted the repair order. Technicians employ a diagnostic strategy to identify the issue. They check whether systems and component securityand functionality first. They then isolate any systems or components that could be the root ofthe issue. For instance, if an air conditioner is not working properly, the technician could lookfor a straightforward issue, like a low coolant level, or a more complicated one, like a broken drive-train connection that has caused the air conditioner to short out. Technicians may do a test drive or employ a number of testing tools, such as compression

gauges or onboard and handheld diagnostic computers, as part of their examination. These tests could reveal if a component can be fixed or whether a replacement is necessary.

2.6.1.2 An array of integrated skills

Olatoye (2022) defined a skilled automobile expert as one who possesses a broad range of integrated abilities, including a working knowledge of the electrical, fuel, and air conditioningsystems. In addition to wrenches, computer abilities are a must for day-to-day operations. Gaining expertise makes it simpler to advance to jobs that are more lucrative.

2.6.1.3 The ability to Adapt

Trial-and-error methods or the untrained grease monkey's methods are no longer applicable. The skill set requires the ability to adapt to changing technologies, as computers are integrated into modern cars. Preparation is the key, and more so than ever before. It is important for the teaching professionals to develop and acquire new skills if the technologies provided to institutions are used effectively by everyone. This implies that investing in information technology, hardware, software, and other essential resources without adequately investing in the professional development of teachers in new skills would be a waste. However, based on experiences worldwide, particularly in developing, industrialised, and informed countries, it has become evident that teacher training plays a critical role in enhancing students' performance in terms of skills development and acquisition. Traditional one-time teacher training workshops have not been effective in helping teachers to feel comfortable using technology or to integrate it successfully into their teaching. Instead, a new paradigm is emerging that replaces training with lifelong professional preparedness and development of teachers.

2.6.2 Future Demand for Skills in the Automotive Industry

The current skills in the automotive industry would not be in high demand in the near future. Some of these skills would not be relevant again. The automobile sector will require more data analysts and scientists in the future, according to the World Economic Forum's ((WEF), 2018) Future of Jobs study. Automation and robotization will enhance the need for technical skills,

particularly in jobs that necessitate STEM (Science, Technology, Education, and Mathematics)-related training fields (ILO, 2018). Therefore, there is a need to plan for the future skills if the present sets of workers in the automotive industry want to be still relevant in the industry. It was further noted by the WEF (2018) that there will be less demand for roles such as assembly and factory workers, and other low-skilled workers. However, there will be greater demand for data analysis and scientists, process automation specialists, and industrial and production engineers, among other high-skilled workers.

The automotive industry is regarded as an engine of growth whose establishment serves as an important stimulus to other types of manufacturing activities because the industry has capabilities to create many job opportunities and generate acquisition of technology. The Federal government established the National Automotive Council (NAC) in 1993. The trust of the National Automotive Policy shall be to ensure the survival, growth and development of the Nigerian automotive industry using local human and material resources. This is with a view to enhancing the industry's contribution to the national economy in the areas employment generation, technology acquisition, effective utilization of local raw materials and resources and in the transportation of people and goods. The National Automotive Policy provided for the establishment of the National Automotive Council as the agency that will carry out its objectives. Act No. 84 of 25th August 1993 was promulgated to back up the establishment of the Council as a parastatal of the Federal Ministry of Industry.

The automobile industry is regarded in any economy as a major instrument for technological and socio-economic advancement, as it serves as an important stimulus for other types of manufacturing activities. It is also a major driver of macroeconomic growth, stability and technological advancement in many developed and developing countries. An electric vehicle (EV) has been described as an apparatus which utilises electric motor(s) for propulsion and based on the kind of vehicle, movement may be provided by wheels or propellers driven by rotary motors, or in the case of tracked vehicles, by linear motors (US Department of Energy, 2019). This vehicle employs large traction batteries to power the electric motor. Periodically, the battery pack must be plugged in to a charging station or wall outlet to charge. The prospect of Electric Vehicles (EVs) in Nigeria was necessitated by developments in the global automotive industry, where the proportion of EVs to total vehicle sales is growing significantly. This importance of EVs arose because of the need for efficient, clean and environmentally-friendly vehicles, given the need to shift away from reliance on wasting energy sources to power vehicles (Agunbiade & Siyan, 2020).

Challenges revolve around the inadequacy of electricity which is critical for the EVs, procuring inputs like lithium and cobalt and provision of charging facilities and good road network. The growth in electric vehicles (EVs) and hybrid electric vehicles (HEVs) continue climbing, such that by 2025, EVs and HEVs have been projected to form about 30% of all vehicle sales (JP Morgan, 2019). The demand for electric vehicles arose as a result of increase in demand for fuel-efficient, high-performance, and low-emission vehicles. Furthermore, the movement towards reduction in vehicular emission due to strict rules and regulations in several countries is fuelling the market growth. However, a major hindrance to the electric vehicle market growth is comparatively the high manufacturing cost of electric vehicles. Technological advancements in electric vehicles and proactive government initiatives will however present significant opportunities for the growth in the electric vehicle market (Agunbiade, & Siyan 2020).

According to the Australian Electric Vehicles Association, there are principally three major types of electric vehicles (EVs), based on how electricity is used as their energy source (Australian Electric Vehicles Association, 2019). Hybrid Electric Vehicles (HEVs) are EVs that are powered by both petrol and electricity. In this instance, electric energy is produced by the vehicle's own braking system that recharges the battery. HEVs start off by utilising the electric motor; thereafter, the petrol engine starts as load or speed rises. Both motors are controlled by an internal computer system which ensures the best economy for the driving conditions. Plug-in Hybrid Electric Vehicles (PHEVs) which are also known as Extended-Range Electric Vehicles (EREVs), are also powered by both petrol and electricity. The battery is recharged through regenerative braking and plugging it to an external electrical charging outlet. In EREVs, the petrol engine extends the range of travel of the car by also recharging the battery as it gets low.

Presently, EVs are not many on Nigerian roads but since this is the direction the world is tending to, drastic action needs to be taken to ensure that Nigeria is not left behind. Nigeria must address this skill shortage in the AE. These new skills should be added to the TCs curriculum in AE to meet the needs of this emerging area in the future. In addition, the teachers and instructors must be prepared to meet these needs so that they can impart the necessary skills to the TVET students in AE. While it is accepted that the introduction of EVs will reduce CO_2 emissions, there is also the environmental issue of battery manufacturing and disposal, which could be quite challenging in Nigeria, where normal domestic waste management system is already an area of concern. These batteries are complex as they contain

toxic chemicals; making their disposals at the end of an electric vehicle's life a major environmental challenge (Agunbiade & Siyan, 2020).

2.6.2.1 The Future Skills in the Automotive Industry

The automotive sector is a major provider of employment in many countries. This sector provides skilled and well-paid employment both directly in the manufacture of vehicles and indirectly through its supply chain (ETF, 2021). The recent changes and development have reshaped how work is being done especially in the automotive industry. There is a need to consider how countries, especially the developing countries, might anticipate and respond to the various changes that are spreading throughout the global economy. The emerging technologies employed in the workplace have a significant role on the skills that workers would need. According to the ETF (2021), the following factors have been identified as drivers of change in Turkey's automotive sector. Given Turkey's status as a developed country, it could potentially serve as a model for developing countries in Africa:

- The introduction of new technologies both with regard to products (electric cars, and smart cars) and production processes
- The emergence of a new business model from online trading to a shift towards renting or sharing vehicles
- Integration with global value chains (GVC)
- International competition leading to the adoption of solutions to improve efficiency, reduce costs, and maintain quality levels
- Standard/regulations which often prompt the development and implementation of innovative technologies
- Safety requirement
- Environmental impact

All these have implications for the types of technology used in the automotive sector.

2.6.2.2 Future Employment and Skills in the Automotive Sector

The transition to electric cars and the use of autonomous technologies will define the future course of the automobile industry globally (ETF, 2021). These changes will, however, affect

the production processes in the automobile technology. Evidently, the automation has already started to influence the current and future demand for skills in the automotive sector.

2.6.2.2.1 Key Drivers of Change in the Sector

The future of the car industry will be shaped by non-technological elements as well as changes in technology. The need for skills is significantly influenced by the quick pace of technological advancement (ETF, 2021). In addition to technology, there are many other components, such as social, economic, and environmental factors, which will shape future skills needs. The introduction of new technology is the most relevant driver of change for the sector. The shift to new types of vehicles, like the electric/hybrid cars and smart/autonomousvehicles, is reshaping the automobile industry. This will bring about the emergence of new business models (Rachinger et al., 2019), brought about as a result of shifts in people's mobility behaviours. Strong international competition from the other countries is another very important driver. The adoption of new production processes and techniques to optimise efficiency and reduce costs such as lean management, smart factory solutions, and increase in investment in robots and automation.

Focus on safety issues, e.g., braking systems for the protection of the passengers (Yunhan et al., 2017). Environmental impact and a greener economy and the decreasing fossil fuels are also seen as drivers. The growth of interest in the various technologies, such as hybrid or electric vehicles,is also a result of recurrent crises in the oil market (ILO, 2021, p. 35).

2.6.3 Skills Development and Lifelong Learning

2.6.3.1 Skills Shortage

The issue of skills gap and skill shortage among automobile technology graduates has raised significant concerns among employers in Nigeria’s automobile industries. This has led employers to question whether TCs are effectively fulfilling their purpose. Skills gap and skill shortage negatively impacts the productivity and profitability of industries, leading to increased labour costs (McGuinness & Ortiz, 2016). Studies have revealed that automobile companies frequently allocate substantial resources to train newly employed graduates of

automobile technology, as their existing skills often fall short of meeting the demands of the 21st century workplace (Rufai et al., 2013).

The automotive industry plays a crucial role in the global economy, driving growth and development worldwide. As a capital-intensive industry, it fosters innovation and attracts substantial investments, while creating millions of jobs and livelihoods. Nevertheless, Caleb (2022) has noted a significant mismatch between the skills demand and supply in the automotive industry. The issue extends beyond employers alone, impacting individuals and the nation as a whole. The government must take the lead in transitioning the country into a high-skilled economy. TVET plays a vital role in skills development in Nigeria. To meet the demands of the 21st century workplace for skilled manpower, TVET should focus on producing TC graduates who possess marketable skills for both employment and self-reliance. Oviawe et al. (2017) have suggested that achieving this requires collaboration between TVET institutions and the industry to bridge the skills gap.

According to Ugwueze et al. (2020), the skill shortage in Nigeria's automotive industry can be attributed to inconsistent implementation of automobile policies, which further strengthens the dominance of non-indigenous automobile manufacturers in the sector. It is recommended that consistent implementation of auto policies, which promote the interests of indigenous manufacturers, is crucial for increased local production and sustainable jobcreation within the sector.

The introduction of On-Board Diagnostic (OBD II) has significantly changed the landscape of diagnosing and repairing modern vehicles. Today, modern vehicles are equipped with intricate electrical and electronic devices/sensors, requiring auto mechanics to possess in-depth knowledge of mechatronics, which combines mechanical and electronics knowledge. However, a considerable number of auto mechanics currently lack this essential knowledge, emphasising the urgent need for more auto mechanics with proficient mechatronics skills. These skilled professionals are crucial for effectively diagnosing and repairing modern vehicles.

Allais and Nathan (2014) affirmed that millions of young people leave the school system with inadequate education. A skill shortage is widely regarded as a major contributor to South African's high employment level. This is also the general case in all the African countries. According to Vally and Motala (2014), education is to blame for the mismatch and for not providing the skills that companies require. It is ideal to learn vocational skills on a job

because they are often needed in the field. However, unemployment has become a structural problem of the capitalist.

Dual System

Companies 3/4days/week => Enterprise school

Vocational School 2days/week =>
VocationalSchool

The advantages of this include the enterprises obtaining highly qualified and motivated young workers and the institutions of higher education benefiting both in terms of content, financially, and createa distinctive image for themselves by offering demand-based courses of study. According to Remington (2018), the dual system tries to solve the problem of mismatches.

2.6.4 Skills and Lifelong Learning

Skill development and lifelong learning are very important in investing in the people's capabilities, which can be used for advancement and sustainable work in the automotive industry. They also make the transition to a future of work that contributes to SD. The automotive industry makes a significant contribution to the global economy and to growth and development worldwide (ILO, 2020). In addition, the use of automobiles is a major cause of local air pollution, greenhouse gas emission, and road accidents.

The automotive industry plays a crucial role in achieving the 2030 Agenda for Sustainable Development, particularly in relation to SDG 8, which aims to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. The industrial sector also has a role to play to achieve the SDGs in other areas – SDGs 3, 4, 9, 11 and 12. The SDGs are integrated in that action taken in one will eventually affect the outcomes in the other goals. The expected development must balance social, economic, and environmental sustainability, and the goals address the global challenges faced by the various countries. The SDGs help in attaining sustainable management of means and resources which will help to ensure a bright future for the generations to come.

Skills development and lifelong learning are keys to investing in people's capabilities and attaining decent and sustainable work in the automotive industry, as well as to ensuring a just transition to a future of work that contributes to SD (ILO, 2020). In the automobile

industry, skills development and lifelong learning are keys to investing in the people's capabilities and advancing decent and sustainable work (ILO, 2020). This is to ensure a just transition to a future of work that contributes to SD. With this in mind, the design and teaching of curriculum in the mechanical trades, especially motor mechanic work, should be conscious of the trends of technology that will define the available jobs/skills in the automobile industry.

It is necessary to ensure that workers can continuously adapt to the changes that will occur during their lifetime. In order to achieve this, their skills need to be improved urgently. A variety of fundamental and essential abilities that are largely learned throughout early infancy and in school will need to be added to this. In the automotive sector, there will be a considerable need for a combination of technical, core, and fundamental abilities. The workers' future and career prospects would be bright after acquiring such abilities. The latter will make it possible for individuals to transition readily between different jobs, professions, and the industrial sectors.

Due to the expected changes in the automotive industry, it is important that the government, workers, and employers work together in better managing skills and skills shortages. This will ensure that employers and workers are best placed to benefit from the opportunities arising from the technological advances. The government should think about the future skill needs by putting adequate measures in place to support lifelong learning. This will include investing in people's capabilities and decent and sustainable work. The workers should be actively involved in continuing education, training, and lifelong learning. This will be needed to secure employment in the automotive industry or find employment in other sectors of the economy. Employers will expect employees to possess the necessary abilities to use new technology for productively and sustainably. Investments in lifetime learning and work-based learning should be enhanced in order to upgrade the skills of the current employees. The TVET system has historically been used by the automobile industry to give people the skills needed to operate in the sector (ILO, 2020). Strengthening the relevance of TVET requires extending qualification profiles and deeply integrating digital and core skills into the curriculum in order to better respond to the shifting demands of the labour market both now and in the future (ILO, 2020). In addition to assuring the development of high-quality and pertinent skills, apprenticeships and internships may be utilised to bridge the gap between the skills obtained during school and the industry's needs (Molz, 2015). Young men and women can help to develop the necessary skills and get exposure to the usage of new technologies through on-the-job training and work experience (ILO, 2017).

Automation and robotisation will increase the demand for technical skills (Roblek et al., 2020). There would be a greater need for the following specialists in the automobile industry in the near future:

- Data analysts
- Scientists
- Process automation specialists
- Industrial and production engineers (ILO, 2020, pp. 33–34).

The automotive industry faces challenges, such as complex supply chain issues, and the industry needs skilled workers who are more technically advanced to meet these challenges. Less demands for these skills or group of workers would be experienced in the future, namely:

- Assembly and factory workers
- Administrative and executive secretaries
- Low-skilled workers (ILO, 2020, pp. 33–34).

Automotive products are becoming increasingly technologically advanced, necessitating the need for highly skilled workers who are well-versed in modern technology. This is crucial for the production of vehicles that are more energy efficient.

2.7 Sustainable Development Goals

The SDGs, also known as the Global Goals, were adopted by the UN in 2015 as a universal call to action by all the nations to end poverty, protect the planet, and ensure that by 2030 all the goals should have been met (Ogwo, 2019). There are seventeen (17) goals. The 17 SDGs are integrated in the sense that action taken in one area will affect the outcomes in the other goals. The development must balance social, economic, and environmental sustainability (Legusov, 2022). These goals address the global challenges faced by countries.

The SDGs assist in the sustainable management of resources which will help to brighten the future for the generations to come. These goals should guide us to meet our needs without compromising the ability of future generations to meet their own needs.

2.7.1 Integrating SD into TVET Curricula

SD is a concept based on integrating socio-cultural, environmental, and economic considerations (Majumdar, 2009). Sadly, TVET is still only able to serve as a source of trained labour for the market, which prevents it from being able to adequately meet the demands of the SD strategies (Lamichhane & Echaveria, 2017). Majumdar (2009) suggested that TVET professionals need to be called upon to reorientthe TVET curriculum towards sustainability while maintaining the principles of the 6Rs, namely: Reduce, Revise, Renew, Recycle, Repair, and Rethink perspectives. These concerns and challenges show that TVET has to concentrate on the economic, social, and environmentalaspects of sustainability. These changes should be reflected in TVET curricula, which will also aid in students' adjustment and coping. The task of TVET professionals is to devise waysfor the concepts of the SDGs to be infused into the curriculum. TVET for SD is a process of incorporating into TVET considerations that impact on the long-term future of the economy, ecology, and society (Majumdar, 2009).

2.7.2 Sustainable Development Goal 4 (SDG 4)

2.7.2.1 Sustainable Development Goal 8 (SDG 4): Quality education

SDG 4 is about quality education – basically, to ensure an inclusive and equitable quality education. This form of education should promote lifelong learning opportunities for all. Formal, non-formal, and informal learning are regarded as the main drivers of SD for improving people's lives and in achieving the SDGS. SDG 4 affirmed education as a public good and fundamental human right. It also notedthe inequality in access to and attainment of education particularly between girls and boys. The important role the culture plays in achieving sustainability should be able to identify the existing TVET programmeme that needs to be updated. Individuals should be encouraged to value education, continue learning, and pursue lifelong education in a learning society. QualityTVET must acquire the information and abilities necessary to assist the welfare to become more adaptable and receptive to the demands of local labour markets while competing in the global economy (UNESCO–ILO, 2002).

2.7.2.2. Sustainable Development Goal 8 (SDG 8):

SDG 8 should promote sustained, inclusive, and economic growth, full and productive

employment, and decent work for all. TVET has been regarded as the best way in achieving this goal (McGrath et al., 2018). It should be seen as the contribution of an economy to the well-being of the people. Emphasis should be placed on the job training. There should be closer interaction between the educational institutions and the industry. The education content and training should be in line with the economic changes and demand for "green skills" and "green jobs" (Pavlova, 2017). This should lead to the establishment of decent work compliance in supply chains. There should be practical application of ways of increasing access and employment opportunities for others. With all these, people should be motivated to become entrepreneurs.

As reiterated in previous discussions, the issue of skills shortage is a significant concern in Nigeria and is a central topic addressed in this thesis. It is briefly mentioned below under its own heading.

2.7.3 Education for Sustainable Development

2.7.3.1 Defining Sustainable Development

Sustainable development (SD) is the development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs (Paryono, 2017). TVET must play an important role in the implementation and promotion of SD by incorporating the considerations and policies that impact on the long-term future of the economy, ecology, and society (UNESCO-UNEVOC, 2005; Aliyu, 2016). According to Pavlova (2017), SD is a socio-ecological process that satisfies human demands while preserving the integrity of the natural environment. Sustainable TVET should be able to alleviate poverty and provide skills for employability, citizenship, and conservation (Obidele, 2014). According to Dike (2013), it has been observed that without skilled technical manpower produced by the TVET institutions, the national development of the nation will be hindered. In order to achieve this, TVET should be driven with a specific focus to equip youth with skills in different areas of specialisation, particularly with competencies relevant to the demands of the industry.

One of the major purposes of TVET is to train, provide and improve necessary skills leading to the production of craftsmen, technical and other skilled personnel who will be enterprising and self-reliant. TVET is seen as the driving force for SD. Thus, it plays an

important role inimplementing and promoting SD (Okorafor & Nnajiofor, 2017). TVET institutions are the major suppliers of workforce who will be in the forefront dealing directly with sustainable issues. TVET institutions have the capability of leading the education and training sector in achieving SD by creating and promoting awareness and producing a workforce with efficientsupport. These ideas should be integrated in the TVET curriculum, learning content, as well as the teaching-learning process that is reflected in the school policies and practices. It has been noted that TVET for SD is to be locally relevant and culturally appropriate (AU, n.d.; UNESCO-UNEVOC, 2010; UNESCO, 2004). TVET in developing countries suffers from misconception, mismatch, and mishandling (Pavlova & Turner, 2007). In order to transform TVET for a sustainable future, UNEVOC (2012) affirmed that the TVET teachers should be adequately empowered. Also, the role of partnerships and networking in global TVETdevelopment should be given adequate attention. The Decade of Education for Sustainable Development (DESD), which the UN proclaimed in 2005, calls on African nations to consider their environmental, economic, and social systems and promotes progress that is beneficial to both the environment and people. The years 2005–2014 are included in this declaration (Pavlova, 2013). Education for SD should be locally relevant, culturally appropriate, and based on local the local needs, perceptions, and conditions. The essential characteristics of education for SD, identified through the DESD, shoulddeal with the well-being of all three reactions of sustainability, namely: environment, society, and economy (Sinakou et al., 2019). This form of education should promote lifelong learning(Cronholm, 2021). Education for SD should engage formal, non-formal, and informal education.

2.7.3.2. Assessment of how SSED is currently promoted through TVET

The Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs), designed by the United Nations (UN), comprise of targets to be attained for socio-economic and environmental development (Leal Filho, et al, 2021). In this regard, equitable and inclusive growth is the real agenda of development, also known as sustainable development. It must be noted that macro-economic growth is only one aspect of development. True development is triggered by the people‘s accessibility to sustainable livelihood (Niaz, 2022) and the individual level of socio-economic development, which will ensure the accomplishment of other development goals (Erlyn,et al,2022). Therefore, poverty reduction, by attaining sustainable livelihood, is a pivotal socio-economic policy and also a challenging

target for developing countries. Poverty is a multidimensional phenomenon that is common in the developing countries, including Nigeria, and its implications and effects on the socio-economic status of the impoverished people (Danaan, 2018).

TVET has the potential to contribute to employment and productivity to better support sustainable economic transformation (Danaan, 2018). TVET system plays a crucial role in the social and economic development of a nation. Owing to their dynamic nature, they are continuously subject to the forces driving change in the schools, industry and society (Razzaly, et al, 2010). This is the right time to position and reform (TVET) in the developing countries. This is important due to the rapidly changing labour markets and evolving skills needs due to globalisation, technological progress, demographic transformation, and climate change. The need for well-performing TVET is critical for ensuring smooth job transitions. In addition, at the time of high youth unemployment, TVET can provide an opportunity for many to transit quickly to the labour market, to perform critical jobs with higher productivity, and to support the transition to sustainable and resilient societies (Comyn, 2018). It is believed that strong and effective TVET systems can help countries meet the Sustainable Development Goals by sustainably and efficiently supporting employment and productivity. However, this is unfulfilled in many countries because secondary and post-secondary TVET institutions focus on what they know how to provide, but not what students need. TVET can be a decisive instrument for youth to participate in the work force and to improve their living conditions and social status, yet the current preoccupation with the general education in Nigeria and the neglect of TVET, reduces economic opportunities of those who are more oriented towards work (Shefiu, & Ayika, 2019). Youth empowerment by TVET system is therefore a sure means to aid sustainable development if utmost consideration is given to the sector.

Some of the challenges facing developing countries like Nigeria are the increasing economic opportunities and productivity while supporting sustainable economic transformation. Too many people are out of work and those who are in work are often in informal, low-productivity jobs with poor working conditions and no social protection. As a result, employment often coexists with poverty: almost 40 per cent of the employed live below the extreme poverty line and women and youth are often particularly disadvantaged (Merotto et al. 2018).

The context for providing TVET is changing rapidly, as rewards rise for workers with the right skills for in-demand jobs. With its unique focus on practical, work-related skills,

TVET can enhance the employability of youth and adults (Sumberg, et al, 2021).

Unemployment is one of the most serious problems facing Nigeria like many other countries in the world. Nigeria is becoming a predominantly youth society with high rate of unemployment (Akor, et al, 2016). The development of youth is critical to economic survival and vibrancy of any nation. In order for a country to achieve her development aspiration, the youths need to have access to education that will enable them to enhance their standard of living and gain competitive skills that will be in high demand in the labour market. Young people that lack skills that are valued in global and local economies face limited job opportunities and income growth. The changing nature of work today is placing increased pressure on the youths to acquire technical and vocational education skills. With the youths among the big losers of the recent economic crisis, technical and vocational education is often seen as the silver bullet to the problem of youth joblessness (Akor, et al, 2016). The bedrock of technological advancement in many countries lies in the effective implementation of TVET programmeme. Countries adopt varied policy guidelines on issues bothering on developing youth knowledge and skills in TVET with a view to producing labour force capable of handling any domestic and/or industrial works demand (Akor, et al, 2016). Nigeria's recovery from her economic recession is anchored on its economic pillar of TVET.

2.7.3.3. Re-Orienting TVET towards Sustainable Development

Equipping TVET graduates with the modern skills can help prepare the current and future workers for productive jobs and entrepreneurship, to the benefit of the entire economy and society. Skills are human capital, which helps people realize their potential for being productive and active citizens. Skills, in the forms of foundational (or core, transversal), cognitive and socio emotional, occupational, job-specific, technical, and digital, can increase the chances of productive employment in the developing countries (Siekmann, & Fowler, 2017). Better educated individuals are on average more likely to be employed and to earn more (Patrinos & Psacharopoulos, 2020). In addition to the benefits that accrue to individuals, the accumulation of skills in the workforce can facilitate the shifting of work and economic activity from less to more productive uses within and between sectors, and thus contribute to the structural transformation and inclusive economic growth. A well-designed TVET programmeme can thus help countries meet the Sustainable Development Goals (SDGs) of "ensuring inclusive and equitable quality education and lifelong learning opportunities for all"

and “promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all” (OECD, 2019; UNESCO 2016). Education and training are the primary agents of transformation towards sustainable development, increasing people’s capacities to transform their visions for society into reality. When re-oriented towards sustainable development, TVET not only provides appropriate scientific and technical skills, it can also provide the understanding, motivation and support needed for applying them in the interest of helping create a sustainable future. However, the process of re-orienting TVET towards sustainable development is a broader and more pervasive task than that of revising syllabuses and devising new teaching and learning materials that incorporate principles and examples of sustainability (Majumdar, 2011).

TVET is often more expensive than the general education. This is partly due to high equipment capital and operating expenses (Hoeckel, 2008). High unit costs also arise from small class sizes, which are characteristic of some fields, some institutions, and some countries. According to OECD data, total per-student spending for vocational upper-secondary programmes is higher than for general upper-secondary programmes. Foundational skills are important because employers seek them but they are also needed for further learning and for adaptability (Carnevale, & Smith, 2013). Adequate investments in TVET staff, infrastructure, and equipment are necessary to improve TVET quality. Generally, in the educational system, the most important input to learning is teachers and instructors. The first thing is to make TVET teaching attractive through better salary/wages and opportunities for career progression. Recruitment should aim to hire teachers with the appropriate technical skills and significant industry experience, not just a teaching certificate (Darling-Hammond, 2017). Particularly important for teacher training in TVET are systematic collaborations with industry. Adequate infrastructure and equipment should complement investments in teachers. Many facilities need upgrading, but for these investments to pay off, they need to be accompanied by reorganization and strengthening of TVET teacher development.

Updating infrastructure and equipment requires additional resources, for maintenance as well as acquisition, which should emphasise increasing private sector inputs when procuring new materials and equipment to ensure they reflect the technological and the needs of the students. The creation of effective pathways requires that TVET provides graduates with strong foundational skills and that the broad education system addresses fragmentations in governance.

In today's global economy, having the right skill set is crucial. Many years ago, it was enough to have a few technical skills and you are set for life. These days, it is not so. To be successful in the modern day, a person is required to have a combination of hard and soft skills, which are transferable and high in demand (Meeks, 2017). Skills are divided into two types; hard and soft skills (Pieterse, & Van Eekelen, 2016). They are determined based on how they are learnt and how they are used. Hard skills are the skills learnt through hands-on experience. Hard skills are more tangible and defined than soft skills. Soft skills, on the other hand, are a bit looser. Like hard skills, they can be taught and learned over time but they are much more tied to one's personality than physical abilities. Because of this, they tend to be much more fluid and transferable than hard skills.

2.8 Conclusion

The emergence of technology advancement has affected the speed of industrial globalisation in our everyday task in our societies. It is crucial for TVET to foresee and adaptto the rapid changes in technology that are having an impact on how society functions and lives. By providing pertinent courses, appropriate curriculum, and fresh approaches to teaching and learning that provide instructors and students easy access to the most recent technological advancements, TVET must be able to anticipate and respond appropriately. Lastly, it is important for TVET institutions to prepare graduates not only for the national andregional job markets but also for the global market too. Attention now shifts in the followingchapter to the methodology employed in this study.

The following chapter discusses the relevantconceptuaal framework used in this study.

CHAPTER 3
CONCEPTUAL FRAMEWORK

3.0 Introduction

This chapter is dedicated to elucidating the conceptual frameworks that undergird this study. It is pertinent to distinguish between a conceptual and a theoretical framework, as both play crucial roles in shaping and directing the research, albeit in distinct ways. Hecker and Kalpokas (2024) contend that a theoretical framework comprises an array of concepts, definitions, and propositions that coalesce to provide a structured, holistic perspective on a particular phenomenon. This framework serves as the theoretical bedrock upon which the study is constructed. It connects the theoretical perspective to the data collection and data analysis strategy and offers a structure for organising and interpreting the collected data. Conversely, a conceptual framework, as posited by the authors, encapsulates the hypothesized interrelations among concepts, constructs, and variables, which are inferred from the extant literature, as well as the unique context and focal point of the current research. It articulates and interconnects specific concepts and variables, delineating the envisaged linkages and relationships therein. As this study aimed to understand specific factors, processes or relationships that are deemed necessary to promote SSED via TVET, developing a conceptual framework that could help us map these specific elements prove more effective.

This study utilised the Triple Helix Model (THM), Quintuple Helix Model (QHM), Integrated Intelligence and the Five Capitals framework, with an enhanced focus on the latter three. The integration of these frameworks is poised to yield a comprehensive conceptual structure. As posited by Hecker and Kalpokas (2024), such a synthesis enables the visualisation and prediction of the interplay among the various concepts, constructs, and variables derived from the extant literature, tailored to the unique context and objectives of our inquiry.

The THM underscores the synergistic endeavours of academia, industry, and governance, laying a solid groundwork for TVET institutions. This foundation is significantly strengthened when augmented by the Integrated Inteligence, QHM and Porritt's (2005) Five Capitals framework, encompassing natural, human, social, manufactured, and financial capitals. Together, these framings offer a holistic strategy that empowers TVETs to drive socio-economic transformation in Lagos. Porritt's (2005)

framework, in particular, further enriches these models by ensuring that TVETs adopt a sustainable and holistic approach to education. By acknowledging the pivotal role of natural capital, TVETs can incorporate environmental considerations into their programmes, preparing students for green jobs and fostering a culture of sustainability. Human capital development is at the core of TVETs, and the framework's emphasis on investing in people's skills and well-being ensures that graduates are not only technically proficient but also adaptable and resilient (UNESCO-UNEVOC, 2020).

By integrating the THM, QHM, TVETs in Lagos State can benefit from the synergy between educational institutions providing cutting-edge knowledge, industries offering practical insights and apprenticeships, and government ensuring supportive policies and funding. This collaboration ensures that the curriculum is relevant, responsive, dynamic, and aligned with the labour market's needs, thus enhancing the employability of graduates. In addition, the integrated intelligence framing encourages and ensures a curriculum that goes beyond technical skills and knowledge, fostering an educational environment where intuitive thinking and broader cognitive abilities are developed.

It has to be noted that while the THM and QHM were initially developed with universities in mind, its principles can be extended to other educational institutions like TVETs, thereby broadening the scope of their application, as demonstrated in this study. There are instances where TVETs have been integrated within the Triple Helix model. For example, a report by the Kenya National Federation of Jua Kali Associations proposed a collaboration framework between the Jua Kali sector (informal Micro, Small and Medium Enterprises) and TVET sub-sector stakeholders. The Triple Helix model was adopted as a reference model for this framework (Kenya National Federation of Jua Kali Associations (KNFJKA), 2020)).

The chapter is structured as follows: commencing with an introductory overview, it delves into the intricacies of the THM, exploring the distinct features of its three iterations—THM I, THM II, and THM III. A comparative analysis acknowledges their respective differences, strengths, and limitations. The chapter then transitions to the QHM, Integrated Intelligance and the Five Capitals framework, underscoring the advantages of employing a holistic framework to investigate the factors that foster SSED via TVETs. The chapter culminates with a succinct conclusion that encapsulates the core arguments and points presented.

3.1 The Triple Helix Model

TVET is the comprehensive term referring to those aspects of the educational processes involving the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding, and knowledge relating to occupations in various sectors of economic and social life (Federal Republic of Nigeria, FRN, 2004, p. 29). It is a form of education designated to develop specific occupational skills. According to Okoye and Okwelle (2014), by implication, TVET delivery system has the potential to train the skilled workforce that the nation needs and create employment for the youths and emerge out of poverty, underdevelopment, and technical backwardness. It has been observed at various platforms, both nationally and internationally that TVET provides the needed employable skills and attitudes necessary for effective performance in the workplace.

Okoye and Okwelle (2014) opined that if Nigerian graduates are adequately prepared through skills oriented academic system of TVET programmes, many skills outlets would be nurtured and developed in the students for paid jobs or self-gainful engagements which would reduce the rate of search for government paid labour. It is expected that TVET graduates should be equipped with integrated set of technical work skills to be relevant in the labour market. The graduates equipped with these work-driven skills are relatively the labour force whose professional responsibility is required to effectively perform in the dynamic and competitive world of work.

According to Prosser and Quigley (1949), effective TVET can only be given where the training jobs are carried on in the same way with the same operations, the same tools, and the same machines as in the occupation itself. This means that teachers and instructors must have recent employment experience in order to be have skills in the use of the latest equipment and must make use of the same types of tools and equipment as would be currently found in employment; and, must use live work or work identical to that provided in employment for instructional experience rather than pseudo or so-called “project” work. Emphasised here is that the skills taught should follow the same basic practices as industrial employers would expect, and learners should be able to move from the training situation to employment situation with little need for adjustment.

From the foregoing statements, it could be affirmed that the TVET institutions alone cannot provide the form of TVET needed for the graduates to function effectively in the industry and the society at large. Hence the need for THM for the study. The Triple Helix thesis is that the potential for innovation and economic development in a Knowledge Society lies in a more prominent role for the university and in the hybridization of elements from university, industry, and government to generate new institutional and social formats for the production, transfer, and application of knowledge (Ranga & Etzkowitz 2015).

The Academia (University) is regarded as knowledge-based and is saddled with the task of training TVET students while the Government is responsible for the formulation of policies that drive TVET and funding of TVET institutions. The Industry main function is the provision of goods and services needed to drive the economy and it employs the TVET graduates that possess the needed skills to work in the industry. The three spheres intersect at a point which reveals the collaboration amongst the three spheres which is needed to move TVET to the expected level of providing up-to-date skills to the graduates that would be needed to work in the industry. The industry knows the skills that are needed for graduates to be gainfully employed and collaboration between the industry and academia is needed to impart these skills to the teachers and instructors by granting them industrial experiences to learn the new skills. Prosser and Quigley (1949) further noted that TVET will be effective in proportional as the instructor has had successful experience in the application of skills and knowledge to the operations and processes he undertakes to teach. This means that the teachers and instructors cannot teach that which they do not know; and, since the subject matter of the vocational teacher is composed of the skills and knowledge of the occupation, it would follow that teachers and instructors who are recognised as highly competent workers themselves through actual successful employment experience would be most desirable for the TVET system.

Based on the collaboration between the academia and industry, the government is also expected to form policies that will guide the collaboration and effective funding of the TVET institutions. The THM is based on the work of Etzkowitz and Leydesdorff (1995, 1998, 2000). It gained popularity followinga conference in 1996 in Amsterdam, and since then, it has undergone several modifications. Etzkowitz and Leydesdorff (2000) attributed the changes observed to the evolving nature of innovation systems and the shifting institutional arrangements of academia, industrial sectors,and the government. The THM of innovation represents the interconnectedness between academia (the university), industry, and

government. Its aim is to foster economic and social development, in line with the concepts of the knowledge economy and knowledge society (Leydesdorff, 2012; Galvao et al., 2019). Aggarwal and Sindakis (2022) revealed that the innovation of the helical theory, where each circle represents a sector, illustrating the development of interactions between these spheres. The current complex interactions are the development from the first model which had two dimensions. The framework was initially developed by Etzkowitz and Leydesdorff (1995) in the 1990s. As a result of the interactions between universities, industries, and governments, new intermediary institutions have emerged, such as technology offices and science parks. Etzkowitz and Leydesdorff (1995) proposed a theoretical relationship between these three spheres, giving rise to these new hybridorganisations.

Some scholars have maintained that the Triple Helix (TH) framework is an interactive model that enhances the analysis of the different spheres (Leydesdorff & Meyer, 2006). With the movement of innovation beyond a single organisation and often across different organisational and institutional structures through TVET, the change process and the way in which the spheres are connected is very important. One method of examining the facts or relationships of knowledge-based innovation is hinged on the university-government-industry relations (Legg-Jack, 2018). The promotion of the new arrangement where the various institutional spheres overlap, and one institutional sphere takes the role of the other, is described by the various government policy initiatives and government's funded innovation projects which require collaborations between the university, government, and industry.

3.1.1 Triple Helix I

The Triple Helix Model I (THM I) is also known as the 'Etatistic model.' This first stage of the model consists of three spheres representing academia, industry, and government. The academia and industry spheres in this model, according to Leydesdorff (2012), are encompassed within the government sphere, as illustrated in Figure 3.1. The government plays the leading roles by monitoring the affairs of both the academia and the industrial sector. The implication of this arrangement is that the government directs the activities of the academia and the industry. These two institutions – the academia and the industry – depend on the government for financial assistance to survive. The government controls almost everything that goes on in the two other spheres.

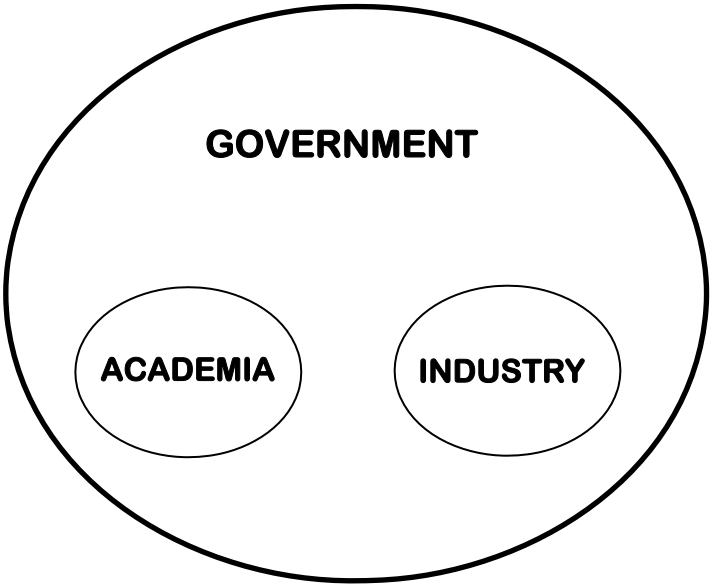

Figure 3.1: Etatistic Model of University–Industry–Government Relation (Source: Leydesdorff, 2012)

For Leydesdorff and Etzkowitz (2003), a similar model of development was introduced by Sabato in which the government was made to play a significant role in directing the affairs ofthe industry and the academia (Dos Santos & Fracasso, 2000). Another similar model was introduced in Brazil in the 1970s and 1980s when the government spearheaded the technologyprojects and research in the universities to support the creation and advancement of technologyin the electrical and electronic fields (Etzkowitz, 2003). The model was popular in Europe andwas considered appropriate for companies that are saddled with the production of products. The major role of the university in this model is to groom and train skilled personnel who willprovide essential services in either the governmental sector or the industrial sector (Cai, 2020).The primary responsibility of the university lies in conducting research; however, its direct involvement in the establishment of new enterprises typically requires approval from the government.

3.1.2 Triple Helix II/Laissez-Faire Model

The Triple Helix Model II (THM II), which is also known as the Laissez-faire model, emerged as the need for an alternative to THM I in order to reduce the leading role of the government (Etzkowitz, 2003). The THM II is made up with three distinct institutional spheres that was

marred by competition instead of collaboration. According to Etzkowitz (2003) and Galvao et al. (2019), the distinct separation in the institutional arrangement of THM II led to the definition of their different separate roles, strict limits, and reasons for the collaboration amongst the three institutional spheres. The arrangement of the model is shown in Figure 3.2 below:

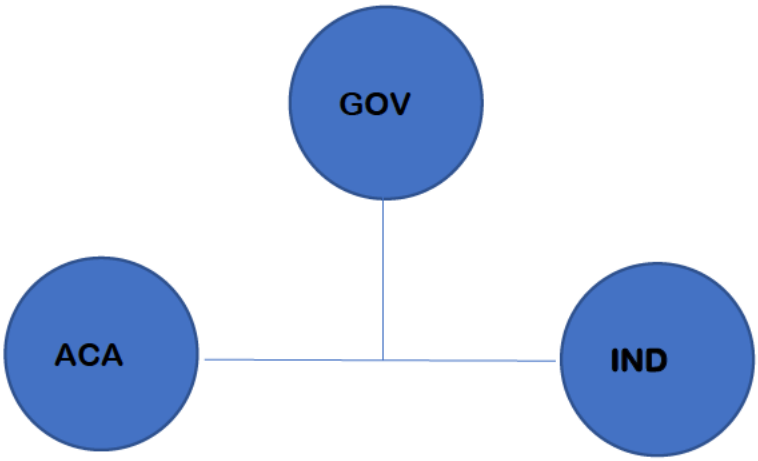

Figure 3.2: Triple Helix II/Laissez-faire model (Etzkowitz, 2003)

According to Ranga et al. (2013), the Laissez-faire model is distinguished by the low involvement of the government in the economy. This is evidenced in the United States of America (USA) and parts of Europe. The role of the university is limited to providing research findings and trained personnel, while its role towards the industry is to share information through research publications and supply qualified graduates. These graduates can utilise the knowledge acquired at the university to contribute effectively to their respective roles in new job placements (Etzkowitz, 2003; Duan & Jin, 2021).

The industry sources knowledge from the university without much assistance and coordination. The part played by the government in the Laissez-faire model is controlled by the rules set by the government except when there is a problem with the economic situation. In such a situation, the government intervened by the provision of adequate funds to support researchers in the institutions (Etzkowitz, 2003). Interaction amongst the institutional spheres in the Laissez-faire model only occurs through intermediaries. It is considered that direct interaction between the industry and the academia is unsuitable, and as such, there is a need for a link for interaction. Etzkowitz and Leydesdorff (2000) noted that both the Etatistic (THM

I) and Laissez-faire (THM II) models seem to generate some issues in their designs. They observed further that the Etatistic model encourages inaction, and it has little accommodation for initiatives from the other spheres, and therefore, it was considered as a failed model. However, the Laissez-faire model simply reduces the dominant role performed by the government in the Etatistic model. The two models are distinguished by some insufficiencies and are unable to maintain the type of technological growth needed to transform any nation. The inadequacies that are implicit in both the THM I and THM II made them unsuitable for modern-day innovation. This, however,led to the appearance of the THM III of the academia-industry-government relations, which is considered as a better option that contributes to innovation in the spheres.

3.1.3 Triple Helix Model III

The THM III designates a change in the relationship amongst the university, industry, and government, as well as within each of the institutional spheres (Dzisah & Etzkowitz, 2008). It is a trilateral institutional arrangement that promotes cooperation among the institutions by allowing one institution to assume the role of another while still holding onto its current position. This collaboration will stimulate innovation and thus bring sustainability.

According to Etzkowitz (2008), the THM III (see Figure 3.3 below) constitutes three basic elements:

- Government
- Academia
- Industry

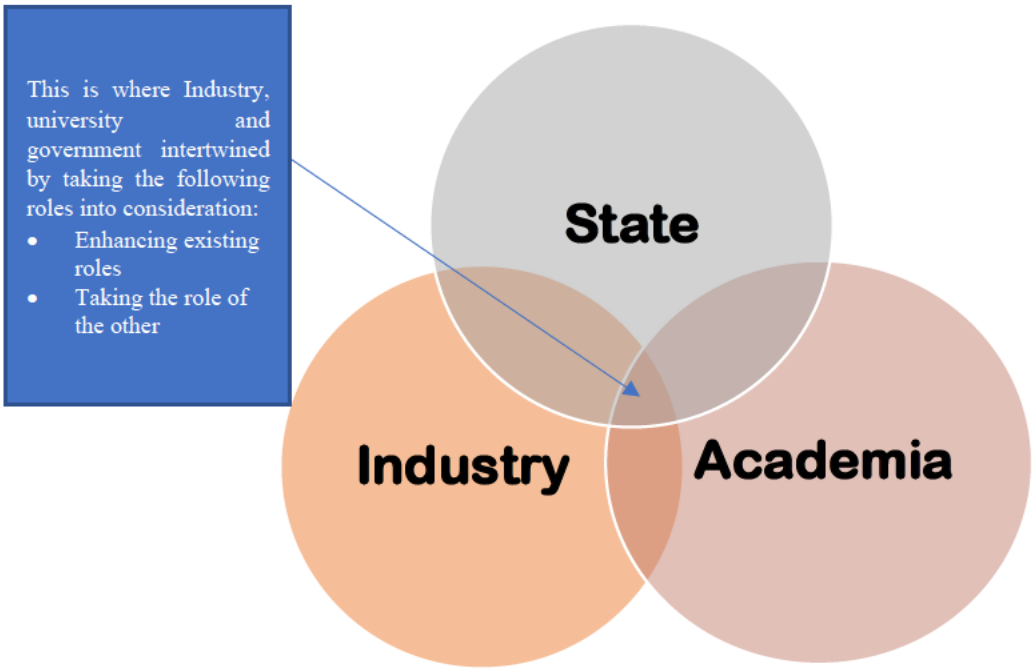

Figure 3.3: The Triple Helix lll Model
(Source: Phillips, 2014)

The THM III aims to capture the changing roles and relationships within the three key institutional spheres: academia, industry, and government. In this model, academia, industry, and government are represented as interwoven spirals with distinct relationships to one another in the context of innovation. Each partner in the Triple Helix framework not only fulfils its conventional tasks but also assumes the roles traditionally associated with the other spheres. The academia is saddled with the preservation and transmission of knowledge as its primary job as well as some business and governance functions. The government is the ultimate guarantor of the societal rules and policies of the game as well as capital, while the industry produces goods and services and conducts research (Vaivode, 2015).

The THM is designed with an effort to explain the factor that controls the invention processes and compounded networks in the three institutions for knowledge exploration. The primary idea within the THM is rooted in the identification of the movement in the innovation policy from the convectional line approach towards a robust and network model that involves all the three different innovation players. According to Etzkowitz (2003), a TH of overlapping spheres of learning institutions-industry-government is increasingly the core, rather than the

periphery, of national, regional, and multinational innovation systems.

