SYNERGISING THE CREATION OF KNOWLEDGE PROCESSES IN A TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING COLLEGE WITH INDUSTRY DEMANDS FOR SUSTAINABLE LECTURER LEARNING ENVIRONMENTS

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DECLARATION OF ORIGINALITY

I, Wayne Anthony David, hereby state that the content relating to this dissertation is dependable, reliable, trustworthy and unique due to my work. In the incidents where other peoples' language, viewpoints and perspectives were utilized, citations are made in the text and supported by references. I also recognize that this dissertation has not been placed forward to another education institution for examination in acknowledgement of another qualification.

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DEDICATION

I would like to thank my family and friends for their sacrifices over the years. It is with your generosity, understanding and goodwill that I dedicate this dissertation to each and every one of you. You have been my beacon of hope, and your kindness has also assisted me in introspecting on my own life experiences and challenged me to be a better person. I pray that Almighty God has his hand of protection over you all. May you always have peace, joy and happiness and reign in the Glory of God.

ABSTRACT

This study explores mechanisms or means by which knowledge-creation processes could be synergised for sustainable lecturer learning environments. The study assumes that lecturers are better positioned to contribute to the sustenance of the business/industry and colleges. The colleges because they are sites whereby employees and employers are prepared. The college plays a vital role only if lecturers are adequately knowledgeable and do so diligently. And competently that graduates are entirely and better prepared for workplace demands.

The purpose is to contribute to the debate or discussion on optimising the utilisation of limited resources for human capital training. In particular, the inequities still lingering from the apartheid past. For instance, in this case, a TVET College has one campus in a relatively big area (Metropolitan area) and two other campuses.

In what is known as formerly homelands. As a result, it is sufficient to say that there are disparities in resources. The point is how a college pulls together the resources in providing. The output is more significant than the sum – so some colleges can address challenges, particularly Lecturer development, which is often criticised for being limited.

This study used the bricolage methodology to attain a critical perspective on all the issues, primarily when qualitative data is generated.

This study is the sub-project of the mega study. Therefore, there are bound to be power differentials in a study like this. Bricolage assisted in exploring social injustice-related issues and power differentials Ideologically and Methodologically. Thus, bricolage guides this study.

The methods relied upon were focus group discussions with lecturers and a business owner and senior manager. Furthermore, this considered the survey results because this college formed part of the study of the mega project. Through the mega project, there were seminars and seminar reflections.

The study used the free attitude technique, brainstorming, and critical discourse analysis to delve deeper and obtain rich information.

The study's findings point to the need for lecturer learning environments that do not reside only with one learning partner, or they will remain trapped within that institution which may not be interested in working with others. It's a space that depends on all stakeholders (DHET, SETA, College(s) and Business/Industries). The model that this study presents suggests the need to have a clear focus on sustainability (social, economic and environmental); in other words, the synergising effort should be fed into by experts from diverse stakeholders so that the learning environment is suited for future sustainability.

Keywords: Bricolage, Knowledge processes, Sustainable learning environments, Technical and Vocational Education and Training (TVET) colleges.

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LIST OF ABBREVIATIONS/ACRONYMS

AU	African Union
CDA	Critical Discourse Analysis
CE	Circular Economy
CISE	Crowd Innovation Space Ecosystem
CPD	Continuing Professional Development
CTS	Critical Thinking Skills
DHET	Department of Higher Education and Training
DoE	Department of Education
DoL	Department of Labour
FAI	Free Attitude Interview
FET	Further Education & Training
HCD	Human-Centred Design
HE	Higher Education
HoD	Head of Department
IAG-TVET	Inter-Agency Group on TVET
IQMS	Integrated Quality Management System
IT	Information Technology
I-WIL / WIL	Work-based Integrated Learning
MerSETA	Manufacturing, Engineering and Related Services Sector Education and Training Authority
NC(V)	National Certificate (Vocational) Level 4
NCFE	National Committee on Further Education
NDTS	National Dual Training System

NHRF	National Human Resource Development
NQF	National Qualifications Framework
OBE	Outcomes-based Education
PBL	Problem-based Learning
PDA	Professional Development Arrangement
QA	Quality Assurance
QCTO	Quality Council for Trades and Occupations
ROI	Return on Investment
RSA	Republic of South Africa
SAL	Shared Action Learning
SAQA	South African Qualifications Authority
SDGs	Sustainable Development Goals
SETA	Sector Education and Training Authority
STEM	Science, Technology, Engineering and Mathematics
TBL	Team-based Learning
TIE	Technology in Education
TOE	Technology of Education
TPCK	Technological, Pedagogical, Content, Working Knowledge
TQM	Total Quality Management
TVET	Technical and Vocational Education & Training
UFS	University of the Free State
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
WIL	Work-integrated Learning

CHAPTER 1
ORIENTATION AND BACKGROUND ON SYNERGISING KNOWLEDGE PROCESSES FOR THE CREATION OF SUSTAINABLE LEARNING ENVIRONMENTS

1.1 INTRODUCTION

This study aims to explore the synergising of the creation of knowledge processes in a technical and vocational education and training college with industry demands for sustainable lecturer learning environments. The objective of chapter one is to provide orientation, background and introduction regarding this research. The chapter also defines the research problem and the vital research questions influencing the body of knowledge, the scope of the research and the conclusion.

1.2 BACKGROUND TO THE STUDY

The technical college sector structure founded in the early twentieth century was established to offer theoretical learning together with the practical training of the apprenticeship system in South Africa. Yet during the early 1990's, the, associations with apprenticeship experienced a drastic degeneration as colleges recruited high numbers of non-apprentices into their programmers/courses, which had a severe impact as practical learning could no longer be synergised with theoretical learning for most learners. Technical colleges were inadequately prepared to accommodate the needs of the new learner. At this stage, learners have also been radically segregated, presenting enormous strategic and operational challenges. At the beginning of 1994, the technical college 'sector' was faced with a multifaceted mixture of historically white institutions with significant autonomy, historically black urban colleges with far less autonomy; plus ex-homeland colleges and lower-level training facilities as a result of apartheid. The newly elected democratic Government of 1994 was saddled with rectifying the imbalance of education structures whereby marginalised groups were deprived of accessibility based on the racial profiles of the Apartheid Regime. This became a top priority.

Therefore, the first steps towards integration needed to create one solitary institution with a common purpose and goal to meet the needs of all segments of South African society. During 1997/1998, the Department of Higher Education and Training (DHET) implemented a policy process that gave rise to the Education and Training Act. Consequently, the Department also formulated a strategy document for the technical college sector. The document was paramount in addressing the historic institutional complex legacy, with the determination to address transformation, equality, and accessibility. The new name, Further Education and Training (FET) College, was established as a symbolic effort to peel away the negative connotations of the old technical college sector and embrace the significance of bringing educational values and applicability to the workplace (McGrath, 2004).

The initiative began with the National Committee on Further Education (NCFE), which produced its draft report in February 1997, emphasising the need for a decision to approve the National Qualifications Framework (NQF). This framework split Education and Training into three categories – general, further, and higher. College *Programmes* included the divide between Further and Higher Education and Training; however, colleges as *Institutions* were perceived as falling under the 'Further' band alongside senior secondary schools. This meant they were to be administered by provincial authorities instead of the new national Department of Education (which was responsible for higher institutions). Even though the NCFE's name had the mandate to look at both schools and colleges, it was to start a trend in policy discussions of treating the two components separately. In the end, it was only colleges that were addressed. The NCFE's representation of colleges was damning; the findings revealed that they lacked adequate: (1) plant and infrastructure; (2) governance and management structures; (3) planning capacity; (4) administrative and organisational systems; (5) support functions; (6) quality training of trainers; (7) linkages to industry (8) quality assurance; and (9) management information systems (DoE, 1997a).

The final report surfaced in August 1997 (DoE, 1997b). It enhanced the draft discussions and underscored the importance of FET in addressing economic growth, poverty eradication and personal development.