The emergence of the THM challenges the traditional linear approach to innovation, which has been criticised for its focus on the linear progression from scientific invention to technological application and production, often neglecting the necessary changes in the market. There is an ongoing debate regarding the new knowledge production system, which acknowledges the intricate nature of the market and emphasises the importance of research in various disciplinary areas. The knowledge that is created through the new types of innovation is not limited to the university but also includes the industry and government (Gibbons et al., 1994; Biggs & Tang, 2011). The key feature addressed within the THM of innovation is the building of effective collaboration between researchers, industries, and government agencies; this is proved to be important for the good outcome of the knowledge-based innovation. The academia, industry and government freely share information and knowledge amongst all the institutional spheres to generate fresh innovation opportunities. The restrictions between institutions are reduced which made it possible for the three institutions to come together and share information about new innovations. This eventually will lead to the formulation of new policies and innovation due to the coming together of the academia, government, and industry. The importance of the THM lies in several prescriptive implications. Firstly, the THM emphasises the need for science-based business by producing knowledge into the economy. This not only considers the economic worth placed on science, but also leaves opportunity for the advancement of applied science and research-related economic growth. Secondly, the THM utilises the shift in the university's conventional teaching and research roles towards knowledge infrastructure that allows for the rise of social and economic fortunes, which was made possible by the development of human capital. It is also revealed that the flow of the latest technological innovations has come to be the academic task, thereby changing the structure and traditional role of the university (Etzkowitz & Leydesdorff, 2000). Thirdly, the THM creates a working framework for improving good understanding and development of science-based inventions and policies. Finally, the study undertaken under the THM aids by identifying the best methods of producing new knowledge and the causes and conditions for attaining knowledge-based innovation.

Without forgetting the usefulness of THM in providing a logical reasoning framework for the study of the knowledge infrastructure, some of the successes put forward by the TH theorists are challenged on the ground of a number of theoretical and methodological issues (Leydesdorff & Etzkowitz, 1998). For instance, O'Malley et al. (2002) conducted a critical

evaluation of the THM and its related research. Their findings revealed that many TH researchers primarily focus on university-industry interactions, with limited emphasis on the role of government, despite the government's crucial involvement. This should not be so, despite gaining much knowledge on the behavioural and organisational changes enshrined within THM, like the observations of the academic entrepreneurial skills (Meyer, 2003). Eun et al. (2006) pointed out that the essential awareness of the THM is that the "nature of knowledge" in the fast-rising industries is quite different from the one in the traditional industries. Therefore, this difference leads to the forming of new institutions. They argue that while the THM places significant emphasis on the importance of new industries, this approach may not fully address the situations faced by developing countries that have inherited well-established industries from more advanced nations, resulting in standardised production (Eun et al., 2006). Many queries are also raised in the way in which the model is applied and the significant role it can play in developing the regional knowledge economy.

The economics geographers are of the opinion that the conditions for creating TH-based knowledge infrastructure varies (Jensen & Tragrdh, 2004). Whilst successful regions have their distinctive culture of socialisation and the way knowledge is shared between business communities and research institutions, less-developed regions do not have the favourable conditions that help to encourage interactions between the academics, industries, and government agencies. For instance, issues such as organisational structure within TH networks and the coordination mechanisms for supporting effective university-industry interactions have been given less attention by TH researchers (Kleyn et al., 2007). The THM should be treated as an investigatory model which designates a process of evolution as well as the arrangement of new institutional arrangement. It is also argued that the THM can be used as a problem-solving framework that combines the comprehension of the production functions with local institutions into the knowledge infrastructure, which is essentially a TH network of university-government-industry relations (Leydesdorff & Meyer, 2006).

In defining the roles of the individual partner in the THM, Leydesdorff (2012) opined that universities engage in basic research, industries produce commercial goods, and governments are regulating markets through the formulation of policies. As interactivities increase within this framework, each component changes to adopt some characteristics of the other institution, which then gives rise to cross-bred institutions. Mutual interactions exist between university, industry, and government. In terms of university-industry interactions, Leydesdorff (2012) also revealed that the initial role of universities is to provide education to

individuals and basic research. Therefore, interactivities between university and industry revolve firstly around those two elements. In a linear model of innovation, universities are meant to provide the research in which the industry will build upon to produce goods for commercial usage. The other interactivities take place through the involvement of industry executives and university academics in two sectors. The movement of people between university and industry constitutes serves as a transfer of knowledge. This can be a lifelong procedure for directions in the two spheres.

Other studies, however, noted that hiring academics as consultants might potentially have shortcomings, such as a diminished emphasis on their core responsibility of instructing students and potential conflicts of interest pertaining to the use of university resources for the benefit of industry (Rubens et al., 2017). According to Sampat (2006), extra information transfer between academia and industry occurs through official and informal dialogue, conferences, or the commercial interest in academic publications. Another type of interaction, for example, is the creation of co-op programmes like the Massachusetts Institute of Technology (MIT); MIT-General Electric course which aims at integrating an industry approach into the students' curricula.

The robustness of the interactivities between the government and university depends on the government's general connection to higher education (HE) and policies. Etzkowitz and Leydesdorff's (1998) model uses a continuum to define the extent of these interactions. On the one hand, when HE is largely public, the government has greater impact on universities and the type of research they conduct by being the primary contributor of funds (Etzkowitz, 2008). Conversely, universities continue to receive some support from the government but often enjoy a greater level of freedom from the government. However, the two extremes of this continuum, are employed as ideal kinds that are not always representative of reality (Etzkowitz, 2011). The changing economic circumstances can force the government to have closer ties with academia, through the funding of important projects in the university.

The existing relationship between government and industry depends on the government's attitude towards the market. Etzkowitz (2008) revealed that in liberal economies, the role of the government will be limited to preventing market failures. However, when the government is more actively involved in the economy, its job is to establish the necessary rules for the sector. These are also two ends of a continuum that leaves much room for a great variation which is based on the circumstances and disciplines. Sampat (2006) also pointed out

that one key role of the government in its interaction with the industry is the establishment of intellectual property law and its enforcement.

Etzkowitz and Leydesdorff (1998) at the beginning argued that the strength of the interactivities between government, industry and university depends on the component that drives the framework (Etzkowitz, 2011). In a static model, a strong state is seen as driving the interactivities between the three components from the top to the bottom. This creates stronger ties and a more integrated model. In a Laissez-faire model, in which the industry and market forces are the main leading forces, the links are weaker, and each institution tends to stay extremely independent of the others. However, the difference between the two models is not always well defined, as the government can choose to adopt a strong or a weak position which depends on the context and the industry (Etzkowitz, 2008). The strength of interactivities can also vary according to the level of development of such country. This is detectable with a single-handed model common in an underdeveloped country; moderate interactivities is noticeable in the developing middle-income country due to the zeal for economic growth, on the one hand, and the push for a competitive market-driven technological advancement, on the other; and strong interactivities is noticed in a developed nation (Kimatu, 2016).

Etzkowitz (2003) asserts that universities have assumed a pivotal role in the transition towards a knowledge-based economy. In this context, the significance of universities as a source of valuable information is continually expanding, particularly as innovation, influenced by technological advancements, continues to advance. He adds that as a result, government, industry, and academia are more on an equal footing, and that nothing is necessarily the THM of innovation's driving force. The THM of innovation also erased the boundaries of the traditional basic roles being played by the university, industry, and government. According to Etzkowitz (2003), this marked the second step in the TH of the innovation framework. For example, the universities now have a greater interest in participating in commercial activities through patenting and licencing, moving them beyond the conduct of fundamental research. The next step is the development of intermediates between the three components and their hybridisation. However, each organisation continues to have a strong precedent in its original area of specialisation, where the university is recognised as the major generator of new information, the industry is the main engine of commercialisation, and the government continues to play a regulatory role.

The THM has been used as a prism to examine the changing interactions between

academia, industry, and the government (Anderson et al., 2019). However, it may also be a tool for forming policies. This has been applied for both purposes by various governmental organisations. Etzkowitz (2008) argued that after the end of the Soviet Era, TH motivated policies that were implemented in Eastern Europe to promote growth in the region. Also, in Sweden, the THM policy was aimed at bringing together the innovation initiatives at different levels to increase their overall efficiency. The THM has also been applied to developing countries and regions (Saad & Zawdie, 2011).

3.1.4 Criticisms of the model

The THM as a policy-making tool for economic growth and regional development has been criticised by many scholars (Anderson et al., 2019; Cai & Amaral, 2021; Cai & Lattu, 2022). One main denunciation is that Etzkowitz and Leydesdorff's framework was patterned after Western developed countries, which means that it is based on a particular set of developed infrastructures and under specific circumstances. For instance, the model takes for granted that the knowledge intensive activities are linked to economic growth in a nation, that intellectual property rights of the creators will be protected, and that the state has a democratic and market-oriented culture (Yuzhuo, 2013). Further scholarly evaluation of the model focuses on the conditions that enable the implementation of a THM innovation policy. It was argued that Etzkowitz and Leydesdorff's model is too indistinct and takes for granted those necessary preconditions needed within their model (Williams & Woodson, 2012). Therefore, according to critics, the THM is not a relevant policy-making tool for developing countries where at least one of these conditions is missing. However, others have argued that the THM is capable of both narrating the situation in developing countries and its usefulness for planning policy formulations (Saad & Zawdie, 2011).

The application of the THM into developing a sustainable TVET system in TCs in Lagos State from fragmentation to integration is not meant to mesh the different communications together into clouded appearance of a comprise but this is to allow for the automatic set of communications with different value systems in the background to achieve a holistic development. Communications are also pronouncement of different instructional traditional and many interests. The collaboration among government, industry, and academia fosters effective communication from diverse perspectives. This collaboration promotes: creativity; provision of relevant training programmes; adequate supply of resources; effective

supervision from government and industry; development of enriched strategies to tackle emerging challenges cooperatively; enablement of TCs to attain an increasingly knowledge-intensive economy, and thus to celebrate innovation as a vital human possibility.

The THM of university – industry – government relation is considered the most suitable framework for this study because it comprises the three institutions that this study foregrounds, namely: academia, industry, and government. The study considered the TCs, and the model was used to look at the type of relationship that existed between the TCs, the industries, and the government in preparing an integrated and sustainable TVET system in the TCs of Lagos State. The government (state) was represented by the personnel of the Lagos State Ministry of Education and the LASTVEB. The academia was represented by the principals and teachers at TCs in Lagos State in the selected trades. Finally, the industry comprised of the workshop managers and the workshop supervisors of selected automobile companies in Lagos State.

The THM could be extended from the academic to policymaking, supporting innovative activities. The THM is inspiring local policy formulations and innovations. The university is known as the knowledge-based society, and it can assume an enhanced role in innovation. The collaboration between the government, academic, and industry spheres is generally seen as a critical pillar when pursuing SD. The THM theory argues that the potentials needed to attain the innovation and economic development in any economy is directly linked to the important role the university plays and the interactivities it has with the other elements in the university, industry, and government to create a new institutional and social format for the production, transfer, and application of knowledge (Ranga et al., 2013). Therefore, for the influence of knowledge and innovation on economic growth, institution and learning processes are of great importance. In this study, the roles of these three stakeholders – academia, industry, and government – in preparing an integrated and sustainable TVET system in the Lagos State TCs, was explored. However, there is also a need to lay emphasis on the teamwork amongst the government, academia, and industry in terms of human capital development and the significant role played by the academia field (Lee, 2014).

3.2 The Quintuple Helix Model

As explained in the previous section, the Triple Helix model, designed by Etzkowitz and Leydesdorff (1995; 1998), focuses on the relations of universities, industry, and governments1. It represents a basic core model of innovation for the knowledge economy.

The Quintuple helix model is a theoretical and practical model for the exchange of knowledge, based on five societal subsystems (Carayannis & Campbell, 2009). As Carayannis and Campbell (2009) explain, it extends the triple helix university-private sector-public sector cooperation model by adding the "media-based and culture-based public" and the "natural environments of society." This model acknowledges the importance of higher education for innovation and stresses the necessary socio-ecological transition of society and economy in the twenty-first century. In a quintuple helix-driven model, knowledge and know-how are created and transformed, and circulate as inputs and outputs in a way that affects the natural environment.

The evolution from the Triple Helix model to the Quintuple helix model represents a shift from a focus on the knowledge economy to a focus on the knowledge society and socio-ecological transition. These models provide a comprehensive framework for understanding the complex interplay of internal and external dynamics in promoting innovation and sustainable development in education research settings.

The Quintuple helix model was developed by Carayannis and Campbell (2009), and it extends the Quadruple Helix model by adding the environment. In a quintuple helix-driven model, knowledge and know-how are created and transformed, and circulate as inputs and outputs in a way that affects the natural environment. Socio-ecological interactions via the quadruple and quintuple helices can be utilized to define opportunities for the knowledge society and knowledge economy, such as innovation to address sustainable development, including climate change.

In education research settings, these models can be used to understand the structure of innovation by modeling the involvement of all actors in the innovation process. Each sector is represented by a circle (helix), with overlapping showing interactions. They can help to analyse how the curriculum design (university sector) influences the skills acquired by students, how these skills are valued in the job market (industry sector), how government policies support or hinder the implementation of educational programmes (government

sector), how societal norms and values shape the perception of these programmes (public sector), and how these programmes contribute to environmental sustainability (environment sector). In these settings, the Quintuple helix model helps to understand the structure of innovation by modeling the involvement of all actors in the innovation process. This includes the university, industry, government, public, and environment sectors. Each sector is represented by a circle (helix), with overlapping showing interactions, as illustrated by Figure 3.4.

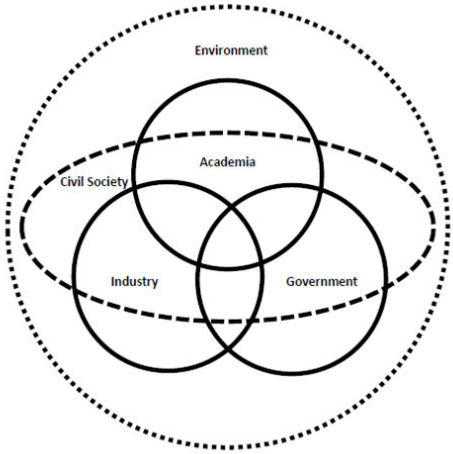

Fig. 3.4: Five Helices of the Quintuple Helix
Source: Carayannis-Carayannis et al. (2012)

In this study it was used to understand how aligning TVETs with global SSED (environment sector) issues could act as an "affordance" (Strong et al., 2014) that could help address skills shortage, through relevant and responsive curriculum (TVET Academia sector) in the TVET system in Lagos State. By implementing programmes aimed at boosting skill development (Government sector), the TVET system will produce skilled graduates who will enhance the image of TVET (Public sector) and foster innovation and reduce employment. This will have to be supported by industry relations (Industry sector) and embedded on robust governance and adequate infrastructure (Government sector).

3.3 Integrated Intelligence

Integrated intelligence as a field of study has undergone significant evolution, expanding the boundaries of traditional cognitive theories to encompass a more holistic understanding of human intelligence. The focus here shifts to the practical implications of

integrated intelligence, questioning how it can be implemented to foster a more intuitive and holistic educational approach that aligns with the evolving needs of society.

The Integrated Intelligence theory posits that the human mind is embedded within a sea of consciousness, and that contemporary human beings can consciously utilize this consciousness (Anthony, 2008). As argued by Anthony (2008), it incorporates the non-rational elements of human intelligence long missing in mainstream western discourses. Marcus Anthony's works in 2005 and 2008 have been pivotal in this development, advocating for a theory of intelligence that includes "transpersonal" dimensions, such as creativity, wisdom, and emotional intelligence. These concepts challenge the reductionist and materialist presuppositions of mainstream intelligence theory, suggesting that intelligence is not merely a function of the brain's physical processes but also involves a broader, more interconnected experience. The evolution of integrated intelligence as a field of study is not just academic; it has practical implications for how we design educational curricula, develop artificial intelligence (AI) technologies, and understand the human mind. It calls for a re-evaluation of the skills and competencies that are valued and nurtured within our societies, emphasising the need for a more balanced and comprehensive approach to intelligence that can adapt to the complexities of the 21st century.

Integrated intelligence, as discussed by Anthony (2005, 2008), suggests a holistic approach to understanding intelligence that transcends traditional cognitive boundaries. This concept advocates for the inclusion of transpersonal dimensions, which encompass aspects such as creativity, wisdom, and emotional intelligence. In the context of TVET, the implications of integrated intelligence are profound. It encourages a curriculum that goes beyond technical skills and knowledge, fostering an educational environment where intuitive thinking and broader cognitive abilities are developed. This aligns with the evolving needs of the global economy, where adaptability and complex problem-solving skills are increasingly valuable. By incorporating integrated intelligence into TVET programmes, educators can nurture a more versatile and innovative workforce, equipped not only with specific technical skills but also with the capacity for critical thinking, collaboration, and continuous learning. Such an approach could lead to a transformation in how skills are developed and applied, ensuring that individuals are prepared for the challenges of the modern knowledge economy. This shift towards an integrated intelligence framework in education could ultimately contribute to a more conscious and sustainable development of human capital.

The field's evolution reflects a growing recognition of the limitations inherent in traditional measures of intelligence, such as IQ tests, which often fail to capture the complexity of human cognitive abilities. Instead, integrated intelligence proposes a more expansive framework that acknowledges the role of intuition, emotion, and even spirituality in human cognition.

In his book "*A Critique of Emotional Intelligence*" Murphy (2006, 2014) presents a comprehensive examination of the concept of emotional intelligence (EI). Murphy scrutinizes the definition and measurement of EI, suggesting that it is often nebulous and inconsistently quantified. He delves into the intricate relationships between EI and other psychological constructs, such as general intelligence, social skills, and personality traits, highlighting a lack of clarity in their interconnections. He challenges the widely held assertions that EI is a definitive predictor of success in academic, professional, and personal realms, deeming some of these claims as unsupported or outright fallacious. Despite these criticisms, Murphy does not dismiss the potential of EI entirely; he acknowledges the possibility of its beneficial applications if grounded in more robust research and methodologies. Murphy (2014) advocates for a more scientific approach to the study of EI, calling for improved theoretical frameworks, reliable testing methods, and practical applications that can withstand empirical scrutiny. This balanced critique aims to refine the understanding of EI and foster advancements in the field that are both scientifically valid and practically useful.

In this regard, the works of Anthony and Murphy serve as foundational texts, offering insights and frameworks that continue to influence the trajectory of this dynamic and interdisciplinary field.

Arguing along the same lines is Steve C (2022) from Medium Steve C (2022) who posit that Intelligence encompasses more than just the traditional Intelligence Quotient (IQ). It is a multifaceted concept that includes not only IQ but also Social Intelligence (SQ) and Emotional Intelligence (EQ). These three aspects together form what is known as Integrated Intelligence. Steve C's argument aligns with the broader understanding of intelligence in contemporary psychology and education. IQ is the traditional measure of cognitive abilities, such as logical reasoning, problem-solving, and analytical skills. It is often used as a measure of intelligence in academic and professional settings. EQ refers to one's ability to manage their emotions. This includes the ability to understand and self-manage their own feelings in positive ways to communicate effectively, empathize with others, overcome challenges,

manage conflict, and relieve stress. SQ refers to one's ability to interact and communicate with others with empathy and assertiveness.

This comprehensive approach to understanding intelligence recognises that our cognitive abilities are not static. They are dynamic, capable of growth and change through learning and experience. This means that intelligence can be developed and refined throughout our lives, allowing us to adapt to new situations and challenges effectively. By considering all three components—IQ, SQ, and EQ—we get a more complete picture of an individual's capabilities and potential. By considering all three components—IQ, SQ, and EQ—we get a more complete picture of an individual's capabilities and potential. This comprehensive approach to understanding intelligence is crucial in today's complex and rapidly changing world.

3.3.1 The Differences between Core and Technical Skills

According to ILO (2023), while technical skills remain crucial for domain-specific expertise, the 21st-century skills landscape demands a more holistic approach that encompasses core, transferable, and transformational skills. This comprehensive skill set not only enhances employability across various sectors but also equips individuals to contribute meaningfully to society and to navigate the challenges and opportunities of an interconnected world. The integration of these diverse skills is therefore seen as a strategic imperative for educational institutions, employers, and policymakers alike, as they seek to cultivate a workforce that is capable of driving progress and prosperity in the 21st century.

Indeed, the discourse on skills pertinent to the 21st century often revolves around the categorisation of core, transferable, and transformational skills, which are deemed essential for navigating the complexities of modern life and work. Core skills, often referred to as foundational skills, encompass basic competencies such as literacy, numeracy, and digital literacy, which are considered fundamental for individuals to effectively participate in today's society and workforce.

ILO (2023, p. 26) groups the 19 core skills considered essential both for work and life and grouping them into the following four categories: Social and emotional slkills; Cognitive and Metacognitive skills; Basic digital skills and Basic skills for green jobs, as illustrated in Figure 3.5.

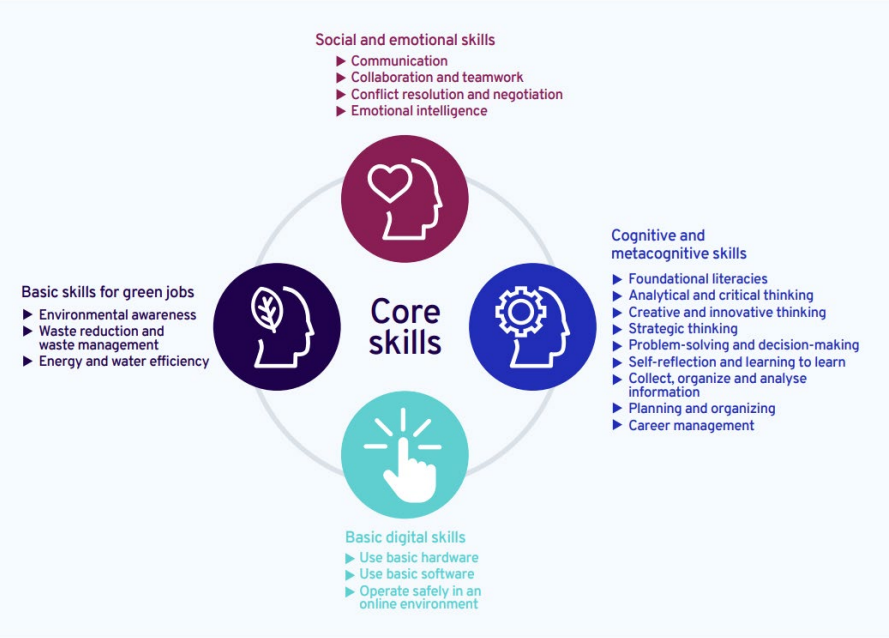

Fig. 3.5: ILO Global Framework for Core Skills

Source: ILO (2023, p. 40)

Transferable skills, on the other hand, are those abilities that can be applied across various domains and industries. They include soft skills like communication, teamwork, and problem-solving, which are not only valuable in a wide range of employment contexts but are also critical for personal development and societal engagement. Transformational skills, a term that is gaining traction in educational and professional circles, refers to those competencies that enable individuals to adapt and thrive amidst rapid change and uncertainty. These skills are characterized by the capacity for innovation, creativity, and the ability to drive change within oneself and in one's environment. Unlike core and transferable skills, transformational skills are often associated with a higher level of cognitive and emotional engagement, and they play a pivotal role in fostering resilience and long-term success. Within the automotive sector, they are referred to as transformational leadership skills. These skills are seen as pivotal in creating an environment that breeds innovation and attracts technical, engineering, and other scarce talent (Mercer, 2023). According to Mercer (2023), these skills include creativity, strategy-setting, adaptability, talent development, influence, motivation, empathy, team-building, risk management, simplification, communication and charisma.

In contrast, technical and engineering skills, particularly in the automotive engineering sector, are highly specialized proficiencies that are closely aligned with the specific knowledge and abilities required to design, develop, and maintain automotive systems. These skills are

often acquired through targeted education and hands-on experience, and they include competencies in areas such as mechanical design, electrical systems, materials science, and computer-aided engineering. Within the automotive sector, the skills needed to innovate, design, and deliver new technologies, include:

- Automotive technology: Autonomous vehicles (AV), electric vehicles (EV)
- Programmeming: Machine learning, AI, C++, Matlab, Java, Python, and others
- Advanced electronics: Electrical/robotics engineering, car connectivity, human-machine interface (HMI), and infotainment related to communication interfaces and protocols
- Secure carware: High-end mechanical design requires cybersecurity best practices to spoof-proof vehicles and safeguard owner's information, requiring skills related to vulnerability scanning and assessment (Mercer, 2023).

The top in-demand skills in the automotive industry, according to Mercer (2023), are presented in Table 3.1.

Table 3.1. Top in-demand skills in the automotive industry

Top emerging skill in the last 12 month:	Top five skills within engineering and sciences:	Top skills driving pay:
Systems design	Engineering design process, Business development, Quality control, Go(the programming language), Avionics	Problem-solving and data analysis

(Source: https://www.tealhq.com/career-paths/automotive-engineer)

It has to be noted that the distinction between these sets of skills is not merely academic but has practical implications for workforce development and education policy. While technical skills are indispensable for the functioning of specific sectors like automotive engineering, the broader categories of core, transferable, and transformational skills are increasingly recognised as critical for the adaptability and continuous learning that are required in a rapidly evolving global economy. As such, there is a growing emphasis on integrating these broader skill sets into educational curricula and professional development programmes to prepare individuals for a future where flexibility and innovation are paramount (ILO, 2023).

3.3.2 The Differences between Internal and External Dynamics of TVET Institutions

In the context of TVET institutions, internal and external dynamics refer to the various factors that can influence the functioning and effectiveness of these institutions. The interplay of internal and external dynamics is pivotal in interpreting the essential factors for fostering sustainable socio-economic development through TVETs.

Internal dynamics typically refer to factors within the institution itself. Internal dynamics, such as the institution's governance, the caliber of its educators, curriculum relevance, and the availability of resources, form the backbone of a TVET's operational capacity. These elements are instrumental in shaping the institution's ability to provide quality education and training that is responsive to the needs of the students and the demands of the labour market (Sithole et al., 2022; UNESCO-UNEVOC, 2020).

On the other hand, external dynamics, including policy frameworks, market demands, technological shifts, societal perceptions, and economic conditions, exert a significant influence on the strategic direction and responsiveness of TVET institutions. These external factors can either facilitate or hinder the institution's efforts to align its offerings with industry requirements and societal needs (Sithole et al., 2022; UNESCO-UNEVOC, 2020).

Both internal and external dynamics play a crucial role in shaping TVET institutions. Understanding the symbiotic relationship between these internal and external factors is essential for TVET institutions aiming to contribute effectively to sustainable socio-economic development. For instance, an institution with a robust internal structure but operating in an unfavorable policy environment may struggle to achieve its objectives. Conversely, favorable external conditions may not translate into successful outcomes if the internal dynamics are weak. Therefore, a comprehensive analysis that considers both internal and external dynamics is necessary to derive meaningful insights from studies on TVETs. Such an analysis can guide institutions in implementing strategic changes, fostering innovation, and developing partnerships that leverage both internal strengths and external opportunities to enhance their contribution to socio-economic development.

3.4 The Five Capitals Model

This study uses the Five Capitals Model as an analytical tool to measure "factors that would ensure SSED through TVET systems." It is hoped that through its use, the analysis will allow us to develop a model or vision of what it *means to promote SSED through TVET systems.*

The Five Capitals model provides a platform for understanding sustainability in terms of the economic concept of wealth creation or 'capital' (Gazzola & Querci, 2017). The Five Capitals model can be used as a template to allow organisations to have a vision of what sustainability looks like and how to use it for its own operations, products, and services (Kurucz et al., 2017). Development may be described as an improvement in the circumstances and quality of life (Bebbington, 1999). This necessitates the provision of products and services that enhance living quality. SD can only happen if this production occurs in ways that it can maintain or increase all of the necessary capital funds (Goodwin, 2003). Godwin (2003) opines that a sustainable socioeconomic system uses its renewable capital reserves without depleting them to provide a flow of valued commodities and services. While it is acknowledged that certain capital stocks may be depleted during the production process (such as non-renewable resources), To support life and well-being, it is still essential to maintain the overall quality and quantity of the resource.

The Five Capitals model was developed by Jonathan Porritt. The concept of 'capital' has several meanings. It is important to distinguish between the five types of capital: financial, natural, manufactured, human, and social. All these are stocks that have the capacity to produce flows of economically desirable outputs (Goodwin, 2003). It should, however, be noted, that the use of all the five kinds of capital is crucial for the sustainability of economic development.

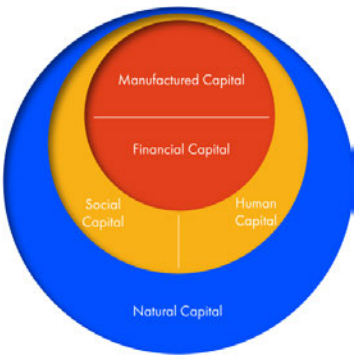

Figure 3.6: The Five Capitals Model
(Source: Forum for the Future, 2020)

Financial capital: *Financial capital* encourages economic production. However, it is important to note that financial capital, by itself, is not considered productive. Instead, it can be described as the system of ownership or control over physical capital (Dean & Kretschmer, 2007). Since natural capital is now often drained by economic output, SD must preserve or expand all productive capital reserves.

Natural capital: *Natural capital,* sometimes referred to as environmental or ecological capital, is made up of the resources and ecosystem services of the natural resources and procedures that businesses use to manufacture their goods and provide their services to individuals in need (Dominati et al., 2010). According to Porritt (2005), natural capital is the basis not only of production but of life itself. Natural resources, such as those found in the form of energy and matter, as well as the processes required by businesses to manufacture their goods and provide their services, are sometimes referred to as natural capital. This includes, but is not limited to, sinks that absorb, neutralise, or recycle pollutants; resources, some of which are renewable like timber and water; and other processes, like the control of the climate and the carbon cycle, which allow life to continue in a balanced manner.

Manufactured capital: The term *manufactured capital* refers to physical assets and infrastructure that a company owns, rents, or controls, and that help with production or service delivery but do not necessarily end up in the company's final product (Mont, 2002). The main components include buildings, infrastructure, tools, and machines. In two ways, manufactured capital is essential for creating a sustainable business. Firstly, the efficient use of manufactured capital helps an organisation to be flexible and inventive, which quickens the pace at which the company offers its goods and services. Secondly, manufactured capital and technology may be leveraged to reduce expenses and improve the organisation's sustainability and efficiency (Ford & Despeisse, 2016). According to Sjödin et al. (2018), the following are some ways an organisation can enhance manufactured capital:

- Making the most effective use of procedures, technology, and infrastructure efficiently.
- Modular production method.
- Shifts from selling items and forgetting about them to leasing products with ongoingservice contracts.
- Reverse logistics and re-use and remanufacturing systems.

- Zero-waste and zero emissions production systems.
- Industrial ecology – looking at synergistic production systems where one organisation's waste streams are another's resources.
- Bio mimicry – mimicking nature and natural processes in industrial processes andindustrial systems design.
- Upgrades to product systems (Eco efficiency and eco-innovation).
- Using sustainable building methods when designing new buildings or offices.

The quality and quantity of the resource base must be maintained in order to sustain life and well-being, even though in some circumstances a portion of some capital stocks (suchas non-renewable) may be used up throughout the production process (Kuhlman & Farrington,2010).

Human Capital: *Human capital*, as defined by Pakdaman and Balideh (2020), encompasses an individual's health, knowledge, skills, intellectual outputs, motivation, capacity for relationships, as well as elements such as joy, passion, empathy, and spirituality. Enhancing human capital within an organisation can be achieved through various approaches, as suggested by Pakdaman and Balideh (2020). Some of these approaches include:

- Provide workers with access to training, development, lifelong learning, knowledgecapture, and sharing, as well as other stakeholders when possible.
- Upholding human rights in all of its operation and geographic areas.
- Recognise and value humans in their cultural context.
- Ensure proper health and safety measures, taking both mental and physical well-beinginto consideration.
- Promote health and educate people about it to help maintain a high quality of health.
- Provide a reasonable wage to workers and treat employees and business partners fairly.
- Create opportunities for varied and satisfying work.
- Allow for and improve leisure time, and encourage people to participate fully insociety.

Human capital matrices focus only on the input, such as cost, and routine practices and activities, and are increasingly focusing on the design and metrics usage. It focuses on the impact and result on the organisation. According to Stiles and Kulvisaechana (2003, p. 15),

human capital “measurement is obviously important to gauge the impact of human capital interventions and address areas for improvement, but in this filed, measurement is a problematic issue”. Surprisingly, information concerning a significant return on investment (ROI) was alsoaddressed in human capital materials and when adequate investment is made on the human capital. ROI is still seen as a good measurement, and its use is even growing throughout the world (Phillips & Phillips, 2005). Pasban and Nojedeh (2016) noted that a significant percentage of consulting companies assess human capital investment using financial measurement, output and/or products and service measurement. This includes units produced,customer satisfaction, number of errors, and measure of time such as tardiness and absence. Mayo (2012) further noted that in order to accurately assess human capital, measurement needs from various audiences must be taken into account. Human capital must be measured by workforce analytics which includes the job type, gender, and location. This are required tomeasure the human capital.

The human capital has influenced and shaped TVET education across the globe (Sibiya & Nyembezi, 2018). TVET programmes are inspired by the human capital approach to human progress and development. According to this perspective, investing in a person's education is the answer to all of the issues with the labour market and economy's ability to fill jobs (Baptiste, 2001). Resources are the inputs that are channelled to education and training. The education and training represent the TCs while the outcomes are the products of the TCs. The lower resources are the skills that the TCs possess that will help them to get employment in the industry. This, in the end, will earn them better wages, and be useful to the society. This trend will bring sustainability to the system. It is believed that well-educated persons, depicted as academia in the study, will be more productive, and the products of such training are likely to get well-paying jobs. Investment in education accounts for economic growth, and spending in education and training is important to achieve this (Baptiste, 2001). Human capital believes that formal education and training is very important and necessary to improve the productive capacity of a population. The provision of formal education is seen as an investment in human capital, which the proponents of the theory have considered as equally or even more worthwhile than that of physical capital. Human capital concludes that investment in human capital through education and training will lead to greater economic outputs and sustainability by producing workers that have up-to-date skills to compete favourably in the labour market. This will encourage investment in education and training which will transcend to economic and societal sustainability.

Such human capital views focus on data and information that are necessary to the organisation with proactive HR programmes – no alignment with business and management objectives with HR at all levels – aligned and cascaded down the goal, strategy, as well as objectives of the organisation at all levels of management. Generally, when reporting on the human capital, it is assumed that it was an input-based management and more than that of output-based. It lays emphasis more on the output and impact it has on organisation. The use of technology was deployed to decrease and avoid error in human capital as much as possible.It promotes a mutual relationship with social systems to enhance the high knowledge performance work system.

The top management makes management decisions and closely coordinates with technical job knowledge. It is decentralised and promotes leadership from the bottom of the structure. The primary objective is to maximise shareholder benefits, which maximisesutilities and values for all stakeholders. Human capital emerged based on the works of the classical economic theorist. Khaykin et al. (2020) revealed that Smith and Richards were the first to introduce into science the ideas of the importance of the labour force, human abilities,and education for the growth of the country's wealth and its population. Petty (2017)considered HCT in the context of national wealth, which is considered as the most important factor in the growth of the country's wealth as well as an integral part of it. Smith (2009) emphasised the predominant role of human abilities in relation to the material factors of production, while Yates (2020) highlighted the importance of education for individuals and the general public in contributing to the nation's economic development (Khaykin et al., 2020).

Despite the advantages of human capital, Li (2019) made the following observations that must be noted by policymakers:

- Investing in human capital is crucial and education is seen as a key tool for ending thepoverty cycle.
- Focusing on RIO and human capital too much will result in a lack of high-qualityeducation.
- Human capital positively links HE investment to economic advantages, but it can alsoresult in the issue of over qualification on the job market.

Social capital: *Social capital* can be regarded as any value added to the activities and economic outputs of an organisation by human relationships, partnerships, and co-operation (Lorenzen, 2007). Social capital may take many forms, including social norms, values, and trust as well as networks, communication channels, families, communities, companies, trade

unions, schools, and non-profit organisations. All these are regarded as important to an organisation since organisations rely on social relationships and interactions to achieve their objectives. This can be taking the form of shared values, trust, communications, and shared cultural norms within the organisation which enable people to work together effectively and so enable the organisation to operate effectively. Externally, social structures contribute to the development of an environment that fosters permission or a licence to operate, enabling trade and other societal activities (Warhurst, 2005). In order to generate a positive operating environment, organisations also depend on larger socio-political structures, such as the government and public services, efficient legal frameworks, trade unions, and other groups that could enhance the structure of the organisation. Organisations can enhance social capital by adopting the following practices:

- Creating a family-friendly environment that considers both living and working conditions, promoting work-life balance, and supporting the well-being of employees.
- Ensuring ethical sourcing practices and treating suppliers, customers, and citizensfairly.
- Demonstrating commitment to legal compliance by honouring and abiding by allapplicable local, national, and international laws.
- Ensuring timely and full payment of taxes, while also providing support for socialsafety nets.
- Establishing effective communication systems throughout the organisation that reflectshared values and objectives, fostering transparency and cooperation.
- Minimising negative social impacts of products and services, or maximising theirpositive effects
- Supporting the economic and communal development of the area in which the groupoperates.
- Advocating for open, transparent, and equitable governance systems that promotefairness and accountability at all levels of government (Marchington et al., 2016).

Social capital is defined as any value that interpersonal connections, joint ventures, and cooperative efforts provide to an organisation's operations and financial results. For instance, societal norms, values, and trust as well as networks, communication routes, families, communities, companies, trade unions, schools, and non-profit organisations. This relates to

the organisations that support in maintaining and growing our human capital in collaboration with others, such as families, communities, businesses, trade unions, schools, and non-profits (Porritt, 2005).

The five capitals model is seen as a visionary way of understanding our economic system as a composition of five vital capitals: natural, human, social, manufactured, and financial. These capitals are seen as the gears that power the engine of our society (Godfrey, 2013). It can be used to allow the TVET system to develop a vision of what sustainability looks like for its own operations, products, and services. The vision is developed by considering what an organisation needs to do in order to maximise the value of each capital. Sustainable development is regarded as the best way to manage these capital assets in the long-term. It is a dynamic process through which organisations can begin to achieve a balance between their environmental, social, and economic activities. It is believed that the best way to achieve a sustainable future is through system change.

Nigeria country is facing a sustainability crisis because the consumption of the stocks of natural, human, and social capital are faster than they are being produced. This trend needs to be controlled so that it will not be difficult to sustain these vital stocks in the long-term (Šlaus, & Jacobs, 2011). It is assumed that by maintaining and trying to increase stocks of these capital assets, we can live off the income without reducing the capital itself but for this to happen, it is the responsibility of every organisation, business or otherwise, to manage these capital assets sustainably. The use of the five capitals model is to help in developing a model of a vision of what it means to promote SSED through TVET.

In developing a sustainable TVET system in TCs in Lagos State from fragmentation to integration, human capital suggests that there should be an increase in productive capacity through greater education and skills training. This calls for proper enhancement of the TVET academic activities in the TCs, providing professional training development for technical teachers in the colleges on achieving a sustainable TVET system with effective use of resources and maximum managerial support from government, industries, and the TC administration at large.

3.5 Merging Integrated Intelligence, Quintuple Helix Model and Porritt's Five Capitals Framework

The merging of the Integrated Intelligence framework, QHM and Porritt's (2005) five capitals framework provides us with a comprehensive framework for understanding the interplay between Phase I and Phase II results of the study. It offered a more holistic and integrated approach to understanding the "change" factors that promote SSED through TVETs. Porritt's model provides a comprehensive view of the resources necessary for promoting sustainable development. It considers not only human capital but also other critical forms of capital such as natural, social, manufactured, and financial.

The use of both framings highlighted the importance of considering a wide range of factors, from teaching methods used (i.e. the skewed curriculum and the need to align TVET programmes with industry needs) used in TVETs to the broader socio-economic and environmental context in which these programmes operate. The socio-ecologial perspective of the Quintuple helix model, and the sustainability emphasis of Porritt's (2005) five capitals framework, both provide a robust and multifaceted lens to can gain a more nuanced understanding of the factors and skills that promote sustainable socio-economic development through TVETs. For example, the Quintuple helix model helped us understand how innovation in TVETs interact with societal and environmental factors, while Porritt's (2005) five capitals framework helped us assess the sustainability of these developments in terms of the five types of capital.

In the context of this study the application of the Quintuple Helix model and Porritt's (2005) five capitals framework brought into sharp focus the significance of TVETs institutions to better align their programmes with the needs of the local job market, to promote sustainable skills and practices, and foster innovation (see Fig. 7.7 in the discussion chapter, Chapter 7). As the discussion chapter posits, this could ultimately lead to improved skills development, reduced unemployment, and enhanced socio-economic development in Lagos and beyond.

3.6 Conclusion

This chapter presented an overview of the theoretical frameworks that underpin this study, with a particular focus on the Triple Helix Model (THM); the Quintuple Helix Model (QHM) and Porritt's (2005) five capitals framework. The THM, which examines the interactions and

collaborations among academia, industry, and government, is highly relevant to the context of this study. These frameworks provide a solid theoretical foundation for understanding the dynamics and interdependencies between the academic, industrial, and governmental sectors in the context of the research being conducted.

The combination of the THM, QHM and Porritt's Five Capitals framework offers a focused and comprehensive approach for TVETs in Lagos. This synergy can significantly contribute to the socio-economic transformation of the region by producing a skilled workforce that is prepared for the challenges of the modern economy and committed to sustainable development. By nurturing human skills, fostering collaboration, and considering all capital types, TVETs can play a pivotal role in driving sustainable socio-economic transformation in Lagos State.

CHAPTER 4
RESEARCH METHODOLOGY

4.0 Introduction

Hecker and Kalpokas (2024) emphasise the critical importance of a study's conceptual framework in steering both data collection and analysis. The authors argue this framework acts as a roadmap, delineating the necessary data to be gathered and offering a lens through which to interpret and comprehend the data obtained.

The use of *Integrated Intelligence*, the *Quintuple Helix model*, and *Porritt's Five Capitals* model offered a deep understanding of the factors that are deemed necessary in promoting SSED via TVET systems in Lagos State. Integrated Intelligence, as a concept, suggests a holistic understanding of "factors," where intuition and rationality coalesce, offering a broader spectrum of insights than traditional methods. This aligns with the Quintuple Helix model, which extends beyond the conventional triadic interaction of academia, industry, and government to include civil society and the natural environment, thus acknowledging the interconnectedness of all societal domains and their impact on innovation and knowledge creation. Porritt's Five Capitals model further complements this by providing a framework for sustainability that recognizes the diverse forms of capital—natural, human, social, manufactured, and financial—as essential components for a thriving TVET eco-system. Our conceptual frameworks together with the statistical package used, were instrumental in helping us pinpoint the specific variables in the data that influenced others. The selection of a mixed methods approach was advantageous, allowing for a nuanced understanding of the dynamics between the identified variables. A purely quantitative or qualitative study, such as those conducted in Phase I and Phase II respectively, would not have sufficed to grasp the complexity of the issue fully or to unearth the depth of insights required regarding the "factors" at play.

When these conceptual framings are integrated into a mixed-method study, they underscore the importance of a robust conceptual framework that guides the research process. Such a framework is not merely an academic exercise but a practical tool that shapes the direction of data collection and analysis, ensuring that every aspect of the research is aligned with the overarching goals of the study. It serves as a compass, directing the researcher through

the complex terrain of inquiry, where multiple forms of data and analysis methods are employed (Hecker & Kalpokas, 2024).

Linking these insights to the pragmatic worldview, as advocated by Creswell (2009), emphasises the action-oriented nature of mixed methods research. Pragmatism as a research philosophy emphasises the practical application of knowledge and the value of integrating diverse perspectives and methodologies to address real-world problems. Pragmatism in mixed methods research is grounded in the idea of what works best to understand the research problem, rather than being confined to strict methodological boundaries. It is a problem-centered approach that values the practical application of findings and the real-world impact of research. The pragmatic foundation of the mixed methods approach allows for flexibility in methodology, enabling researchers to adapt their strategies to the unique contexts and challenges presented by their contexts (Creswell, 2009).

In essence, the integration of the three conceptual framings' philosophical insights within a mixed-method study allows for a more nuanced and dynamic understanding of research. It acknowledges the complexity of the world we live in and the need for research methodologies that are adaptable, interdisciplinary, and deeply connected to the practical concerns of society (Creswell, 2009). By embracing a pragmatic worldview, we can navigate the multifaceted nature of our inquiries, producing results that are not only academically rigorous but also socially relevant and actionable. This approach ultimately enriches the research process, yielding insights that are both profound and pragmatically useful, thus contributing to the advancement of knowledge in a manner that is truly reflective of the complexities of the contemporary world.

The structure of the chapter is as follows. It begins by discussing the research design and the rationale and characteristics of the MMR approach. It then explores the sample and sampling technique employed, followed by an examination of the data collection tools. The method of data analysis is also presented. Subsequently, ethical considerations and researcher reflexivity are addressed. The chapter proceeds to acknowledge the limitations of the study, and finally concludes with a brief summary.

4.1 Research Design

Research design serves as a link different component in a study as it explains the

comprehensive and logical manner to successfully address a research problem under study. The research design explains the type of data required for a study as well as the suitable method to gather and analyse data with the aim of addressing each of the research questions (Van Wyk, 2012). Similarly, Zohrabi (2013) described a research design as the blueprint for conducting a study with maximum control over factors that may interfere with the validity of the findings.

To this end, the design-based research (DBR) design was employed in this study, which is based on the works of Brown (1992) and Collins (1992). Wang and Hannafin (2005, p. 8) defined DBR as a "systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-word settings, and leading to contextually-sensitive design principles and theories". McKenney and Reeves (2013) argued that this type of research strives toward both the development of an intervention to address a problem in a practice and empirical investigation yielding theoretical understanding that can inform the work of others. DBR is a method designed by and for educators that seek to increase the impact, transfer, and translation of education research into improved practice (Anderson & Shattuck, 2012; Herrinton et al., 2011). The selection and creation of the intervention is a collaborative task of both the researcher and the practitioners. DBR is a practical research methodology that could effectively link the gap between research and practices in formal education.

Wang and Hannafin (2005, p. 8) identified the four main characteristics of DBR as follows:

- It is pragmatic. Its goals are solving current real-world problems by designing and enacting interventions as well as extending theories and refining principles.
- It is grounded in both theory and the real-world context.
- It is interactive, iterative, and flexible.
- It is integrative because researchers need to integrate a variety of research methods andapproaches from both the qualitative and quantitative research.

The use of design-based research in mixed methods studies grounded in pragmatism provides a powerful means to explore and enhance the role of TVET in promoting sustainable socio-economic development. It allows for a nuanced exploration of educational strategies and their outcomes, ensuring that TVET systems remain relevant and effective in the face of

evolving global challenges. This research approach, with its emphasis on practical application and integration of multiple methods, is well-suited to addressing the complex and dynamic nature of skills development for sustainability.