The report underlined: (1) the need to address historical gender differences to focus on rural poverty, especially women in the informal sector and (2) the hardships of the

unemployed youth. It was observed that the system in FET colleges provided for the employed to a far greater degree than the unemployed. Furthermore, the report highlighted a series of major systemic transformations in governance, finance and certification. Increased autonomy became a central theme of the proposed improvements. This was strengthened by a desire to ensure strong articulation and direction that serves national and provincial developmental goals.

The *Green Paper on Further Education and Training* (DoE, 1998) presented substantial departures from the NCFE Report. For example, it highlighted the need to position the proposed reform within a broader range of intersectoral policies. Precise reference was made throughout the Green Paper of the parallel policy development process of the Department of Labour (DoL), which continued to be accountable for workplace training. The DoL considered learnerships as the replacement for the apprenticeship model.

Tripartite agreements were established between employers, learners/workers and learning providers, combining theoretical learning off the job with workplace learning and work experience.

Additionally, The Green Paper emphasized the need to implement a three-to-five-year plan to drive institutional change. Four task teams were recommended to address the most challenging areas of FET Sector development, i.e., management capacity development, management information systems, funding and programmes and qualifications (DoE, 1998).

The Green Paper came under massive criticism for not adequately addressing four critical areas: (1) it placed more emphasis on the economic value of FET at the expense of the social, cultural and humanistic aspects; (2) insufficient attention was given to the aspects of FET bands; (3) Inadequate connections on clear roles and responsibilities between FET and Department Higher Education; (4) inadequate attention was given to the relationships between the Ministry's FET Policies and the Department of Labour's Skill Development Strategy.

As a result of these criticisms, the White Paper emerged, making striking modifications to the position of the Green Paper, suggesting a joint Council for Higher Education and National Board for Further Education and Training Committee on the problematic courses. The White Paper clarified its opposition to 'mission drift' and the need for FET

institutions to focus mainly on their ‘core businesses of provision within the FET band (McGrath, 2000).

The White Paper further outlined a clear implementation policy, crafting a more distinctive and purposeful vision for integrating than previously attempted. The most fundamental priority was to transform the FET Sector in forming synergies between the Department of Education, the Department of Labour and the business sectors as clear steps to explore and foster partnerships geared towards the need for appropriate Learnerships in FET colleges (McGrath, 2000).

As soon as the FET Act was passed, the FET Branch of the DoE focused on strategy and policy development for implementation, which was finalised in 1999 (DoE, 1999). A new funding model became critical to the strategy's success, and such funding should be directed towards developing management, staff and learner support systems and new learning support materials. A firm decision was made that FET institutions would have access to substantial amounts of funding out of the new levy system established by the DoL.

The policy regulated that a 1% levy on enterprises’ payrolls is raised. The DoL was able to generate R3 billion [1] per annum for skills development. Eighty per cent of the budget was allocated to 25 Sector Education and Training Authorities, whereas 20% of the budget was allocated to the National Skills Fund for supporting strategic skills issues, which include meeting the needs of micro-enterprises and community development.

It became apparent to the Department of Education (DoE) during this process that the existing number of colleges, and the differences between them, were unsustainable. Therefore, the Department published its policy in response in 2001 to these challenges following a succession of provincial analyses supervised by a national task team. The *New Institutional Landscape for Public Further Education and Training colleges* (DoE, 2001a) envisaged a series of 50 significant institutions grounded in nine attributes: (1) large, multi-site institutions; (2) increased autonomy; (3) a mixture of specialisation and multi-purpose institutions; (4) a new quality assurance framework; (5) an increased focus on open and distance learning; (6) a greater focus on access for learners with special needs; (7) better articulation and collaboration with higher

education; (8) a commitment to improved student support services; and stress on partnerships with government and the private sector (DoE, 2001a).

The report strengthened the need for the staffing of colleges to be more representative. It reinforced the need for curricular improvement and the necessity for a broader range of programme offerings supported by new funding methods. It also recommended an evolution over time in the extent of college self-sufficiency as colleges developed sufficient capacity to manage them and pointed out the need for a capacity initiative that will endure in supporting the growth capability.

In 2001, in response to widespread criticisms of the process within the system, the Departments of Education and Labour chose to commission an international study team to examine the performance of the NQF. *The Report of the Study Team on the Implementation of the National Qualifications Framework* was published in April 2002 (DoE & DoL, 2002).