4.2 Mixed Methods

Creswell (2014b) suggests that mixed method studies involve the integration of quantitative and qualitative approaches to collect and analyse data within a single study, aiming to address research problems from multiple perspectives. Utilising MMR reduces the inadequacy if either approach – the quantitative or the qualitative – are used on their own. Hence, MMR is used for the purpose of achieving a complementary view about an identified problem (Soffer & Hader, 2007). For the purpose of this investigation, the explanatory sequential design strategy was adopted as it allows researchers to begin by collecting and analysing quantitative data in a sequential manner. The results from the quantitative data are then used to guide the sample selection for the Qualitative Phase.

The MMR is also described by Creswell and Plano Clark (2007, p. 5) as a research design incorporating philosophical presumptions in addition to techniques of investigation. It uses philosophical presumptions to govern the collection and interpretation of data, and it combines qualitative and quantitative data in a single research or set of studies. In sum, utilising both quantitative and qualitative approaches combined provides a better understanding of the research problem than using one approach on its own. The study was carried out in three phases, namely: A Preliminary Phase (Phase 0); a Quantitative Phase (Phase I); and a Qualitative Phase (Phase II). The quantitative method revealed the broad patterns of design-based discourse while the qualitative method was used to facilitate local clarification through interviews. This will be discussed in more detail further below. However, for now, my motivation for using MMR is explained next.

4.2.1 Rationale for Using MMR

Creswell (2008) made it a known fact that there are diverse of reasons why MMR should be considered in a particular study, this includes:

- When both quantitative and qualitative data are employed to provide a better

understanding into the research problem.

- When only one type of research technique (qualitative or quantitative) fails to addressthe research problem, or offer solutions to the research questions that form the basis ofthe study.
- Adding a qualitative element to a study that is mostly quantitative; and
- To build one phase of a research upon another, i.e., to examine qualitatively and then construct an instrument, or to follow-up a quantitative study qualitatively to get more in-depth knowledge about a phenomenon.

According to Creswell and Plano Clark (2011, p. 54), the key principles to follow while designing a MMR study include:

- Deciding on the type of design.
- Identifying the design approach to use.
- Matching the design to the research problem, purpose, and questions; and
- Being explicit about the reason for using mixed methods.

MMR, as posited by Soffer and Hadar (2007), consists of six different strategies, namely: (i) explanatory sequential design, (ii) exploratory sequential design, (iii) transformative sequential design, (iv) concurrent triangulation design, (v) concurrent nested design, and (vi) concurrent transformative design. The study made use of the explanatory sequential design. According to Soffer and Hadar (2007), this design has been made to addressthe research objectives as it guarantees the achievement of a complementary view about the identified problem. The TVET aims to provide a complex delivery system; hence, it requires a multi-stakeholder representation to avoid any gap that will compromise the achievement ofa sustainable TVET system in Lagos State Nigeria.

4.2.2 Characteristics of MMR

Creswell (2014a) asserts that the triangulation of qualitative and quantitative methodologies is a precursor to the growth of MMR. Torrance (2012) listed some characteristics of the MMR design that can be useful to researchers. These characteristics include the methods, phenomena, paradigms, status, implementation timing, and study. These characteristics also contribute to the in-depth understanding of MMR study as they focus on purpose, paradigm issues, data analysis, methods, and its significance.

Thus, considering the reasons outlined above, the MMR approach was deemed appropriate to address the objectives of the study. Having outlined the advantages and characteristics of the MMR approach, and explaining the suitability thereof for this study, attention now shifts to the design of the instrument.

4.3 Design of the Instrument for the Study

4.3.1 Co-development of the Research Instrument

The Delphi technique was used to develop the research instrument that was used with participants from the following three sectors: *academia; industry,* and *government*. According to Green (2014), the Delphi technique is a communication structure aimed at producing a detailed critical examination and discussion. Delphi studies have been useful in educational settings in forming guidelines, standards, and in predicting trends.

What was envisaged basically was that a group of experts exchanged views, independent of each other, providing a list of skill sets from most relevant to least relevant. The nominated facilitators reviewed the data and issued a summary report. This, the facilitators did in collaboration with me. Two facilitators were appointed: one in Nigeria and the second one in South Africa.

The group members were given the chance to review the summary report; thereafter they gave an updated skill set list to the facilitator, who again reviewed the material and issued a second report. This process continued until all the participants reached a consensus. The experts at each round had a full record of what skill set other experts had foregrounded, but they did not know who highlighted which skills set. Anonymity not only allowed the experts to express their opinions freely, but also encouraged openness and avoided admitting errors by revising earlier forecasts.

Table 4.1 and the steps discussed therein were informed by Green's (2014) work.

Table 4.1 Steps followed

STEPS	COMMENT
1. Develop the initial Delphi probe or question	The problematic question addressed by the panel of experts was structured as follows: *How can sustainable socio-economic development be promoted through TVET systems?* The following sub-questions were formulated: • What strategic and leadership skills are required for initiating and promoting change and why? • What process skills are required for enabling change and why? • What practical skills are required for delivering change and why?
2. Select the expert panel	Key experts in the subject field were selected to elicit the latest thinking and to inform policy making.
3. Select an independent facilitator	This was a policy practitioner – an individual well versed with the African TVET system and its challenges.
4. Distribute Round 1 questionnaire	The questionnaire consisted of the above questions – broad and sub-questions. The experts exchanged views – independent of each other – giving their list of 5 skills in each question, listed from the most relevantto the least relevant skill. The purpose of Round 1 was to form/elicit issues around the questions posed.
5. Collect and analyse Round 1 responses	The facilitator, together with the researcher, analysed the responses. The facilitator provided feedback.

6.	Provide feedback from Round 1 responses; formulate the second questionnaire basedon Round 1 responses; and then distribute the latter	Round 2 provided the panelists with feedback from Round 1. The group members discussed and reviewed the summary report, and rated the items on the questionnaire using a predetermined scale. The experts at each round had a full record of what skill sets the other experts foregrounded, but they did not know whohighlighted which skill set. Individual experts were asked to re-evaluate their opinions in the Round 3 when they differed significantly from the other panelists.
7.	Repeat Steps 4 and 5 toform the questionnaire for Round 3	Round 3's goals were to offer input from Round 2 and either achieve a definitive agreement or make it clear that one could notbe reached. The consensus is presented and identified using measures of central tendency. People who stated opinions that differed from those of the other participants were requested to explain their stances by giving reasons. The panelists' opinions and the literature were contrasted. Triangulating expert opinion with the literature was the goal of this comparison.
8.	Analyse final results	The facilitator, together with the researcher, carried out the analysis.
9.	Distribute results topanelists	For final review before the questionnaire was sent out, the second group of participants were selected from the following 3 sectors: *academia; industry,* and *government.*

STEP 1: The initial Delphi questions were developed.

The problematic question addressed by the panel of experts was structured as follows:

- ***How can* SSED *be promoted through TVET systems?***

The following sub-questions were formulated:

- What SLS are required for initiating and promoting change and why?
- What PS are required for enabling change and why?
- What PRS are required for delivering change and why?

STEP 2: Letters were sent to nine experts to participate in the study.

This was done after the Ethical Clearance approval was received from the University. Three experts were invited – each fromthe academia, the government, and the automobile industry. Out of the nine experts, seven agreed to participate in the study.

STEP 3: TVET experts were contacted to be facilitators for the study.

A facilitator is a person who helps a group of people work together to better understand their common objectives and planhow to achieve these (Phillips & Phillips, 1993). One of them finally agreed to take up the task. Unfortunately, the facilitator requested to be excused from the process after the distribution of the first round of the questionnaire to the experts. I, therefore, requested more TVET experts to be the facilitator. Eventually, two experts agreed to be the facilitators for the study. The facilitators appointed for the study were from South Africa andNigeria, respectfully.

STEP 4: The Round 1 questionnaire was distributed to the experts via email.

A reminder email was sent to the experts after a week when responses were not forthcoming.

STEP 5: Responses were received from the seven experts and analysed

These were collected and analysed. The two facilitators further analysedthe responses which resulted in the production of the next round of the questionnaire.

4.3.2 Round 1 Questionnaire

The responses of the seven experts were arranged in a spreadsheet in preparation for the analysis in Round 2.

4.3.3. Round 2 Questionnaire

The responses from the seven experts in Round 1 were analysed by the facilitators and myself. The items were arranged into the format of the instrument. The Round 2

questionnaire was then forwarded to all seven experts for their inputs and observation about the presented items after the facilitators had done the necessary corrections. The completion of this procedure led to Round 3 of the questionnaire.

4.3.4. Round 3 Questionnaire

The Round 2 questionnaire facilitated the Round 3 questionnaire. The questionnaires were returned to me with the experts' comments and observations. The Round 3questionnaire was formulated based on the feedback from the experts. They were asked to ratethe items on the questionnaire using a predetermined scale. The experts worked independentlywithout knowing who highlighted the skills that were listed.

The Round 2 responses were analysed by the facilitators and myself. The facilitators gave the final feedback that informed the Round 3 questionnaire. The Round 3 questionnaire was sent to the seven experts to re-evaluate their opinions in the third round of the questionnaire when they differed significantly from the other experts. The feedback fromthe third round enabled the final consensus to be reached.

The measures of the central tendency were used to determine the consensus reached by the experts. The views of the experts were compared with the literature of the study. The reason was to triangulate the experts' views with the literature.

4.3.5. Round 4 Questionnaire

The final phase of the questionnaire was sent to the experts for their final inputs. After the return of the questionnaire, the facilitators and I did the analysis and produced the final questionnaires that were used for the study. The final questionnaires were sent to the second group of participants in the academia, industry, and government.

4.4. Method of Data Collection

The data collection consisted of three stages. The first stage involved the construction of the research instrument by the experts. The second stage entail the first Phase I of the study, which

was the quantitative phase. The third stage was Phase II, the qualitative phase of the study.

4.4.1 Phase I – Quantitative Phase

Stage 1: Identification of experts

Based on one of the characteristics of DBR, the instrument used for the survey was co-developed with the assistance of experts from the three spheres of the THM, namely: academia, government, and the industry. Academia included the TCs; government was the LASTVEB/Ministry of Education; and the industry was the automobile industry. Three experts were identified in each sphere for the purpose of this study.

Stage 2: Invitations of experts to participate in the study

At the end of identifying the experts to be used for the construction of the instrument, invitation letters were written to each expert identified to participate in the study.

Stage 3: Confirmation of study participation

The experts confirmed their interest in participating in the study. During this stage, the objectives and purpose of the study were explained to the experts. The main objective was to construct the instrument to be used for the study, using the research questions. This is to influence the policy and practice of TVET systems.

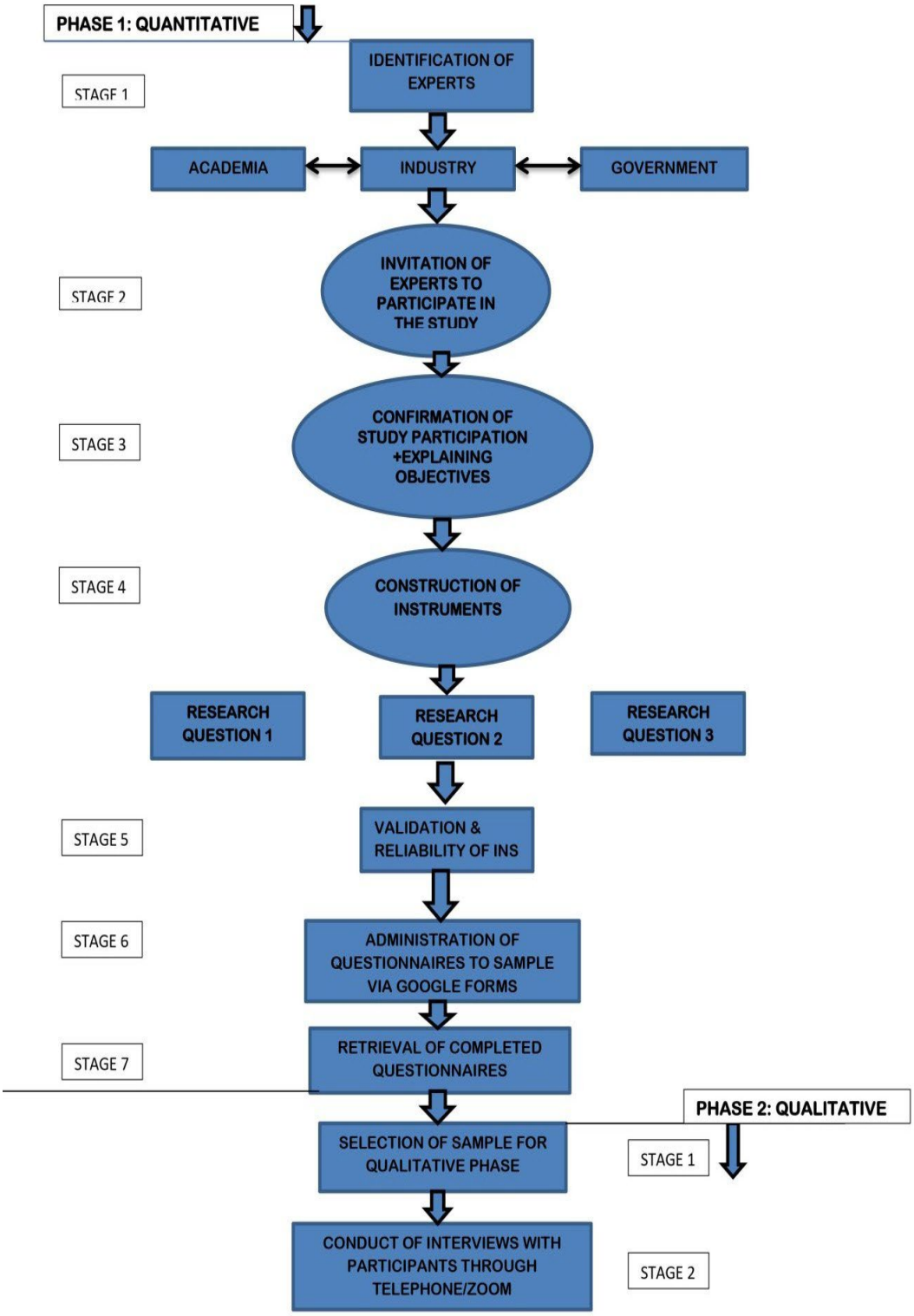

Figure 4.1 Data Collection Flow Chart

Stage 4: Construction of the instrument for the survey

The instrument was constructed with the assistance of the experts who were carefully selected for the study. This entailed the collaborative efforts of the experts chosen from the three

spheres of the THM: academia, government, and industry. The development of the questionnaire was co-developed by the experts and myself adopting the Delphi technique.

Stage 5: Validation and Piloting of the Instrument

The instrument after the design by the experts was presented to the facilitators for the final review. The validity of a test is defined as the extent to which a test measures what it is supposed to measure (Uzoagulu, 2011).

The instrument was subjected to content validity and construct validity by the experts involvedin the construction of the instrument. The instrument was later subjected to a pilot test to determine the reliability of the instrument. Pilot testing was conducted to establish the contentreliability of the instrument. Cronbach's alpha was used to determine the reliability coefficientof the instrument for data collection. The validity of a test is the extent to which it measures what it is supposed to measure (Uzoagulu, 2011). The instrument for data collection (Questionnaire) was validated by the experts involved in the construction of the instrument. This was done to ensure that the items are clearly stated and appropriate for the research questions. Content and construct validity were also established. In addition, suggestions made for the improvement of the questionnaire to meet the objectives of the study were taken into consideration.

Pilot testing was conducted to establish the content validity and reliability of the research instrument (Questionnaire). Cronbach's alpha was employed to weigh the reliability of the instrument that will be used for data collection. The Cronbach alpha serves as a dependable method used to estimate the expected correlation of one instrument (Uzoagulu, 2011). To determine this, 30 respondents comprising 10 officials of the Ministry of Education (TechnicalEducation unit); 10 supervisors from automobile maintenance industries in Ibadan, Oyo State;and 10 teachers of mechanical trades from TCs in Ibadan, were selected. Oyo State has similarcharacteristics to Lagos State. These respondents were asked to respond to the items in the questionnaire to test the reliability of the instrument. The reliability of a test is the consistencyof the test in measuring whatever it is supposed to measure (Uzoagulu, 2011). These respondents were used to determine the reliability coefficient of the instrument to be used forthe data collection. The coefficient of the reliability was 0.85. The reliability coefficient of theinstrument was based on the result and the instrument was adjudged for measurement.

Stage 6: Administration of the Instrument

Probability sampling was utilised for the Quantitative Phase of the research. Probability sampling is a sampling technique whereby the researcher chooses samples from a larger population using a method based on the theory of probability (Daniel, 2012). Within probability sampling, cluster sampling therefore was selected to obtain the samples for the Quantitative Phase of the study. According to Harrison and Creswell (2020), cluster sampling involves dividing the population into subsets or clusters for the purpose of the study. The researcher then selects a random group from these clusters using systematic and simple random techniques for data collection and analysis. Tarherdoost (2016) further supports this method, stating that random sampling is typically performed within these clusters, often serving as the final sampling approach. The clusters used for the study were: Government (LASTVEB); Industry (automobile personnel), and Academia (personnel from the five selected TCs, including: Principals, HoDs, and teachers of mechanical trades.

The questionnaire was distributed through Google Forms on the 15th of August 2021. This method was preferred to avoid face-to-face interaction in the distribution of the questionnaires. This process took a longer time than anticipated to complete. The respondents were expected to complete the questionnaires and return them via my Google Drive account. However, the response rate was very poor. I therefore followed up through telephone calls and emails on the 23rd of September 2021, which yielded some progress. Despite the shortcomings of the late responses, the Google Forms proved to be a reliable form for collecting data. The data collection process was completed on 12 December 2021.

The questionnaires were administered to 230 respondents using Google Forms. The survey was cross-sectional. The data were collected at one point in time. The sample for the Quantitative Phase is presented on Table 4.2. The sample was selected randomly from the population.

Table 4.2: Phase I Sample

SECTOR	EMPLOYMENT LEVEL	#
ACADEMIA	Principals of technical colleges	5
	Teachers of mechanical trades	80
GOVERNMENT	Ministry of Education, Lagos State	20
	LASTVEB	20
	NBTE	5
INDUSTRY	Automobile service engineers	20
	Automobile workshop managers	30
	Automobile workshop supervisors	50
	Total	230

Stage 7: Retrieval of the Instrument

The questionnaire was distributed through Google Forms on the 15th of August 2021. This method was preferred to avoid face-to-face interaction in the distribution ofthe questionnaires. This process took longer to complete than anticipated. The respondents were expected to complete the questionnaires and return them via my Google Drive account. However, the response rate was very poor. I therefore followed up through telephone calls and emails on the 23rd of September 2021, which yielded some progress. Despite the shortcomings of the late responses, the Google Forms proved to be a reliable form for collecting data. The data collection process was completed on 12 December2021.

4.4.1.1 Analysis of Phase I the data

The main instrument used for data collection was the questionnaire designed with the TVET experts. The questionnaire was used to elicit responses from the respondents from the academia, industry, and government. The questionnaires were distributed through Google

Forms. This was done to observe the Covid-19 protocol as well as the UKZN protocol for research duringthe Covid-19 pandemic. The Google Forms containing the questionnaires were sent to the respondents via email and the WhatsApp platform.

According to Queirós et al. (2017), quantitative analysis is a technique that uses mathematical and statistical modelling, measurements, and research to understand behaviour. The study used exploratory factor analysis (EFA) to analyse the research questions. EFA is regarded as a complex and multivariate statistical technique commonly employed in information system, social science, education, and psychology (Taherdoost et al., 2020). Watkins (2018) defines EFA as a multivariance statistical method that attempts to bring intercorrelated variables together under more general underlying variables. It is used to examine the internal reliability of a measure and to investigate the theoretical factors that might be represented by a set of items. According to Winter and Dodou (2011), when conducting an EFA, a researcher has to make decisions regarding four things: (i) the estimation method, (ii) the number of factors to retain, (iii) the rotation method, and (iv) the method for calculating scores.

In this study, the analyses were conducted using the IBM® SPSS® 28 statistical package. EFA was applied on the items using principal axis factoring (PAF) as an extraction method and Oblimin rotation (Mabel & Olayemi, 2020). PAF analysis with Oblimin rotation was used to identify underlying factors or latent variables in a set of observed variables. The latter allows for the factors to be correlated with each other (which is not possible with traditional principal factor analysis), whilst still allowing for the identification of the underlying patterns in the data. In other words, it helps reduce the number of variables in a data set while preserving the relationship among the variables. The Oblimin rotation was used to improve the interpretability of the factors by allowing for the factors to be rotated in a way that maximises the similarity between the factors and the variables. This allows for a better understanding of the relationship between the variables and the underlying factors.

The variables with high intercorrelations measured one underlying variable called a “factor.” The number of factors to be retained after the factor extraction was made based on eigenvalues. Factors that have eigenvalues of 1.0 and above were retained, and factor loading was classified based on their magnitude. The best practices in the use of EFA were followed in the presentation of the results as stipulated by prominent scholars in EFA (Castello & Osborne, 2005; Taherdoost et al., 2014; Watkins, 2018). This implies doing the following

analyses:

- Descriptive Statistics for each variable (item) and the Analyses *N*;
- Correlation Matrix
- The Kaiser-Meyer-Olkin (KMO) Test
- Total Variance Explained
- Pattern Matrix
- Reliability Statistics
- Item-Total Statistics for Factor(s)
- Interpretation and Factor Labelling.

For the broad research question, we factor analysed a 15-item questionnaire on the factors that promote SSED through TVET systems. The participants responded to each of the 15 items on a numeric scale ranging from 1 to 4, where 1 indicated "strongly disagree", 2 "disagree", 3 "agree", and 4 "strongly agree", as illustrated in Table 4.3.

Table 4.3: Factors identified as needed to ensure the promotion of SSED through TVET systems

ITEMS	RATING			
	SA	**A**	**D**	**SD**
	4	**3**	**2**	**1**
SSED1: Provision of education for productive employment				
SSED2: Provision of training for productive employment				
SSED3: Provision of up-to-date tools for training				
SSED4: Provision of a safe working environment				
SSED5: Adequate investment of the government in technical training institutions				
SSED6: Assistance of Industries with training institutions				
SSED7: Assistance of NGOs in training institutions				
SSED8: Making TVET training institutions attractive to the youth to get skills in different trades				
SSED9: Provision of adequate funds to run the TVET institutions				
SSED10: Developing favourable policy for TVET programmeme				
SSED11: Implementing policy for successful attainable of the curriculum				
SSED12: Using TVET innovation in the development of the green economy				

SSED13: Using TVET innovation in renewable energy resources to boost food security

SSED14: Training of skilled workforce to address socio-economic development challenges

SSED15: Making TVET a tool for productivity enhancement and poverty reduction

The data were gathered from 162 participants who represented three sectors: academia, government, and industry. They represented eight employment levels as illustrated in Table 4.4. Table 4.4 suggests that the most prevalent sector where participants came from was academia. The academic sector was made up of Ministry of Education (n= 49; 31.5%), Principals of Tech Colleges (n= 9; 6.0%), and Mechanical Trades Teachers (n= 9; 6.0%). The academic sector was followed by government and industry.

Table 4.4: Sector and employment level of participants

SECTOR	Employment Level	Frequency	Percent	Valid Percent
GOVERNMENT	NBTE*	8	4.9	5.4
	LASTVEB**	13	8.0	8.7
	Auto Engineer	50	30.9	33.6
ACADEMIA	Min of Education	47	29.0	31.5
	Principal of Tech College	9	5.6	6.0
	Mech Trades Teacher	9	5.6	6.0
INDUSTRY	W/shop Manager	9	5.6	6.0
	W/shop Supervisor	4	2.5	2.7
	Total	149	92.0	100.0
	Missing	13	8.0	
Total		162	100.0	

Note: * National Board for Technical Education
** Lagos State Technical and Vocational Education Board

4.4.2 Phase II: Qualitative

The goal of qualitative research is to get a thorough knowledge of social phenomena in their natural environment (Merriam & Grenier, 2019). Qualitative research involves collecting and analysing non-numerical data to understand concepts, opinions, and experience. Phase II of the study comprised qualitative research which facilitated local clarification through interviews. The non-probability sampling technique was employed in this phase. Therefore, purposive sampling enabled us to select the participants for the interviews.

4.4.2.1 Data collection strategy

Interviews were conducted to elicit responses from the participants. A semi-structured interview was the main instrument used for data collection in the qualitative phase. According to Roulston (2018), a semi-structured interview is a data collection method that relies on asking questions within a predetermined thematic framework. I scheduled the interviews telephonically with the participants. The interviews were conducted thereby adhering to all the Covid-19 protocols. All the interviews took place between 15 December 2021 and 21 February 2022.

4.4.2.1.1 Individual interviews

The quantitative stage was analysed and the respondents to be interviewed were identified and selected based on their responses and positions held in some TVET establishments and the automobile industry. The Qualitative Phase of the study was conducted after the analysis of the Quantitative Phase of the study using semi-structured individua interviews.

Semi-structured interviews serve as a flexible method in qualitative research, striking a balance between the rigidness of formal surveys and the openness of unstructured interviews. They prove particularly beneficial for exploratory research questions that require a deep dive into specific phenomena, such as identifying elements that enhance SSED via TVET systems, as observed in this study. These interviews facilitate a conversational tone that yields comprehensive and actionable data, yet they're structured enough to ensure the conversation remains on topic (Magaldi & Berler, 2020). Interviewers can adapt to emerging information by adjusting the order of questions, while still adhering to a predetermined focus (Albaret &

Deas, 2023; Magaldi & Berler, 2020). While conducting semi-structured interviews with a limited number of participants may raise concerns about the validity of the findings, the insights gained can be invaluable, particularly when the participants are experts or have unique insights, as observed in this study. Creswell (2009) has extensively explored the concept of validity in qualitative research, defining it as the accuracy with which the findings reflect the participants' true experiences and the credibility these findings have to those participants. He argues that the selection of validity strategies should be influenced by my chosen theoretical framework and their fundamental beliefs about research (Creswell & Miller, 2000). Creswell further asserts that the choice of validity techniques should depend on who is evaluating the study's credibility and my philosophical approach to qualitative research. Established methods for ensuring validity in qualitative studies include member checking, triangulation, detailed descriptions, peer debriefing, and external audits. This particular study employed the first three methods to reinforce its findings.

4.4.2.1Analysis of Phase II Data

The process of qualitative analysis commences with data collection. Burrough et al. (2015) define ‘data’ as valuable information collected in an organised manner, often recordedby the researcher, to facilitate the interpretation of the information more effectively. This is then followed by transcription. According to Slembrouck (2007), transcription in a research study involves the translation or transformation of sound or images from a recording to text. It requires close observation of data through repeated careful listening, which is an important step in the data analysis.

Thematic analysis was employed to analyse Phase II data. This thematic analysis process is iterative and non-linear, often requiring researchers to move back and forth between the different steps as their understanding of the data deepens. It is a method that allows for flexibility and creativity in interpreting the data, but also demands rigor and a systematic approach to ensure the validity and reliability of the findings. The ultimate goal is to construct a rich, textured understanding of the data that sheds light on the research question and contributes new insights to the field.

In qualitative research, deciding on themes is a critical process that involves several steps to ensure a comprehensive understanding of the data. Initially, researchers immerse themselves in the data through a process of familiarization, which may involve reading and

re-reading the data, taking notes, and beginning to organise the data into initial codes. This coding process is where researchers begin to identify patterns and topics that recur across the dataset.

After coding, researchers generate potential themes by collating all the codes that relate to each other into meaningful groups. These groups are then reviewed and refined to ensure they form coherent themes that accurately reflect the data's nuances and complexities. This step may involve a back-and-forth process where themes are compared against the dataset to ensure they are supported by the data and are not just the researchers' interpretations or assumptions.

Defining and naming themes is the next step, which requires researchers to identify the 'essence' of what each theme is about and to determine what aspect of the data each theme captures. This involves a detailed analysis of each theme and may include writing detailed analyses for each theme, identifying the story that each theme tells, and determining how it relates to the overall research question.

We could briefly sum up the above six steps as follows:

- **Step 1: Familiarization**:

Researchers immerse themselves in the data, becoming thoroughly acquainted with the content. This is done in order to fully grasp its content through repeated review.

- **Step 2: Coding**

During this step, researchers identify and label meaningful segments within the data. Codes represent topics, ideas, or patterns that recur across different cases.

- **Step 3: Generating Themes**

In generating Themes, researchers organise related codes into broader themes that encapsulate key concepts or patterns in the data.

- **Step 4: Reviewing Themes**

Reviewing Themes, requires a critical examination of these themes to ensure they accurately represent the data, making refinements, as necessary. This is an iterative process in which we

have to make sure that our themes are useful and accurate representations of the data. Here, we return to the data set and compare our themes against it. Are we missing anything? Are these themes really present in the data? What can we change to make our themes work better?

- **Step 5: Defining and Naming Themes**

Defining and Naming Themes, involves articulating clear definitions for each theme and assigning concise names that capture their essence. As Caulifield (2023) advises, defining themes involves formulating exactly what we mean by each theme and figuring out how it helps us understand the data. Naming themes involves producing a succinct and easily understandable name for each theme.

- **Step 6: Reporting Themes**

Finally, in Reporting, this is a step in which the identified themes are presented to a critical audience for validation. The Themes of the study were discussed at length with my supervisor.

In our study, the themes identified were organised into three groups: Categories; Main Themes and Sub-themes. Categories of description, Main Themes, and Sub-themes are distinct elements that serve different purposes in the analysis of data. Categories of description are essentially the groups into which data is sorted based on shared characteristics; they help us identify and describe the features of the data, allowing for a clear definition and comparison with other categories (Turner, 2022). Themes, on the other hand, are the central concepts or "essences" that recur throughout the data, reflecting the underlying topics or ideas present in the narrative. Sub-themes are narrower strands of the main theme, providing a more detailed and specific exploration of the data's aspects. While categories are useful for organising data and understanding what it contains, themes and sub-themes delve deeper into interpreting the data, revealing the meanings and patterns that emerge from the participants' experiences. This layered approach to analysis enabled us to construct a rich, complex understanding of the qualitative data we were examining.

In the presentation of our results or findings section in Chapter 6, we address each theme in turn. We describe how often the themes come up and what they mean, including examples from the data as evidence.

Table 4.5 presents the Themes identified in the study which are grouped into Categories, Main themes, and Sub-themes.

Table 4.5: Categories, Themes and Sub-themes of the Study

Categories	Themes	Sub-themes
Understanding the Objectives of TVET to Re-evaluate them	Curriculum-Policy Alignment and Coherence	Curriculum Design Skills Development Stakeholder Engagement
Improving Public Perception of TVET	Provision of Incentives/Motivational Packages	Conscientising the Public about the Benefits and opportunities of TVET Attracting and Retaining Staff and Students
Robust Governance	Innovative Leadership and Expertise	Strictly, Individuals with Technical Expertise should Manage TVETs Adequate Funding and Infrastructure Needed for TVET Sustainability

4.5 Ethical Considerations

When conducting studies that involve human subjects, it is imperative to strictly adhere to the ethical requirements prescribed by one's institution, e.g., first obtaining ethical approval from the Research Ethics Committee (Mphatheni, 2016). Thus, conducting research without the latter's full approval is completely unacceptable (Roberts, 2015). In adherence to the ethical requirements prescribed by my institution, I first sought permission from the UKZN Research Ethics Committee, which was granted.

Thereafter, after explaining the scope of the study and the participants' rights, their permission to participate was obtained through informed consent via a consent form. It is crucial for individuals involved in a research study to fully understand the nature and purposeof the investigation, allowing them to make an informed decision regarding their participation(Bless, 2006). Participants should also be aware of the potential benefits and

risks associated with the research (Bless, 2006). In this study, the participants were adequately informed that they have the right to withdraw from the study at any point if they wished to do so. Each participant received an informed consent form outlining the study's expectations. It also statedthat participants would face no consequences if they chose to withdraw. Additionally, permission was obtained to record the interviews, and I also took handwritten notes during the interviews to refer back to later on.

The participants received assurances of their confidentiality and anonymity throughoutthe data collecting procedure as well as the data presentation, keeping to the ethical standardsrequired. The participants were informed that pseudonyms rather than their real identities would be used during this procedure. The study's participants were given the assurance that the recorded audio would be kept in a secure location for a period of five yearsbefore being destroyed. Therefore, participants who were recruited for this study gave their consent to participate in the study.

I took full responsibility for the well-being of the participants during theinterview process and remained within the ethical requirements. With the discretion and guidance of the research supervisor, I clearly followed laid out plan from the research proposal which was submitted to the University's Research Ethics Committee. Therefore, no alternation was made in regard to the research topic, key questions andobjectives for investigation, location of the study, and the research methods after the full approval had been given to conduct the study. Thus, the participants recruited for the study were assured that a copy of the thesis will be sent to them upon the completion of the study. Smith (1999, n.p.) notes the importance of "reporting back to the people and sharing the knowledge, based on the principle of reciprocity between the researcher and the people who have helped to make the research".

As with all research projects there are some sort of limitations that are encountered. The penultimate section below acknowledges the limitations of this study.

4.6 Researcher Reflexivity

Reflexivity generally refers to the examination of one's own beliefs, judgments, and practices during the research process and how these may have influenced the research. If positionality refers to what we know and believe then reflexivity is about what we do with this knowledge.

Reflexivity involves questioning one's own taken for granted assumptions.

Reflexivity is important because researchers are part of the social worlds they inhabit and can never be truly neutral or outside the study they are conducting2. They bring their own social positions, knowledges, and expectations to their work2. Reflexivity helps researchers to reflect upon and think hard about their own effects on their research

My role as the researcher of the study was to recruit experts (from Academia, Government, and Industry) in the field of automotive engineering and engage them, through one-on-one interviews, in a discussion about the factors that are deemed necessary in promoting SSED through the TVET system in Lagos, Nigeria. The experience of conducting the interview among the staff of the TCs was easierfor me as an insider and a lecturer. I have a good knowledge about the Nigerian educational system. Having about 30 years of experience in the civil service helped to produce much information and rapport during the interviews. My role as an insider had several advantages and my knowledge of the TVET and educational system facilitated communication with the participants during the interview. As a researcher, I was also aware of the TVET challenges. My role as the researcher was to start the interview by engaging in a conversation with each of the participants about TVET. This 'ice-breaker' facilitated a free flow of expression on thetopic of the research questions during the interview process. I then steered the conversation inthe direction of the research questions to make sure that these were answered.

Another advantage as an insider researcher conducting interviews on TVET in Lagos State, Nigeria, was that it allowed the participants to express their thoughts freely on what theybelieve can be done to develop a sustainable TVET system in the TCs of Lagos State.

Nevertheless, the majority of the participants were content to express their narratives.For instance, in the interview process, the participants were asked about their views on the TVET system. Different narratives were provided which created further insight into the study.The study of TVET is viewed as a right way of lifting the youths out of poverty. Some participants saw it that way, while the majority challenged the government's interventions oninadequate teaching-learning facilities. Hence, after the interview, each participant saw the uniqueness of the study, which focused on developing a sustainable TVET system in the TCsof Lagos State.

After conducting all the interviews, I listened to the recordings multipletimes to

grasp the narratives of the participants. This aided in transcribing the interviews and facilitating the translation of the data. The transcribed interviews were carefully read several times to familiarise myself with the data for the analysis process. Through this continuous reading, themes started to emerge from the data, ensuring that no important information was overlooked. The familiarity with the data allowed the me to gain deeper insights and understanding. This accuracy in comprehending the data contributed to reliable transcriptions and analysis, ultimately resulting in trustworthy and authentic findings.

Information was also obtained through observation, e.g., tone of voice, which suppliedrich and supplementary information. The information gathered through observation and the information supplied by the informants were combined in the analysis and discussion of the research. However, some disadvantages/challenges were identified during the interviews. Partof it was that some participants deviated from the research questions, but I adhered to the ethical consideration. When this occurred, I gently asked the interview question again to get the main themes from the participants.

Some of the challenges experienced during the interviews included the following: Firstly, conducting a telephonic interview was a challenge. Several calls were made to book an appointment with each participant to know when they were available for the interview. These challenges were overcome as I developed a close rapport with the participantsbefore the interviews were conducted. Secondly, the problem of power outages impeded the progress of the study. Many telephone calls were made before appointments could be secured.Failure to reach the participants was blamed on their inability to charge their cell phones. Thethird challenge was studying at PhD level outside the country. In this regard, the majority of the participants viewed me as a rich man who spends in dollars. It is assumed that anyone who has been out of the country is rich and exposed to several opportunities which will make him/her superior to others residing in the country; but, in reality, this is actually notthe case. Nevertheless, as a researcher I maintained professionalism and did not take anythingpersonal. The last challenge was bureaucracy in the government offices. This slowed down the pace of getting things done in the offices.

4.7 Limitation of the Study

The limitations of this study included the following:

Firstly, the semi-structured interviews that were used to collect the data had some constraints. The nature of these interviews limited exploration in certain areas of the research.Due to the structured format, there was less flexibility for digression, and the focus remainedon the context of the semi-structured questions. However, the questions captured the needed area of the study.

Second, as a tutor and researcher, interviewing other teachers was challenging. Some teachers displayed apathy towards research based on their previous experiences, believing thatlittle comes out of it. However, I managed to convince them that the study had acomprehensive design and that the outcomes/results would be shared with LASTVEB for guidance and implementation in the TCs.

Third, some participants were hesitant to discuss issues related to the education system in Nigeria. They held the view that the system suffers from poor management and corruption, with good policies often remaining unimplemented. Consequently, during the discussions, they were cautious about what they communicated due to fear of reprisal or negative consequences. Despite these concerns, I was able to gather sufficient data to support the study's findings.

Fourth the “context of practice as an “affordance” (Strong et al., 2014). This complexity arises from the dualistic role of the “context of practice” as both a facilitator and a barrier, a concept that mirrors the idea of affordances as described by Strong et al. (2014). These affordances, intrinsically linked to their practical use, defy easy separation for examination or duplication beyond their initial environment. The unique and dynamic nature of the “context of practice,” as characterized by Alant and Bakare (2021), presents a formidable obstacle in controlling or quantifying this variable in educational research. This is especially true when attempting to extrapolate results across various TVET settings on a broader scale.

The primary challenge associated with this limitation is the resistance of the “context of practice” to be isolated for research or replication, which in turn hampers the regulation or assessment of variables within educational studies. To address these difficulties, our research adopted a mixed-methods approach, integrating both quantitative and qualitative

data to gain a deeper insight into the context. Furthermore, we embraced a comprehensive analytical method, utilizing the Integrated Intelligence framework, the Quintuple Helix model, and Porritt's Five Capitals framework. This strategy facilitated an in-depth investigation into the ways in which certain affordances function as enablers or impediments, thus enriching the narrative beyond the figures.

The study's conceptual frameworks depend on the collaboration of various sectors or entities, which may impede the execution of its suggestions. For example, if a key sector that is essential for providing resources or policy support does not share the study's goals, it could result in strategies that are either not fully formed or ineffective in advancing SSED. Furthermore, the necessary coordination among different stakeholders can be a lengthy process and might cause delays, diminishing the study's timeliness and practicality. Thus, while integrative models like the Quintuple Helix and Porritt's Five Capitals can provide extensive understanding, their success relies on the active and synchronized involvement of all parties.

The methodological soundness of such conceptual frameworks is based on their capacity to encapsulate the intricate operations of TVET systems and the varied requirements of their stakeholders. This necessitates a thorough review of how these models correspond with the particular situations and aims of TVETs. There is also a need to consciously avoid oversimplification to ensure that the subtle dynamics among different capitals and helices are properly represented and factored into TVET strategies. Establishing strong validity checks was essential during the research design and analytical stages. This was accomplished by using triangulation techniques to corroborate data and by conducting repeated consultations with participants my supervisor.

Fifth, is the limited sample size of nine out of a pool of 162 participants in Phase I. The reliance on a small qualitative sample (Phase II) following a larger quantitative phase (Phase I) indeed posed a threat to the study's external validity (Creswell, 2009). The transition from quantitative to qualitative methods necessitated a careful consideration of how these research approaches complement each other to ensure that the findings are robust and reliable. A mixed-methods approach was employed to mitigate some of the limitations by leveraging the strengths of both qualitative and quantitative approaches to enhance the validity and reliability of the findings (Creswell, 2009). For instance, while quantitative data provided a broad overview of trends and patterns, qualitative data offered nuanced insights

into individual experiences and perceptions about the factors that are truly essential for TVETs to effectively promote SSED.

Furthermore, ensuring methodological consistency was essential for the comparability of results. This involved maintaining a clear and logical link between the research questions, the design of the study, and the methods used for data collection and analysis (Hecker & Kalpokas, 2024; Hart, 2018; Creswell, 2009). The interviews in the qualitative phase were structured in a way that they align with the initial quantitative measures, allowing for a coherent analysis that can inform the overall research objectives.

Although we are aware that the results of this small case study cannot be generalisable, however, the ability to generalise findings is contingent upon a representative sample that captures the complexity of the population being studied (Hecker & Kalpokas, 2024; Hart, 2018, Creswell, 2009). In the context of this study, this meant including participants from various employment level backgrounds, regions, and levels of AE industry experience with TVET programmes. A more representative sample would not only bolster the study's generalisability but also provide a richer, more detailed picture of the factors that are critical to fostering SSED through TVET programmes.

4.8 Conclusion

In conclusion, this chapter discussed the methodology employed in conducting the study. The mixed methods approach, combining both quantitative and qualitative methods, was deemed appropriate to address the research problems at hand. Cluster sampling was used to select participants for the quantitative phase, while semi-structured interviews were conducted for the qualitative phase.

Following the interviews, I thoroughly listened to the recordings multipletimes to comprehend the participants' narratives. This aided in the transcription and translationof the data. The transcribed interviews were carefully read and analysed, allowing themes to emerge from the data. My familiarity with the data ensured that no crucial information was omitted and provided valuable insights into the research topic.

The accuracy in understanding and analysing the data led to trustworthy and authenticfindings. My commitment to maintaining the integrity of the research was evident

through the rigorous transcription and analysis process. By ensuring accurate transcriptions and analysis, the study's findings are robust and can be relied upon for further interpretation and implications.

Overall, the methodology employed in this study enabled a comprehensive explorationof the research questions, combining both quantitative and qualitative data to provide a well- rounded understanding of the factors that promote SSED through TVET systems. The methodological approach utilised in this study sets astrong foundation for the subsequent chapters and enhances the validity and reliability of the research findings.

Attention now shifts to the quantitative analysis phase of the study

CHAPTER 5

PRESENTATION OF RESULTS OF PHASE I

5.0 Introduction

As discussed in Chapter 1, and emphasised in subsequent chapters, this study is concerned with determining ways in which we can shift the Nigerian TVET system from a "fragmented" to an "integrated" one. In this regard, it is concerned about change. It thus asks a broader question: ***what kind of change would be required to gear TVET systems towards promoting sustainable socio-economic development***. As Haughey (2015, p. 1) emphasises, in the emerging countries in Asia, Africa and the Americas and Europe, meeting the needs of industry and our growing population requires the utilisation of technology, human capital, and skills like never before. In this regard, he argues, young people ***need new skills*** ─ skills that are innovative, creative, entrepreneurial ─ to allow them to forge a sustainable and positive future for themselves (Haughey, 2015). It is, indeed, these skills that this Chapter tries to identify and bring to the fore. At a deeper level is the question of, which of the identified skills (factors) are perceived to stand a chance to promote sustainable development by fostering employment, decent work, and lifelong learning (Shiohira, 2021). The type of skills identified seem to resemble a **dynamically integrated set of skills**, which we have labelled "***integrated intelligence***." Our use of the term "integrated intelligence" in presenting the results of the three sub-question is based on our understanding that intelligence is not a fixed trait, but rather a dynamic set of skills and abilities that can be developed and improved over time (Bushuyev et al., 2023, p. 105).

In this regard, this chapter addresses three aims. First, to determine the skills (as represented by factors) that are deemed necessary to promote SSED through TVET systems. Second, to critically look at the reasons given by the 162 participants who participated in this study regarding the skills that promote SSED through TVET systems. Both the first and the second aims are explored with reference to the following three skills: *strategic and leadership skills* (SLS); *process skills* (SL); and *practical skills* (PRS). Third, to interrogate whether the skills explored correlate with the three employment sectors identified and selected in the study: *academia*, *government*, and *industry*. The four hypotheses proposed are addressed in this regard:

- **Ho1.** There is no significant difference in the selection of the factors needed to ensure the promotion of SSED through TVET systems by the participants.
- **Ho2.** There is no significant difference in the selection of the strategic and leadership skills needed to ensure the promotion of SSED through TVET systems by the participants.
- **Ho3.** There is no significant difference in the selection of the process skills needed to ensure the promotion of SSED through TVET systems by the participants.
- **Ho4.** There is no significant difference in the selection of the practical skills needed to ensure the promotion of SSED through TVET systems by the participants.

The best practices in the use of EFA were adhered to in the analysis of the results as stipulated by prominent scholars in EFA (Castello & Osborne, 2005; Taherdoost et al., 2014; Watkins, 2018) and followed the following structure:

- Descriptive Statistics for each variable (item) and the Analyses N;
- Correlation Matrix
- The Kaiser-Meyer-Olkin (KMO) Test
- Total Variance Explained
- Pattern Matrix
- Reliability Statistics
- Item-Total Statistics for Factor(s)
- Interpretation and Factor Labelling

However, to allow for easy reading and flow, we have moved the copious data tables that accompany the presentation of the results to the Appendix section (Appendices 1-5).

The chapter ends with a conclusion which summarises the results and highlights some salient issues that are addressed in the next chapter, Chapter 6.

5.1 Broad Research Question: How Can SSED be Promoted Through TVET Systems?

This broad research question tried to solicit responses from the 162 respondents' understanding of the factors that promote SSED through TVET systems by three different sectors: *academia*, *government*, and *industry*. The participants responded to each of the 15 items on a numeric scale ranging from 1 to 4; where 1 indicated strongly disagree, 2 disagree, 3 agree and 4 strongly agree, as illustrated in Appendix 1. The results suggest that the most prevalent sector where participants came from was government, which was made up of NBTE (n=8; 5.40%), LASTVEB (n=13; 8.70%) and Auto engineers (n=50; 33.60%). The government sector was followed by academia (43.50%) and industry (8.70%), respectively.

The two requisite factors that the participants perceived would *transform* the TVET system and gear it towards promoting SSED are:

- SSED Factor 1: Innovative green growth for SSED.
- SSED Factor 2: Infrastructure for enhancing manufactured, human, and financial capitals.

As shown in the analysis, the 15 items (SSED1 to SSED15) were sorted into three overlapping groups of items. The items were sorted so that the items that have the highest loading (not considering whether the correlation is positive or negative) from SSED Factor 1 (eight items in this analysis) are listed first, and they are sorted from the one with the highest factor weight or loading (i.e., SSED13, with a loading of 0.916) to the one with the lowest loading from that first factor (SSED9, with a loading of 0.300). Next, the three items that have their highest loading from SSED Factor 2 are listed from the highest loading (0.928) to the lowest (0.553). Finally, the three items on which Factor 3 loads most highly are listed in order.

It should be noted that although three factors were initially identified for SSED Factor 3, namely; '*Making TVET training institutions attractive to the youth to get skills in different trades*' (SSED8), '*Developing favourable policy for TVET programmes*' (SSED10) and '*Assistance of NGOs in training institutions*' (SSED7), however due to the fact that all the Cronbach's values for SSED Factor 3 were less than 0.7, all the items were removed. It is for this reason that we only present the above-mentioned two factors.

5.1.1 SSED Factor 1: *Innovative green growth for SSED*

As illustrated in Figure 5.1 below, the reliability statistics for SSED Factors 1 and 2 were 0.831 and 0.819, respectively. The variables (SSED13 and SSED12) with the strongest association to Factor 1 (the underlying latent variable), were '**using TVET innovation** *in renewable energy sources* (RES) *to boost food security*' and '**using TVET innovation** *to develop the green economy*', with factor loadings of 0.916 and 0.682, respectively. Since factor loadings can be interpreted like standard regression coefficients, one could also say that the variables SSED13 and SSED12 have correlations of 0.916 and 0.682, respectively, with Factor 1. It is significant to note that these two variables talk directly to one of Porrit's (2005) five capitals; viz., the **natural capital**.

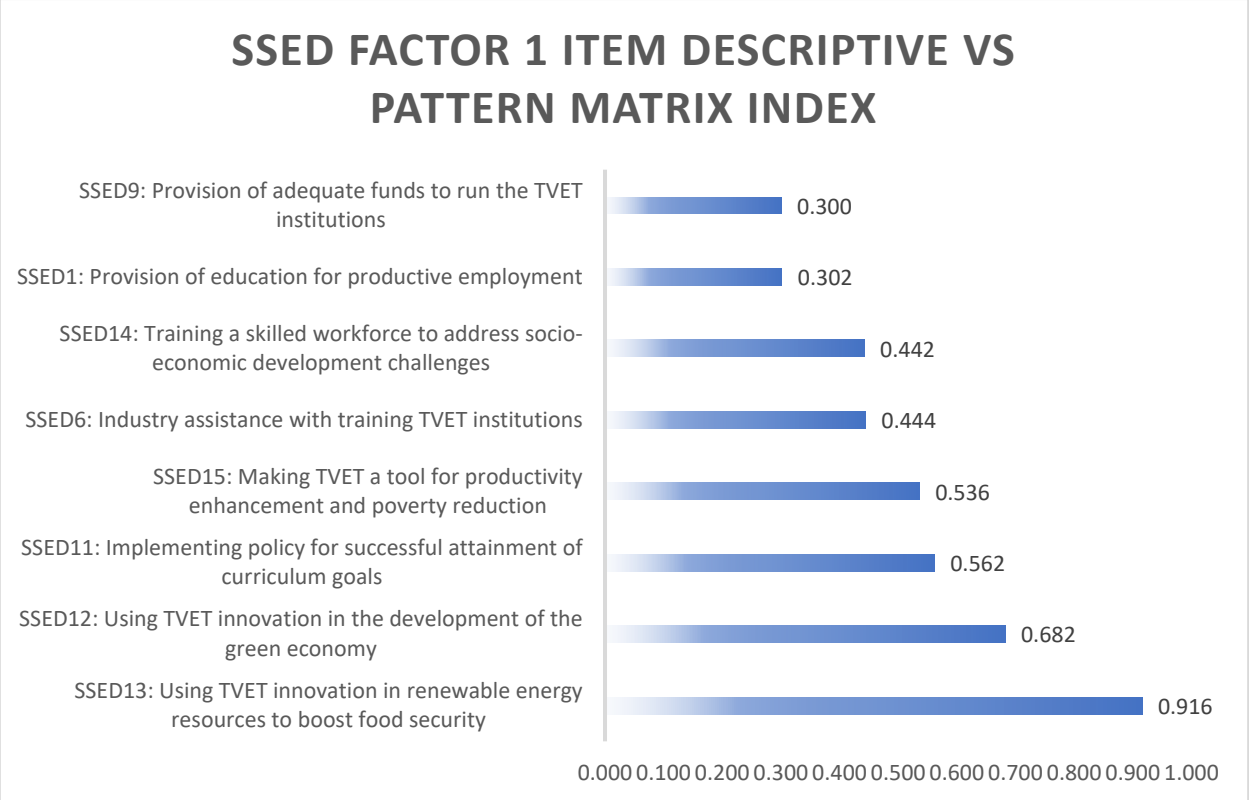

Figure 5.1: SSED Factor 1 Items vs Pattern Matrix Index

You will note that six other variables, whose associations range between moderate and marginal, SSED11[*1]; SSED15[*]; SSED6[**2]; SSED14[**]; SSED1[**]; SSED9[**], are also associated with Factor 1. As can be seen, all six variables talk to four of Porritt's five capitals

*Moderately important

**Marginally Important

framework, such as **social capital** - *curricular-policy alignment*, **human capital** - *poverty reduction*, **social capital** - *education and training for productive employment*, **financial capital** - *adequate funding*, etc. What is significant to note is the marginal loading of the provision of funding as well as education and training for productive TVET. In the literature, they are regarded as the mainstays in the achievement of SSED goals (Uba, 2017). Thus, based on the variables loading highly and moderately onto SSED Factor 1, we could call SSED Factor 1: *Innovative green growth SSED*. The assumption is, of course, that green growth brings about both economic and social development. As Fernandes et al. (2021, p. 2021) argue, "sustainable innovation promote[s] green growth, which in turn positively impacts economic growth".

5.1.2 SSED Factor 2: *Infrastructure for enhancing manufactured, human, and financial capitals*

As shown in Figure 5.2, the three items that have their highest loading from SSED Factor 2 are listed from the highest loading (0.928) to the lowest (0.553). Figure 5.2 shows that all three items (SSED3; SSED43, and SSED5) have a strong association (≥0.5) to Factor 2, with SSED3 having the strongest with a factor loading of 0.928. All three variables seem to talk to three of Porritt's five capitals framework with regards to issues of infrastructure, whether **physical** (SSED3), **human**, i.t.o. well-being (SSED4), or **financial** (SSED5). Based on these three variables which load highly onto SSED Factor 2, we could call SSED Factor 2: *Infrastructure for enhancing manufactured, human, and financial capitals*.

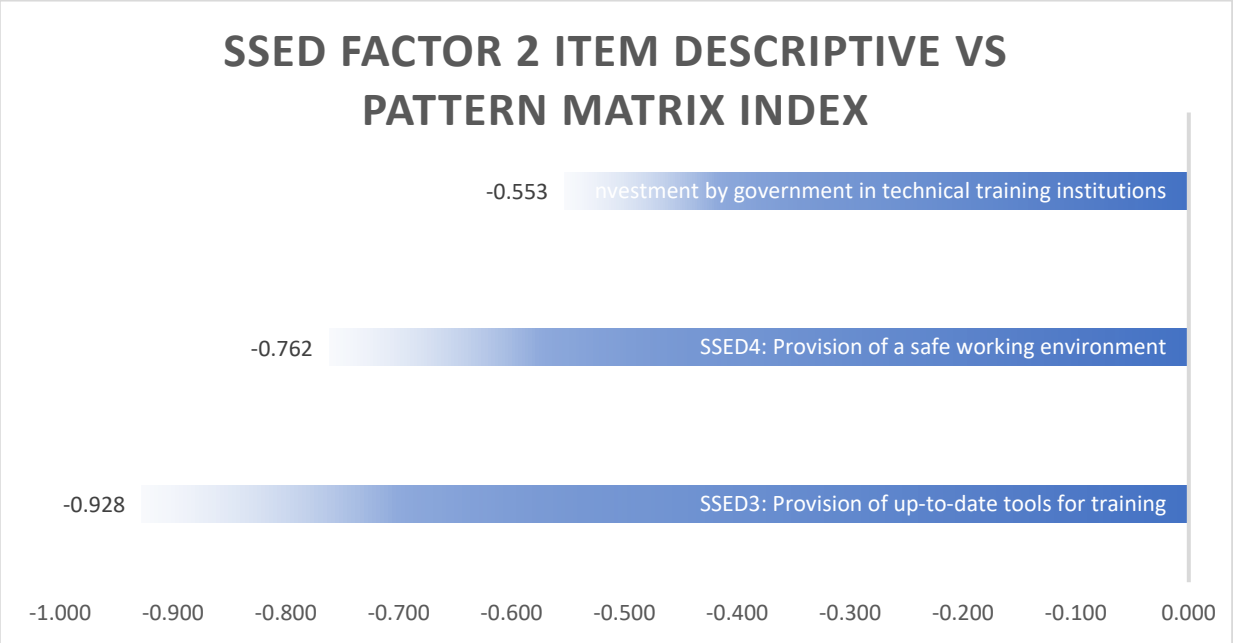

Figure 5.2: SSED Factor 2 Items vs Pattern Matrix Index

5.1.3 Examining the 1st null hypothesis

We now determine whether the first null hypothesis is supported by the data.

> **Ho1.** There is no significant difference in the selection of the factors needed to ensure the promotion of SSED through TVET systems by the participants.

We look at the correlation between three variables: a) Employment levels, SSED Factor 1, and SSED Factor 2.

Table 5.1: Pearson correlation among employment level, SSED Factor 1, and SSED Factor 2

	Employment Level	SSED Factor 1	SSED Factor 2
Employment Level	1		
SSED Factor 1: Innovative green growth for sustainable SSED	.067 .419	1	
SSED Factor 2: Infrastructure for enhancing manufactured, human, and financial capitals	.087 .289	.579** <.001	1

** Correlation is significant at the 0.01 level (2-tailed).

Table 5.1 above shows that the Pearson correlation amongst employment level, SSED Factor 1, and SSED Factor 2 is not significant (r=0.067, p. ≥0.01 and r=0.087, p. ≥0.01). Hence, $H_0 1$ is supported.

To address the next research question, we follow the same format as was presented in this section. However, we look closely at the types of skills, being foregrounded and the reasons thereof. The particular focus on integrated skills or intelligence is key in this study since these are seen to have the potential to positively impact human life by empowering individuals with a diverse skill set, they need to thrive in a complex and ever-changing 21 century world.

5.2 SUB-RESEARCH QUESTION 1: What Kind of Strategic and Leadership Skills (SLS) are Needed for Promoting SED Through TVET Systems?

For this research question, we factor analysed a 20-item questionnaire on the strategic and leadership skills that are needed for initiating and promoting sustainable TVET systems and why such skills are particularly important. In respect of the strategic leadership skills (SLS) necessary for "*initiating and promoting change*" (Majumdar, 2009), the results point to the following three factors:

- SLS Factor 1: *Integrated intelligence driven by* ***problem-based teamwork*** *and merged with* ***critical thinking skills***.
- SLS Factor 2: *Integrated intelligence driven by* ***self-awareness***
- SLS Factor 3: *Integrated intelligence driven by* ***motivational leadership***.

The 20 items (SLS1 to SLS20) were sorted into three overlapping groups of items. They are sorted from the one with the highest factor weight or loading (i.e., SLS18, with a loading of 0.868) to the one with the lowest loading from that first factor (SLS11, with a loading of 0.497). Next, the three items that have their highest loading from Factor 2 are listed from highest loading (0.854) to lowest (0.414). Finally, the seven items on which Factor 3 loads most highly are listed in order.

5.2.1 SLS Factor 1: *Integrated intelligence driven by teamwork and problem-solving and merged with critical thinking skills*

Based on the variables loading highly and moderately onto SLS Factor 1, we called SLS Factor 1: *Integrated intelligence driven by teamwork and problem-solving and merged with critical thinking skills*. Figure 5.3 below shows that the variables (SLS18 and SLSE14) with the strongest association to Factor 1, are '*teamwork*' and '*problem-solving skills'*, with factor loadings of 0.868 and 0.864, respectively. You will note eight other variables whose associations range between good and moderate. The variables SLS17 and SLS16, which have factor loadings of 0.791 and 0.769, respectively, are '*Influence – AQ'* and '*Character Quotient (CQ)*'; and the association to Factor 1 is good. The variables SLS19 and SLS20 with factor loadings of 0.659 and 0.628, respectively, are also considered good. The factor loadings for the variables SLS12, SLS9, and SLS13 are good, while SLS11 is marginal.

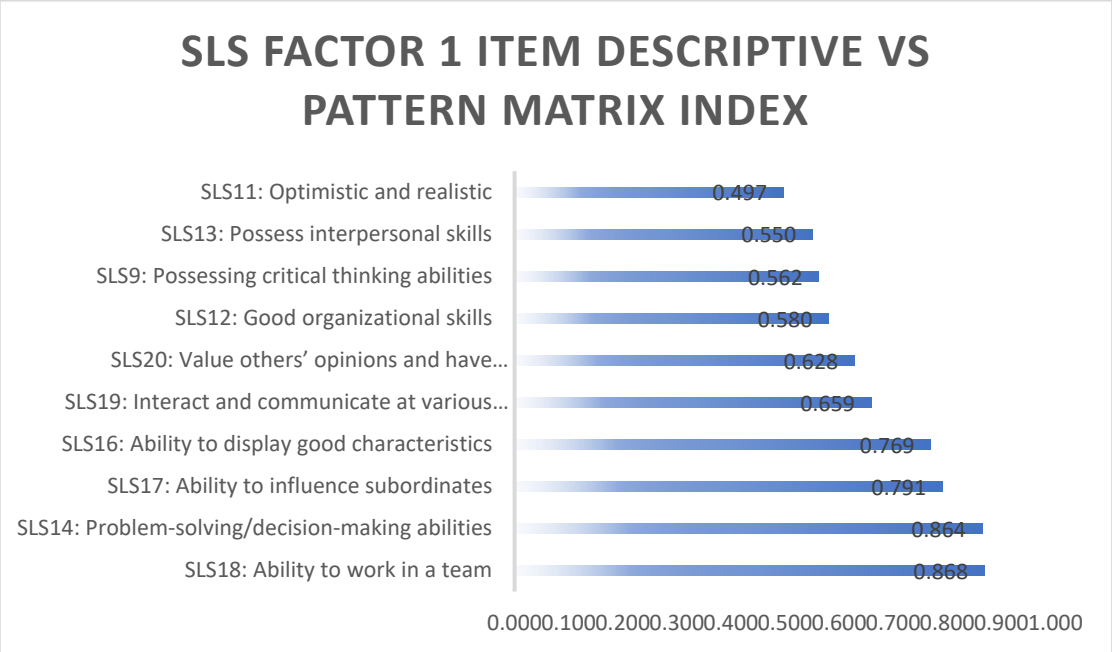

Figure 5.3: SLS Factor 1 Items vs Pattern Matrix Index

5.2.2 SLS Factor 2: *Integrated intelligence driven by self-awareness*

Based on the variables loading highly and moderately onto SLS Factor 2, we could call SLS Factor 2: *Integrated intelligence driven by self-awareness*. Figure 5.4 shows that the variable (SLS7) with the strongest association to SLS Factor 2, is '*Self-awareness'* (Emotional Quotient – EQ), with a factor loading of 0.854. This is followed by variable (SLS8), which is '*Teamwork*' (SQ), with a loading factor of 0.559; and lastly, by variable (SLS10) '*Grit/Emotional Resilience'* (AQ), with a loading factor of 0.414.

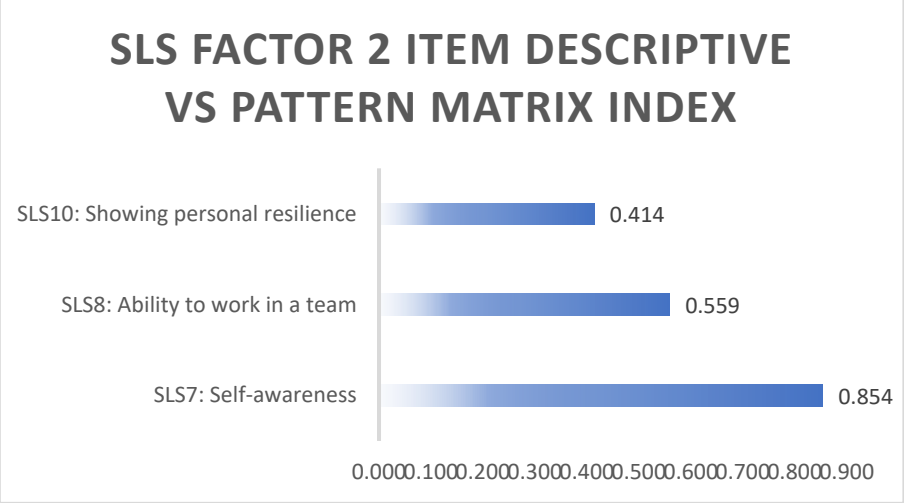

Figure 5.4: SLS Factor 2 Items vs Pattern Matrix Index

5.2.3 SLS Factor 3: *Integrated intelligence driven by motivational leadership and complemented by strategic intelligence and character (value)*

Based on the variables loading highly and moderately onto SLS Factor 3, we could call SLS Factor 3: *Integrated intelligence driven by motivational leadership and complemented by strategic intelligence and character (value)*. Figure 5.5 shows that the variable (SLS1) with the strongest association to SLS Factor 3, is '*Motivational Leadership'* (EQ), with a factor loading of 0.776. The variable (SLS 4) '*Adapting to Change'* (EQ) has a loading of 0.649 and it is good. The variable SLS3 has a factor loading of 0.576, while SLS2, SLS5, SLS6 and SLS15 have factor loadings of 0.495, 0.470, 0.439 and 0.417, respectively. The variables with less than 0.500 are marginal.

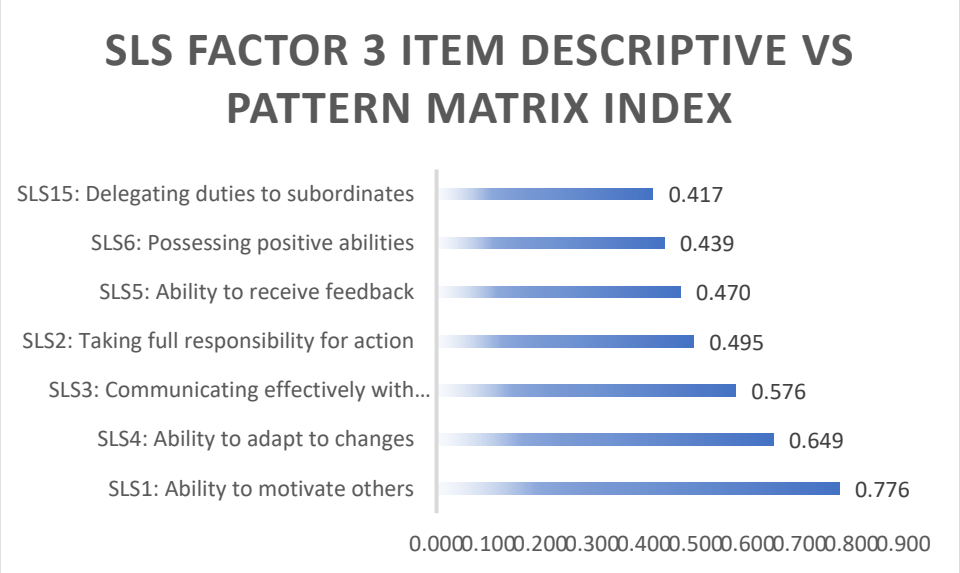

Figure 5.5: SLS Factor 3 Items vs Pattern Matrix Index

5.2.3 Reasons for SLS Factors

5.2.3.1 Reasons for SLS Factor 1

As shown above, the results for SLS Factor 1 showed that i*ntegrated intelligence driven by* ***teamwork*** *and* ***problem-solving*** *and merged with critical thinking skills* are deemed necessary in promoting SSED through TVET systems. When we explored the reasons, the participants gave for items that made up SLS Factor 1, the results show that *leadership quality* is key, as

illustrated in Figure 5.6 below. Furthermore, the results show that the quality of leadership should be complemented by, inter alia, the ability to: *collaborate, motivate, delegate, be decisive, take initiative,* and *communicate effectively*.

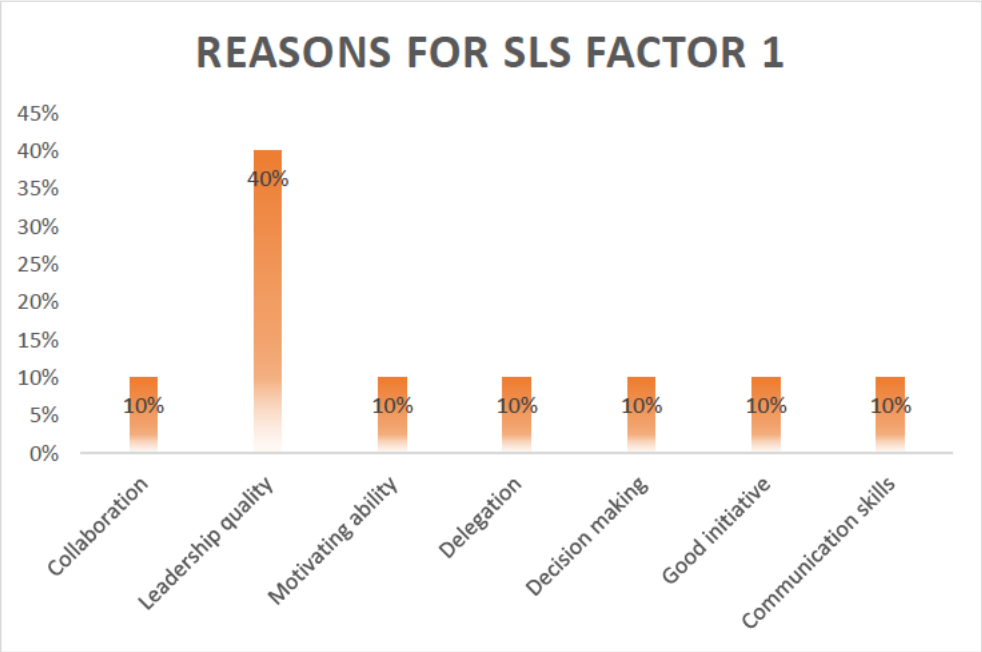

Figure 5.6: Reasons for SLS Factor 1

5.2.3.2 Reasons for SLS Factor 2

The results for SLS Factor 2 illustrated that *integrated intelligences driven by* ***self-awareness*** are deemed necessary in promoting SSED through TVET systems. When we explored the reasons, the participants gave for items that made up SLS Factor 2, the results show that three skills are equally key: *creativity, leadership quality, and critical thinking*, as illustrated in Figure 5.7 below.

Figure 5.7: Frequency of Reasons for SLS Factor 2

5.2.3.3 Reasons for SLS Factor 3

The results for SLS Factor 3 showed that *integrated intelligence driven by* ***motivational leadership*** is deemed necessary in promoting SSED through TVET systems. When we explored the reasons, the participants gave for items that made up SLS Factor 3, the results show that ***leadership quality*** is key, followed by ***mentorship****, with promptness* and *collaboration being of equal importance,* as illustrated in Figure 5.8 below.

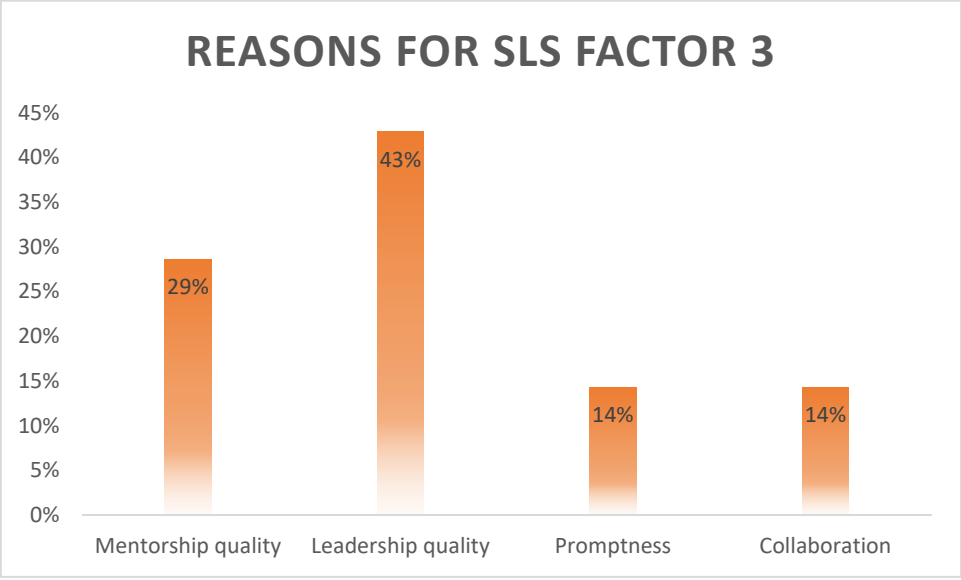

Figure 5.8: Reasons for SLS Factor 3

5.2.4 Examining the 2nd null hypothesis

We now determine whether the null hypothesis below is supported by the data.

> **Ho2.** There is no significant difference in the selection of the strategic and leadership skills needed to ensure the promotion of SSED through TVET systems by the participants.

We look at the correlation between four variables: a) Employment levels, SLS Factor 1, SLS Factor 2, and SLS Factor 3.

Table 5.2: Pearson Correlation among employment level and SLS Factors 1, 2 and 3

	Employment Category	SLSFactor1:	SLSFactor2:	SLSFactor3:
Employment Category	1			
SLS Factor 1: *Integrated intelligence driven by **teamwork** and merged with critical thinking skills*.	.048	1		
SLS Factor 2: *Integrated intelligence driven by **self-awareness***	.021	.622**	1	
SLS Factor 3: *Integrated intelligence driven by **motivational leadership***.	-.037	.797**	.557**	1

** Correlation is significant at the 0.01 level (2-tailed).

Table 5.2 above shows that the Pearson correlation amongst employment level, SLS Factor 1, SLS factor 2 and SLS Factor 3 is not significant ($r=0.048$, p. ≥ 0.01; $r=0.021$, p. ≥ 0.01 and $r=0.037$, p. ≥ 0.01). Hence $H_0 2$ is supported.

5.3 Sub-Research Question 2: What Kind of PSs are Required for Promoting SED through TVET Systems?

For this research question, we factor analysed a 20-item questionnaire on the PSs that are needed in enabling change that would promote sustainable TVET systems and why such skills are particularly important. The results point to the following two factors:

- PS Factor 1: *Integrated intelligence driven by **empathy** and complemented by soft-skills, strategic intelligence, **innovation quotient** and communication skills*
- PS Factor 2: ***Management of** Diversity and Conflict skills*

The items were sorted such that the items that have the highest loading from Factor 1 (17 items in this analysis) are listed first, and they are sorted from the one with the highest factor weight or loading (i.e., PS6, with a loading of 0.795) to the one with the lowest loading from that first factor (PS3, with a loading of 0.457). Next, the two items that have their highest loading from Factor 2 are listed from highest loading (0.823) to lowest (0.696).

5.3.1 PS Factor 1: *Integrated intelligence driven by empathy and complemented by soft-skills, strategic intelligence, innovation quotient, and communication skills*

Based on the variables loading highly and moderately onto PS Factor 1, we could call PS Factor 1: *Integrated intelligence driven by empathy and complemented by soft-skills, strategic intelligence, innovation quotient, and communication skills*. Figure 5.9 shows that the variable (PS6) with the strongest association to Factor 1, is '*Empathy'* (EQ), with a factor loading of 0.795. This is a strong association for a factor analysis. You will note that five variables – PS7, PS9, PS4, PS8, and PS1 – are also within the 0.70 range, an association range which is regarded as good. The variables PS14, PS10, PS2 and PS1 have a factor loading in the 0.60 range, while PS20, PS11, PS12 and PS16 have loadings in the 0.50 range. PS3 and PS17 have loadings below 0.50 and are considered marginal.

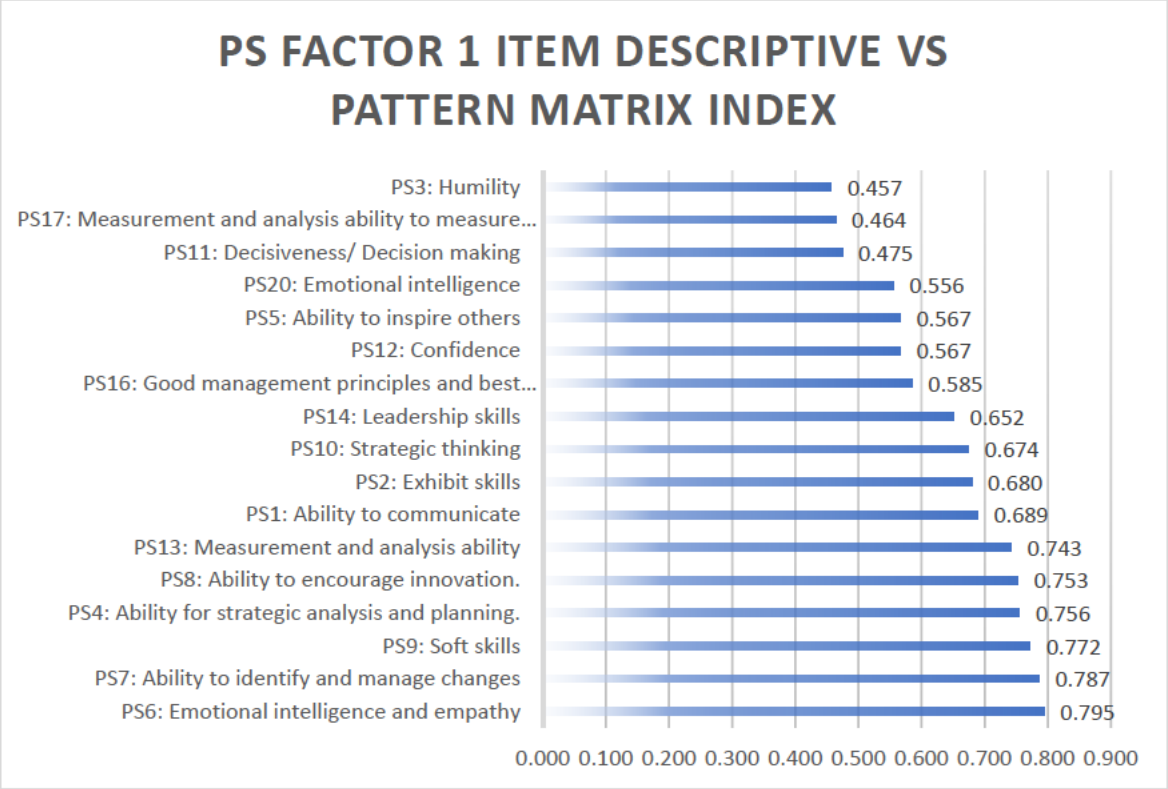

Figure 5.9: PS Factor 1 Items vs Pattern Matrix Index

5.3.2 PS Factor 2: *Management of Diversity and Conflict skills*

Based on the variables loading highly and moderately onto PS Factor 2, we could call PS Factor 2: *Managing diversity and conflict skills*. Figure 5.10 shows that the variable (PS19) with the strongest association to Factor 2, is '*Conflict management*' (EQ), with a factor loading of 0.823, and it is strong and good. The variable PS18 has a factor loading of 0.696 and it is regarded as good.

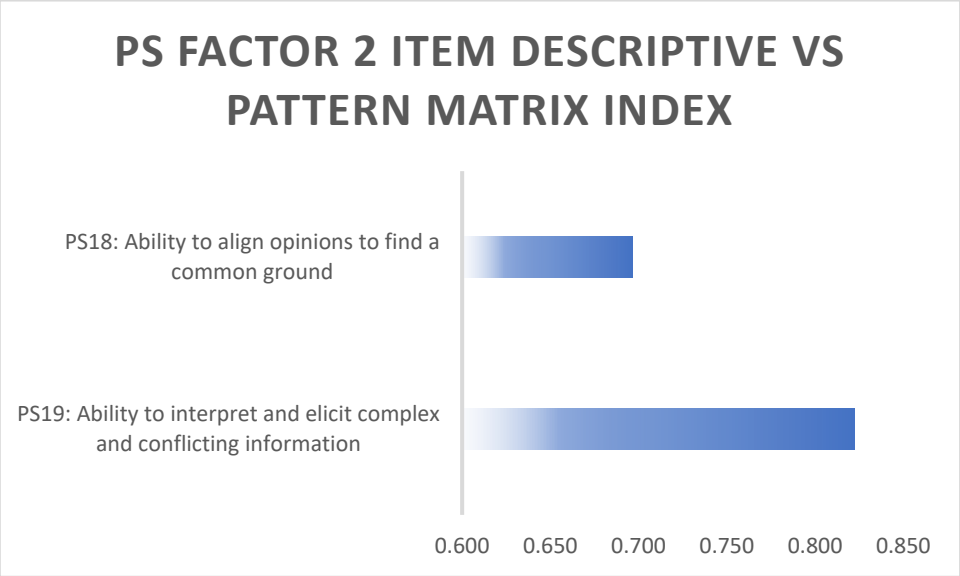

Figure 5.10: PS Factor 2 Items vs Pattern Matrix

5.3.3 Reasons for PS Factors

5.3.3.1 Reasons for PS Factor 1

As shown above, the results for SLS Factor 1 pointed out that *integrated intelligence driven by **empathy** and complemented by soft-skills, strategic intelligence, innovation quotient and communication skills* are deemed necessary in SSED through TVET systems. When we explored the reasons the participants gave for items that made up PS Factor 1, the results show that *affective knowledge* and *leadership quality* followed by *content knowledge* and *cognitive skills* are key, as illustrated in Figure 5.11 below. These skills are then complemented by *being understanding, the ability to interact with people, process skills, knowledge management*, *mentorship, 21st century skills*, *and an excellent emotional disposition*.

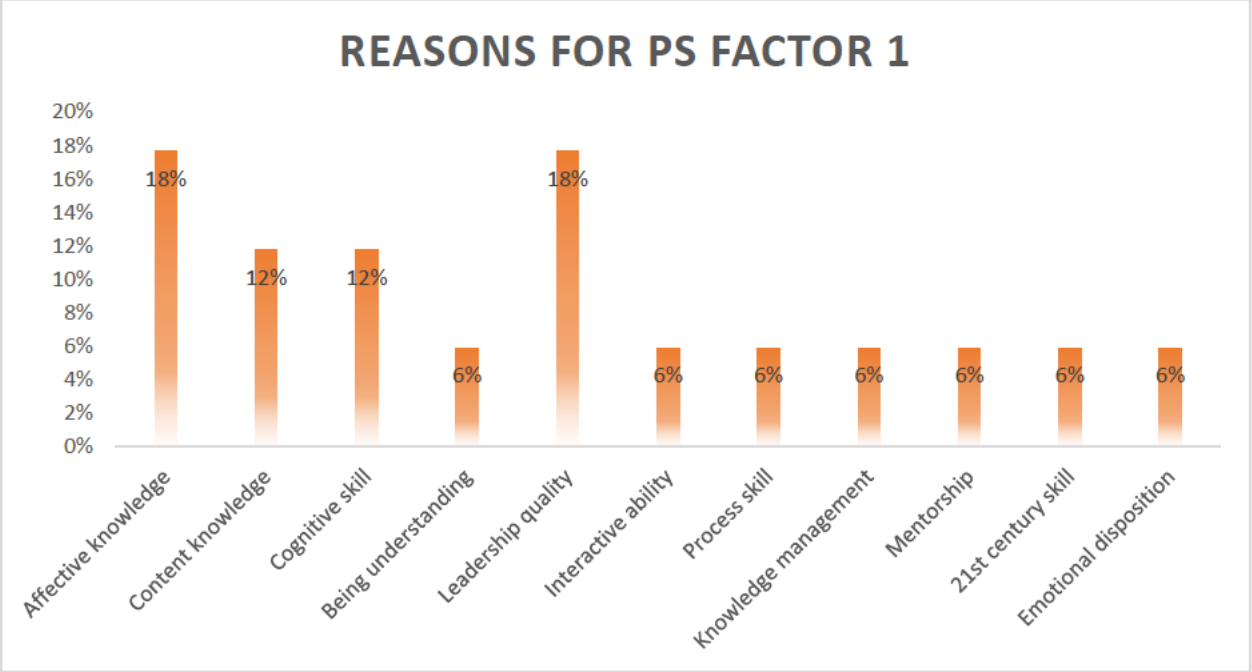

Figure 5.11: Reasons for PS Factor 1

5.3.3.2 Reasons for PS Factor 2

The results for PS Factor 2 showed that *management of diversity and conflict skills* are essential in promoting SSED through TVET systems. The reasons given by the participants for the items that made up PS Factor 2, show that *rational thinking ability and leadership qualities* are equally significant, as illustrated in Figure 5.12 below.

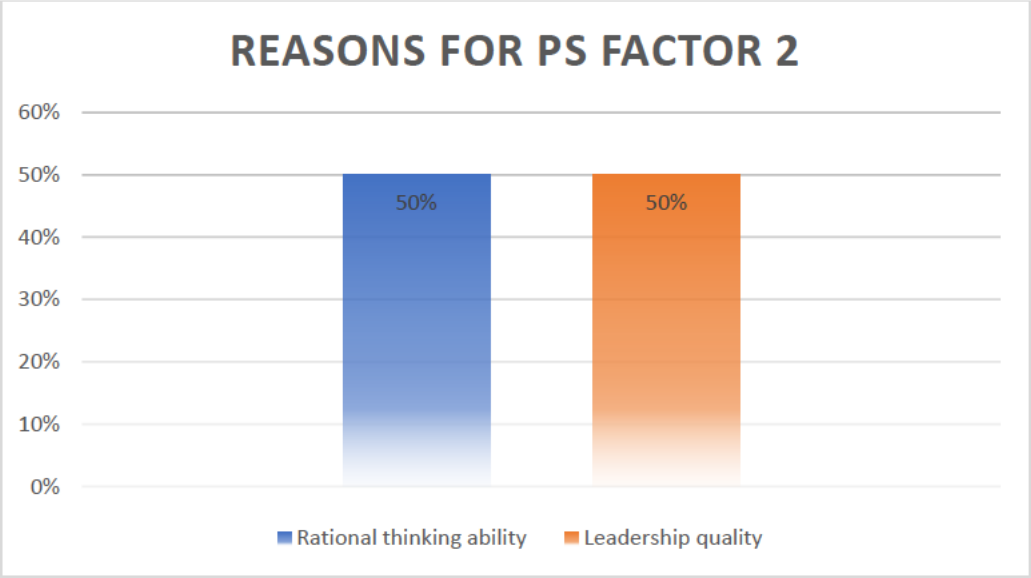

Figure 5.12: Frequency of reasons for PS Factor 2

5.3.4 Examining the 3rd null hypothesis

We now determine whether the null hypothesis below is supported by the data.

> **Ho1.** There is no significant difference in the selection of the PS needed to ensure the promotion of SSED through TVET systems by the participants.

We look at the correlation between employment level, PS Factor 1, and PS Factor 2.

Table 5.3: Pearson correlation among employment level, SLS Factors 1 and 2

	Employment Category	PS Factor 1	PS Factor 2
Employment Category	1		
PS Factor 1: Integrated intelligence driven by **empathy** and complemented by soft-skills, strategic intelligence, innovation quotient and communication skills.	.012	1	
PS Factor 2: **Management of** Diversity and Conflict skills (EQ)	.092	.674**	1

** Correlation is significant at the 0.01 level (2-tailed).

Table 5.3 above shows that the Pearson correlation amongst employment level, PS Factor 1, and PS Factor 2 is not significant ($r=0.012$, p. ≥ 0.01 and $r=0.092$, p. ≥ 0.01). Hence, $H_0 1$ is supported.

To answer the next research question, we follow the same format as was presented in this section.

5.4 Sub-Research Question 3: What Kind of Practical Skills (PRS) are Needed for Promoting SSED Through TVET Systems?

For this research question, we factor analysed a 20-item questionnaire on the PRS needed for the delivery of change that would promote sustainable TVET systems and why such skills are particularly important. With reference to the question on the practical skills (PRS) that would enable the "*delivery of change*" (Majumdar, 2009), the results point to the following:

- PRS Factor 1: *Integrated intelligence driven by* ***problem-solving*** *as well as* ***teamwork*** *(team-based problem solving) and complemented by collaborative innovation intelligence, as well as communication, organisational and strategic skills*
- PRS Factor 2: *Integrated intelligence driven by* ***planning skills*** *and complemented by optimism, strategic management and being tolerant to uncertainty*

The 20 items (PRS1 to PRS20) were sorted into two overlapping groups of items. The items are sorted so that the items that have the highest loading from PRS Factor 1 (13 items in this analysis) are listed first, and they are sorted from the one with the highest factor weight or loading (i.e., PRS11, with a loading of 0.929) to the one with the lowest loading from that first factor (PRS3, with a loading of 0.365). Next, the seven items that have their highest loading from PRS Factor 2 are listed from the highest loading (0.739) to the lowest (0.429).

5.4.1 PRS Factor 1: *Integrated intelligence driven by problem-solving as well as teamwork (team-based problem solving) and complemented by collaborative innovation intelligence, as well as communication, organisational and strategic skills*

We examined the factor pattern to see which items load highly on which factors. The reliability statistics for PRS Factors 1 and 2 showed Cronbach's alpha of 0.938 and 0.865, respectively. For Factor 1, the variables (PRS11, PRS12 and PRS19) with the strongest association to Factor 1, were *Problem-solving* (IQ), *Teamwork* (SQ) and *Innovation quotient* (Inn. IQ) with factor loadings of 0.929; 0.779 and 0.772, respectively. The three variables with loadings <0.5 were *influence, curiosity,* and *creativity* quotients.

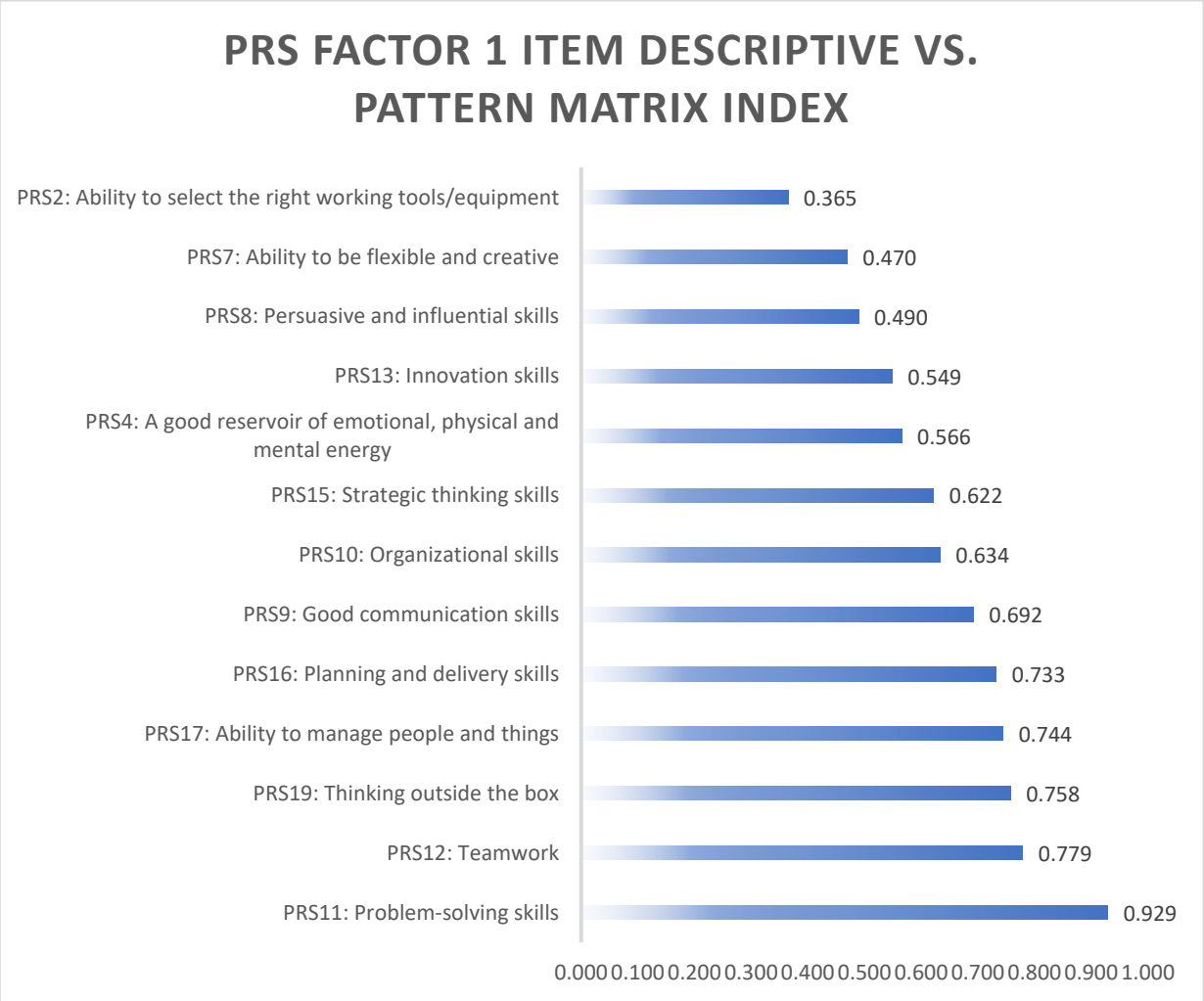

Figure 5.13: PRS Factor 1 Items vs. Pattern Matrix

Thus, based on the variables loading highly and moderately onto PRS Factor 1, we could call PRS Factor 1: *Integrated intelligence driven by problem-solving and complemented by teamwork, innovation intelligence as well as communication, creative, and curiosity skills*.

5.4.2 PRS Factor 2: *Integrated intelligence driven by planning skills and complemented by optimism, strategic management and being tolerant to uncertainty*

Figure 5.14 shows that for Factor 2, the variable (PRS1) with the strongest association to Factor 2, was *Job planning* (EQ/SQ), with factor loading of 0.739, followed by *Optimism* (EQ/SQ), *skillful manager of change* (SQ) and *ability to accept uncertainty* (EQ) at 0.607, 0.614 and 0.599, respectively. The variables with factor loadings <0.500 were *negotiation*

(EQ), *realistic optimism* (CQ), and *time management* (EQ) with loadings of 0.491, 0.462 and 0.429, respectively.

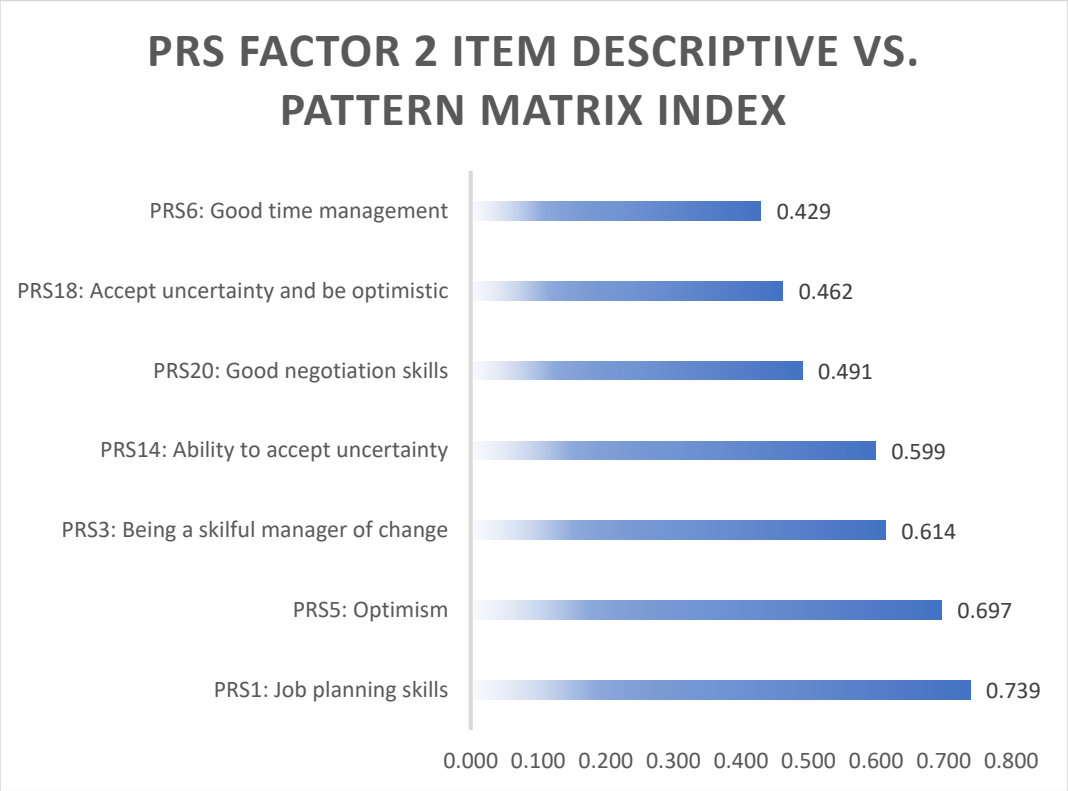

Figure 5.14: PRS Factor 2 Items vs. Pattern Matrix

Thus, based on the variables loading highly and moderately onto PRS Factor 2, we could call PRS Factor 2: *Integrated intelligence driven by planning skills and complemented by optimism, strategic management and being tolerant to uncertainty*.