The findings revealed that even though the goals of the NQF were encouraging, it made it evident that expected gaps exist between Education and Training and that there are significant tension and differences regarding the particular roles of the leading institutional stakeholders, including SAQA. The report also underlined the inequity and ineffectiveness of the system. It mirrored the extensive stakeholder apprehensions about complexity and bureaucracy, which were appraised as constraining as opposed to enabling the success of the system's stated goals.

In 2002, the technical and Vocational Education and Training (TVET) college division in South Africa was formed in the stipulation of the FET Act 98 of 1998. The amalgamation process involved 152 former technical colleges consolidated into fifty TVET colleges in nine South African Provinces. The Department of Education's, DoE (2001) report stated that it was vital to effect such a significant number; it was a decisive step in addressing the historical heritage of apartheid Education and that this change was essential in becoming more globally aligned.

In July 2003, both Departments developed a joint response to the Study Team's Report. Their response, An Interdependent Qualification Framework System, was a cautiously constructed piece that sought to modify the NQF model in ways that balance out both Departments' specific interests (DoE & DoL, 2003). The NQF response recognised that there had been weaknesses in the education and training

integration. It recommended that set of new Meso-level structures be introduced beneath the South African Qualifications Authority (SAQA) that would allow SAQA amalgamation whilst these structures addressed the sectional interests of Education and Training beneath the SAQA umbrella. Henceforward, the existing Council for Quality Assurance in General and Further Education and Training (UMALUSI) would continue to manage academic and 'general vocational' programmes, whilst a new Trades, Occupations and Professions Qualifications Council would manage vocational awards, mainly notably learnerships (DoE & DoL, 2003).

In reply to the response, Young (2003) explains the likely continuance of overlapping and differing responsibilities in the FET and Higher Education (HE) bands. There is a strong indication of conflicting views from within the DoE concerning the range and scope to which colleges should be providing programmes at level 5 of the NQF. This is mainly considered as roughly half their current provision is at this level. Nevertheless, according to a vague interpretation of the NQF system and the evolving FET policy, this is to be discouraged.

Moreover, the NQF response features another NQF-related discourse challenge. Roughly 80% of college learners already have a School Leaving Certificate equivalent to Level 4; however, they will spend a further year in college to get another Level 4 certificate. The NQF response presents the solution to this apparent inefficiency as refocusing colleges to take NQF Level 1 Graduate (i.e., learners who have completed nine years of schooling rather than 12 as is typical now). Hence, the impact on colleges making their average entrants three years younger has not been adequately scrutinised. Additionally, misunderstandings within the NQF system seemed to hamper the delivery of learnerships. Sector Education and Training Authorities (SETAs) have blamed the NQF system for the lack of accredited providers and their non-delivery of learnerships. It was apparent that there are fairly few quality private providers. Many in the system have misinterpreted the function of the public providers due to the complexity of regulations.

Colleges have often seemed likely to complain about this state of affairs rather than market themselves to local employers. Colleges have not always been able to respond to employers' needs in developing short courses within the whole qualification-dominated NQF. By 2002 SAQA was unable to resolve this issue. The drop in

apprenticeship colleges made it difficult for students to gain substantial work experience (McGrath, 2003).

Learners showed concern and uncertainty about where they are going after college and little concern about taking control of their learning or their shift to workplace employment. As a result of a lack of exposure to career guidance, 17% of graduates surveyed in 2001 and 22% of workplace graduates surveyed demonstrated a poor understanding of the world of work after attending college (Cosser, 2003).

The ethnic and cultural profile of learners in the college sector has shifted considerably since the advent of democracy in 1994. Admissions now essentially represent the overall racial profile of the country in general, bearing in mind they were once virtually entirely white. As a result of this change, colleges are confronted with wider and broader challenges in addressing the apartheid heritage of weaknesses in School Education, most prominent in English, Mathematics and Science Teaching and learning, mainly evident in African Schools. Although marginal progress has been made in these areas, the legacy of the past will be a continuous uphill journey. Consequently, in the interim, colleges must focus on intensifying work in crucial skills and knowledge areas.