5.4.3 Reason for PRS Factors

5.4.3.1 Reasons for PRS Factor 1

As shown above, the results for PRS Factor 1 showed that *integrated intelligence driven by problem-solving and complemented by innovation intelligence, as well as communication, creative and curiosity skills* are deemed necessary in promoting SSED through TVET systems. When we explored the reasons the participants gave for items that made up PRS Factor 1, the results show that two qualities are key, *creativity* and *excellent time management skills* - both at 15%, as illustrated in Figure 5.15 below. However, these are to be complemented by *critical*

skills, persuasion skills, provision of a conducive environment, all the way up to *soft skills*. These complementary skills are regarded to be of equal importance.

Figure 5.15: Reasons for PRS Factor 1

5.4.3.2 Reasons for PRS Factor 2

As shown above, the results for PRS Factor 2 illustrate that *integrated intelligence driven by empathy work and complemented by soft skills, strategic intelligence, innovation quotient, and communication skills* are important in promoting SSED through TVET systems. The reasons given by the participants on the items that made up PRS Factor 2 show that *effectiveness* together with other skills such as *soft skills*, *leadership qualities, optimism, connectedness, 21st century skills,* and *efficiency* are of equal significance, as illustrated in Figure 5.16 below.

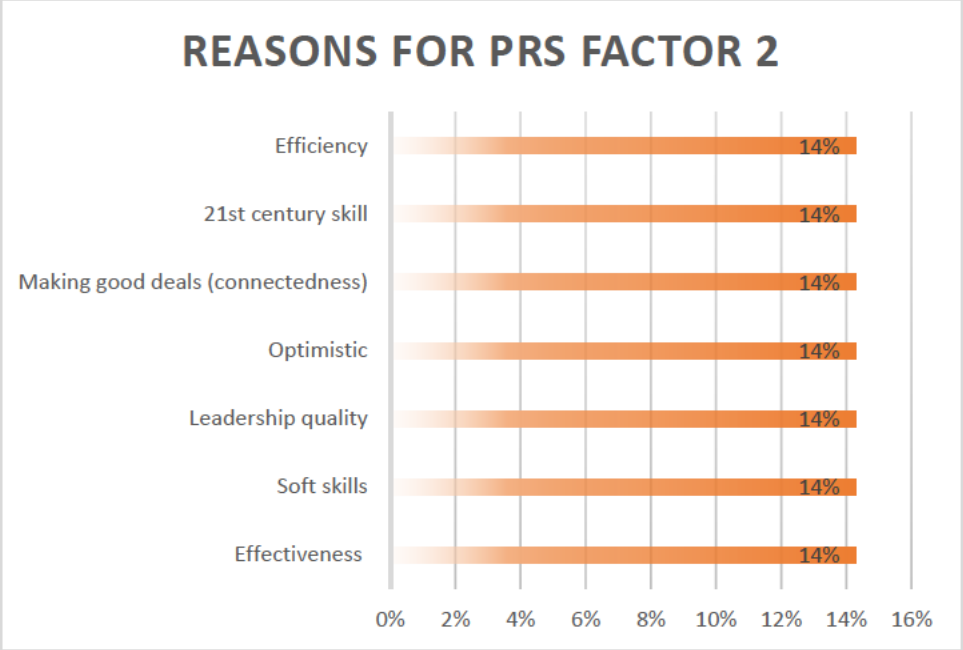

Figure 5.16: Reasons for PRS Factor 2

5.4.4 Examining the 4th null hypothesis

We now determine whether the null hypothesis below is supported by the data.

> **Ho1.** There is no significant difference in the selection of the PRS needed to ensure the promotion of SSED through TVET systems by the participants.

We looked at the correlation between the variables, employment level, PRS Factor 1, and PRS Factor 2.

Table 5.4: Pearson correlation among employment level, PRS Factor 1, and PRS Factor 2

	Employment Category	PRS Factor 1	PRS Factor 2
Employment Category	1		
PRS Factor1: Integrated intelligence driven by problem-solving and complemented by innovation intelligence, as well as communication, creative and curiosity skills.	-.016	1	
PRS Factor2: Integrated intelligence driven by empathy work and complemented by soft-skills, strategic intelligence, innovation quotient and communication skills.	-.009	.804**	1

** Correlation is significant at the 0.01 level (2-tailed).

Table 5.4 above shows that the Pearson correlation amongst employment level, PRS Factor 1, and PRS Factor 2 is not significant (r=0.016, p. ≥0.01 and r=0.009, p. ≥0.01). Hence, $H_0 1$ is supported.

5.5 Conclusion

This chapter presented the results of the key research question of the study: *How can SSED be promoted through TVET systems?* This question was further broken down into the following sub-questions:

- What *strategic and leadership skills* are required to promote SSED through TVET systems?
- What *process skills* are required to promote SSED through TVET systems?
- What *practical skills* are required to promote SSED through TVET systems?

Four hypotheses were formulated and tested:

- **Ho1.** There is no significant difference in the selection of the factors needed to ensure the promotion of SSED through TVET systems by the participants.
- **Ho2.** There is no significant difference in the selection of the strategic and leadership skills needed to ensure the promotion of SSED through TVET systems by the participants.
- **Ho3.** There is no significant difference in the selection of the process skills needed to ensure the promotion of SSED through TVET systems by the participants.
- **Ho4.** There is no significant difference in the selection of the practical skills needed to ensure the promotion of SSED through TVET systems by the participants.

5.5.1 Summary of the results of the broad research question and the three sub-questions

The results of Phase I of the study, do confirm that indeed TVET systems can be regarded as tools for the eradication of unemployment, underemployment, and poverty in society, especially among the youths. With regards to the main research question addressed in this study, the results foreground the **use of TVET innovation** in two ways to *transform* the TVET system and gear it towards promoting SSED: *innovative green growth* and *infrastructure* that is meant to enhance manufactured, human, and financial capitals. It is significant to note that these two ways were aligned to Porritt's (2005) five capitals model.

As argued by Haughey (2015, p. 2) ***leadership*** is key to the success in innovation. Thus, as for the question relating to the **strategic leadership skills (SLS)** necessary for "***initiating and promoting change***" (Majumdar, 2009), the results point to **three key types of integrated intelligence**: *integrated intelligence* ***driven by teamwork*** and merged with ***critical thinking skills***; *integrated intelligence* ***driven by self-awareness*** and *integrated intelligence* ***driven by motivational leadership skills***. Using Steve C's, (2022), three components of Integrated Intelligence — classic intelligence or IQ, emotional intelligence (EQ), and social intelligence (SQ), on the three types of integrated intelligences identified, Figure 5.17 below shows that the results fall in all three categories. The first type of integrated intelligence is driven by *Teamwork* (SQ) and *Problem-solving skills* (IQ). The second type of integrated intelligence is characterised by *Self-awareness* (EQ), whilst the third one is characterised by

Motivational Leadership (EQ). This result shows that there is no single IQ threshold that is critical for initiating and promoting change, but rather a combination of distinct types of intelligence that can enhance the change process.

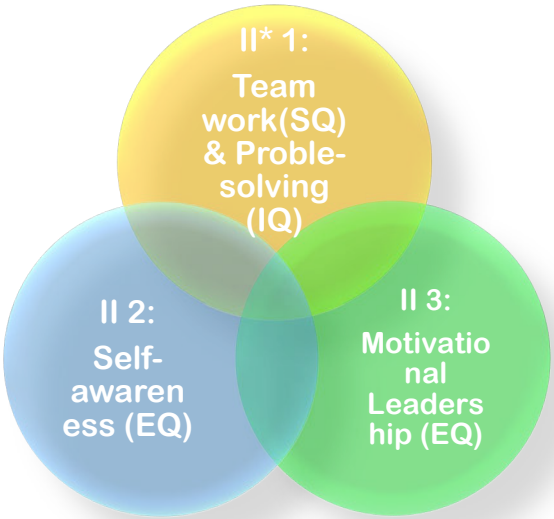

Fig. 5.17: Drivers of the 3 Integrated Intelligences Identified

*II = Integrated Intelligence

With regards to the question on the **process skills (PS)** that would "***enable change***" (Majumdar, 2009), the results point to **two key types of integrated intelligence**: *integrated intelligence* driven by *empathy* and complemented by *soft skills, strategic intelligence, innovation quotient*, and *communication skills* as well as *management of diversity* and *conflict skills.* In this category the integrated intelligence is characterised by *Empathy* (EQ) and a strong sense of *Conflict management* (EQ) skills. In this regard, the results fall within one category, namely; emotional intelligence (EQ). This result is significant because emotional intelligence is regarded as a crucial skill for bringing about change. According to Ugoani (2016), emotional intelligence competencies allow organizational members to acknowledge the need for change, remove barriers, and enlist others in pursuit of new initiatives aimed at organisational success. Indeed, the forever uncertain and changing context of TVET demands people that can adapt to change, maintain productivity despite conflicting work relationships and negative emotions, and keep a positive outlook on the big picture. In this regard, emotional intelligence informs our ability to feel empathy.

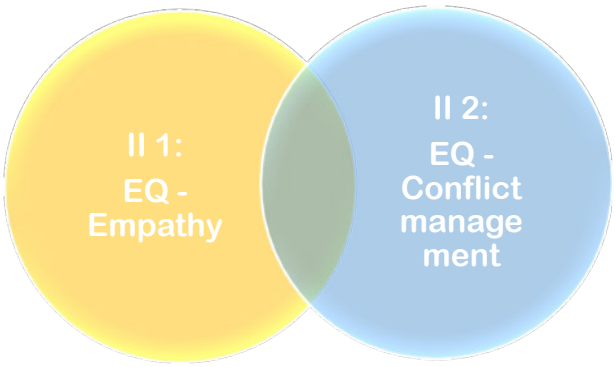

Fig. 5.18: Drivers of the 2 Integrated Intelligences Identified

With regards to the question on the **practical skills (PRS)** that would enable the "***delivery of change***" (Majumdar, 2009), the results point to **two key types of integrated intelligence**: *intelligence driven by problem-solving* and complemented by *innovation intelligence* as well as *communication, creative*, and *curiosity skills* as well as *integrated intelligence driven by planning skills and complemented by optimism, strategic management and being tolerant to uncertainty* In this category, the integrated intelligence is characterised by a combination of *Problem-solving* (IQ); *Team work* (SQ); Planning (EQ/SQ) and *Innovation quotient* (Inn. IQ). It is interesting to note that variables such as influence, curiosity and creativity quotients, negotiation (EQ), realistic optimism (CQ), and time management (EQ) registered loadings that were less that 0.5 (<0.5).

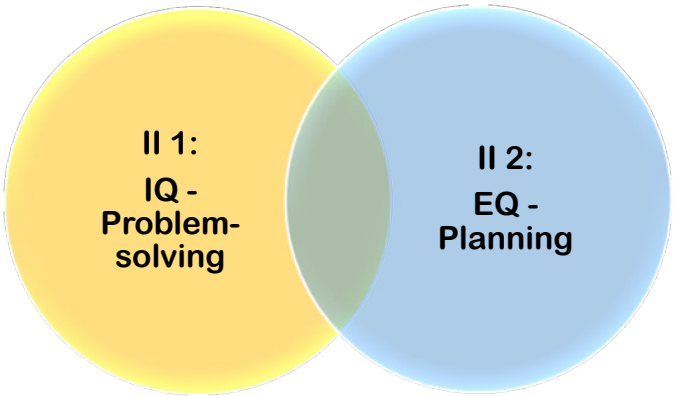

Fig. 5.19: Drivers of the 2 Integrated Intelligences Identified

What is significant to note from the results is the expression of *Innovation Intelligence* and *Thinking* which seems to be linked to *Curiosity* and *Creative Intelligence*. We have lumped these together because, according to Batey and Furnham (2006), when it comes to *Creative Intelligence*, psychology refers to it as the ability to generate, create, or discover novel

solutions for unfamiliar problems or situations. It combines creativity, innovation, intuition, perception, and intellectual curiosity. In the literature, ***Innovation Intelligence*** is distinguished from ***innovation*** because of its emphasis on the process of solving problems which entails discovering and combining ***ideas and methods in new ways*** (Isaksen et al., 2010). It is in this regard that Haughey (2016) argues that transformative and innovative leadership skills are needed to sustain TVET competitiveness for future prosperity.

5.5.2 Summary of the reasons given to justify identified factors

The reasons given by the 162 participants who participated in this study regarding the factors that promote SSED through TVET systems, with regards to the 3 sub-questions show that the participants perceived SLS *leadership* and *mentorship* as key. For PS, *affective knowledge* and *leadership qualities* were foregrounded. And lastly, for PRS, *creativity*, *leadership qualities*, and *excellent time management* skills were essential. What was evident in all three sets of data was the fact that "excellent leadership qualities" were used as the explanatory frame for their choice of factors. Furthermore, what is significant to note is that the notion of "integrated intelligence" continues to be flagged in their explanations, with the term "21st century" skills being used repeatedly.

5.5.3 Summary of the correlation between the factors explored and the three employment sectors identified

It is significant to note that the Pearson correlation amongst employment level and all the Factors identified in the broad question and the three sub-questions were not significant. Hence, all four hypotheses were supported. This result can be seen as very encouraging because it tells us that all the different stakeholders are in agreement about the changes that need to be made to promote sustainable TVET systems. In other words, there is a broad agreement and shared general understanding on the skills needed.

In conclusion, we could argue that the above findings show that, indeed, not only is a high level of competence in a specific occupational area, as well as the ability to update their knowledge and skills in response to technological innovations and industry standards needed, but soft skills are key as well. The focus on using TVET innovation to grow the green economy, in this study, is significant. As Paryono (2017, p. 9) argues, if TVET cannot create

the new green technology, at least it should be able to support and adopt the technology by preparing the future workforce which is capable of handling the technology. In this regard, TVET also improves responsiveness to changing skill-demands by companies and communities (UNESCO, 2016, p. 7). For **effective interaction with the various stakeholders**, the results pointed to a range of interpersonal and communication skills that are needed. Furthermore, for **the 21st century workplace**, the results show that skills such as problem-solving, critical thinking, creativity, teamwork, innovative leadership, and entrepreneurship are essential. This implies that a major effort to upgrade education and skills for the 21st century, needs to be put into the Lagos TVET systems, so that Lagos can *participate fully in the knowledge economy and the information revolution.* Of significant importance are **change management skills**: the ability to anticipate, plan, implement, and evaluate change initiatives in TVET systems and institutions. These skills enable us to cope with uncertainty, ambiguity, and resistance to change, as well as the ability to **foster a sustainable culture of innovation and continuous improvement in TVET systems**.

In the next chapter, Chapter 6, we revisit the question on the kind skills (as represented by factors) that are deemed necessary to promote SSED through TVET systems, with a group of selected participants. We delve into their perceptions of the "***change***" that would be required to gear TVET systems towards promoting sustainable socio-economic development.

CHAPTER 6
PRESENTATION OF RESULTS OF PHASE II

6.0 Introduction

As mentioned in Chapter 5, this chapter revisits the question on the kind skills (as represented by factors) that are deemed necessary to promote SSED through TVET systems, with a group of purposively selected participants. We delve into their perceptions of the "change" that would be required to gear TVET systems towards promoting sustainable socio-economic development. This exploration is premised on the fact that all countries, both developing or developed, aspire for greater development which will foster long-term sustainable development (Education for All (EFA), 2004). From this perspective, the need to transform the TVET sector to maximise its potential to contribute all the SDGs (Sustainable Development Goals) in the context of promoting sustainable economies and societies is imperative (Paryono, 2017).

The chapter is divided into 3 main sections. The first section introduces the findings of Phase 2 by presenting the categories, themes, and sub-themes in a tabular format. The second section is divided into three sections in which the identified categories, themes and sub-themes are further unpacked. As explain in the methodology chapter, this layered approach to analysis has enabled us to construct a rich, complex understanding of the factors that are deemed necessary to promote SSED through TVET systems. These layers of analysis help to organise the data (categories), interpret the central narrative (theme), and provide detailed insights (sub-themes) into the promotion of SSED through TVET systems phenomenon.

The conclusion provides a summary of the salient issues and highlights the points that are going to be further discussed in Chapter 7.

6.1 Broad Research Question: How Can SSED be Promoted Through TVET Systems?

Three (3) categories, themes (3) and seven (7) sub-themes emerged from the analysis, which will be presented and discussed further in this chapter. These identified patterns helped to address the research problem of the study (Braun, 2006). The categories and themes which

emerged from the participants' explanations were gathered to form a comprehensive picture of the collective perceptions of the three cohorts, namely the Academia, Government, and Industry.

As mentioned in Chapter 4, ten participants were purposefully selected from those that participated in the quantitative phase. However, at the end, only nine (9) participants were interviewed. One of the selected participants was not available for the interview. The details of the participants per sector are as follows in Table 6.1.

Table 6.1: Interview Participants as per Sector

SECTOR	SAMPLE NUMBER
ACADEMIA	• Two (2) Principals from the Lagos state technical colleges • Two (2) Mechanical trade teachers
GOVERNMENT	• Two (2) officials from LASTVEB
INDUSTRY	Three (3) comprising • one (1) automobile engineer, • one (1) workshop supervisor, and • one (1) workshop manager.

Table 6.2 provides the profiles of the nine (9) participants that took part in Phase II of the study.

Table 6.2 Participants' Profiles

Participant	Sex	Cohort	Job Title	Occupation	Level of Education
1	M	Academia	Principal	Teaching	PhD
2	M	Academia	Principal	Teaching	MSc
3	M	Academia	Teacher	Teaching	MSc
4	M	Academia	Teacher	Teaching	MSc
5	M	Government	LASTVEB	Director	MSc
6	M	Government	LASTVEB	Director	MSc
7	M	Industry	W/Shop Supervisor	Auto Engineering	BSc
8	M	Industry	Workshop Manager	Auto Engineering	MSc
9	M	Industry	Auto Engineer	Auto Engineering	PhD

The three (3) categories, three themes (3) and seven (7) sub-themes that emerge during the analysis are presented in Table 6.3 and discussed in more detail thereafter under their own respective sub-headings.

6.2 Categories, Themes & Sub-themes Identified

The three (3) categories, themes (3) and seven (7) sub-themes that emerged from the analysis of the Phase II qualitative data are presented in Table 6.3 below.

Table 6.3: Categories, Themes and Sub-themes of the Study

Categories	Themes	Sub-themes
Understanding the Objectives of TVET to Re-evaluate them	Curriculum-Policy Alignment and Coherence	Curriculum Design Skills Development Stakeholder Engagement
Improving Public Perception of TVET	Provision of Incentives/Motivational Packages	Conscientising the Public about the Benefits and opportunities of TVET Attracting and Retaining Staff and Students
Robust Governance	Innovative Leadership and Expertise	Strictly, Individuals with Technical Expertise should Manage TVETs Adequate Funding and Infrastructure Needed for TVET Sustainability

As illustrated by Figure 6.1, category 1 is one of the themes that received 100% (n = 9) occurrence amongst the participants. This was followed by Categories two and three, both at fifty five percent (56%; n = 5) and forty four percent (44%, n=3), respectively.

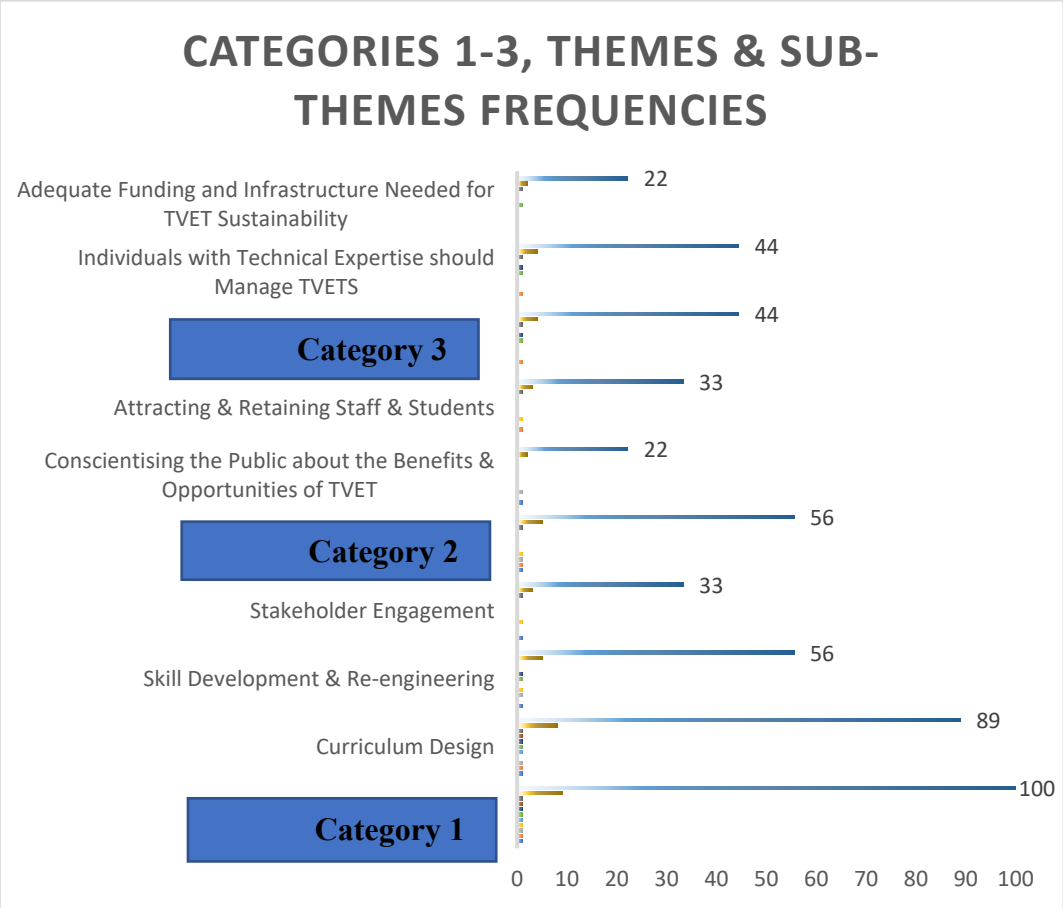

Fig 6.1: Categories 1-3, Themes and Sub-themes Frequencies

In the next section, we discuss the first category: Understanding the Objectives of TVET.

6.2.1 Category 1: Understanding the Objectives of TVET to Re-evaluate them

6.2.1.1 Theme: Curriculum-Policy Alignment and Coherence

This category is undergirded by the theme: **Curriculum-Policy alignment and coherence**. The acknowledgement of TVET as a driver of national development, poverty reduction, social and economic inclusion by the participant is significant. It is in this regard that 100% (n=9) of the participants in this study see the first category of description: **Understanding the objectives of TVET systems to re-evaluate them**, as critical for sustainable development of TVETs in Lagos. This theme highlights *two key* factors. First, the need to ensure that TVET policies and practices are coordinated with the broader socio-economic goals, objectives, and priorities of the country. Second, to see to it that TVET policies are coherent with the government's broader socio-economic policy goals, objectives, and priorities at the national,

regional, and local levels. The Curriculum-Policy alignment and coherence theme is further broken down into three sub-themes, reflecting their frequencies, as illustrated in Fig. 6.2:

- Curriculum Design;
- Skills development and re-engineering, and;
- Stakeholder engagement

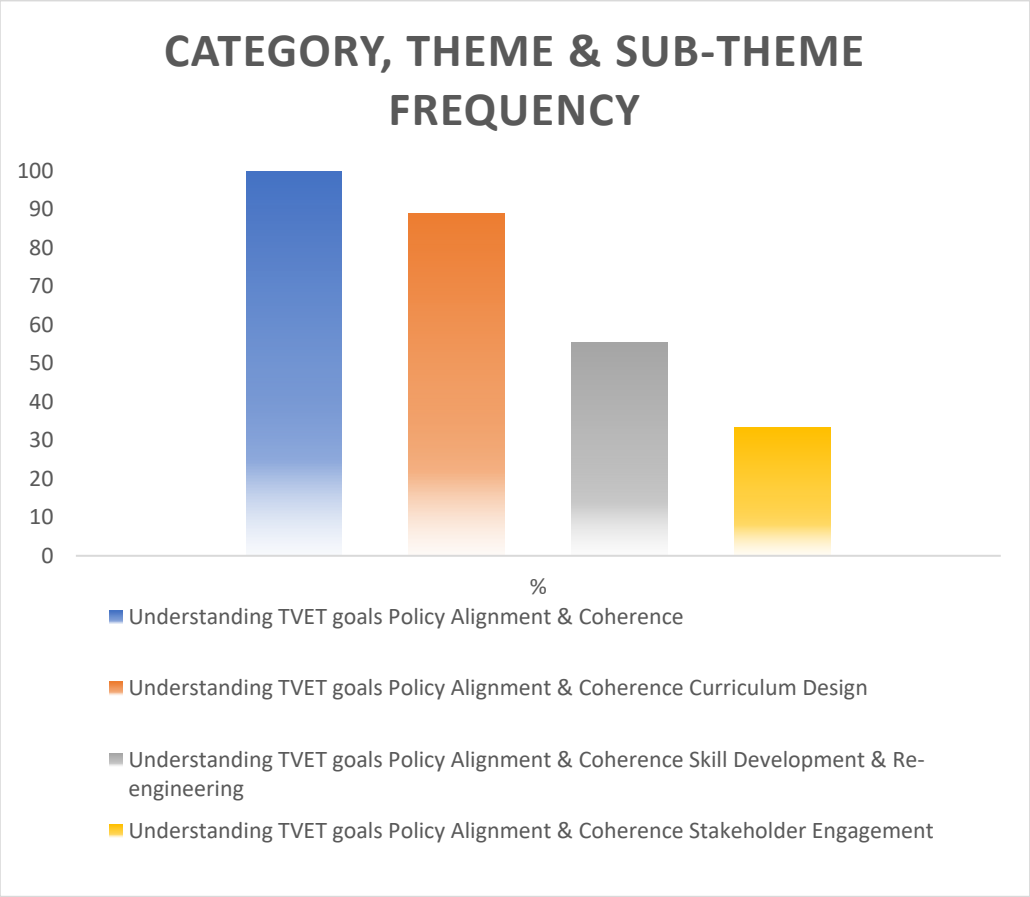

Fig. 6.2: Category 1, Themes, and Frequencies

6.2.1.1.1 Sub-theme 1: Curriculum Design

Most of the participants in this sub-theme lament about the problematic nature of the curriculum, which they perceive as **limiting TVETs to contribute towards sustainable development**. They concur on the need for reform in the technical education curriculum in Nigeria, which will put a **greater focus on skill acquisition** to better prepare students for the world of work and beyond.

P5 sees skill competency as a non-negotiable for the different trades if we are to prepare the students for the world of work.

> *P5: First of all, the skill competence is a must. All the trades are broken down into competency. And these competencies have their learning outcomes, we must first of all satisfy the hunger of ensuring that these students get competency vis-versa training from the normal tools to the mini tools. The reason I call it a normal tool is that this are the tools to see around, especially in this informal setting. You train them first on that, then they will have their hands on a modern tool. Tools that will take them further into a vocational and technical training, then we now couple with education which is the basic studies and life skills.*

P2 asserts:

> *P2: There is a need for so many things to be put in place, the teaching of the students in the programme should be looked into because it is the product that will come out and give us sustainable development, but students that are not having employment. So, how will they give us a sustainable development…?*

…

> *P2: When we say the students produced are not employable, it implies that the training which they undergo is not a full package – full package in the sense that the technical education programmeme should empower the students to be self- sufficient [skill wise] … and also be able to rende[r] services. Even if the job is not there in the market, if such [a] student is self-sufficient and he[she] is sure of himself[herself], he/she can set up an enterprise and start working for himself[herself]. There are so many things lacking on the back of the government which the government is not cognisant of these.*

Participant 2 (P2) raises a highly relevant question that challenges and disrupts our commonly accepted understanding of what sustainability entails and implies for the youth in Nigeria. Indeed, "can youth that is not employable and can't gain employment offer us sustainable development?" As P2 rightly asks, can we blame the product (the graduate), when the problem is with the process (education and training)? And, in order to address the process, government will have to be involved to provide the necessary infrastructure. What is also emphasised in

P2's response is the notion of a "full package" and what this package entails. Notions of "self-sufficiency" and "entrepreneurship" are brought to the fore, meaning that a particular skill set should undergird the TVET system.

With regard to entrepreneurship, P2 sees the government's initiative to support graduates to develop their enterprises and be self-employed as a move in the right direction. This he sees as offering opportunities of developing expertise that could later be exported. What P2 highlights here is the importance of properly aligned and coordinated policies and strategies. These can contribute to more clarity and direction, resulting in more effective and efficient TVET systems.

P3 underscores the need for practical, industry-relevant training in educational institutions, by stating:

> *P3: When they get to the industry, they need to be reshowed that is why it is unendurable in the labour market.*

He notes that when graduates enter the industry, they often need to be "reshowed," implying a gap or a mismatch between what is taught in educational institutions and what is required in the industry.

The problem of skills gap is further elaborated upon by P8. He notes that graduates often lack the requisite skills for the workforce. The graduates' unfamiliarity with modern tools, due to a lack of hands-on training and practical experience, causes them to struggle to operate modern equipment in industry. He observes that when graduates enter the workforce, they are taken aback by the modern tools and equipment they encounter, which should ideally be part of their training.

> *P8: My experience with technical college graduates, basically, I feel they are not capable enough… When they graduate and come to the labour market, they find these tools very strange; they find them very modern and actually, this should be what they are exposed during their periods of training seeing modern objects, seeing modern equipment's but then reverse is the case. They come to the labour market so surprised, and they do not know how to handle these [the] equipment. So, I will put this to the [a lack of] theoretical aspect of modern equipment and automobile as a whole.*

This gap in the theoretical understanding of modern equipment and automobiles clearly indicates that **the curriculum is not keeping pace with advancements in the field**, as pointed out by P7 below:

> *P7: The vehicles of today, they are technically equipped that is they use sensors and actuators which makes it difficult for some of them to work on. In the school, however, they are teaching them the theoretical aspect, most of the schools they lack the capacity to take them through the practical aspect because some of the equipment, they do not have. If they do not have the people that will be able to handle it very well; this hamper[s] a lot of vehicle repairs because when students are half baked … it's like someone preparing a cake and we are just trying to put an icing on it so that they will be self-employed.*

P7 underscores two basic needs: a) the need for technical education systems to adapt to technological advancements and b) the need to improve practical training and ensure the availability of skilled personnel to guide students. Without these improvements, he argues, the goal of preparing students for self-employment will remain difficult to achieve. However, in the last two lines of the excerpt, he cautions against putting too much emphasis on the end goal (self-employment) without adequately addressing the steps needed to get there (comprehensive training). Those two need to go together.

It is in this regard that P6 suggest we go back to the drawing board and see to it that the curriculum of TVET programmes is designed in such a way that it **emphasises and foregrounds skill acquisition in technical colleges as per the national policy for education**. The objective is for graduates to not only practice their trained trades but to become experts in their fields. Given the employment challenges in Nigeria, P6 suggests that the acquisition of necessary skills would enable graduates to practice their trades independently, potentially leading to self-employment.

> *P6: We need to teach them how to acquire the skills as set out in the national policy for education so that once they graduate from the technical colleges, they will be able to practice the trained trades and be experts in their fields. Because there is no doubt, in Nigeria today there is no job. **Employment is scarce**. The only way is that they should acquire the needed skills is for them to be able to practice at the end of the day.*

P1 emphasises that the path to success for technical students after graduation lies in being skilful. However, he identifies the skewness of the curriculum as the problematic. The perceived imbalance in the curriculum, relates to too much emphasis on theory and not enough on practical skills. As a result, the curriculum does not adequately and effectively equip students with the necessary skills for their future careers.

> *P1: The way forward for technical students after graduation is to be skilful. Presently in Nigeria, the curriculum is not adequate. It is inadequate in the sense that it is tailored more on theoretical aspect, rather than the skill aspect. The period for the theoretical aspect, is more than the period for the skill acquisition period.*

In reviewing the role of government and educational agencies in improving the employability of students, P9 argues:

> *P9: If the government can come up and make sure that the agency in charge of curricula are [is] able to review it to meet the modern-day needs, most of them [graduates] will come out and be able to go and work.*

P9 sees government intervention as necessary in ensuring the effectiveness of the TVET system. He emphasises the need for the agency (i.e. NBTE) in charge of the curriculum to review and update it regularly. This is to ensure that the curriculum remains relevant and meets the needs of the modern-day job market. The goal is, according to P9, to improve the employability of students. If the curriculum is updated to meet modern-day challenges and needs, P9 believes that most students will be able to find work after graduation.

6.2.1.1.2 Sub-theme 2: Skills Development and Re-engineering

Whilst the first sub-theme highlighted the problematic nature of the TVET curriculum and the need for skill acquisition to address the skills gap, the second sub-theme focuses on skills development and the need for skill re-engineering (often referred to as "reskilling") in TVET systems. According to the participants, emerging industries need new skills; thus, both teachers and students need to be retrained. Training and retraining in this age of automation are seen as a means to address the key challenges in the system, relating to skills gap, skill acquisition and up-dating individuals' skillset and knowledge with the new developments in the AE industry.

In the excerpt below, P4 highlights the importance of continuous professional development for teachers, particularly in the context of industrial training. When teachers are equipped with real-world skills and knowledge of the new AE technology, they can be more effective in passing the skills and knowledge of how to use them.

> *P4: As I have mentioned earlier that teachers should be sent on industrial training so that they will get used to all this modern equipment too.*

It is in this regard that P3 emphasises the need to reengineer skills to meet the demands of the labour market. This draws our attention to the importance of aligning educational outcomes with industry needs, and the necessity of updating educational content and methods to keep pace with changes in the job market.

> *P3: The skills will be reengineered to meet the demand of the labour market which has to reflect in our scheme of work. It should be in the system and to some point, teachers should teach such topics but how many of them are using such new systems in this 21st century.*

P1 underscores the idea that the effective use of new AE technologies in TVET requires that educators themselves are proficient in these technologies He thus advocates for a comprehensive and continuous development approach to training in TVET education, one that keeps pace with technological advancements and industry needs and conceives of both students and instructors as life-long learners. It is significant to note how P1 links training and retraining to "sustainable development in delivering their duty". This points to a view of education as a key driver of sustainable development, with well-trained instructors being crucial to this process.

> *P1: As students are in need of training, likewise the instructors (teachers) will need the training on the emerging machines, because when these things are installed and there is nobody to operate it [them], it will still be back to square one (base). So, if we want to move forward… it means our students are going for industrial training. There must be a call for teachers also to be going for training and retraining for sustainable development in delivering their duty.*

Still along the lines of sustainable development, P6 is emphatic about the acquisition of core skills, particularly the ability to diagnose faults in their trade areas. The emphasis on

sustainable development suggests that P6 views education as a key driver of long-term, sustainable growth - equipping students with skills that will remain relevant in the future. He advocates for a comprehensive approach to skill development and re-engineering, which should encompass entrepreneurial and managerial skills as well as soft skills, such as critical thinking, interpersonal, intrapersonal, and communication skills. The inclusion of entrepreneurial and managerial skills, such as leadership, is crucial in today's economy where innovation and leadership are highly valued.

> *P6: For sustainable development, the student should be trained to acquire the core skills needed in the world of work. Those are the skills needed to be able to at least diagnose faults, in each of these trade areas so that they will be able to at least graduate and practice the trained trade. When you go to entrepreneurial skills, we have what we call managerial skills. It is under the managerial skills, where we have the leadership skills. And added to it is the core work skills, critical thinking skills, interpersonal skill, intrapersonal skills, and communication skills. These are the skills that they need to be able perform in the present world of work which is a global economy.*

P6 acknowledges the global nature of today's economy suggesting that the skills taught should enable students to perform effectively in a global context.

P7 echoes the need for lecturers to be retrained due to the rapid advancements in AE technology. He further argues for a dynamic and integrated approach to TVET education, one that equips both educators and students with the skills, mindset, and passion needed to adapt and thrive in a rapidly changing technological landscape. He suggests that students should be taught to be "problem solvers rather than contributors to the country's problems" and be made aware of alternatives to traditional employment, such as starting their own businesses.

> *P7: The lecturers of technology that are teaching them this automobile technology need to be retrained. Because the technology now has improved and the pace at which it is moving is very fast. One cannot stand by and say you want to work on the old methods. So, they need to be trained and retrained on that, and apart from that, the way they train the students too, they need to show students that they have passion for it, they need to see the importance of being self-employed apart from looking for a white-collar job. The importance of been [being] self-employed, aside that they need to make the students realize*

that they are supposed to be problem solvers not to contribute to the problems of the country.

We could argue that what P7 presents suggests a belief in the transformative power of education and its role in societal improvement

6.2.1.1.3 Sub-theme 3: Stakeholder Engagement

By understanding the goals of TVET, TVET programmes can be designed in collaboration with local employers to meet the specific needs of the job market. The participants making this third sub-theme concur that partnerships with industry need to be further developed. In this regard, they advocate for strong partnerships between education and industry to navigate the challenges of technological advancements and prepare students for the evolving labour market.

P1 regards the limited nature of collaboration as not having collaboration at all with industries. P1 points out that students only go for internships once in a 3-year programme, and these internships last for only 3 months. This suggests that students have limited opportunities to gain practical experience in their field of study.

P1: In Nigeria, we don't have collaboration with the industries. Our students only go for internships (IT) once in a 3-year duration programme which is on a 3-month basis.

P9 is also critical of the limited internship currently offered and suggests a prolonged period so that students can gain the necessary practical experience in industries

P9 The SIWES programme [has] to be more than 3 months ... let it be around 6 months so that they [the students] will be able to get used to the environment for a year they are going to do their SIWES and get used to most of the machines and human relations in the industry.

P4 also feels that industrial training is key and should be incorporated into the curriculum by adopting a dual system, as observed in German TVETs.

P4: Like when we were in Germany, by the help of the Executive secretary we

were to study the dual system of education, and some other management things. Most of the institutions that is most of the training schools we visited; they have enough machines to train the students with. And with the system they use, the classrooms are not congested. So, there is no way a student will not finish within the specific period of time they have been given. A student to a machine, a student to a toolbox, A student to LMS equipment, the computer, all this above but gradually we will get there.

P1 feels that the limited collaboration with industries and the infrequency of internships could potentially impact the readiness of students for the workforce. Without regular and meaningful engagement with industry practices, students might not be adequately prepared for the demands and realities of the job market. This challenge once again foregrounds the gap between what is being taught and produced, and the evolving needs and tools of the industry.

P1: There is nothing like partnership. If there is [could be] partnerships: the students, to school and to the industries, because we are in the 21st century.

It is in this regard that P1 emphasises the importance of partnerships in the 21st century, a time of rapid technological advancements. The multi-stakeholder approach: *students-TVET-Industry* partnerships, to TVET education and industry development, ensures that all relevant parties are involved and invested in the process.

P1: Most of the products we are producing now cannot be fixed into the new machine that is emerging. So that's the major problem we are facing now, and I think Lagos state government is trying its best in order to improve the situation because we have some industries emerging now. For instance, in my section here, there is a company partnering with us and promising to improve our equipment's, infrastructures in the session.

P1 highlights the commendable efforts that the Lagos state government is making to improve the situation, particularly as new industries continue to emerge. This points to a *TVET-Gov-Industry* partnership. In his department, for example, there is a company that has partnered with them and has committed to enhancing their equipment and infrastructure.

Arguing along the same lines regarding government involvement is P4 who feels that if the government and companies can collaborate effectively, it would greatly benefit the apprentices or students they are currently training. Ultimately, the students may be offered

employment in these industries. However, if the students choose not to accept these positions after receiving their certification, they will still be well-equipped to work in any company due to their education in a dual system.

> *P4: If government and the company can work hand in hand, this apprentice or students that we are training too, as they are working in the school, learning for the period of that 3 years has they have divided it, the industries they will be going there to learn. At the end of the day, they will absorb them to work there and if those students do not like to work there, after been certificated at the end of their training they can go into any company because they know they come from dual system of education. So, if government and the industry can come together, with little renumeration, to be given to all these students, at the end of the week, it will go a long way.*
>
> *Well, if 100 %cannot be achieved, at least we can achieve 95% on this particular area since we work well in the country.*

P9 believes that government involvement can be used strategically to influence policy changes towards a dual TVET system in Nigeria. However, P9 believes that the industry partners will have to lead the process since they are better placed and equipped (knowledge and skill-wise) to offer relevant industrial training. It is in this regard, that P9 proposes that the Chambers of Industry are made part of the National Board of Technical Education (NBTE) in Nigeria. The Chambers of Industry will not only facilitate opportunities for trainees to gain real work experience, become efficient workers, and expand employment opportunities, but could also ensure that the TVET curriculum is aligned with the needs of the industry and the country. This will help to ensure that the skills being taught in TVET institutions are relevant and meet the current and future needs of the industry.

> *P9: I think what I will suggest that it if government can change their policies on the issue of technical colleges. Let us adopt the system of the German where they do dual system and the company has higher percent involvement, in technical education because they know the importance of technical education in their country.*

...

> *P9: Whereby we have chambers of industries been involved as part of the board*

members of technical body in Nigeria, they must have a percentage in NBTE when they are doing their curriculum so that it will be able to fit into the work, they are doing so that when the student finish they can easily key into their system and the other aspects that they should make.

P4 also sees government intervention coming in when there's dispute between industry and the TVET institutions. There seems to be a disconnect between the expectations of the corporate sector and the readiness of students for professional environments.

P4: Some of these big companies have complained that our students are underage. That is why we have some companies rejecting or refusing our students. Government needs to assist us in liaising with them.

P4's call for government intervention indicates a need for a structured approach to bridge this gap, ensuring that students are adequately prepared and legally eligible for opportunities offered by these companies. This situation underscores the importance of not only aligning educational outcomes with industry standards, but with legal frameworks as well.

In the section, we discuss the second category: Improving Public and Government Perceptions of TVET.

6.2.2 Category 2: Improving Public & Government Perception of TVET

6.2.2.1 Theme: Provision of Incentives /Motivational Packages

This category is undergirded by the theme: **Provision of Incentives /Motivational Packages**. As discussed in the literature review chapter, in Africa, TVET programmes play a subordinate role in people's choice of education. The question thus becomes **how TVET can improve and develop its attractiveness** amongst the youth and the public. It is significant to note that fifty six percent (n=5) of the participants perceive the **provision of incentives** as a catalyst for enhancing the appeal and value of TVET, which is often overshadowed by the academic route in Nigeria. The provision of incentives theme is further broken down into two sub-themes, reflecting their frequencies, as illustrated in Fig. 6.3 below.

- Conscientising the public about the benefits and opportunities of TVET;
- Attracting and retaining staff and students.

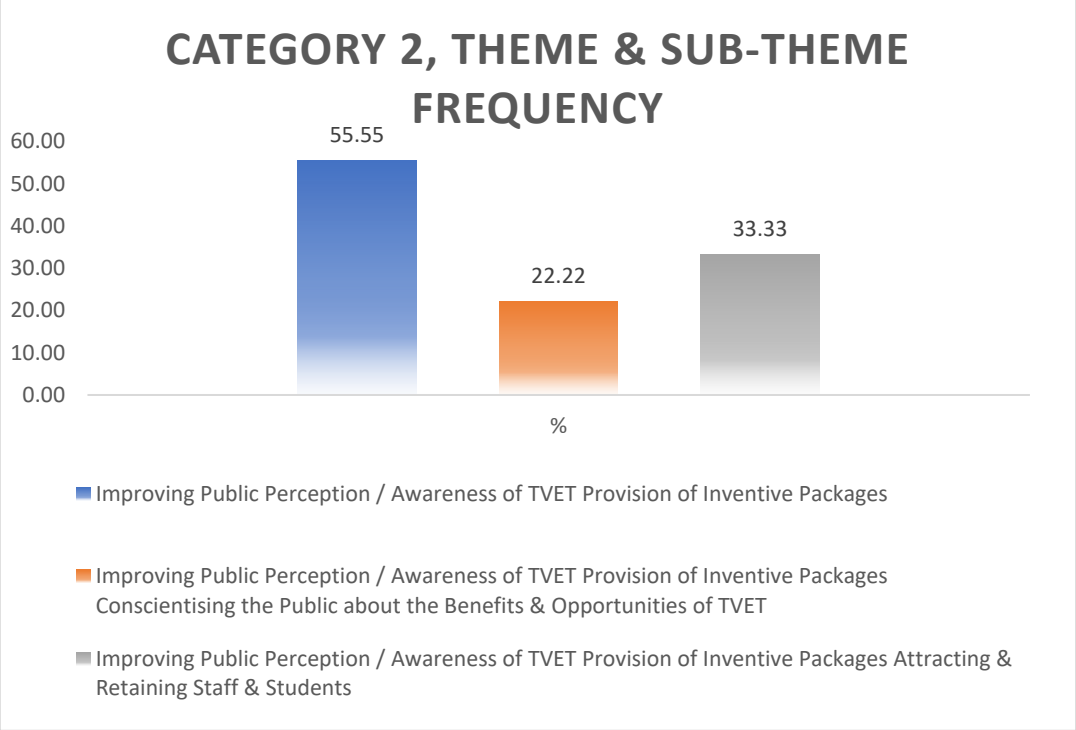

Fig. 6.3: Category 2, Themes and Sub-themes Frequencies

According to the participants, the negative perceptions around TVETs emanate from three misconceptions about these institutions:

- technical colleges are an easier alternative to traditional academic paths;
- technical colleges are primarily for workers, and thus do not foster high societal performance;
- technical colleges are primarily for students who are weak academically.

P3 draws our attention to the flaws in the advice often given to underperforming secondary school students to attend technical colleges, which highlights a misconception that technical colleges are an easier alternative to traditional academic paths. This ignores and undermines the rigorous and skill-intensive nature of technical education.

P3: When a student from secondary school who could not perform well in mathematics and other science subjects and the advice from the principal or vice principal (head of school) is: Go to technical college. The challenges that

build up all the way from secondary school will be transferred to the technical colleges. Forgetting that technical college is not a vocational school. It is a college on its own where they match graduate and skill acquisition together. So, by the time such students get to technical college, they find it very difficult to cope. Some of them come to school and not attend the classes. A student who does not attend the classes regularly has technically failed which is a part of the policy.

The perception among students that technical colleges are primarily for workers further undermines the value of technical education and perpetuate a negative stereotype that affects policymaking, as argued by P3 below.

P3: Secondly, the students on societal influence, they believe that technical colleges are for workers, and they never perform well in societies. So, this impression has a great negative influence on the policy as a whole.

P1 draws our attention to the flaw of educational policy where students with lower performance in secondary schools are funnelled into technical colleges. This policy may inadvertently contribute to a negative perception of TVET and challenge the students' ability to succeed due to their prior academic struggles. This suggests a need for policy reform to align student capabilities with the appropriate educational pathways, thereby enhancing the overall effectiveness of TVET institutions. However, P1 remains optimistic that things might improve for these students.

P1: In the area of student's attitudes, for now, basically the problem, emanated from the policy of federal government. When they saw those students, who did not perform well in secondary schools are the ones to come down to the technical college. It is a slap on TVET. That is why some of the students we are having here, it is highly difficult for them to comprehend some things but as times goes in, I pray that things keep improving.

6.2.2.1.1 Sub-theme 1: Conscientising the Public about TVET

According to the participants, when people are more informed about the benefits and opportunities that TVET provides, such as skill development aligned with market demands and potential for entrepreneurship, it can shift perceptions and encourage more individuals to

pursue TVET pathways. This, in turn, can lead to a more skilled workforce, reduced unemployment, and economic growth, as argued by P1 below.

> *P1: I think what the TVET institutions can do to improve the image of TVET education is to conscientise the public and tell them the importance of TVET education. Because if technical education is improved it means the unemployment rate will be reduced. It is for competency. If a student can play according to the laid down rules of the game, it will reduce the unemployment rate because it is not one of the white-collar jobs but entail some practicals.*

On the other hand, P3 sees TVET as a critical tool for empowering the diaspora, enabling individuals to contribute significantly to their host and home countries. According to P3 TVET graduates hold a pivotal role in expanding government technical education across the diaspora. His submission is that TVET graduates serve as grassroots ambassadors, carrying the skills and knowledge acquired through training to various communities worldwide. This not only aids in the economic development of their home countries by addressing skill shortages but has the possibility and potential to foster a global exchange of technical expertise.

> *P3: Now the government should encourage technical education and not to take them as people with learning disability. These [TVET graduates] as the **grassroot that can build the government** technical education throughout the diaspora. That's my submission.*

It is in this regard that governments can serve as facilitators of knowledge transfer and innovation, fostering economic growth and development.

6.2.2.1.2 Sub-theme 2: Attracting and Retaining Staff and Students

P2 acknowledges the inconducive environment in which TVET teachers work, with regard to inadequate staffing levels, insufficient training, and inadequate financial compensation. In order to create a supportive environment that enables teachers to thrive professionally, P2 believes that a comprehensive welfare package is critical, and this should precede the "repackaging of the training".

P2: ...the teacher teaching the students, many of them are not contented on the job because of the workforce, the training for them, the welfare packages for the teachers is [are] not adequate.

The concept of repackaging training to prioritize teachers' welfare involves restructuring professional development programmes to include incentives for educators. This approach recognises that teachers' performance and motivation are intricately linked to their well-being.

P2: Repackaging of training foregrounding the teachers' welfare – incentives for teachers. A repackaging of the training has to come up after the provision for the teachers' "welfare package."

By offering incentives, such as opportunities for advancement, recognition, and financial rewards, within the welfare package, it encourages teachers to engage more actively in their professional growth. Ultimately, this leads to a more effective educational environment where teachers feel valued and supported.

P2: Also, as well as the student is graduating there should be a motivation package. There should be an encouragement what are the government doing to encourage students on this area of discipline in TVET programme. So, if all these are in place, then we can start saying we are heading somewhere.

Regarding student support, P2 calls for enhanced incentives and governmental backing to foster student development and success in TVETs. He thus proposes a motivational package to be provided to students upon graduation.

P4, on the other hand raises the issue of gender disparity in the fields of engineering and construction and the need to recruit and retain female students in these fields. He notes that while women are present, their numbers are low, in contrast with creative trades, where female representation is higher. He highlights efforts to encourage female participation through exposure to the work environment and tasks performed by engineers on-site, as illustrated below.

P4: Looking at the involvement of ladies into the apprenticeship and the trade, that is the percentage of ladies coming in, into some areas like engineering, they are not many. But we are encouraging them with samples to see what engineers do often at the sites, so in our place here, hardly can you see any trade in engineering or constructions that do not have ladies there. They may not be

many, they may be 3 or 4, 2 or 1 in those two areas: engineering and construction. But when you look at the creative trades, they are many there. So, we are also making efforts to bring more of them into engineering and constructions.

In the excerpt below, P4 highlights the use of incentives, like an award, to motivate female students in particular, over a three-year period. To encourage female participation in trades often perceived as challenging or hazardous, P4 tries to dispel fears and misconceptions about engineering and construction trades by showcasing women successfully working in roles such as mechanics, bricklayers, welders, and carpenters. This visibility is meant to enlighten and inspire others, potentially leading to increased interest and diversity in these fields.

P4: We are equally encouraging them with an award been organised for them at the end of the 3 years programme so that it will encourage others to come into that trade. We equally during the orientation programme allow them to know that it is not a difficult thing to do because some of them may be looking at working with machines, we allow them to see lady mechanic, lady bricklayer, lady welder and a lady carpenter. So, they are being encouraged by this. If you do not allow, people to really know and see. They continue to fear, those trades thinking that the hazard there will be too much. But when they are enlightened on that particular area, then some of them will consider and move into those trades.

P9 draws our attention to the role that government should play in ensuring employment for technical college graduates. He asserts that a guaranteed job post-graduation, reminiscent of the 1960s-1980s era, would encourage more individuals to pursue technical education. He thus proposes that the government reserves a percentage of service roles for those with a NABTEB[3] (National Business and Technical Examinations Board) Level 5 qualification, providing a clear progression path from education to employment. This he believes would potentially increase the number of skilled workers and address parental concerns about their children's job security after completing their education.

[3] NABTEB is an examination board in Nigeria that conducts exams for technical and business innovation colleges. Established in 1992, NAPTEB was created to take over the responsibilities of conducting technical and business certificate examinations from other bodies like the West African Examinations Council and the London Royal Society of Arts. This move was aimed at tailoring the exams to better meet the needs of the Nigerian society.

P9: *And at the end of the day government should make certain percentage of their enrolment into services to those who finish from technical colleges. Let them pick them from level 5 with a NABTEB result, they can start progressing from there so that one will give us more people. Once they are assured that once they graduate, they will secure a job like the way it is in the 1960s- 1980s during those times we went to school. What a lot of parents needed was for their children to finish school and be able to feed them. Once they know that when you finish and there is an already made job for you, they will surely convince their children to be part of technical education.*

We now move onto the last category: Robust governance.

6.2.3 Category 3: Robust Governance

6.2.3.1 Theme: Innovative Leadership and Expertise

This category is undergirded by the theme: **Innovative Leadership and Expertise**. Innovative leadership and expertise are seen by forty four percent (n=4) of the participants as crucial in enhancing the governance of TVET institutions. Leaders who embrace innovation can drive policy changes that adapt to evolving educational needs and labour market demands. The participants foreground the importance of expertise in the various trades of people employed to administer TVET institutions. This is to ensure that these institutions can effectively manage resources, engage with stakeholders, and implement strategies that improve the quality and relevance of vocational training. This combination according to the participants fosters an environment where TVETs can thrive and contribute to sustainable development and economic growth. The innovative leadership and expertise theme is further broken down into two sub-themes, reflecting their frequencies, as illustrated in Fig. 6.4 below.

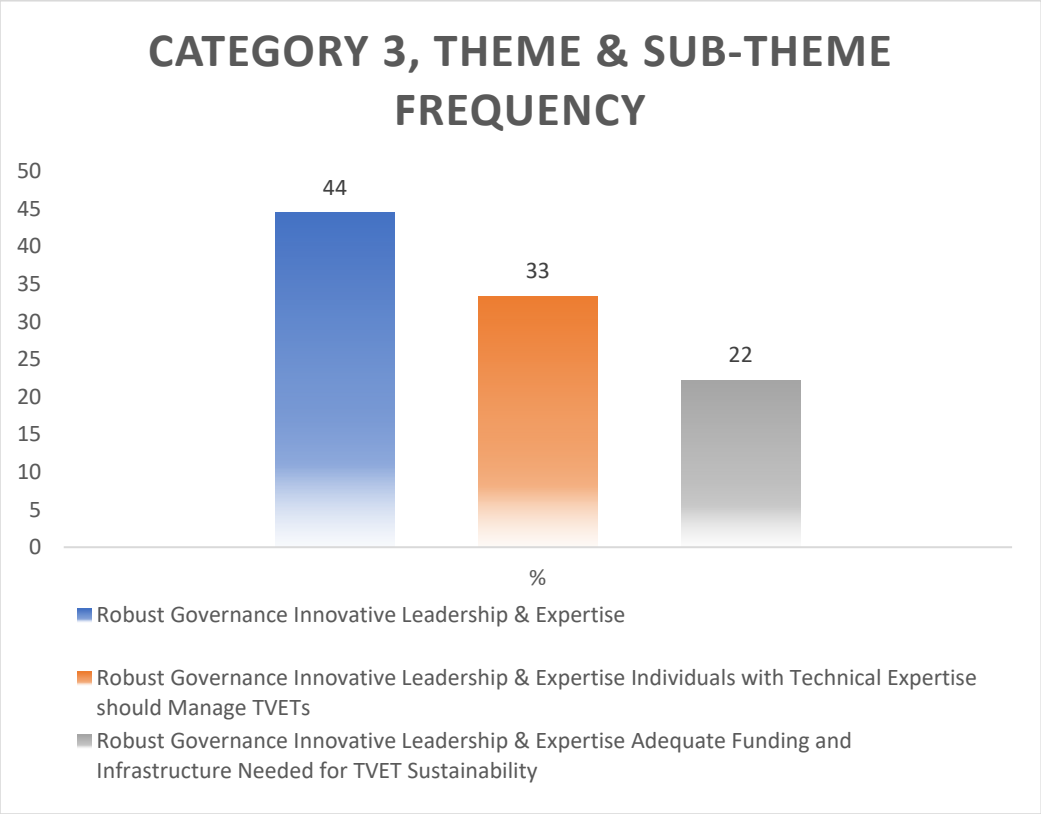

Fig. 6.4: Category 3, Themes and Sub-themes Frequencies

6.2.3.1.1 Sub-theme 1: Managers of TVETs should have Technical Expertise

Technical expertise in TVET administration is perceived by the participants as crucial for effective governance. According to the participants, administrators with a strong technical background can better understand the educational needs and industry demands, leading to more informed decision-making and policy development.

P2 having highlighted the problem plaguing TVET administration moves onto foregrounding the importance of leadership skills "that would initiate the promotion of sustainable development."

> *P2: The major problem that is on this TVET programme is that the type of people that are managing the programme … and what do I mean? In many situations the mangers are not even experts on this field. Experts in this field have to be brought in to do the work. When experts in the field are not doing the work, we run into problems.*

…

P2: *For us to say we are ready, and we want to implore strategy,* ***leadership skills are very important we need leadership skills which will initiate the promotion of sustainable development.*** *And when we are talking about the leadership skill,* ***the 21st century skill should come in place****.*

According to P6, managers of TVET institutions should be "technically inclined". They should be equipped with the technical know-how to oversee the implementation of technical programmes, ensuring that the curriculum remains relevant and up-to-date with the latest industry standards.

P6: *Proper administration is important because we found out that even though we are technical colleges;* ***most administrators are not technical educators*** *so most of these managers are not technically inclined.* ***They do not know the reasons for the programme and as such they do not administer the programme the way it should be*** *administered. Unless the government looks into that we will continue to have problems.*

P2 paints a picture of skills that a TVET manager should possess:

P2: *When we are talking about technical area expertise,* ***you should be able to modify, innovate, think outside the box****. That requires critical thinking …* ***The thinking skills should be sharp and prompt****: Good planning and delivery skills… There should be what we call looking in between what we call the* ***problem-solving skill, organising skill, good communication skill****, … we are looking at ability to put into place,* ***a fluent and good communicator****. When there is good communication within the system of work, then there is humility…* ***you should be able to talk strategically****, when you work strategically, you should be able to carry people along … all these should come into place, and this is [these are] the things that will help here*

P2 emphasises the importance of various skills in technical expertise. Critical thinking is highlighted as a cornerstone, enabling innovation and the ability to "think outside the box." He also underscores the necessity of sharp thinking skills for effective planning and execution. He deems problem-solving, organising, and communication skills as essential, with a particular focus on the latter as a means to foster humility and strategic collaboration within a team.

P7 is at pains at getting someone who understands the versatility of skills. The accelerating pace of change in skills, technology, and tools, suggests that what once took a decade to evolve now changes in half that time or even less. This rapid evolution requires individuals who are not only versatile but also possess a global perspective to effective approaches of transferring knowledge and skills.

P7: But you know what, we must also be aware of the fact that skill change, before it used to be 10 years, now there after it becomes 5 years. Now skill, technology, tools equipment's changes every minute and to keep up with those changes, you need somebody who is versatile who is global in transferring knowledge and skills.

6.2.3.1.2 Sub-theme 2: Sustainability of TVETs depends on Adequate Funding and Infrastructure

Other than poor administration, the participants felt that poorly targeted funding can significantly impact the governance of TVET institutions in Nigeria. A lack of technical expertise in the governance of TVETs does not ensure the effective management of its resources and thus limit TVETs' potential contribution to sustainable development. Without proper allocation and management of funding, TVETs will continue to struggle to secure and maintain equipment; update their curricula, and attract qualified instructors, which are crucial for equipping students with relevant skills for the job market.

P2: In most cases a lot of money is pumped (fuelled) into this programme but less Service is rendered.

P6 highlights the significance of not only administration, but also financing in the governance of TVET institutions and programmes, calling for accountability and transparency in the management of educational funds to optimize the benefits of TVET programmes. He acknowledges the excessive costs associated with such programmes, emphasising the need for consistent funding and proper monitoring. It is in this regard that he argues that government support is crucial, not only in terms of providing adequate funds but also in ensuring that the allocated money is spent effectively and for the intended purposes.

P6: In addition to practical skills and work skills that I have mentioned, ***administration and financing is very important****.* ***We know that the programmeme of technical and vocational education is expensive****. Every day*

we need to use themachine and buy expendables; ***the government should be able to provide moneyadequately for the institutions*** *and, apart from that,* ***to monitor this programmeme*** *to the extent that you ensure that the money that is being channelled to thisprogrammeme is spent on what ... it's supposed to be allocated for.*

P9 sees the chambers of industry play a crucial role in the management of TVET beyond just curricular issues.

P9: ...whereby we have chambers of industries been [being] involved as part of the board members of technical body in Nigeria

P9 sees them also play a role in the strategic management of TVET institutions by helping to define their mission, vision, and objectives, and by supporting the implementation of policies and plans designed to achieve long-term goals.

6.3 Conclusion

As mentioned earlier, the analysis yielded three (3) categories of description, three (3) main themes and seven (7) sub-themes. Sustainability and effectiveness of TVET systems are critical for the development of skilled labour that meets the demands of the job market. In Lagos, Nigeria, these factors are particularly significant due to the city's growing economy and its need for a technically skilled workforce.

The emergence of modern technologies in the automotive engineering industry in Lagos, Nigeria, is a pivotal development with significant implications for TVET, as argued by the participants in this study. The automotive sector's evolution, marked by advancements such as automation, electrification, and digitalization, necessitates a **re-evaluation of TVET's objectives** to ensure alignment with industry needs. In this regard, curriculum-policy alignment and coherence are essential, with curriculum design and skills development needing to adapt to incorporate new automotive technologies. This adaptation is seen as paramount in ensuring that TVET graduates possess the relevant competencies for the evolving job market, thereby enhancing their employability. Stakeholder engagement is seen as critical in this process, involving industry partners in curriculum development to bridge the gap between education and practical application.

With regard to the second category; the results highlight Improving public perception as another crucial factor. The results of this study confirm that TVETs often suffer from the stigma of being a "second choice" education pathway. To combat this, the study shows that providing incentives and motivational packages can be effective. These could include public awareness campaigns that highlight the benefits and opportunities of TVET. Attracting and retaining both staff and students is vital, emphasising the value of TVET in building a skilled workforce for the future of automotive engineering. The results indicate that this can be achieved through scholarships, (including those aimed at attracting female students, in particular) and "welfare packages" which include competitive salaries, professional development opportunities, and supportive learning environments.

Managers of TVETs should not only possess technical expertise but also the foresight to anticipate industry trends and prepare students accordingly. The sustainability of TVETs hinges on adequate funding and infrastructure, which are necessary to support the integration of modern technologies into educational programmes.

With regard to the third category; the results identify robust governance as playing a pivotal role in the sustainability of TVETs. The results show that robust governance within TVET institutions must also evolve, with a focus on innovative leadership and expertise. The participants are adamant that managers of TVETs should possess not only administrative skills but also technical expertise to lead by example and inspire confidence in the system. Managers of TVETs should possess technical expertise and the foresight to anticipate industry trends and help prepare TVET programmes accordingly. The sustainability of TVETs hinges on adequate funding and infrastructure, which are necessary to maintain high-quality training programmes that are both relevant and effective as well as support the integration of modern technologies into educational programmes.

In conclusion, for TVETs in Lagos, Nigeria, to be sustainable and effective, the results of this study show that a multifaceted approach is needed. This approach should encompass a clear understanding of TVET objectives, curriculum-policy alignment, curriculum relevance, stakeholder engagement, improved public perception, robust governance, and adequate funding and infrastructure. These elements combined will ensure that TVETs can provide the skilled workforce necessary for Lagos' continued economic growth and development. In the next chapter, the discussion chapter, we look at the implications of these results against the backdrop of Nigeria's growing automotive industry and the effectiveness of TVET in

empowering self-employed youths and fostering sustainable skills in a knowledge-based economy.

CHAPTER 7

DISCUSSION OF THE RESULTS

> Most people entering the global labour market will not be putting the skills they learn in school, in skills interventions, at home, or in formal sector jobs to use – though most of the world's skills systems are oriented towards just that assumption (Palmer, 2020).

7.0 Introduction

This mixed-method study sought to explore how sustainable socio-economic development can be promoted through the TVET system, focusing on TVET's potential in the promotion of sustainable economies and societies, in particular. As discussed in the previous chapters, this study is concerned with determining ways in which we can shift the Nigerian TVET system from a "fragmented" system to an "integrated" one. In this regard, it is **concerned with change**. The first phase of the study, the quantitative phase, sought to address the broad question: **what would be required to transform the TVET system to gear it towards promoting sustainable socio-economic development.** This broad question was then translated into the following three sub-questions:

- what strategic leadership skills would initiate and promote sustainable socio-economic development through TVET systems;
- what process skills would enable change in promoting sustainable socio-economic development through TVET systems and
- what practical skills would enable the delivery of change which seeks to promote sustainable socio-economic development through TVET systems.

The breakdown of the main research question into sub-questions regarding strategic, process, and practical skills (Majumdar, 2009) is pivotal in understanding the dynamics of sustainable socio-economic development through TVET. The strategic leadership skills involve creating a vision for sustainable development and inspiring others to commit to this vision. Process skills are necessary for implementing strategies in a way that is participatory and inclusive, ensuring that all stakeholders are engaged in the journey towards sustainability. Practical skills, on the other hand, are the tangible competencies that individuals need to perform their

jobs effectively in a sustainable manner. The study argues that together, these skills foster an environment where TVET can thrive as a catalyst for socio-economic development, equipping individuals with the knowledge and abilities to contribute to their communities and economies in a way that is environmentally sound, economically viable, and socially responsible. Thus, by understanding the specific skills demanded by the local context, TVET programmes can be tailored to meet these needs effectively.

As argued earlier, the study's focus is premised on the fact that all countries, either developing or developed, in pursuit of sustainable development, have put ***skills development strategies*** high on their priority list. Indeed, TVET is seen as the panacea for economic development and unemployment reduction in many nations, especially, the developing countries (Bhurtel, 2015). Thus, the recognition of TVET institutions as key to sustainable socio-economic development is foregrounded in order to be opened up for critique. The literature reviewed, although it confirms the role of TVET systems in this regard, it inadvertently also points to a widespread consensus, that TVET systems, particularly in Africa, are failing to adequately prepare all students with the essential skills for them to acquire "gainful" employment (Okoye & Okwelle, 2014). These essential skills, which have come to be referred to as 21st century skills (and knowledge) are regarded as necessary to succeed in life, career, and citizenship (Voogt, et al, 2013). It is in this regard, when talking about "an integrated TVET system"; a "re-imagined TVET system" or "transformed TVET system" (as this study hoped to explore), the study foregrounds not only the importance of understanding the interface amongst economic, human and sustainable development (McGarth et al., 2020), but also the "context of practice" (Alant & Bakare, 2021) or implementation. The notion of "context of practice" is in line with McGarth and Badroodien's (2006) ***Policy learning*** and Powell and McGrath's (2014) "***Capabilities Approach***" which offer a more nuanced, people-centered, and context-specific approach to skills development and TVET, ensuring that development does not come at the expense of social equity and environmental stewardship.

The Quintuple helix model and Porritt's 5 capitals provide a comprehensive framework for understanding the various factors that contribute to promoting SSED through TVET. By considering the interactions between academia, industry, government, civil society, and the environment (quintuple helix), as well as the role of natural, human, social, manufactured, and financial capital (Porritt's 5 capitals), the study identified a holistic approach to reducing unemployment through skill development that is aligned with both sustainable economic

practices and the broader societal and environmental context. It is an approach that responds to the challenges of the "context of practice."

The chapter is divided into three parts. The first part presents a summary of the results of the first phase of the study. The second part presents a summary of the results of the second phase of the study. This is followed by a discussion of the overall results of the study. Herein we look at the main trends, patterns and connections that have emerged from the results of this study. Furthermore, we look at how the results of this study relate to other previous research, exploring both the theoretical and practical consequences of our results. The chapter concludes by highlighting the potential contributions this study has made to the field.

7.1 Summary of Phase I Results

7.1.1 What were the identified factors?

During the first phase of the study, 162 participants coming from three different employments sections, academic, government and industry, were engaged to address the above research questions and sub-questions. In addition to determining the skills (as represented by factors) that are deemed necessary to promote SSED through TVET systems, the participants were also asked to talk about the reasons behind their chosen factors. Their responses regarding the factors they deemed necessary to promote sustainable socio-economic development were then correlated against the hypotheses formulated regarding the significance of the three employment levels of the participants. The hypotheses tested offer a quantitative measure to assess the consensus among participants on the importance of various skills and factors in promoting SSED through TVET.

The study's findings provide a compelling insight into the transformation of the TVET system, highlighting two critical factors essential for fostering Sustainable Socio-Economic Development (SSED).

- **SSED Factor 1: Innovative Green Growth:** This refers to incorporating sustainable practices and environmentally friendly approaches within TVET programmes. By training individuals in green technologies and eco-friendly practices, TVET can contribute to both economic growth and environmental sustainability.

- **SSED Factor 2: Infrastructure Enhancement:** Improving TVET infrastructure is essential. High-quality facilities, modern equipment, and up-to-date technology enhance the learning experience and better prepare students for the world of work.

The first factor emphasises the importance of innovative green growth, which is pivotal for SSED. This includes the innovation in Renewable Energy Sources (RES) to **enhance food security and the development of a green economy**, which are strongly associated with the underlying latent variable, as indicated by their high factor loadings. The second factor underscores the significance of infrastructure in bolstering manufactured, human, and financial capitals, which are fundamental components for a robust SSED framework.

Our Cronbach's correlation analysis shows the high reliability statistics for both SSED Factors 1 and 2, standing at 0.831 and 0.819 respectively, indicate a strong internal consistency. This suggests that the items within each factor are well-correlated and reliable measures of the underlying latent variables.

For SSED Factor 1, the emphasis on innovative green growth aligns with global trends towards sustainability and the green economy. The strong association of variables SSED13 and SSED12 with Factor 1 underscores the critical role of renewable energy sources (RES) in food security and the broader green economy. The high factor loading of 0.916 for innovation in RES to boost food security reflects the importance of sustainable practices in agriculture to ensure a stable food supply, while the loading of 0.682 for innovation in the green economy suggests a significant, though comparatively lesser, impact. Conversely, the lower loadings for the provision of funding and education for productive TVET highlight potential areas of improvement. These elements are crucial for the development of skills and knowledge necessary for SSED, and their lower association with Factor 1 may point to a need for increased investment and focus in these areas.

Regarding SSED Factor 2, the strong loadings for items SSED3, SSED4, and SSED5 indicate that infrastructure—be it physical, human, or financial—is a pivotal component of SSED. The exceptionally high loading of 0.928 for SSED3, which pertains to physical infrastructure, suggests that tangible assets such as facilities, equipment, and technology are perceived as fundamental to the development process. The associations with human well-being and financial infrastructure also highlight the multifaceted nature of SSED, where social and economic factors are interdependent.

In our Pearson Correlation results, SSED Factor 1 and SSED Factor were shown to have a correlation of 0.067 and 0.087 respectively with Employment Level, which suggests a very weak positive relationship. The p-values of 0.419 and 0.289 indicate that these results are not statistically significant. However, the correlation between SSED Factor 1 and SSED Factor 2 was 0.579. The accompanying p-value of less than 0.001 was well below the 0.05, suggesting a moderate positive relationship between these two factors. This indicates that while neither SSED Factor 1 nor SSED Factor 2 shows a significant correlation with Employment Level, there is a significant and moderate positive correlation between the two SSED factors themselves. The reliability of these factors, indicates a strong internal consistency, thus reinforcing the validity of the results.

In relation to strategic leadership skills (SLS) necessary for initiating and promoting change, the study identifies three distinct factors:

- SLS Factor 1: Integrated intelligence driven by problem-based teamwork and merged with critical thinking skills.
- SLS Factor 2: Integrated intelligence driven by self-awareness
- SLS Factor 3: Integrated intelligence driven by motivational leadership.

The Cronbach's alpha indicated a robust internal consistency among the three SLS Factors, which is crucial for the validity of the study. Factor 1's exceptionally high reliability score of 0.927 suggests that the items within this factor are highly correlated, thus providing consistent results across different measurements. The influence of Teamwork (SQ) and problem-solving skills (AQ) on Factor 1 with impact measurements of 0.868 and 0.864, respectively, underscores the importance of collaborative and cognitive skills in initiating and promoting SSED through TVETs. These high values suggest that these variables are not only significant contributors to the factor but also that they may be integral components of the construct being assessed. Factor 2's reliability, while lower than Factors 1 and 3, is still within an acceptable range, indicating a moderate level of consistency. The prominence of Self-awareness (EQ) with an impact measurement of 0.854 is noteworthy. It implies that self-awareness is a critical attribute within this factor. For Factor 3, the identification of Motivational Leadership (EQ) as the most influential variable with a factor loading of 0.776 is significant. This finding suggests that motivational leadership is a key component of this factor and may be essential for the construct it represents. The factor loading, while lower than the impact measurements for the variables influencing Factor 1, is still substantial and indicates a strong relationship.

For the Pearson Correlation, all three SLS factors showed a low positive correlation (0.048) to a negative correlation (-0.037) with the employment category. The correlations between employment category and the SLS factors are not strong (all coefficients are close to zero). However, the statistical reliability of these two SLS factors, as indicated by the Pearson correlation values, suggests a high level of consistency within the constructs measured. Particularly, the values for SLS Factors 2 (0.797) and 3 suggest a robust internal consistency, which reinforces the validity of these factors in assessing strategic leadership qualities. The association of specific variables with each SLS factor further clarifies the elements that constitute effective leadership in the context of change. For instance, the strong association of teamwork and problem-solving skills with Factor 1 underscores the importance of collaborative intelligence in strategic leadership. Similarly, the significant correlation of self-awareness with Factor 1 (0.557) and motivational leadership with Factor 3 underlines the essential nature of emotional intelligence in leading change.

Regarding the process skills for enabling change, the results point to the following two factors:

- PS Factor 1: Integrated intelligence driven by empathy and complemented by soft-skills, strategic intelligence, innovation quotient and communication skills
- PS Factor 2: Management of Diversity and Conflict skills

The high Cronbach's alpha values for both PS Factors 1 and 2 indicate a strong internal consistency within the constructs being measured, suggesting that the factors are reliable indicators of the underlying skills they aim to assess. PS Factor 1’s emphasis on integrated intelligence, which is driven by empathy and supported by a suite of complementary skills, underscores the multifaceted nature of effective leadership, and change management. The strong association of empathy with this factor, as evidenced by the factor loading of 0.795, highlights the critical role that emotional intelligence plays in understanding and navigating the complex interpersonal dynamics that are inherent in change processes. Similarly, PS Factor 2’s focus on the management of diversity and conflict skills points to the importance of emotional intelligence (EQ) in fostering an inclusive environment where diverse perspectives are valued and conflicts are managed constructively. The factor loading of 0.823 for the variable associated with conflict management skills further reinforces the significance of EQ in this domain.

The integration of soft skills, strategic intelligence, innovation quotient, and communication skills with empathy in PS Factor 1 suggests a holistic approach to leadership that balances emotional awareness with strategic thinking and innovative problem-solving. This blend of skills is particularly relevant in today's rapidly changing business landscape, where leaders are required to navigate complex challenges and drive transformational change. The automotive industry continues to evolve with modern technologies and methodologies, making it essential for Automotive Engineers to possess a combination of technical prowess, creative thinking, and practical expertise.

The Pearson Correlation analysis suggests that while the Employment Category does not have a strong correlation with either of the process skills factors, there is a significant and positive relationship between the two factors themselves. The first factor encompasses a blend of empathy, soft skills, strategic intelligence, innovation, and communication, suggesting a quality of well-roundedness coupled with the capability of understanding and relating to others, while also being innovative and articulate. The second factor is centered around the management of diversity and conflict, suggesting that the ability to navigate complex interpersonal dynamics is vital for change management. The most notable figure is the correlation coefficient of 0.674 between PS Factor 1 and PS Factor 2. This moderate positive correlation suggests that there is a meaningful relationship between integrated intelligence (PS Factor 1) and the management of diversity and conflict skills (PS Factor 2).

Lastly, the study identified two key types of practical factors relevant to enabling change:

- PRS Factor 1: Integrated intelligence driven by problem-solving as well as teamwork (team-based problem solving) and complemented by collaborative innovation intelligence, as well as communication, organisational and strategic skills
- PRS Factor 2: Integrated intelligence driven by planning skills and complemented by optimism, strategic management and being tolerant to uncertainty

The high Cronbach's alpha values for both PRS Factors 1 and 2 suggest a strong internal consistency within each factor, indicating that the items grouped under each factor measure the same underlying construct effectively. For PRS Factor 1, the high factor loadings for problem-solving, teamwork, and innovation quotient underscore the importance of these skills in driving integrated intelligence, which is further enhanced by communication,

organizational, and strategic skills. This suggests that a multifaceted approach to problem-solving that leverages diverse skill sets is critical for successful change management.

Conversely, the lower factor loadings for influence, curiosity, and creativity quotients indicate that while these traits are valuable, they may not be as central to the core construct of PRS Factor 1 as initially hypothesized. This could imply that these skills are more situational or supplementary, rather than foundational, in the context of delivering change. However, we know how vital the skills of creativity and innovation are in automotive engineering to develop new vehicle designs and engineering solutions. For PRS Factor 2, the strong association with job planning suggests that this skill is pivotal for integrated intelligence in this domain, supported by soft skills, strategic intelligence, innovation quotient, and communication skills. However, the lower loadings for negotiation, realistic optimism, and time management suggest these skills, while relevant, may not be as critical to the construct of PRS Factor 2 or may require further development to enhance their contribution to change delivery.

The Pearson correlation between employment category and the PRS factors is not strong (both coefficients are close to zero). However, the Pearson correlation between PRS Factor 1 and PRS Factor 2 is 0.804, which suggests a strong positive correlation.

In summary, the results of the study highlight the importance of infrastructure and innovative green growth in developing SSED. We see innovation i.t.o. the green economy and its "context of practice" (Alant & Bakare, 2021) being flagged as key factors for developing SSED. By "context of practice" we mean the context within which innovation is practiced. This construct pays particular attention to the infrastructure needed to implement the said innovation. The results to the SSED factors show that this context is the infrastructure needed to enhance the following three types of capitals: "manufactured," "human," and "financial" (Porritt, 2005). For the three sub-question, integrated intelligence is flagged for all three skill sets. For SLS, it is integrated intelligence driven by Team work, Problem solving, Self-awareness, and Motivational leadership. For PS, it is integrated intelligence driven by Empathy, and Management of Diversity and Conflict. For PRS, it is integrated intelligence driven by Problem solving, Team work as well as Job "career" planning skills. Employment level does not play a significant role in predicting these factors.

7.1.2 What were the reasons given for the identified factors?

In this section, we begin our presentation here with the reasons provided for the identified strategic leadership skills (SLS), followed by process skills (PS) and practical skills (PRS).

7.1.2.1 Strategic Leadership skills Reasons

As you would recall, within strategic leadership skills, three factors were identified, implying that three reasons were reported. Regarding the reasons in response to SLS Factor 1, "Leadership quality" stands out significantly with 40%, suggesting that strong leadership is considered paramount for driving development. The equal distribution of the remaining skills at 10% each indicates a balanced view that, while leadership is key, other skills such as "Collaboration", "Motivating ability", "Delegation", "Decision making", "Taking initiative", and "Communication skills" are also essential, albeit to a lesser extent. The reasons in response to SLS Factor 2 place an equal emphasis on "Creativity", "Leadership quality", and "Critical thinking", each at 33%. This requires a paradigm shift towards recognising the equal importance of innovative thinking and problem-solving skills alongside leadership for development. These skills remain at the heart of the automotive engineer's role. With the rapid pace of technological advancement, automotive engineers must think creatively to overcome design challenges, improve existing systems, and invent new solutions. It is said that the ability to approach problems with an innovative mindset and develop groundbreaking technologies will distinguish leaders in the field. Automotive Engineers who excel in creative thinking will drive the industry forward, delivering cutting-edge vehicles that meet the evolving demands of consumers and society.

Regarding SLS Factor 3, "Leadership quality" again receives the highest percentage at 43%, reinforcing the notion that leadership is central to development efforts. "Mentorship quality" follows at 29%, highlighting the role of guidance and knowledge transfer in building capacity. "Promptness" and "Collaboration" are seen as less critical but still necessary, each at 14%, indicating that timely action and cooperative efforts support the overarching goals of leadership and mentorship. Automotive Engineers often work in teams and must have strong project management skills to lead and collaborate effectively.

The above results, underscore the importance of leadership as a driving force for change. However, it is evident that for TVETs to initiate sustainable socio-economic

development, a multifaceted skill set that includes strong leadership, creativity, critical thinking, and effective mentorship is essential. These skills, combined with the ability to act promptly and collaborate effectively, form a robust foundation for fostering growth and adaptability in the TVETs evolving socio-economic landscape. Furthermore, in the dynamic field of automotive engineering, professionals must be equipped with a multifaceted skill set to excel in designing, developing, and manufacturing vehicles that are safe, efficient, and innovative.

7.1.2.2 Process Skills Reasons

Regarding process skills, two factors were identified, implying that two reasons were reported. The first set of reasons reflected under PS Factor 1 shows a balanced emphasis on affective knowledge and leadership quality, each constituting 18% of the factors. This indicates a recognition of the importance of emotional intelligence and leadership in the TVET context. Content knowledge and cognitive skill, both at 12%, underscore the need for a solid foundation of subject matter expertise and the ability to think critically. The lower percentages for being understanding, interactive ability, process skill, knowledge management, mentorship, 21st century skill, and emotional disposition, all at 6%, may suggest these are seen as supportive rather than primary competencies. However, their equal weighting also implies that no single one of these factors should be neglected, highlighting the need for a holistic approach to skill development.

PS Factor 2 reasons present an equal distribution between rational thinking ability and leadership quality, each at 50%. This suggests a paradigm where logical problem-solving and effective leadership are viewed as equally critical to the advancement of TVETs. The emphasis on rational thinking ability aligns with the cognitive skill highlighted in the first data set, reinforcing the value placed on intellectual capabilities.

What is significant about these results is the strong focus on leadership and affective knowledge, which may imply a shift towards recognising the role of emotional intelligence and leadership skills in driving change and innovation within TVETs. The equal importance given to rational thinking and leadership in the PS Factor 2 reasons further supports this trend.

7.1.2.3 Practical Skill Reasons

Regarding practical skills, two factors were identified, implying that two reasons were reported. PRS Factor 1 reasons emphasise a balanced distribution among various skills, with creativity and excellent time management skills being given a slightly higher importance at 15% each. This suggests a recognition of the need for innovative thinking and efficient use of time as drivers of change. The equal weighting of 8% for the remaining factors indicates a holistic approach to skill development, acknowledging that a conducive environment, effective communication, planning skills, adaptability (21st-century skills), dedication (ability to go the extra mile), and negotiation ability, along with soft skills, are all integral to the process. In the dynamic world of automotive engineering, possessing a robust skill set is the engine that drives career advancement. As vehicles become more sophisticated, with a growing emphasis on sustainability, safety, and technology integration, the role of an Automotive Engineer demands a diverse array of skills. Mastery in this field is not just about understanding the mechanics of automobiles but also about innovating for the future.

PRS Factor 2 reasons focus on broader attributes, assigning an equal value of 14% to each. This uniform distribution underscores the belief that effectiveness, soft skills, leadership quality, optimism, connectedness (making good deals), 21st-century skills, and efficiency are equally vital for the success of TVETs in promoting sustainable development. The emphasis on soft skills in both data sets highlights their perceived importance in the modern workforce, where interpersonal interactions and emotional intelligence are increasingly valued. These results show that empowering automotive innovation can be achieved through teamwork, adaptability, and a relentless pursuit of excellence in communication and leadership.

The prioritisation of creativity and time management, in the results above, could imply a need for a shift towards more dynamic and agile educational environments. The repeated emphasis on soft skills suggests a trend towards a more human-centric approach in education and work, valuing empathy, and communication. Leadership quality and optimism are also notable, hinting at a focus on visionary and positive leadership styles that could inspire change and resilience in the face of challenges. The automotive sector is subject to rapid technological advancements and regulatory changes. Automotive Engineers must be adaptable, willing to learn, and able to quickly assimilate latest information and techniques. Continuous learning is necessary to stay current with emerging trends, such as electrification, connectivity, and sustainable materials, which will shape the future of automotive design and manufacturing.

7.2 Summary of Phase II Results

The second phase of the study, explored the factors that are deemed necessary to promote SSED through TVET systems, with a group of purposively selected participants (n=9). Thee (3) categories, three themes (3) and seven (7) sub-themes were derived from the analysis.

The results of the study indicate that **Category 1: Understanding TVET goals to re-evaluate them** is paramount, as evidenced by the 100% emphasis on the main theme: ***Curriculum-Policy Alignment and Coherence.*** This suggests a unanimous agreement on the need for policies that align with the overarching goals of TVETs. *Sub-theme 1: Curriculum Design* also scores high at 89%, highlighting the importance of relevant and up-to-date curricula that meet the demands of the modern workforce. *Sub-themes 2 and 3; Skill Development & Re-engineering*, at 56%, and *Stakeholder Engagement*, at 33%, suggest a moderate but significant recognition of the need for continuous skill enhancement and active involvement of all stakeholders in the TVET system. These sub-themes are critical for ensuring that TVETs remain responsive to the changing needs of the economy and society.

The emergence of new technologies in the automotive engineering industry in Lagos, Nigeria, is a pivotal development with significant implications for TVET. The automotive sector's evolution, marked by advancements such as automation, electrification, and digitalization, necessitates a re-evaluation of TVET's objectives to ensure alignment with industry needs. Curriculum-Policy alignment and coherence is essential, with curriculum design and skills development needing to adapt to incorporate new automotive technologies. This adaptation ensures that TVET graduates possess the relevant competencies for the evolving job market, thereby enhancing their employability. Stakeholder engagement is critical in this process, involving industry partners in curriculum development to bridge the gap between education and practical application.

Category 2: Improving public perception and awareness of TVETs is another critical category, with the main theme: ***Provision of incentive/motivational packages*** marked at 56%. This indicates a strong belief in the need for innovative approaches to make TVETs more attractive and relevant. However, the lower percentages for *Sub-theme 1: Conscientising the public about the benefits and opportunities of TVET* (22%) and S*ub-theme 2: Attracting*

and retaining staff and students (33%) point to challenges in public engagement and institutional appeal, which could be areas for strategic focus.

Moreover, the public perception of TVET can be improved by highlighting the sector's technological advancements and the career opportunities they present. Incentives and motivational packages could play a role in attracting and retaining both staff and students, emphasising the value of TVET in building a skilled workforce for the future of automotive engineering.

Category 3: Robust Governance is identified as a necessary category for change, with the main theme: ***Innovative Leadership and Expertise***, scored 44%. This reflects the importance of strong and knowledgeable leadership in driving the TVET agenda forward. Sub-theme 1: *strictly, individuals with technical expertise should manage TVETs* also scored 44%. However, Sub-theme 2: adequate funding and infrastructure needed for TVET sustainability is at a concerning low of 22%, signaling a potential risk area that could undermine the effectiveness of governance and the implementation of necessary changes.

Governance within TVET institutions must also evolve, with a focus on innovative leadership and expertise. Managers of TVETs should not only possess technical expertise but also the foresight to anticipate industry trends and prepare students accordingly. The sustainability of TVETs hinges on adequate funding and infrastructure, which are necessary to support the integration of modern technologies into educational programmes.

The above results provide a clear recognition of the importance of curriculum-policy alignment and coherence, curriculum design, and innovative leadership in TVETs. However, it also highlights significant gaps in the perceptions of the participants of stakeholder engagement, public perception, and funding, which are crucial for the sustainability and success of TVETs in promoting socio-economic development. Addressing these gaps could be pivotal in enhancing the role of TVETs in Lagos as engines of growth and innovation in the economy.

7.3Discussion of Findings against Literature

In this section we try to make sense of the results from the two phases of the study by thrusting these results against the backdrop of the challenges faced by TVET systems in Nigeria. In our

pursuit to produce a model of an integrated TVET system based on the results, we provide a comprehensive analysis of the results looking at:

- *How aligning the vision of TVET with global trends, as advised in the literature, may cause tension or prove problematic when cast against the "context of practice"* (Alant & Bakare, 2021).
- *How the interplay between internal and external dynamics of TVET could support the envisaged changes for TVET to promote SSED.*
- *How our results compare to the UNESCO strategy 2022-2029?*
- *What sense do the Theoretical Framings used in the help us make of the phenomenon under study.*
- *What are the Theoretical and Practical Significance of the Study.*

7.3.1Discussion of Findings 1: The Problematic of Aligning the Vision of TVET with Global Trends

In order to make better sense of the results, it is imperative that we first take a quick look at what the participants deem as the problematic with the TVET system in Lagos and how these compare to the literature (see Chapter 2 section 2.3.1). This is presented in Figure 7.1

Fig 7.1: TVET Challenges as Drawn from the Participants' Experiences

It is important to highlight that the challenges identified from the semi-structured interviews in the qualitative part of the study corroborate the 11 challenges outlined in Chapter 2 (refer to sections 2.3.1.1 to 2.3.1.11), with one notable exception: the inadequate use of ICT (2.3.1.10). This unexpected observation will be revisited in Chapter 8, section 8.2, where we examine the unspoken aspects of or "silences in" the findings.

The identified challenges, in this study and the literature are arguerd to be the resultant of skills deficit in Lagos State.

Figure 7.1 illustrates, what we could consider as both the internal and external dynamics of these challenges. *Poor Management of TVETs*; *Quality Deficiency*; *Obsolete Instructional Facilities*; *Poor Staffing and Teacher Motivation* entail all the **internal dynamics factors**. These are factors that operate within TVET institutions, directly influencing teaching, learning, and overall effectiveness. However, the *Lack of Industry Linkages*; *Gender Inequality* and *Inadequate Funding* represent **external dynamics factors**. These are factors that operate beyond TVET institutions, connecting them to the broader socio-economic context.

It is significant to note that both phases of the study acknowledge the fragmented state of TVET systems in Nigeria. In addition, the notion of the role of TVET as a catalyst for SSED is also brought to the fore. In this regard, both phases of the study confirm that the sustainability and effectiveness of TVET systems hinge on several interrelated factors, hence the need for a holistic and multipronged strategy to "*initiating*, *enabling* and *delivering* ***change***" (Majumdar, 2009) that promote SSED through TVETs, as illustrated in Figure 7.2.

Fig. 7.2: Summary of Results from Phases I and II Foregrounding the Integrated Skills

Figure 7.2 highlights the key requirements for transforming TVET systems to support SSED. The study emphasises the need for the TVET systems, in Lagos, Nigeria, to align with global SSED goals to remain relevant and responsive. During the first phase of the study, this alignment is exemplified by "SSED Factor 1", which focuses on "innovative green growth". This is further evidenced by the significant factor loading of 0.916 for "innovation in Renewable Energy Sources (RES) to enhance food security," underscoring the critical role of sustainable agricultural practices in securing a consistent food supply. The second phase of the study reflects this alignment in its initial category: Understanding TVET goals in order to re-evaluate them. Here, the participants recognise the globalised nature of the current economy, indicating that the existing curriculum is not up-to-date with the advancements in the Automotive Engineering (AE) sector: "*the curriculum is not keeping pace with advancements in the [AE] field*." This leads to the conclusion that the skills imparted should prepare students to be effective in a globalised work environment: *the skills taught should enable students to perform effectively in a global context.*" Consequently, the study spotlights the significance of "***Integrated Intelligence***" skills, which are deemed crucial for meeting the complex demands of contemporary automotive sector workplaces that require *adaptability*,

teamwork, and *innovative thinking*. The automotive industry in Lagos is witnessing significant technological disruptions. It is operating in a dynamic and ever-changing environment. Factors such as technological advancements, market trends, and regulatory shifts impact the industry. TVETs offering Automotive engineering must stay informed about these changes and be ready to adapt their curriculum and approaches accordingly. This makes it essential for graduate automotive engineers from TVETs to be instilled with the ability to adapt to technological advancements, market shifts, and changing job roles (TealHQ, 2024).

Technical knowledge remains the cornerstone of automotive engineering, coupled with amongst others *Innovative Design and Engineering*; *Project Management and Teamwork*; *Adaptability* as well as 21st *skills,* and both phases of the study underscore this. Furthermore, the 10 skills listed as the ***top 10 Soft skills*** for Automotive Engineers in 2004 (TealHQ, 2024), as illustrated in Figure 7.3, are also covered in the two phases of this study. The dashed out soft skill, ***Continuous Learning and Knowledge Upgradation*** (TealHQ, 2024), is more pronounced in Phase II. These collective skills, also known as "***transferable skills***" remain relevant across different contexts. The study posits that by aligning TVET programmes with these specific skills, Lagos State TVET systems can better prepare its graduates for sustainable economic growth.

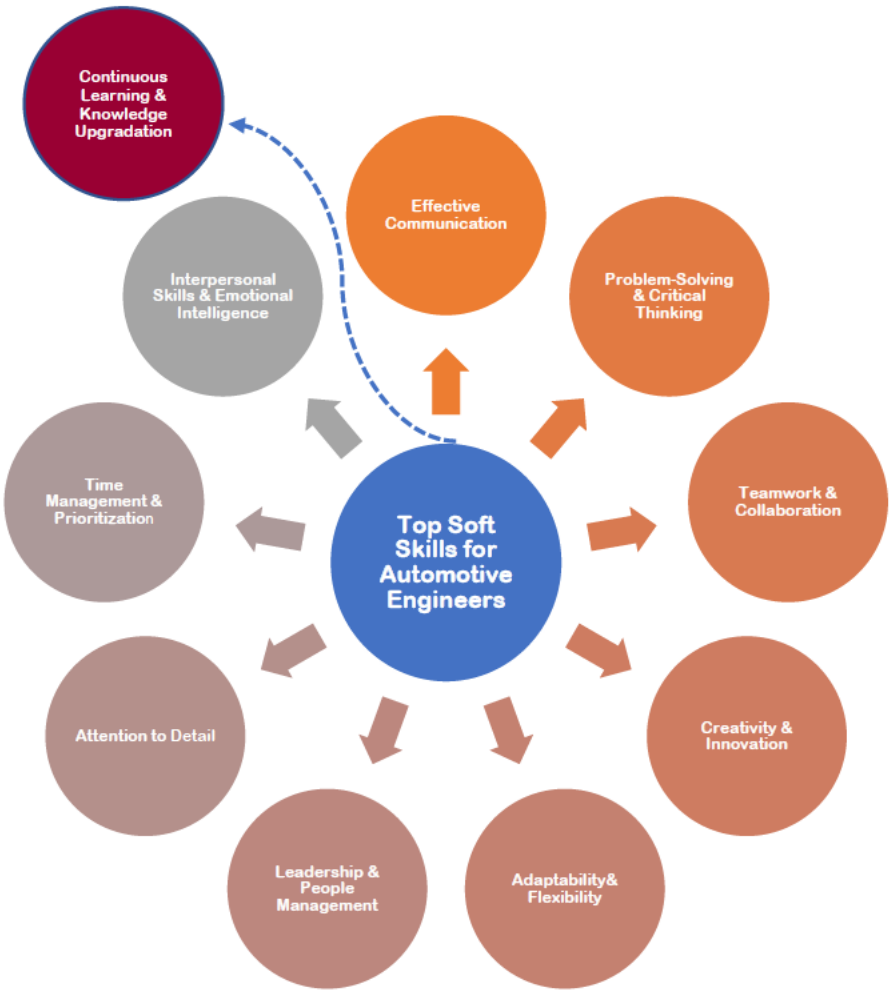

Fig. 7.3: Top Soft Skills for Automotive Engineers - 2024

Source: https://www.tealhq.com/career-paths/automotive-engineer

In this study, we have conceptualized the combination of all these skills as "***Integrated Intelligence*** (II)." Both Phase I and Phase II, foreground "***integrated intelligence***" as a pervasive skill that would be required to ***change the TVET system to gear it towards promoting SSED***. It is this integrated intelligence that drive the type of:

- ***Strategic Leadership Skills (SLS)*** *that* ***would initiate and promote SSED*** *through TVET systems;*
- ***Process Skills (PS)*** *that* ***would enable change in promoting SSED*** *through TVET systems? and*
- ***Practical Skills (PRS)*** *that* ***would enable the delivery of change*** *which seeks to promote SSED through TVET systems?*

Steve C (2022) identifies three elements of ***"Integrated Intelligence"***: ***IQ***, or classical intelligence; ***EQ***, or emotional intelligence; and ***SQ***, or social intelligence. These components, when synergized, define one's overall functional intelligence. However, the concept of

"***integrated intelligence,***" as evidenced by our research findings, extends beyond this triad. It includes transpersonal elements that go past conventional cognitive limits, incorporating creativity, wisdom, and emotional depth, as discussed by Anthony (2005, 2008). It represents a form of intelligence that is not confined to Gardner's (2012) multiple intelligences theory but is instead responsive to specific contexts such as poverty, underdevelopment, and youth unemployment. It is an intelligence that seeks to integrate a variety of components highly aligned to the practitioners' "context of practice" (Alant & Bakare, 2021). This intelligence is closely tied to the practitioner's environment and demands a reassessment of the skills and competencies valued in global TVET systems. It calls for our approach to intelligence within these ecosystems to be more holistic, valuing a balance of skills that are adaptable to the complexities of the 21st century. It is in this regard that this study advocates for a comprehensive view of intelligence that enables individuals to not only meet immediate challenges but also to proactively and sustainably shape their futures.

As revealed earlier (Fig. 7.1), Lagos State's TVET systems face distinct challenges. These challenges complicate the alignment with international standards, which is crucial yet difficult to achieve. The initial phase of the study emphasises the practitioners' dilemma in reconciling local and international approaches to SSED. In an increasingly interconnected world, the dichotomy between local and global perspectives shapes the trajectory of SSED. This straddle – balancing local realities with global trends – becomes particularly pronounced in the results of this study. The "context of practice" highlight that the reconciliation of local and global perspectives in TVET is not straight forward, but intricate and multifaceted.

This study reveals that while participants may aspire to integrate into the global network, their engagement with innovation and the green economy is predominantly influenced by local circumstances. Specifically, their engagement is informed by Nigeria's challenges with food security. Within the SSED Factors, Factor 1 includes a variable, SSED13, which aims to enhance food security through innovative renewable energy solutions, and it has demonstrated a significant impact with a factor loading of 0.916. This contrasts with SSED12, which focuses on advancing the green economy and has a lower factor loading of 0.682.

Furthermore, SSED Factor 2 foregrounds the importance of infrastructure, whether physical, human, or financial, as a critical element of socio-economic development. Among the associated variables, SSED3, which pertains to modern equipment and tools, shows the

strongest correlation with a factor loading of 0.928. These findings emphasise that a lack of fundamental infrastructure, which represents "the lack of context of implementation" reinforces a cycle of disadvantage. Therefore, in our discourse on SSED, addressing the tensions between local needs and global movements, it is crucial to adopt a balanced strategy. The results of the study show that such a strategy (i.e. grassroot strategy) should not only align with global trends but also catalyse a transformation that is meaningful within the local context, fostering progress that extends from local communities to the global arena.

7.3.2Discussion of Findings 2: The Interplay between Phase I and Phase II and their Symbiotic Relationship

In this section, we delve into a grassroots approach, as illustrated by the interplay between the outcomes of Phase I and Phase II. Figure 7.4 serves as a visual guide highlighting Phase I outcomes that concentrate on the *internal dynamics of change.* These outcomes underscore **three core attributes** that characterize the nature of the "transformation" necessary for fostering SSED within TVET systems. Conversely, Phase II focus on *the external dynamics of change*. The results foreground **three strategic moves** essential for transforming TVET systems into entities that are relevant, responsive, sustainable, and impactful.

The first core attribute, ***Fostering Adaptation*** denoted by SLS Factors 1 through 3, underscores the essential soft skills such as teamwork, problem-solving, self-awareness, and effective communication. Automotive Engineers often work in teams and as a result must have strong project management skills to lead and collaborate effectively. This includes planning, organising, and overseeing projects from conception to completion, while managing resources and timelines. Teamwork skills are also critical, as engineers must communicate effectively with colleagues from various disciplines, suppliers, and stakeholders to ensure project success (TealHQ, 2024). These skills are vital for individuals to navigate new challenges and workplace dynamics within the AE sector. They are particularly critical for TVET students poised to enter the Lagos AE's fluid job market that prizes adaptability. The second attribute, ***Being Transformational*** represented by PS Factors 1 and 2, builds on these core skills. It fosters empathy and identity, crucial for change management and appreciating diversity, thereby promoting a profound self and interpersonal understanding necessary for adeptly managing change, especially in varied work environments. Such understanding is instrumental

in cultivating leaders capable of steering teams through the transformative processes often integral to SSED initiatives.

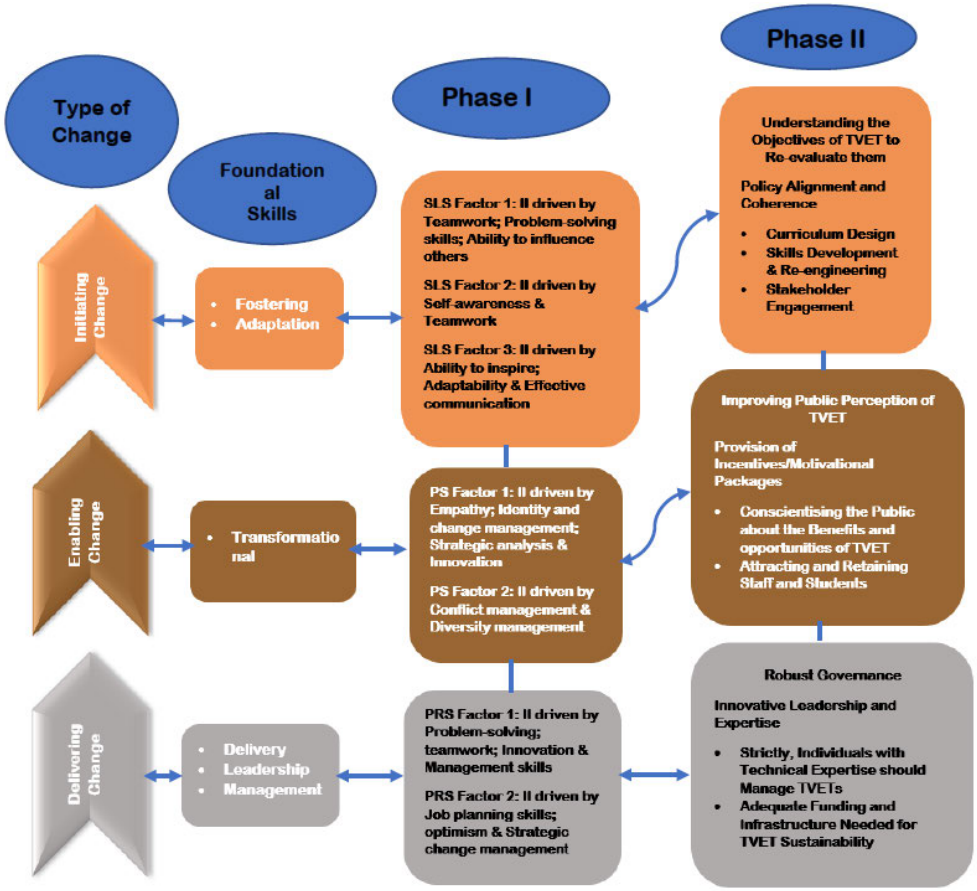

Fig 7.4: Summary of Findings - Phases I and II Highlighting the Type of Change Foregrounded

Lastly, the attribute of ***Leadership Management Delivery***, encapsulated by PRS Factors 1 and 2, augments the prior attributes by centering on strategic planning and innovation while refining problem-solving and teamwork skills. Creative problem-solving and innovation remain at the heart of the Automotive Engineer's role. With the rapid pace of technological advancements, engineers are forced to think creatively to overcome design challenges, improve existing systems, and invent novel solutions. The ability to approach problems with an innovative mindset and develop groundbreaking technologies will distinguish leaders in the field. Automotive Engineers who excel in creative thinking will drive the industry forward (TealHQ, 2024).

The integration of these three key attributes cultivates an extensive array of skills, empowering graduates of TVET to not just join the workforce, but to thrive and assume

leadership roles within their chosen professions. These elements exert a profound influence on TVET institutions, educators, and students alike, molding the the quality of education, student experiences, and institutional effectiveness. In this context, the optimisation of internal dynamics is recognised as pivotal in augmenting the quality of teaching and learning, as well as in elevating the general outcomes of TVET.

The results of Phase I indicate that a collaborative integration of Fostering Adaptation, Transformational, and Delivery Leadership Management within the curriculum is pivotal for equipping students of TVET with the necessary competencies to navigate the complexities of today's economy. Such an approach ensures that TVET institutions in Lagos, Nigeria, are not merely producing proficient technicians but are also nurturing versatile, innovative individual who can propel SSED. This comprehensive approach is vital for the enduring growth of Lagos' Automotive Engineering economy, especially given the swift pace of technological innovation and societal changes.

Conversely, Phase II redirects attention to external dynamics, which encompasses three strategic moves: ***Understanding TVET objectives to re-evaluate them*** (Phase II: Category 1), ***Improving public perception of TVETs*** (Phase II: Category 2), and ensuring ***robust governance*** (Phase II: Category 3). The first move involves the alignment of educational policies and curricula with market-relevant skills, reflecting the internal cultivation of adaptability and innovation (as indicated by SLS, PS, and PRS Factors). The second move, improving public perception, builds upon a solid internal base by effectively communicating the benefits and opportunities that TVETs offer, necessitating the empathetic and identity-driven approaches integral to transformational strategies (referenced in Phase 1: PS Factors 1-2). The third move, robust governance, calls for visionary leadership and specialised knowledge, mirroring the leadership attributes outlined in delivery leadership management (Phase I: PRS 1-2). These external factors are pivotal as they shape the way TVETs are viewed and endorsed by the wider community and stakeholders, connecting TVETs to broader societal ambitions, economic imperatives, and workforce demands. They sway funding, policy-making, and partnerships with external entities. When these external dynamics are managed effectively, they bolster the pertinence, viability, and influence of TVETs.

The interplay between these two phases suggests that for TVETs to be sustainable, there must be a continuous loop of ***internal development*** and ***external engagement***. The

analysis thus points to a **symbiotic relationship** where internal capabilities empower external outcomes, and these external validations, in turn, reinforce the internal strengths of TVETs. In other words, the internal qualities of adaptability, strategic transformation (innovation), and leadership management must translate into external actions that align with policy, improve public perception, and ensure governance is equipped to support these changes.

We could conclude this section by arguing that the results from both phases show that a holistic approach is crucial to ensure that TVETs not only adapt to immediate needs of the "context of practice" but also simultaneously proactively shape their future in a sustainable manner.

7.3.3Discussion of Findings 3: Declaring the Study's Holistic Approach and Thrusting it against the UNESCO strategy 2022-2029?

Based on the conclusion of the previous section, in this section we solidify the argument that a holistic approach that combines internal and external dynamics of change can promote SSED through TVETs. To do this, we go back to the problematic this study seeks to address; namely, TVET fragmentation in Lagos State. We thus explore how do the results of the study shed some light on how we could create robust and effective integrated TVET systems in Lagos State, Nigeria.

In the literature, the greatest concern about TVET fragmentation, beyond, a lack of a cohesive national policy framework, is the mismatch between skills acquired and labour market demands, limiting graduates' employability (World Bank, ILO, & UNESCO, 2023). And in Nigeria, multiple studies attest to the skills deficit having significantly contributed to the fragmentation of its TVET systems (Egunsola & Kumazhege 2023; Igberaharha, 2021; Okoli et al., 2021; Onwussa, 2021; Osidiphe, 2017). To remedy this, a holistic strategy involving policy overhaul, increased investment, an enhanced reputation for TVET, and better stakeholder cooperation is regarded as essential (Egunsola & Kumazhege 2023; Okoli et al., 2021; Nwakile, 2020). Even proposals have been made for a national board, beyond NABTEB, to oversee TVET policy implementation across Nigeria's six geopolitical zones, emphasising TVET's role in fostering economic growth and tackling socio-economic challenges. Onwusa (2021) confirms TVET's crucial role in Nigeria's economic growth. He advises that Nigeria should adopt proven quality assurance practices from developed nations to enhance TVET. Additionally, Onwusa (2021) calls for substantial government investment and strategic

management of TVET in technical schools. He also highlights the importance of aligning training with industry standards, mirroring successful models like Germany's dual system, echoing the sentiments of the participants in this study "*P9: Let us adopt the system of the German where they do dual system and the company has higher percent involvement, in technical education because they know the importance of technical education in their country.*" These steps aim to consolidate Nigeria's fragmented TVET system and boost its role in economic advancement. The Nigerian government has acknowledged the critical role of TVET in national development and has evolved many policies aimed at reforming TVET to address socio-economic challenges (see for example, Federal Republic of Nigeria, FRN, 2004, section 7, 52 pp. 35; FME, 2012, pp. 54; FME, 2009, pp. 14). However, the outcomes have fallen far behind expectations (Okorafor & Nnajiofor, 2017).

It is against this background that we present our integrated approach to fragmentated TVET systems. As drawn from the literature and the results of this study, the core challenges around TVET fragmentation are related to these four key issues: *skills development deficit*; *unemployment*; *poor perception of TVETs* by the public and *poor governance* (Egunsola & Kumazhege 2023; Okorafor & Nnajiofo, 2017; Nnajiofor, 2017).

Figure 7.5 illustrates a conceptual framework that merges the Internal and Externa dynamics. It shows that by integrating both internal and external dynamics, TVET can become a transformative force that not only equips individuals with the necessary skills but also aligns with the broader socio-economic objectives. The connections among the different elements in the diagram represent the interactions and relationships between the various components. Elements with more connections play a more central role and have a greater influence on the system. However, elements with fewer connections imply that they are in need of strengthening for TVET to deliver on the goals written in the middle. These goals represent the "context of practice."

In this regard internally, TVET systems in Lagos will have to prioritise adaptation, allowing curricula and teaching methods to evolve with Automotive Engineering technological advancements and labour market demands. As highlighted earlier, transformational skills and practices within TVET can empower learners, enabling them to become innovators in their fields. Leadership management delivery is crucial, as it ensures that TVET institutions are guided by visionary leaders who can implement effective strategies and inspire both educators and students.

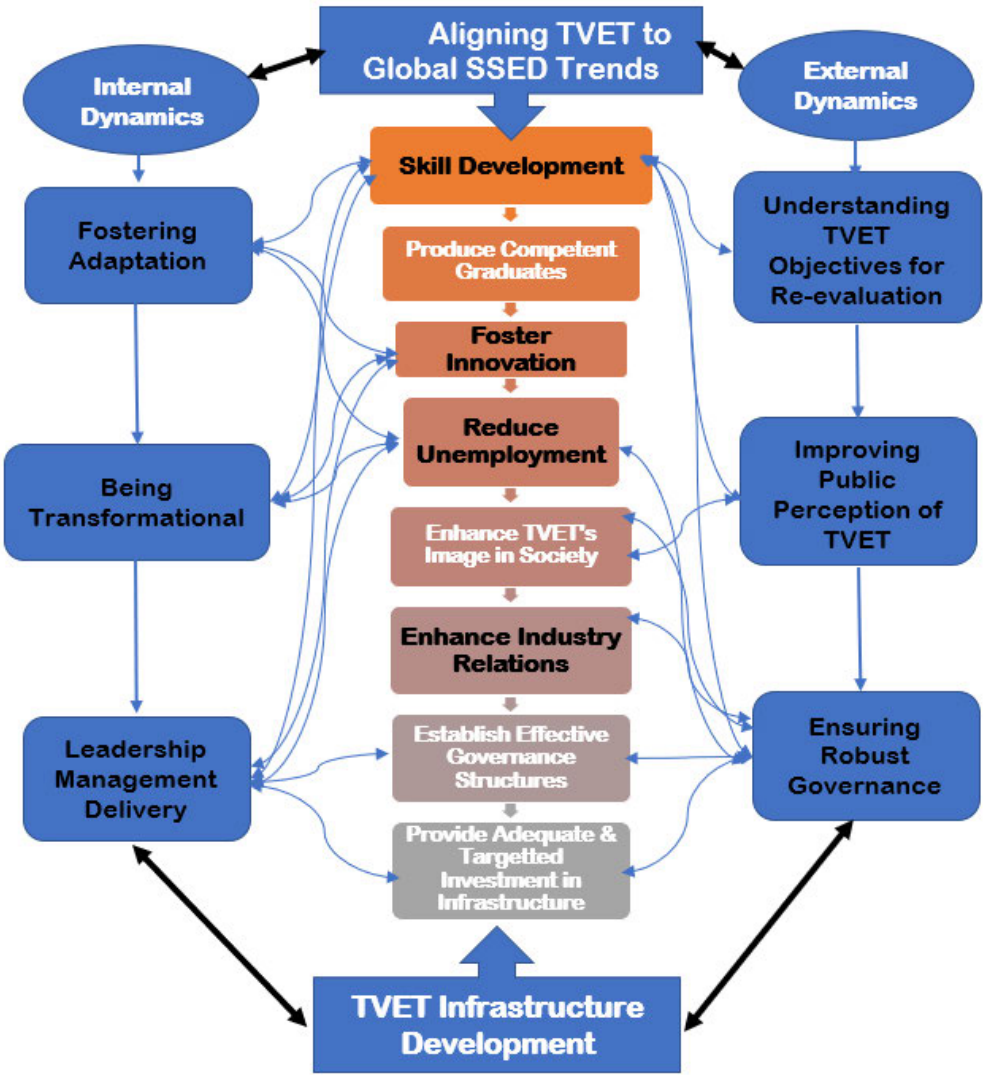

Fig. 7.5: Proposed Integrated Approach to Fragmentated TVET systems

Externally, Figure 7.5 shows that understanding the objectives of TVET is essential for aligning its goals with national development plans. Improving the public perception of TVET can lead to a greater appreciation of vocational education as a viable and respectable pathway to employment. Robust governance structures are necessary to provide accountability,

transparency, and responsiveness, which are all key to the successful implementation of TVET programmes.

When compared to other approaches or strategies out there in tackling TVET fragmentation, our model or approach appears to be in synch with, for example, the UNESCO's TVET strategy for 2022-2029 and the International Institute for Educational Planning (IIEP-UNESCO, 2023) strategy between 2022 and 2030. The UNESCO's TVET strategy for 2022-2029, titled "Transforming Technical and Vocational Education and Training for Successful and Just Transitions," builds on the TVET strategy adopted in 2015: UNESCO Strategy for TVET 2016–2021, which focused on three priority areas, including fostering youth employment and entrepreneurship; promoting equity and gender equality; and facilitating the transition to green economies and sustainable societies. The UNESCO's TVET strategy for 2022-2029 aims to address the critical role of TVET in the recovery and transformation of education systems and labour markets worldwide after the COVID-19 pandemic. The strategy emphasises recovery, transition, and transformation in the post-COVID-19 era. It seeks to reshape TVET for equitable and sustainable transitions. It champions skill-building for empowerment, gainful employment, and fair labour, while supporting shifts towards digital, eco-friendly, and inclusive economies and societies. The strategy prioritises youth job creation and entrepreneurship, equality and gender parity, and the move towards green economies and sustainable communities. These priorities align with the eight critical TVET issues in Africa as identified by IIEP-UNESCO (2023), which are founded on three pillars: ***TVET access***, ***employability***, and ***quality***, as illustrated in Figure 7.6. By concentrating on these elements, the aim is to cultivate a workforce skilled in adapting to the changing global economic environment.

As illustrated by Figure 7.5, central to the TVET system is **skill development**, which directly contributes to **reducing unemployment** by equipping learners with a skill set that prepares them not just for the jobs of today, but for the challenges of tomorrow, ensuring that they are capable of contributing to the economy and society in meaningful ways. In this regard, s**kill development acts as a catalyst for innovation** within TVET, enabling learners to adapt, create, and contribute to a rapidly changing world.

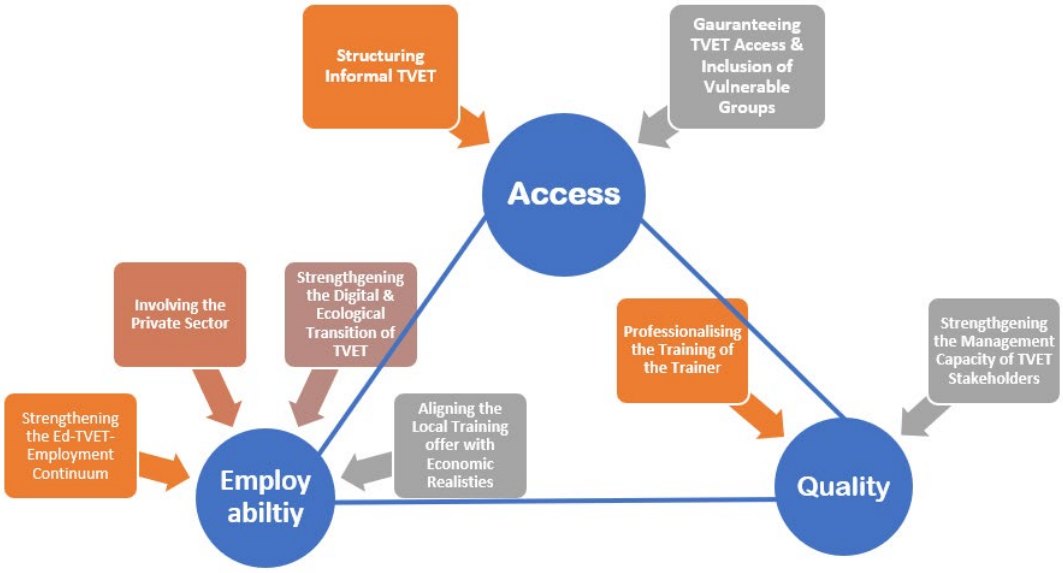

Fig. 7.6 Eight Key Issues for TVET in Africa between 2022 and 2029

Furthermore, Figure 7.5 shows that **enhancing TVET's role in society** involves ***establishing effective leadership*** in TVET institutions, ***providing adequate and targeted investment in infrastructure***, and ***strengthening partnerships*** with industries. These actions ensure that TVET institutions are well-equipped, well-funded, and connected to the labour market, thereby enhancing their relevance and impact. In this way, our approach ensures that TVET systems are responsive, relevant, and resilient, capable of adapting to changing socio-economic landscapes and empowering individuals to achieve their full potential while contributing to the broader goals of sustainable development – addressing the challenges posed by the "context of practice."

7.3.4Discussion of Findings 4: Thrusting the Results against the Theoretical Framings of the Study

As argued in Chapter 3, the use of the ***Integarted Intelligence model***, ***Five Capitals*** framework and the ***Quintuple helix model*** in the study provided a more holistic and integrated approach to understanding the "change" factors that promote SSED through TVETs.

Anthony's (2005) perspective on the importance of combining cognitive abilities with emotional and spiritual intelligence is particularly relevant in this context. The integration of these intelligences can foster a more holistic approach to education and training, enabling

individuals to better navigate the complexities of the job market and societal expectations. It suggests a paradigm shift from traditional education systems to one that encompasses a broader range of human capacities, which is essential for personal and professional success in today's rapidly changing world.

Although, the study initially focused on the Triple Helix Model, which emphasises collaboration among three key actors: academia, industry, and government (Etzkowitz & Leydesdorf, 2009; 2000), the use of Porritt's Five Capitals necessitated the consideration of the fourth (Quadruple Helix: Carayannis & Campbell, 2009) and fifth (Quintuple Helix: Carayannis & Campbell, 2010, 2013) helices in the analysis. Both these helices bring onto the table the dimensions of the public or civil society and the natural environments of society, respectively. The Quintuple Helix, was of particular interest because it addresses the socio-ecological transition of society and economy in the twenty-first century, bringing an ecologically sensitive perspective to the discussion of innovation and knowledge production (Cia & Lattu, 2021, p. 258).

The Quintuple Helix (Carayannis & Campbell, 2010, 2013) emphasises the role of the public and the environment, alongside traditional stakeholders like universities, industries, and government, in driving innovation. By applying this model, the study could identify key stakeholders and their roles, understand the dynamics between them, and think of ways to enhance their collaboration. The participants emphasised the public-private partnerships (PPP) more than the academia-government partnerships because of the historical lack of delivery by the entrusted government structures. A suggestion was made that the chambers of commerce replace the current NBTE in Nigeria. The participants saw the PPP as providing a better avenue in which the TVETs can benefit from shared resources, knowledge, and expertise. Industry based training for both the students and the educators was highly priced. Furthermore, being aware of the current limitations of TVETs in terms of research and innovation, these partnerships were seen to offer the potential that would lead to advancements in research, innovation, and workforce development. By using Porritt's (2005) five capitals framework, the study could identify the dire state of TVET systems in Lagos in term of funding and resource provision. It is in this regard that TVET infrastructure development is at the bottom of our proposed integrated approach and SSED at the apex. Infrastructure development is a key area that connects to all other elements represented as the foundation of the proposed integrated approach. By investing in infrastructure development, TVET programmes can

provide a high-quality, relevant, and responsive education that equips students with the skills they need to succeed in the workforce. This, in turn, contributes to SSED.

In the previous section, we alluded to the fact that addressing the fragmentation of the TVET system requires a concerted effort from governments, educational institutions, and industry stakeholders to create an integrated approach that aligns with market demands and fosters sustainable development. Figure 7.7 shows how the application of the Quintuple helix model and Porritt's five captitals framework could contribute to addressing the fragmentation in TVETs by promoting a more integrated, resource-optimised, and development-oriented approach to TVET systems in Lagos, Nigeria. As pointed out in the previous section, the links between various elements in Figure 7.7 illustrate how they interact and relate to one another. Those elements with numerous links are more pivotal and exert more influence within the system. Conversely, elements with sparse links suggest areas that require fortification to enhance TVET's effectiveness in achieving its central objectives, which are outlined as the "context of practice" as represented by the middle section of the figure.

The Quintuple helix model's inclusive approach ensures that all stakeholders are considered in the development process (Carayannis & Rakhmatulli, 2014). Furthermore, the model fosters innovation by encouraging interaction and cooperation among the five helices (Carayannis et al., 2021). This ultimately leads to improved skills development, reduced unemployment, and enhanced socio-economic development.

As illustrated by Figure 7.7, skill development ensures that individuals acquire the necessary competencies to thrive in a dynamic and ever-evolving environment. By incorporating emerging technologies and 21st-century skills (such as critical thinking, problem-solving, creativity, adaptability, and digital skills), TVET programmes remain relevant and responsive to industry and societal demands (Zakharoff, 2023). As argued earlier skill development programmes that ***nurture critical thinking and creativity*** contribute directly to an environment conducive to innovation (UNESCO, 2020). By enhancing collaboration with industry and integrating industry feedback into curricula, TVET institutions ***enhance their graduates' employability*** and ***contribute to industry-driven innovation*** (UNESCO, 2020).

Porritt's Five Capitals Model complements the Quintuple Helixd Model by categorising sustainable development into five distinct but interconnected capitals: natural, human, social, manufactured, and financial. This holistic approach ensures that TVET systems

not only equip individuals with the skills necessary for economic growth but also promote environmental stewardship and social well-being. By integrating these models, stakeholders in Lagos can identify key areas for policy intervention and investment, ensuring that TVET systems contribute effectively to the region's sustainable development goals. In this regard, Porritt's Five Capitals model provides a comprehensive view of the resources necessary for promoting sustainable development. It allowed our analysis to considers not only human capital but also other critical forms of capital such as natural, social, manufactured, and financial.

In conclusion, Figure 7.7 provides a conceptual model that integrates the Quintuple Helix Model and Porritt's Five Capitals within the context of TVET systems. This model emphasises the interplay of Quintuple Helix model's five different helices (on the left) with Porritt's Five Capitals (on the right). It shows that it is at the juncture of these two models that the elements shaping the "context of practice" (central section) arise and are established. Within this framework, ***skill development*** through TVET becomes a ***powerful driver of innovation***. It prepares graduates not just for the jobs of today, but for the challenges of tomorrow, ensuring that they are capable of contributing to the economy and society in meaningful ways. As such, continuous investment in TVET, along with robust governance, a focus on the quality and relevance of the skills being taught, is essential for nurturing the next generation of innovators and entrepreneurs.

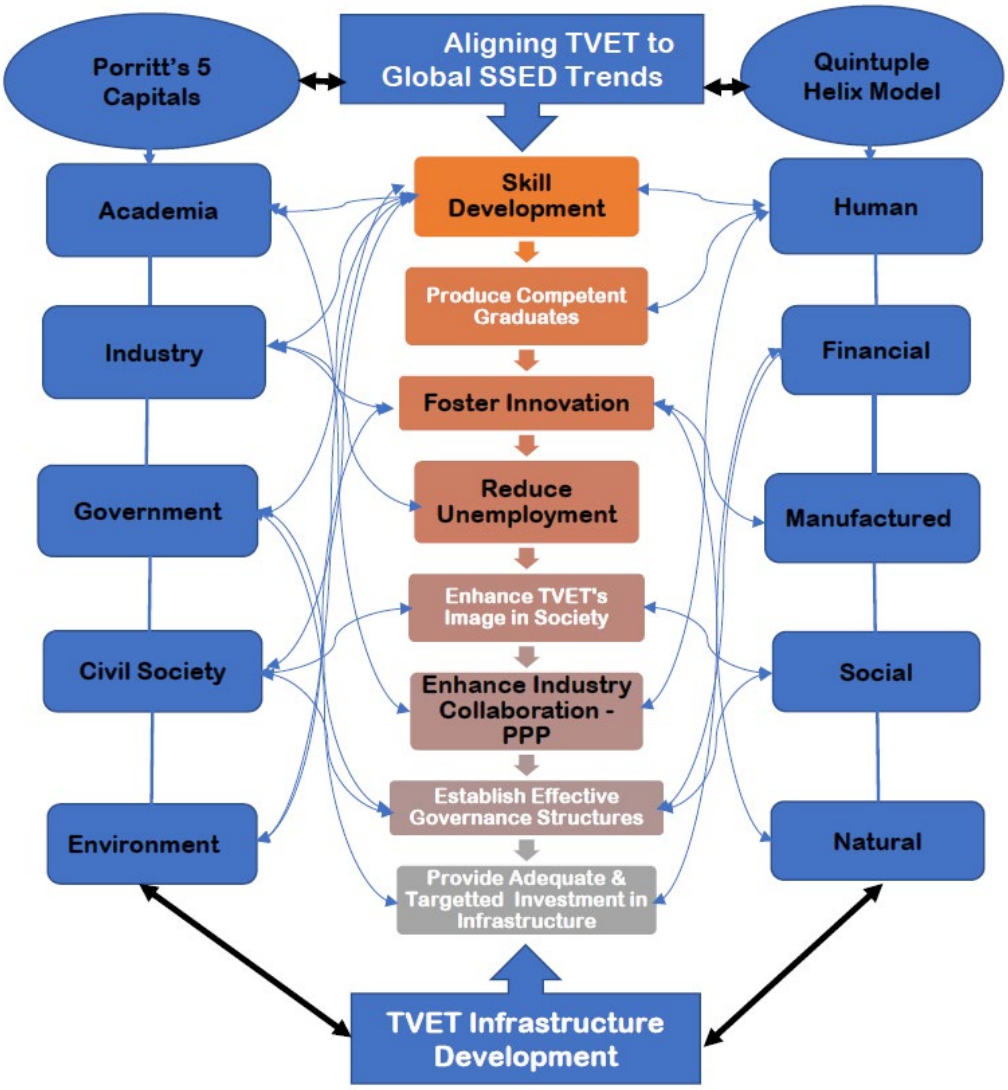

Fig. 7.7: The Application of Porritt's 5 Capitals and the Quintuple helix model

7.3.5Discussion of Findings 5: Practical Significance of the Study

"***Core technical and engineering skills***" and "***transformative leadership skill***" remain the cornerstone of automotive engineering (Mercer, 2024; TealHQ, 2024). The findings of this study, Phase II in particular, confirm that the TVET system in Lagos, Nigeria faces a multifaceted skills deficit, rooted in both structural and perceptual issues (UNESCO, 2019). The mismatch between the skills demanded by employers and those supplied by the TVET system is a critical concern, as it leads to a workforce ill-prepared for the current labour market demands. This gap not only hinders individual career progression but also impacts national productivity and economic growth. The prevalence of a largely low skills economy, extreme poverty rates (40.3%) (Guera, 2024), and youth unemployment (15-24 years in Q2 2023 was

7.2% having been at 6.9% in Q1 2023) (Nigeria Bureau of Statistics, 2023) in Lagos exacerbates this issue.

The automotive engineering sector in Lagos, Nigeria, is fortunately characterized by a combination of both low and high skill sets, which opens up an avenue for the sector to innovate and grow. This implies that the sector can simultaneously involve traditional aspects of vehicle manufacturing and maintenance, while at the same time shift towards more advanced areas of automotive engineering – opening the space up for progression and participation by TVET and University graduates.

Actors driving this shift, include amongst others, the Nigerian government's 10-year National Automotive Industry Development Plan (NAIDP - 2023), which aims to transform Nigeria into a full-fledged vehicle manufacturer by 2033 (Aliyu, 2023). The NAIDP is a policy framework designed to foster the growth of the automotive industry in Nigeria. Furthermore, it is the National Automotive Design and Development Council (NADDC) which is actively promoting the development of the automotive industry in Nigeria (NADDC, 2023). They are focusing on areas such as the development of electric vehicles and the establishment of auto-test centers to provide technical support services to the automotive sub-sector. Furthermore, there's an emphasis on automotive safety, energy efficiency, environmental protection, vehicle structural design, vehicle dynamics, and electronic control (Kuforiji, 2020). These areas require a high level of technical knowledge and skills, indicating a high-skilled aspect of the sector. Mastery in this field is not just about understanding the mechanics of automobiles but also about "***innovating for the future"*** (TealHQ, 2024).

So, what does "***innovating for the future"*** mean for TVET systems trying to align with SSED goals within the context of Lagos' underdevelopment, high rates of poverty and youth unemployment mean?

Several studies show that the changes underway within the automotive sector are primarily induced by technological innovations (Mercer, 2024). Novel combinations of artificial intelligence and related autonomous technologies, the Internet of Things (IoT)/Internet of Robotic Things (IoRT) and edge computing are going to dramatically transform automotive manufacturing as well as the capabilities of the vehicles they produce (Mercer, 2024).

Innovating for the future within the automotive industry within Lagos' context of high rates of poverty, youth unemployment, and underdevelopment implies leveraging

technology and local resources to create sustainable solutions that can stimulate economic growth and job creation. For the TVET system in Lagos, this implies an approach that not only introduces technological advancements but also ensures inclusivity and accessibility. Sustainable growth in this sector must, therefore, be envisioned through the lens of social impact, with a focus on creating job opportunities and fostering skill development among the youth. Within the context of this study this implies responding to the "***context of practice,***" as illustrated in the approach proposed in Figure 7.7. At the interface of the Quintuple helix model and Porrit's five capitals ***skill development through TVET becomes a powerful driver of innovation***. This means that TVET systems themselves become transformative forces that not only equip individuals with the necessary skills but also align with the broader socio-economic objectives. It means TVET systems prepare graduates not just for the jobs of today, but for the challenges of tomorrow, ensuring that they are capable of contributing to the economy and society in meaningful ways. These necessary skills, our study shows, are "***core technical and engineering skills***" and "***transformative leadership skills***." The core technical and engineering skills are needed to innovate, design, and deliver new technologies whilst the transformative leadership skills are pivotal in creating an environment that breeds innovation and attracts technical, engineering, and other scarce talent (Mercer, 2024).

The study argues that this is the closest way in which, we can come to achieve what McGrath and Akoojee (2009) call "sustainable political, social, and economic development". McGrath and Akoojee (2009) recognise that national development challenges are complex and cannot be resolved through skills development alone. However, the findings of this study emphasise that the importance of TVET should not be overlooked. By integrating TVET into a comprehensive development framework, its potential impact could be significantly amplified. The literature reviewed in this study shows that a skilled workforce is essential for the adoption of new technologies and innovations, which can lead to increased productivity and economic growth. This is the concept illustrated by Figure 7.7, which posits that addressing skill development through the production of capable, innovative graduates; mitigating unemployment by tailoring TVET to meet the demands of the industry; improving public perception; and creating robust governance frameworks, are all essential for the sustainability of TVET programs in Lagos, Nigeria.

7.4Conclusion

This chapter had four objectives. First to present the summary of the results of the first and second phases of the study. Second, to discuss the overall results of the study, herein we looked at the main trends, patterns and connections that have emerged from the results of this study. Furthermore, we looked at how the results of this study relate to other previous research, exploring both the theoretical and practical consequences of our results. The chapter foregrounded two interrelated concepts: "***the context of practice***" and "***innovating for the future***" as the closest way in which, we could come to achieve what McGrath and Akoojee (2009) call "sustainable political, social, and economic development."

This discussion chapter showed that the journey towards sustainable socio-economic development in Lagos State through TVET is a multifaceted endeavour that necessitates a harmonious blend of internal and external dynamics. The holistic development of skills is paramount, requiring a curriculum that transcends technical prowess to include core, transferable, and transformational competencies. Such an inclusive approach ensures that graduates are not only job-ready but also equipped with the adaptability and resilience needed in a rapidly evolving global landscape. The integration of diverse skills into TVET programmes speaks to the strategic necessity for TVET institutions, employers, and policymakers to move from a fragmented system to one that is cohesive and comprehensive. This shift is critical in fostering a workforce that is not only technically proficient but also innovative, creative, and capable of driving progress and prosperity in the 21st century. Stakeholders across the spectrum must unite in their efforts, recognising that their collaborative engagement is the cornerstone of cultivating a robust and dynamic workforce.

Moreover, the emphasis on employability and societal contribution underscores the dual objective of TVETs: to enhance individual career prospects and to empower graduates to become valuable contributors to society. In essence, the skills imparted through TVETs in Lagos should not only fuel economic growth but also promote social cohesion and environmental stewardship, thereby charting a course towards a sustainable future for all. As Lagos continues to navigate the complexities of socio-economic development, the role of TVETs in equipping individuals with a comprehensive skill set becomes increasingly significant, ensuring that every learner can thrive in the face of change and contribute meaningfully to the collective well-being of the Lagos community.

As we conclude our work, in the next chapter, the conclusion chapter, we look at the implications of the results of this study for the automotive industry in Lagos, Nigeria.

CHAPTER 8

THE CONCLUSION

> To contribute to the achievement of the 2063 African Agenda for inclusive growth and sustainable development, modernizing and strengthening TVET in Africa is an imperative (*Foreword* – Reddy & Doroba, 2023, p. 5).

8.0 Introduction

This mixed method study was concerned with determining ways in which we can shift the Nigerian TVET system from a "fragmented" system to an "integrated" one. Thus, in addressing the question of how do we to shift TVET systems in Lagos State, Nigeria from a fragmented state to "an integrated TVET system"; a "re-imagined TVET system" or "transformed TVET system," the study foregrounded not only the importance of understanding the interface amongst economic, human and sustainable development (McGarth et al., 2020), but also the "context of practice" (Alant & Bakare, 2021) or implementation. This is because the effectiveness of TVET systems in addressing high rates of poverty, underdevelopment, and unemployment hinges on their alignment with the specific socio-economic realities of the Lagos State. A TVET system that is well-integrated and responsive to the local context can better equip individuals with the skills needed for the current job market, fostering entrepreneurship and innovation that drive economic growth. Moreover, a re-imagined TVET system that considers the context of practice can lead to more effective policy-making and implementation, ensuring that the intended outcomes of such policies are realized. This is especially pertinent in African contexts where there is often a gap between policy design and its practical application, as highlighted by Allais (2023). In Lagos, where the challenges of poverty and unemployment are acute, a transformed TVET system could play a pivotal role in equipping the youth with relevant skills, thereby enhancing their employability and ability to contribute to the economy and society.

Thus, the broad research question this study sought to address was: ***What would be required to transform the TVET system to gear it towards promoting SSED***? This broad question was then translated into the following three sub-questions:

- What SLS would initiate and promote SSED through TVET systems?
- What PS would enable change in promoting SSED through TVET systems?
- What PRS would enable the delivery of change which seeks to promote SSED through TVET systems?

This mixed method study explored how SSED can be promoted through the TVET system, focusing in particular on TVET's potential in the promotion of sustainable economies and societies. As discussed in the previous chapters, this study is concerned with determining ways in which we can shift the Nigerian TVET system from a "fragmented" system to an "integrated" one. In this regard, it is concerned about change. It sought to address the broad question: What would be required to transform the TVET system to gear it towards promoting SSED? This broad question was then translated into the following three sub-questions:

- What SLSs ***would initiate and promote SSED*** through TVET systems?
- What PSs ***would enable change in promoting SSED*** through TVET systems?
- What PRSs ***would enable the delivery of change*** which seeks to promote SSED through TVET systems?

The study argues that not only do we need to go "beyond crude technical approaches to what skills appear to be needed at the surface level, and to consider what knowledge, as well as skills, [are] required for transformative VET" (McGarth et al., 2020, pp. 473-474), but to simultaneously engage critically with what it means to strive for sustainable development within the context of poverty, unemployment and underdevelopment as represented by Lagos State , Nigeria and Africa as a whole. It is in this regard that the study employed the Integrated Intelligance model, Quintuple helix model and Porritt's Five Capitals, as a comprehensive framework to study these "***change factors***" that could promote SSED through the TVET systems. Anthony's (2005) integrated inteeligence theory offers a comprehensive framework for understanding intelligence and in the context of this study: the diverse set of skills necessary for SSED. It emphasises the importance of harmonising intellectual-rational, emotional, and spiritual intelligences, which can foster a more holistic approach to education and training. The quintuple model's emphasis on socio-ecological interactions and Porritt's focus on maintaining and enhancing capital assets for sustainability provided a lens through which we could explore these "***change factors***" that aligned with both sustainable economic practices and the broader societal and environmental context.

The chapter is divided into 3 sections. First, we present the results of the study, in a very succinct way. Second, we discuss the limitations of the study. Third, in making suggestions for future research, this section discusses new research questions that emerge as a result of the findings of this study. And, lastly, we provide some concluding remarks about the potential impact of integrating TVET systems in Lagos State into a comprehensive development framework.

8.1 Summary of Results

The "***High Gear Quarterly Skills Survey***," conducted by the National Association of Automotive Component and Allied Manufacturers (NAACAM) to identify existing and potential future skills gaps in the automotive component sector highlight the following key findings:

- More than 70% of respondents reported that their organizations face a skills gap within the artisan, skilled, and leadership occupation categories.
    - The most pressing current and potential future skills gaps identified were digital skills, complex problem-solving skills, and technical skills.
    - The main reasons given for these skills gaps were that candidates do not have the right experience (64.44% of companies surveyed stated this), new technology entering the industry (55.56% of respondents agreed), and qualifications are not aligned with the industry (48.89% of respondents agreed) (Lasiende & Kanakan, 2017).

The survey results underscore the importance of aligning education and training with industry needs, particularly in rapidly evolving sectors like automotive. It also emphasises the need for continuous skills development and training to keep up with technological advancements and industry demands. There have been similar surveys conducted in Nigeria to understand the skills gap in various sectors, including the automotive sector. For instance, the National Automotive Design and Development Council (NADDC) conducted a nationwide skill gap survey of mechanics in 2010. The survey was conducted to ascertain the difference ***between available know-how*** and the ***requirements for modern automobile maintenance*** in Nigeria

due to perceived skill deficiencies of Nigerian auto mechanics. The survey revealed several skill deficiencies among Nigerian auto mechanics, including:

- Lack of understanding of the electrical and electronics (mechatronics) systems in modern cars.
- Lack of standard method of fault-finding (step-by-step); instead, trial and error is the most used.
- Improper tools, equipment, and materials handling.
- Little or no experience in workshop management and organization.
- Lack of environmental consciousness.
- Non-adherence to safety standards while performing certain given tasks (NADDC, 2010).

The skills gap in Nigeria's automotive sector (see Figure 8.1) is regarded by many scholars and industrialists alike as a significant challenge. This gap is perceived to be due to a variety of factors, however, the three factors are said to boil down to: a lack of technical training programmes, inadequate infrastructure for skills development, and a disconnect between the education system and industry needs.

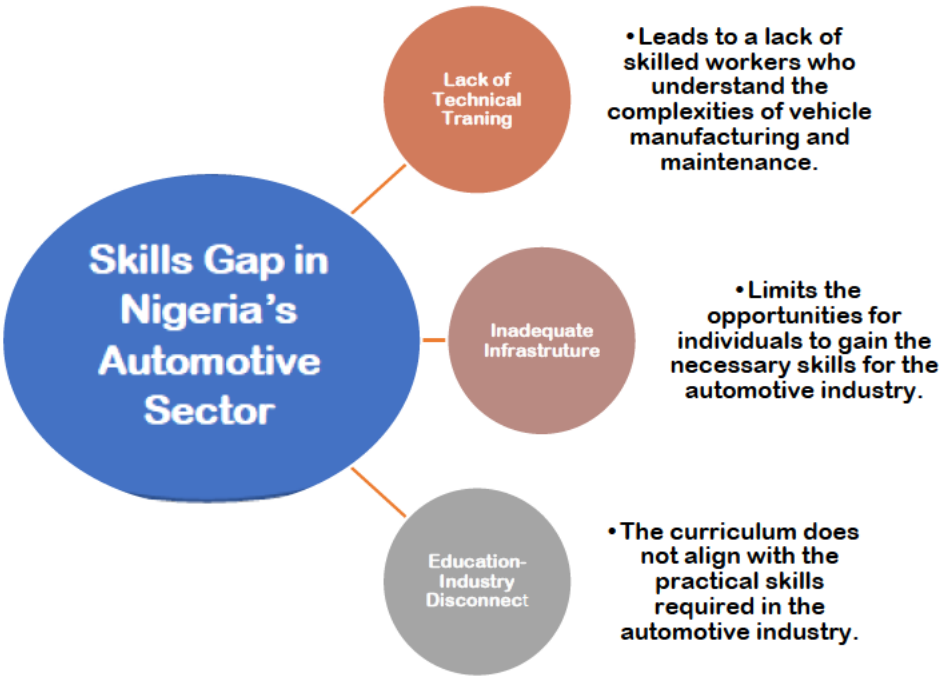

Figure 8.1: Skills Gap in Nigeria's Automotive Industry

Although the automotive sector has witnessed significant improvement in terms of innovation within the past decade, skills development in the automotive sector still remain a challenge.

Notably, material, skills and process improvement have taken the center stage, with availability of skilled labour emerging a major component for global competitiveness ranking in this dynamic industry (Laseinde & Kanakana, 2017). The availability of foreign direct investment (FDI) has largely been credited to the level of skilled and proficient human resources within an economy. However, the rapid pace of technological advancements in the automotive industry, such as ***digitalisation***, ***electrification***, ***autonomous vehicles***, ***sustainability*** and ***changing consumer preferences***, have given rise to a host of new challenges within the sector. This ***requires continuous updating of the curriculum*** and ***training methods*** to keep up with the industry trends and demands.

With there being a dearth of empirical research on the skills that are required for transforming TVET systems to gear them towards promoting sustainable socio-economic development, the results of this study are significant.

The results of the study highlight the critical importance of both foundational technical skills and transformative leadership abilities in the field of automotive engineering. They underscore the challenges faced by the TVET system in Lagos, Nigeria, which is struggling to meet the evolving demands of the automotive labour market due to a skills deficit. This deficit, the study shows, is attributed to structural inadequacies within the educational system and societal perceptions that undervalue vocational training. The disparity between the skills employers need and those the TVET system provides is a significant barrier to economic growth and individual career development. The high rates of poverty and youth unemployment further compound the issue, creating a cycle that is difficult to break.

Indeed, there is a demand for skilled automotive engineers in Nigeria due to the growing number of automotive companies that have set up operations in Nigeria like General Electric, Siemens, and Honeywell (Onyilo et al., 2020). An Automobile Engineering craftsman equipped with the requisite “skills of the trade” is supposed to competently assess vehicle problems, perform all necessary diagnostic tests, and repair or replace faulty parts (MacQuarrie, 2005). The skills to do this job are based on a sound understanding of auto-technology, on-the-job experience, and training in modern technology as it is introduced by the auto manufacturers (Awolola & Olayiwola, 2021). However, as pointed out, one of the major setbacks to the skills of auto mechanics is the mode of their training (Onyilo et al., 2020). Most craftsmen produced by TCs are not well-equipped with the modern-day innovations in the automobile world. For automotive engineers, the skills demand is even more

challenging because they need skills to innovate, design and deliver modern technologies, including:

- Automotive technology: Autonomous vehicles (AV), electric vehicles (EV)
- Programmeming: Machine learning, AI, C++, Matlab, Java, Python, and others
- Advanced electronics: Electrical/robotics engineering, car connectivity, human-machine interface (HMI), and infotainment related to communication interfaces and protocols
- Secure carware: High-end mechanical design requires cybersecurity best practices to spoof-proof vehicles and safeguard owner's information, requiring skills related to vulnerability scanning and assessment (Mercer, 2024)

It is on this basis that we talk about the automotive industry experiencing a profound shift. New skills for future success are needed for the automotive sector - automotive manufacturers and suppliers (Mercer, 2024).

However, the results also point out a silver lining for the automotive engineering sector in Lagos. The presence of a diverse range of skill levels within the workforce offers a unique opportunity for innovation and expansion. The study shows that by leveraging both the ***core skills*** - traditional skills associated with vehicle manufacturing and maintenance and the ***transformational leadership skills*** – the more sophisticated competencies required for advanced automotive engineering, there is potential for significant sectoral growth. This growth could provide a pathway for both TVET and university graduates to engage in the industry, fostering skill development and employment opportunities. This suggests that with the right focus on skill enhancement and leadership development, the automotive both the TVET systems and the engineering sector can play a pivotal role in addressing the skills gap and driving economic progress in Lagos.

The emergence of new technologies in the automotive engineering industry in Lagos, Nigeria, is a pivotal development with significant implications for TVET systems. The automotive sector's evolution, marked by advancements such as automation, electrification, and digitalization, necessitates a **re-evaluation of TVET's objectives,** as highlighted by the findings, to ensure ***curriculum alignment*** with industry needs. ***Policy coherence*** is essential, with curriculum design and skills development needing to adapt to incorporate new automotive technologies. This adaptation ensures that TVET graduates ***possess the relevant competencies*** for the evolving job market, thereby ***enhancing their employability***.

The results also point to ***stakeholder engagement*** as critical in this process, involving industry partners in curriculum development to bridge the gap between education and practical application. Moreover, the public perception of TVET can be improved by highlighting the sector's technological advancements and the career opportunities they present. Incentives and motivational packages could play a role in attracting and retaining both staff and students, emphasising the value of TVET in building a skilled workforce for the future of automotive engineering.

Furthermore, the results show that ***governance within TVET institutions*** must also evolve, with a focus on innovative leadership and expertise. Managers of TVETs should not only possess technical expertise but also the foresight to anticipate industry trends and prepare policies and frameworks accordingly. The sustainability of TVETs hinges on adequate funding and infrastructure, which are necessary to support the integration of modern technologies into educational programmes.

In Lagos, Nigeria, the implications of these findings are profound. As the automotive industry grows, bolstered by policies like the African Continental Free Trade Agreement (AfCFTA), which encourages regional value chains and supplier networks, TVETs must adapt to support this economic opportunity. The potential for the automotive industry to contribute significantly to Nigeria's economy is evident, with projections suggesting that by 2050, a substantial portion of new cars sold could be manufactured or assembled locally. For TVETs, this represents an opportunity to become central to the nation's industrial strategy, equipping youths with the skills necessary for Nigeria to become a hub for automotive manufacturing in Africa.

By interfacing Anthony's (2005) Integrated Intelligence theory, Quintuple helix model and Porritt's (2005) Five Capitals framework, the results of the study showed study this could contribute to addressing the fragmentation in Nigerian TVETs by promoting a more integrated, resource-optimised, and development-oriented approach to TVET. The interface promotes a more integrated and collabourative approach to TVET. Anthony's (2005) Integrated Intelligence model emphasises the importance of harmonizing intellectual-rational, emotional, and spiritual intelligences, which can foster a more holistic approach to education and training. Porritt's (2005) Five Capitals ensure that all aspects of TVET - from infrastructure and equipment (manufactured capital) to teaching staff (human capital) and community relationships (social capital) - are adequately resourced and aligned with each

other. The Quintuple helix model's inclusive approach ensures that TVET institutions in collaboration with various stakeholders are not only considered, but drive innovation, skill development, and sustainable development process (Carayannis & Rakhmatulli, 2014). Furthermore, the model fosters innovation by encouraging interaction and cooperation among the five helices (Carayannis et al., 2021). This ultimately leads to improved skills development, reduced unemployment, and enhanced socio-economic development. By focusing on SSED, the results of the study ensure that TVET systems in Lagos, Nigeria, are not only addressing immediate skills needs but also contributing to long-term socio-economic goals. This helps address fragmentation because it aligns TVET with broader development strategies and making it more relevant to the needs of the economy and society.

8.2 Silences in the Data

As highlighted in the introduction of section 7.3.1 that, among the nine participants involved in the study's second phase, only a single individual pointed out the issue of inadequate use of ICT skills in TVET institutions.

> *P9: I will give a brief example the ICT programmes offered in technical colleges These programmes require knowledge of ICT to manage various machines, especially in production settings. Most of the time, students encounter equipment they have never seen before, and without proper training, they are unable to operate it effectively encounter equipment they have never seen before, and without proper training, they are unable to operate it properly. they should get more teachers to be trained in that area and then supply the college with the equipment so that the students will have what we call hands on practical.*

P9 highlights a significant gap in the TVET programme, particularly in respect of Information and Communication Technology (ICT) integration. He underscores the importance of foundational ICT knowledge for students to effectively engage with new machinery, suggesting that current programmes may not adequately prepare students for real-world challenges. To address this, he proposes an increase in specialised teacher trainingl, along with

providing the necessary equipment to TVET colleges. This ensures that students gain practical, hands-on experience.

A study conducted to partially map ICT infrastructure shows that of 38 technical colleges participating in an ongoing World Bank IDEAS project, about 75 per cent have no access to internet connectivity and 79 per cent have no servers. The report continues: 'The availability of bandwidth determines how students learn: whether through online, blended or face-to-face initiatives and whether teaching is traditional or more student-centred.' (IIEP-UNESCO, 2022, p. 41; World Bank IDEAS Project. 2021) While some of the technical colleges surveyed had internet connectivity equipment such as C-band satellite dishes, radio beacons, and masts, the study indicates that the equipment available was not in working order37. Of the 38 technical schools surveyed, the majority do not have educational software (76 %), school management soft ware (68 %), or engineering soft ware (78 %). It is difficult to imagine the digitalization of TVET without the required software infrastructure or, as 98 per cent reported, not having access to reliable electricity (IIEP-UNESCO, 2022, p. 39). Without the ability to engage with online resources, blended learning models, and student-centered teaching approaches, the educational experience remains traditional and disconnected from the realities of the contemporary workplace. This disconnect not only limits the students' exposure to current industry practices but also restricts their capacity for innovation and adaptation.

To align its goals with the Pan-African Initiative for Digital Transformation of TVET and Skills Development Systems in Africa (NESCO-UNEVOC, 2021), the NBTE has established a centre for the development of emerging ICT skills, as part of a proposal to use the Internet and Computing Core Certification (IC3) accelerated standard to build the capacity of instructors and students in NBTE regulated TVET institutions (NBTE, 2024). However, the World Bank IDEAS Project's 2021 report shows that most of those consulted stated that they were not aware of any policy for the digitalization of TVET and the skills development system (IIEP-UNESCO, 2022). This leads to the conclusion that no coordinated digital transformation policy and strategy for TVET and skills development seems visible to those who should benefit from it.

The implications of this digital deficit are profound, particularly in the automotive field, which is increasingly relying on ICT for innovation and efficiency. In Lagos, the heart of Nigeria's automotive industry, the lack of ICT infrastructure in technical colleges hinders

the development of a skilled workforce adept in modern automotive technologies. As the industry moves towards more sophisticated, computerised systems, the gap in digital literacy and technical proficiency could pose a substantial barrier to growth and competitiveness. The absence of reliable electricity, reported by an overwhelming majority of the institutions, casts a long shadow over the potential for digital learning and the operation of advanced automotive equipment.

For Nigeria, and Lagos in particular, to harness the full potential of its burgeoning automotive sector, a concerted effort to bridge the digital divide in TVET institutions is imperative. Investment in ICT infrastructure, from internet connectivity to specialized software and reliable power supply, is essential. Such advancements would enable the integration of digital tools in the curriculum, fostering a more dynamic learning environment that aligns with the needs of the automotive industry.

The current status of digitization in Nigerian TVETs presents a significant challenge to the automotive field's development. The lack of ICT infrastructure not only impedes the educational process but also has broader implications for the industry's evolution. Addressing this gap is crucial for empowering the next generation of automotive professionals and ensuring Nigeria's place in the global automotive landscape.

8.3 Limitations of the Study

Three limitations require mention. The first is the "***context of practice***" in TVETs presents a complex challenge for researchers aiming to identify essential factors for promoting SSED. This is due to its dual nature as outlined by Strong et al. (2014) where it acts both as an "enabler and a constraint", mirroring the concept of affordances. These affordances, being inherently tied to their practical application, are not easily isolated for study or replication outside their original setting. Consequently, "the fluidity and specificity of the context of practice" (Alant & Bakare, 2021) make it a difficult variable to control or measure within educational research, particularly when seeking to generalise findings across different TVET environments, if the study were to be done on a large scale.

The inherent challenge with this limitation lies in the fluidity and specificity of this context, which resists isolation for study or replication, thus complicating the control or measurement of variables within educational research. To mitigate these issues, we employed

a mixed-methods research design that provided a more comprehensive understanding of the context by combining quantitative and qualitative data. In addition, we adopted a multifaceted approach to the analysis of data, using the Integaredt Intelligence framework, Quintuple helix model and Porritt's five Capitals framework. This approach allowed for the exploration of how and why certain affordances act as enablers or constraints, thereby offering a richer narrative to the numerical data.

The second is the ***study's conceptual framing's reliance on multiple sectors or actors***, which could hinder the implementation of its recommendations. For instance, if a sector crucial for providing necessary resources or policy support is not aligned with the study's objectives, it can lead to incomplete or ineffective strategies for promoting SSED. Moreover, the coordination required among various actors can be time-consuming and may introduce delays, affecting the study's relevance and applicability. Therefore, while the collective approach of models like the Quintuple Helix and Porritt's Five Capitals can offer comprehensive insights, their effectiveness is contingent upon the active and harmonious participation of all involved parties.

The analytical validity of such models depends on their ability to capture the complex realities of TVETs' operations and the diverse needs of their stakeholders. It requires a critical examination of how these frameworks align with the specific contexts and objectives of TVETs. Additionally, there must be a concerted effort to avoid oversimplification, ensuring that the nuanced interplay between different capitals and the helices is adequately represented and addressed in TVET strategies. It was crucial to establish robust validity checks throughout the study's design and analysis phases. This was achieved by employing triangulation methods to cross-verify information, and engaging in iterative consultation with the participants as well as my supervisor to ensure alignment with the study's objectives.

The third one is the ***limited sample size of nine out of a pool of 162 participants*** in Phase I. The reliance on a small qualitative sample (Phase II) following a larger quantitative phase (Phase I) indeed pose a threat to the study's external validity. The transition from quantitative to qualitative methods necessitates a careful consideration of how these approaches complement each other to ensure that the findings are robust and reliable. A mixed-methods approach was employed to mitigate some of the limitations by leveraging the strengths of both qualitative and quantitative rese enhance the validity and reliability of the findings. For instance, while quantitative data provided a broad overview of trends and

patterns, qualitative data offered nuanced insights into individual experiences and perceptions about the factors that are absolutely essential for TVETs to effectively promote SSED.

Furthermore, ensuring methodological consistency was essential for the comparability of results. This involved maintaining a clear and logical link between the research questions, the design of the study, and the methods used for data collection and analysis. The interviews in the qualitative phase were structured in a way that they align with the initial quantitative measures, allowing for a coherent analysis that can inform the overall research objectives.

Although we are aware that the results of this small case study can't be generalisable, however, the ability to generalise findings is contingent upon a representative sample that captures the complexity of the population being studied. In the context of this study, this meant including participants from various socio-economic backgrounds, regions, and levels of experience with TVET programmes. A more representative sample would not only bolster the study's generalisability but also provide a richer, more detailed picture of the factors that are critical to fostering SSED through TVET programmes.

8.4 Suggestions for Future Research

New research questions emerge as a result of these findings. Such studies would shed light on the eight areas illustrated by Figure 8.2. These research areas could provide valuable insights into how the TVET system in Lagos, Nigeria, and similar contexts, could be transformed to address the skills gap and drive economic progress. They could also inform policy-making and practice in the field of technical and vocational education and training.

The proposed research areas for TVET in Lagos, Nigeria, present a comprehensive approach to enhancing skill development and employability in the automotive industry. Skills Gap Analysis is crucial for aligning TVET curricula with market demands, thereby improving graduate employability and addressing the persistent issue of unemployment. Policy Coherence is essential to ensure that TVET institutions remain up-to-date with advancements in automotive technologies, which is vital for maintaining the relevance and effectiveness of their programmes.

Effective Training Modes are imperative for equipping students with contemporary skills required in the modern automotive industry, which can lead to improved employment

prospects and contribute to poverty alleviation. Leadership in TVET Systems emphasises the need for visionary leadership that can anticipate industry trends and adapt training programmes accordingly, fostering better employment outcomes and economic growth.

Stakeholder Engagement is key to developing curricula that reflect real-world workplace requirements, thus enhancing the employability of TVET graduates and reducing joblessness. Public Perception of TVET is a significant factor; enhancing it can increase enrollment in TVET programmes, meeting the skilled labour demands of the automotive industry and aiding economic development.

TVET Governance focuses on the importance of innovative leadership and expertise in governing TVET institutions, which is necessary for anticipating industry trends and preparing students effectively, further contributing to economic progress. Lastly, the role of TVET in SSED explores how TVET can contribute to long-term SD goals, highlighting its potential impact on broader socio-economic growth.

Critically, while these research areas are promising, their successful implementation requires careful consideration of local contexts, robust funding, and continuous evaluation to ensure they contribute meaningfully to scholarship and practice. The integration of TVET systems in Lagos will depend on the effective collaboration between government, industry, and educational institutions, ensuring that the initiatives not only promote SSED but also lead to a cohesive and responsive TVET system. The critique lies in the practical application of these research areas, as they must be adaptable, scalable, and sustainable to truly transform TVET's impact on Lagos' socio-economic landscape.

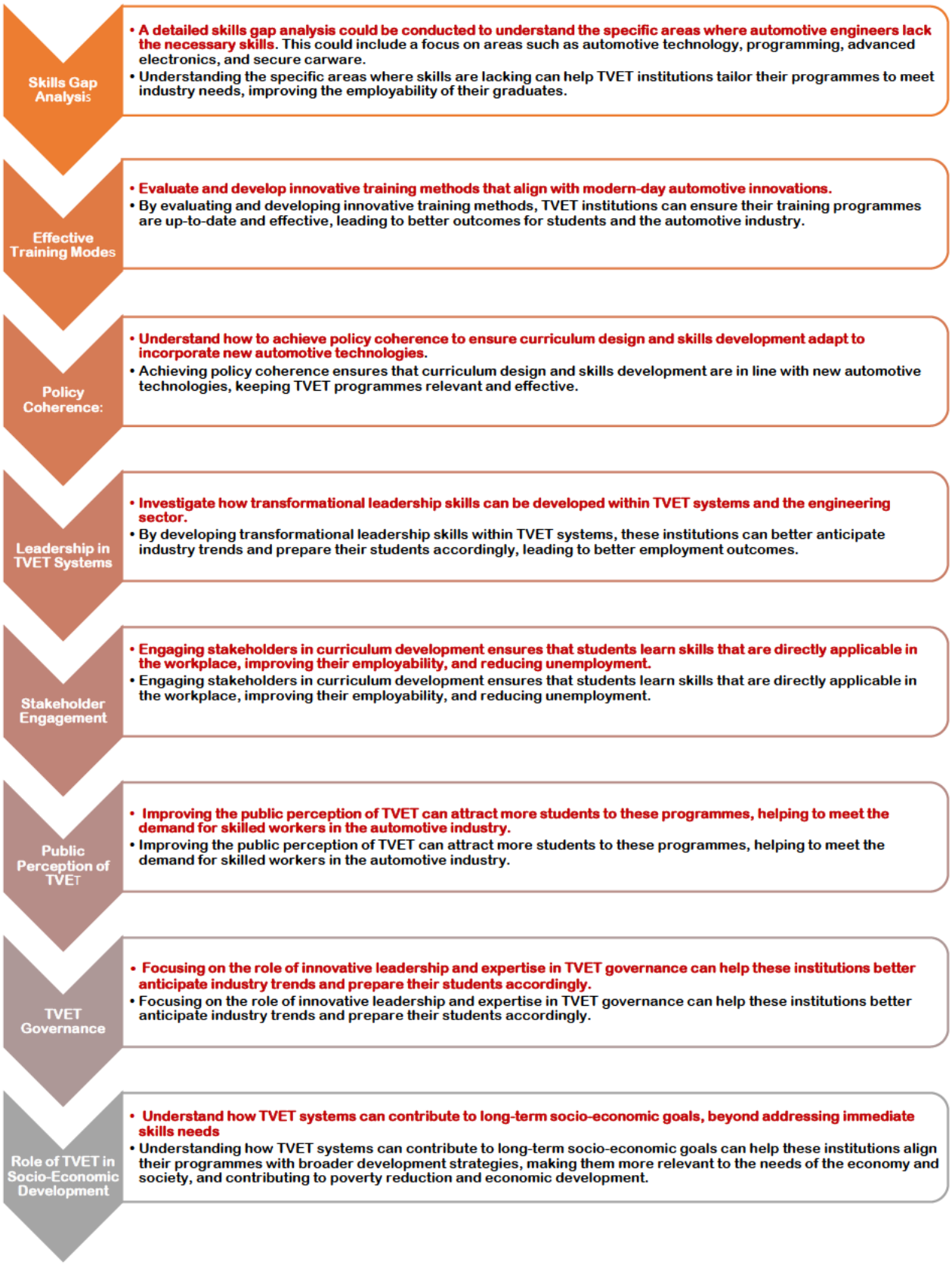

Figure 8.2: Suggestions for Future Research

8.5 Final Conclusions

The fragmentation of Technical and Vocational Education and Training (TVET) systems in Lagos, Nigeria, presents a paradoxical scenario when juxtaposed with the presence of seven leading automobile companies in the region. Despite the potential for a symbiotic relationship between TVET institutions and the automotive industry, which could foster skill development and employment opportunities, the reality, as this study showed, is marred by systemic inefficiencies and misalignments.

The automotive industry in Lagos, despite housing major players like Coscharis Motors Limited and Toyota Nigeria Limited, has not reached its potential in driving economic growth and reducing unemployment. This is attributed to several factors, including an over-reliance on imported vehicles and parts, which stifles local production and innovation. Additionally, as shown by the findings of this study, the absence of robust partnerships between the automotive companies and TVET institutions means that the opportunity to develop a skilled workforce that can contribute to the growth of the local automotive industry is largely untapped.

High unemployment rates, poverty, and underdevelopment in Lagos are further exacerbated by the inadequate response of the TVET system to the evolving demands of the job market. The presence of top automobile companies has not translated into widespread economic benefits due to the disconnect between the education system and industry requirements, as confirmed by this study. This situation is compounded by broader economic challenges, such as sluggish growth, low human capital, and labour market weaknesses, which the World Bank identifies as significant barriers to poverty reduction in Nigeria.

As the results of the study have shown, to bridge the gap between TVET systems and the automotive industry, a multifaceted approach is needed. This includes reforming the TVET curriculum to align with industry standards, fostering public-private partnerships to facilitate knowledge transfer and apprenticeships, and incentivizing local production to reduce the dependency on imports. Such measures could catalyze the development of a skilled workforce, spur innovation in the automotive sector, and ultimately contribute to economic development and poverty alleviation in Lagos.

The integration of TVET systems into the automotive sector is not just beneficial but necessary for Lagos State's economic diversification and industrial development. It is a

strategic investment that can transform the automotive landscape by fostering local production, reducing dependency on imports, and positioning Lagos State as a competitive player in the African automotive market. The findings of this study are clear: for Lagos State to drive forward in the automotive sector, it must gear up its TVET systems to meet the demands of the industry and the aspirations of its people.

To bolster the automotive sector in Lagos State, specific TVET programmes can be implemented that are tailored to the industry's needs. For instance, Morocco's success with automotive manufacturing can serve as a model, where TVET initiatives are closely aligned with sector requirements. In Lagos State, similar programmes could include specialized training in automotive engineering, vehicle design, and manufacturing processes. Additionally, partnerships with automotive companies could lead to apprenticeship programmes, providing hands-on experience and facilitating the transition from education to employment.

Another example is the Manufacturing, Engineering and Related Services Sector Education and Training Authority (MerSETA) in South Africa, which has developed a comprehensive range of accredited programmes to upscale skill levels in the automotive industry. Lagos State could adopt a similar approach by establishing a dedicated sector education and training authority for the automotive industry. This authority could oversee the development of curricula that incorporate the latest industry standards and technological advancements, ensuring that graduates are well-prepared for the demands of the sector.

In conclusion, the implementation of specific, industry-aligned TVET programmes is essential for the development of Lagos State's automotive sector. These programmes should focus on technical skills, practical experience, and industry partnerships to ensure that the workforce is capable of supporting and advancing the domestic automotive industry. By learning from successful models in other African countries and tailoring programmes to meet local needs, Lagos State can cultivate a skilled workforce that contributes to economic growth and industrial development.

By integrating TVET into a comprehensive development framework, its potential impact could be significantly amplified. The thesis posits that a comprehensive, coordinated approach involving *Skills Gap Analysis*, *Policy Coherence*, *Effective Training Modes*, *Leadership*, and *Stakeholder Engagement*, coupled with efforts to improve *Public Perception*, can transform the TVET system in Lagos, Nigeria. Such transformation is poised to bridge the

skills gap, enhance employability, and drive sustainable socio-economic development, ultimately contributing to the overarching goal of poverty alleviation and economic advancement. These areas present a strategic roadmap for policymakers, educators, and industry stakeholders to collaboratively work towards an improved TVET system that aligns with the dynamic needs of the automotive industry and the broader needs of the economy and society.

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APPENDICES

APPENDIX A: INFORMATION SHEET AND CONSENT LETTER (EXPERTS)

HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE (HSSREC)

APPLICATION FOR ETHICS APPROVAL
For research with human participants

Information Sheet and Consent to Participate in Research

Date: November 03, 2020

Dear Prof/Doc/Mr./Ms.……

My name is Abayomi Adegbenjo, a PhD student from the University of KwaZulu-Natal (Science and Technology Education Cluster), Durban, South Africa. I am also a lecturer at the Federal College of Education (Technical), Akoka, Lagos in Nigeria. My contact details are: abayimo60ade@gmail.com mailto:213571311@stu.ukzn.ac.zaand +2348130007388 (cellphone).
In the light of your expertise in the area of (automobile technology/mechanical trades/TVET), you are being invited to consider participating in a study, the topic, which is

From Fragmentation to Integration: Developing a Sustainable Technical and Vocational Education and Training System in the Technical Colleges of the Lagos State, Nigeria

Through your participation, it is envisaged that insights will be gained on how sustainable socio-economic development can be promoted through TVET systems as well as understand the following three key areas:

- The kind of strategic and leadership skills that are required for initiating and promoting a sustainable TVET system;
- The type of process skills that are required for enabling a sustainable TVET system;
- The type of practical skills that are required for delivering a sustainable TVET system.

The nature and duration of your participation, if you choose to participate, will involve the following stages:

Stage 1: The development of the instrument. You will be asked to contribute 3 to 5 responses (in ranking order) to the above mentioned 3 key areas.

Stage 2: To validate the instrument.

Stage 3: Determine the reliability of the instrument.

The duration of your participation if you choose to enroll and remain in the study is expected to be four weeks.

The goal of the study is to develop models that will explore how sustainable socio-economic development can be promoted through TVET system to achieve sustainable development. The employability skills incorporated into the TVET curriculum will make graduates fit for the industry or self-employment.

Should you agree to participate, you will be requested to confirm your participation in the study. Online and semi-structured interviews will be conducted via Zoom in order to observe the COVID-19 regulations. The study is self-funded.

The study does not involve any risk or discomforts. The recommendations emanating from the completed study's findings will provide useful suggestions and a knowledge base for policymakers, TVET practitioners, teachers as well as students within the sector. It is also envisaged that this study, through its focus on skills and competencies acquisition, will benefit technical college graduates, especially those in mechanical trades, helping them become more self-reliant. Finally, it is hoped that the outcome of this study will stimulate the graduates' interest in the opportunities that abound in the industry.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number:_____).

In the event of any problems or concerns/questions you may contact the researcher at (provide contact details) or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details as follows:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557- Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Your participation in the study is voluntary and by participating, you are granting the researcher permission to use your responses. You may refuse to participate or withdraw from the study at any time with no negative consequence. There will be no monetary gain from participating in the study. Your anonymity will be maintained by the researcher and the School of Education (Science and Technology Education) and your responses will not be used for any purposes outside of this study.

All data, both electronic and hard copy, will be securely stored during the study and archived for 5 years. After this time, all data will be destroyed.

If you have any questions or concerns about participating in the study, please contact me at the numbers listed above.

Sincerely,

[redacted]

APPENDIX B: Consent Letter (Experts)

CONSENT

I (Name .....) have been informed about the study entitled: **From Fragmentation to Integration: Developing a Sustainable Technical and Vocational Education and Training System in the Technical Colleges of the Lagos State, Nigeria** by Abayomi Adegbenjo

I understand the purpose and procedures of the study.

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at: abayimo60ade@gmail.com/or +2348130007388

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researcher, then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Additional consent, where applicable:

I hereby provide consent to:

Audio-record my interview / focus group discussion YES / NO

_____ _____
Signature of Participant **Date**

_____ _____
Signature of Witness (Where applicable) **Date**

_____ _____
Signature of Translator (Where applicable) **Date**

APPENDIX C: INFORMATION SHEET (PARTICIPANTS)

UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE (HSSREC)

APPLICATION FOR ETHICS APPROVAL
For research with human participants

Information Sheet and Consent to Participate in Research

Date: November 03, 2020

Dear Prof/Doc/Mr./Ms.……

My name is Abayomi Adegbenjo, a PhD student from the University of KwaZulu-Natal (Science and Technology Education Cluster), Durban, South Africa. I am also a lecturer at the Federal College of Education (Technical), Akoka, Lagos in Nigeria. My contact details are: abayimo60ade@gmail.com mailto:213571311@stu.ukzn.ac.zaand +2348130007388 (cellphone).

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Through your participation, it is envisaged that insights will be gained on how sustainable socio-economic development can be promoted through TVET systems as well as understand the following three key areas:

- The kind of strategic and leadership skills that are required for initiating and promoting a sustainable TVET system;
- The type of process skills that are required for enabling a sustainable TVET system;
- The type of practical skills that are required for delivering a sustainable TVET system.

The nature and duration of your participation, if you choose to participate, will involve the following stages:

Stage 1: Filling out the questionnaires for the study.

Stage 2: Participating in interviews to be conducted by the researcher (for selected few participants)

The duration of your participation if you choose to enroll and remain in the study is expected to be four weeks.

The goal of the study is to develop into the TVET curriculum models that will explore how sustainable socio-economic development can be promoted through TVET system to achieve sustainable development. The employability skills incorporated will make graduates fit for the industry or self-employment.

Should you agree to participate, you will be requested to confirm your participation in the study. Online and semi-structured interviews will be conducted via Zoom in order to observe the COVID-19 regulations. The study is self-funded.

The study does not involve any risk or discomforts. The recommendations emanating from the completed study's findings will provide useful suggestions and a knowledge base for policymakers, TVET practitioners, teachers as well as students within the sector. It is also envisaged that this study, through its focus on skills and competencies acquisition, will benefit technical college graduates, especially those in mechanical trades, helping them become more self-reliant. Finally, it is hoped that the outcome of this study will stimulate the graduates' interest in the opportunities that abound in the industry.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number:_____).

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Your participation in the study is voluntary and by participating, you are granting the researcher permission to use your responses. You may refuse to participate or withdraw from the study at any time with no negative consequence. There will be no monetary gain from participating in the study. Your anonymity will be maintained by the researcher and the School of Education (Science and Technology Education) and your responses will not be used for any purposes outside of this study.

All data, both electronic and hard copy will be securely stored during the study and archived for 5 years. After this time, all data will be destroyed.

If you have any questions or concerns about participating in the study, please contact me at the numbers listed above.

Sincerely,

[redacted]

APPENDIX D: Consent Letter (Participants)

CONSENT

I (Name .....) have been informed about the study entitled: **From Fragmentation to Integration: Developing a Sustainable Technical and Vocational Education and Training System in the Technical Colleges of the Lagos State, Nigeria** by Abayomi Adegbenjo

I understand the purpose and procedures of the study.

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at: abayimo60ade@gmail.com/or +2348130007388

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researcher, then I may contact:

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Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Additional consent, where applicable:

I hereby provide consent to:

Audio-record my interview / focus group discussion YES / NO

_____ _____
Signature of Participant **Date**

_____ _____
Signature of Witness (Where applicable) **Date**

_____ _____
Signature of Translator (Where applicable) **Date**

APPENDIX E: QUESTIONNAIRE

FROM FRAGMENTATION TO INTEGRATION: DEVELOPING A SUSTAINABLE TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING SYSTEM IN THE TECHNICAL COLLEGES OF THE LAGOS STATE, NIGERIA

Please complete the following questionnaire by checking (√) in the spaces provided against each of the following statements as it best presents your opinion on the above topic.

SECTION A

Automobile Engineer ☐
Automobile Workshop Manager ☐
Automobile Workshop Supervisor ☐
Lagos State Min of Education ☐
LASTVEB ☐
Mechanical Trades Teacher ☐
NBTE ☐
Principal Technical College ☐

RATING KEY

SA = Strongly Agree (4); **A** = Agree (3); **D** = Disagree (2); **SD** = Strongly Disagree (1).

SECTION B
HOW CAN SUSTAINBLE SOCIO-ECONOMIC DEVELOPMENT BE PROMOTED THROUGH TVET SYSTEM?

/N	ITEM/ STATEMENTS	RATING	

		A			D	
1.	Provision of education for productive employment.					
2.	Provision of training for productive employment.					
3.	Provision of up to date tools for training					
4.	Provision of safe working environment					
5.	Adequate investment of the government in technical training institutions.					
6.	Assistance of Industries on training institutions.					
7.	Assistance of Non-Governmental organizations on training institutions.					
8.	TVET training institutions should be made attractive to the youths to get skills in different trades.					
9.	Provision of adequate funds to run the TVET institutions.					
10.	Developing favourable policy for TVET programmeme					
11.	Implementation of policy for successful attainable of the curriculum					
12.	Using TVET innovation in the development of the green economy					
13.	Using TVET innovation in the renewable energy resources to boost food security.					
14.	By training skilled workforce to address socio-economic development challenges.					
15.	By making TVET a tool for productivity enhancement and poverty reduction.					

SECTION C

WHAT KIND OF STRATEGIC AND LEADERSHIP SKILLS ARE REQUIRED FOR INITIATING AND PROMOTING A SUSTAINABLE TVET SYSTEM AND WHY?

/N	ITEM/ STATEMENTS	RATING				WHY

		A 4			D	
1.	Ability to motivate others.					Be a good coach
2.	Ability to take full responsibility of action.					Leadership quality
3.	Communicate effectively with various groups of people.					Mentoring role
4.	Ability to adapt to changes.					Leadership role
5.	Ability to get feedback.					Promptness
6.	Possess positivity abilities.					Leadership role
7.	Self-awareness.					Creativity
8.	Ability to work in a team.					Leadership role
9.	Possess critical thinking abilities.					Good initiative
10.	Show personal resilience.					Critical thinking
11.	Be optimistic and realistic.					Leadership role
12.	Good organizational skills.					Leadership role
13.	Possess interpersonal skills.					Communication skill
14.	Problem solving/decision making abilities.					Leadership role
15.	Ability to delegate duties to subordinates.					Collaboration
16.	Possess ability to display good characteristics.					Motivating ability
17.	Ability to influence subordinates.					Leadership role
18.	Ability to work in a team.					Collaboration
19.	Interact and communicate with individuals with various depths of knowledge capabilities.					To pass instructions to others
20.	Value others' opinions and have confidence in one's opinion.					Decision making

SECTION D

WHAT TYPES OF PROCESS SKILLS ARE REQUIRED FOR ENABLING A SUSTAINABLE TVET SYSTEM AND WHY?

/N	ITEM/ STATEMENTS	RATING				WHY
		A	3	2	D1	

	Ability to communicate					Interactive ability
	Exhibit skills.					Process skill
	Humility					To access emotional disposition
	Strategic analysis and planning.					It evaluates understanding
	Ability to inspire others.					Mentoring skill
	Show emotional intelligence and empathy.					Affective knowledge
	Ability to identify and manage changes.					Content knowledge
	Ability to encourage innovation.					Affective knowledge
	Possess soft skills.					Cognitive skill
0	Strategic thinking.					Cognitive skill
1	Decisiveness/ Decision making.					Leadership role
2	Confidence.					Affective knowledge
3	Measurement and analysis ability.					Leadership role
4	Leadership skill.					Leadership role
5	Critical thinking.					21st century skill
6	Good management principles and best practices					Knowledge management
7	Measurement and analysis ability to measure progress and make sure that the change accomplishes the results.					Content knowledge and leadership role
8	Alignment of opinions to find a common ground.					Leadership role
9	Ability to interpret and elicit complex and conflicting information.					Rational thinking ability
0	Emotional intelligence.					21st century skill

SECTION E

WHAT PRACTICAL SKILLS ARE REQUIRED FOR DELIVERING A SUSTAINABLE TVET SYSTEM AND WHY?

/N	ITEM/ STATEMENTS	RATING				WHY
		A			D	
	Job planning skills.					To be effective
	Ability to select right working tools/equipment.					Good time management
	Skillful manager of change.					Leadership role
	Good reservoir of emotional, physical and mental energy.					Ability to go extra mile to achieve goals
	Optimistic.					Soft skill
	Good time management.					Efficiency
	Ability to be flexible and creative.					Soft skill
	Persuasion and influencing skills.					Good negotiation ability
	Good communication skill.					To pass instructions effectively
0	Organising skill.					Good planning of assigned jobs
1	Problem solving skill					Critical thinking
2	Team work.					To get the cooperation of the members
3	Innovation skill.					Creativity
4	Ability to accept uncertainty.					Optimistic
5	Strategic thinking skills.					21st century skill
6	Planning and delivery skills.					Good time management
7	Ability to manage people and things.					Conducive environment

8	Accept uncertainty and be optimistic.					21st century skill
9	Thinking outside the box.					Creativity
0	Good negotiation skill					Good deals

ANY ADDITIONAL COMMENTS?

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Thank you

APPENDIX F: QUALITATIVE RESEARCH SCHEDULE QUESTIONS

Qualitative Research Schedule Questions

Research Interview Schedule

Greetings

Introductions: From Fragmentation to integration: Developing Sustainable TVET system in the Technical Colleges of Lagos State, Nigeria.

Demographics:
Sex:
Occupation:
Educational level:
Job title:

Icebreaking question:

1. How can sustainable socio-economic development be promoted through TVET systems?
2. What role can TVET play in reducing unemployment among the youths?
3. What role can the technical colleges play in providing job opportunities for her graduates?

General in-depth research questions:

4. What is your opinion about strategic and leadership skills?

5. What kind of strategic and leadership skills are required for initiating and promoting a sustainable TVET system and why?
   -
6. What is your opinionated narrative about process skills?
7. What types of process skills are required for enabling a sustainable TVET system and why?
8. What are the types of practical skills needed in the todays, workshop?
9. What types of practical skills are required for delivering a sustainable TVET system and why?
10. How can these practical skills be acquired by the students?

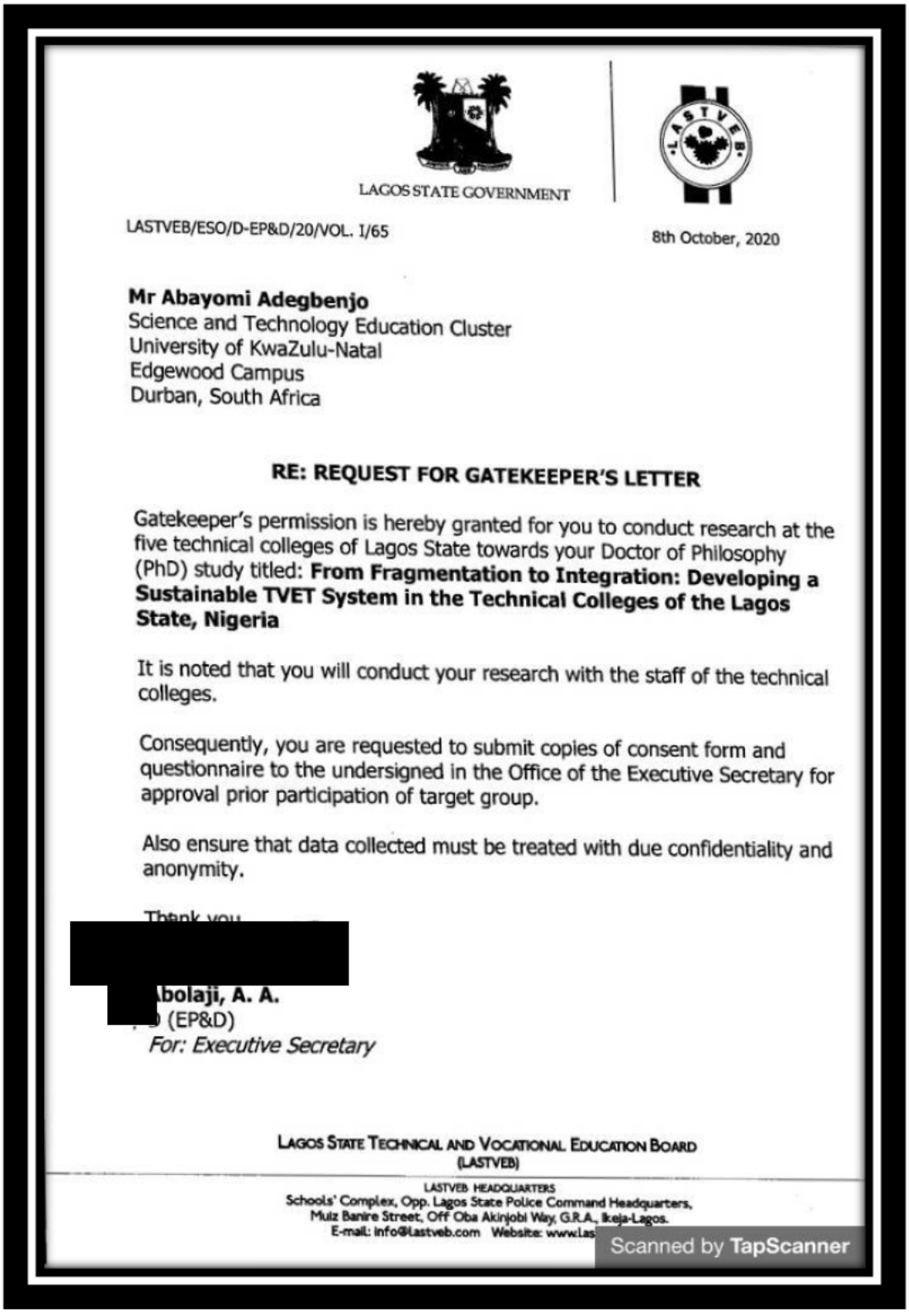
Concluding research questions/remarks

11. What can be done to improve TVET in Nigeria?
12. From your overall experience how can the short comings in TVET be achieved?

13. What roles can the government play in achieving a sustainable TVET system in the technical colleges?
14. What do you think can be done to reduce unemployment among the youths?

Once again, thank you for participating in this study. Your opinion is valuable. As promised in the consent form you signed, your identity will be kept confidential – and all information you provided will be used for the purpose of fulfilling research requirement for my degree.

APPENDIX G: GATEKEEPER'S LETTER



LAGOS STATE GOVERNMENT

LASTVEB/ESO/D-EP&D/20/VOL. I/65

8th October, 2020

Mr Abayomi Adegbenjo
Science and Technology Education Cluster
University of KwaZulu-Natal
Edgewood Campus
Durban, South Africa

RE: REQUEST FOR GATEKEEPER'S LETTER

Gatekeeper's permission is hereby granted for you to conduct research at the five technical colleges of Lagos State towards your Doctor of Philosophy (PhD) study titled: **From Fragmentation to Integration: Developing a Sustainable TVET System in the Technical Colleges of the Lagos State, Nigeria**

It is noted that you will conduct your research with the staff of the technical colleges.

Consequently, you are requested to submit copies of consent form and questionnaire to the undersigned in the Office of the Executive Secretary for approval prior participation of target group.

Also ensure that data collected must be treated with due confidentiality and anonymity.

Thank you

[redacted]

[redacted]bolaji, A. A.
[redacted] (EP&D)
For: Executive Secretary

LAGOS STATE TECHNICAL AND VOCATIONAL EDUCATION BOARD
(LASTVEB)

LASTVEB HEADQUARTERS
Schools' Complex, Opp. Lagos State Police Command Headquarters,
Muiz Banire Street, Off Oba Akinjobi Way, G.R.A., Ikeja-Lagos.
E-mail: info@lastveb.com Website: www.las

APPENDIX H: ETHICAL APPROVAL LETTER

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

21 March 2021

Mr Abayomi Adegbenjo (219091625)
School Of Education
Edgewood Campus

Dear Mr Adegbenjo,

Protocol reference number: HSSREC/00002489/2021
Project title: From Fragmentation to Integration: Developing a Sustainable Technical and Vocational Education and Training System for the Technical Colleges of the Lagos State, Nigeria
Degree: PhD

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 16 January 2021 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid until 21 March 2022.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,

[redacted]

Professor Dipane Hlalele (Chair)

/dd

Humanities and Social Sciences Research Ethics Committee
Postal Address: Private Bag X54001, Durban, 4000, South Africa
Telephone: +27 (0)31 260 8350/4557/3587 **Email:** hssrec@ukzn.ac.za **Website:** http://research.ukzn.ac.za/Research-Ethics
Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

APPENDIX I: EDITING CERTIFICATE

PROOF-READING

DR LEE-ANNE ROUX

EDITOR | PROOFREADER

+27 82 825 7325
leeanne@proof-reading.co.za
www.proof-reading.co.za

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27 June 2023

TO WHOM IT MAY CONCERN

RE: LANGUAGE EDITING

This letter serves to confirm that I have edited the thesis titled:

From fragmentation to integration: Developing a sustainable technical and vocational education and training system in the technical colleges of the Lagos state, Nigeria

by

Abayomi Adegbenjo

Please feel free to contact me if you need any further information.

Yours sincerely,

Dr Lee-Anne Roux