Positioning learners for work experience and employment will continue to be influenced by racialised perceptions of learner suitability. Simultaneously, the advancement of employment equity will inevitably impact the placement rates of students into the labour market and the salary scale offered (McGrath, 2003).

By no means can all the labour market failures of graduates be placed at the door of the colleges (McGrath, 2003). Notions of the unsuitability of female learners for work in technical trades also continue to be a particular challenge for college efforts in securing employment for graduates. Colleges can play a part in overcoming this through their policies and practices, but it is clear that broader efforts to change employer and societal views will also be necessary. Here colleges are envisaged to be responsive to national goals that are not necessarily in line with the expressed needs of employers and communities (McGrath, 2003).

Colleges are also torn in two respects. On the one hand, they are being urged to play a speer-heading role in addressing the matter of youth unemployment. On the other,

they are expected to address the needs of adult learners. However, both factors are in dire need of skills advancement to access the labour market.

If they are to achieve their diverse expectations, colleges will be faced with balancing these sensitivities, but this will also depend on the right economic and policy frameworks to assist their decision-making (McGrath, 2003).

A significant aspect of placing learners in employment depends on the effectiveness, guidance and counselling systems. This has internationally been an accepted valuable norm, yet it has been highlighted as an area of weakness (Cosser, 2003; King & McGrath, 2002).

The objective of TVET is to train for a specific occupation or specified employment, which includes facets of general education, for example, the advancement of basic skills (Descy & Tessaring, 2000). TVET is a comprehensive field that provides initial vocational training and ensures vocational training and work-based learning (Descy & Tessaring, 2000). Ellström (1999) understands that TVET is often distinguished as a complex social system because it is positioned at the centre of two fundamental human activities: learning and working. TVET is designed to enhance the productive capacity of society on the premise that the more resources invested, the more productive gains will be achieved in the labour market. The function of TVET is to prepare students for the world of work and making an entry, and sustainable development and advancement in the workplace (Clark & Winch, 2007, p.6).

Employers have severe apprehensions about vocational education's ability to cultivate and produce skilled employees that meet the standards expected in the workplace. A paradox emerges whereby the TVET sector needs to consider the needs of other stakeholders, such as the expectations of industry demands. Moreover, Clarke and Winch (2007) characterise Vocational Education and Training as social enablement in developing and enhancing highly effective graduates that need to play a pivotal role in advancing societal capability.

1.3 PROBLEM STATEMENT

Knowledge-creation processes in the TVET colleges tend to side-track lecturer development that seems to encourage the continued production of inadequately

prepared and incompetent graduates for the world of work. These knowledge-creation processes encapsulate the lecturer development-related matters (input) and their (inputs') transformation to envisioned quality product (output). The ultimate result becomes the misalignment and lack of synergy between TVET college graduates' attributes and industry demands, as well as unsustainable college-industry relations.

The interest and focus of this study are on 'synergising knowledge processes for creating sustainable learning environments for lecturers at TVET colleges. This interest is borne out of the findings of the recent survey that suggested the prevalence of a challenge relating to the inability to keep pace with technological developments in so far as it affects their curriculum content and methodology in their teaching. This is critical in ensuring balance and synergy between industry and lecturer development needs regarding teaching and learning, meaning that the lecturer serves as a gateway that strives to strike a balance between industry (advancements) and learning, thus making learning relevant to the demands of the day. The **question** that the study seeks to respond to was, therefore,

How can knowledge-creation processes in a TVET college be synergised with industry demands to enable the sustainable development of TVET college lecturers?

To this end, the study set to achieve the following aim and objectives derived from the aim and consistent with the research question.

1.3.1 The Aim of the Study

The main aim of this study was to develop mechanisms that would ease the synergy between knowledge processes in TVET colleges and industry demands through the creation of sustainable TVET lecturer development. It isn't easy to synergise knowledge processes and create sustainable learning environments because both knowledge processes and sustainable learning environments are dynamic and complex. The envisioned synergy needs to be guided towards attaining public mandates; conversely, public mandates evolve with time, and varying levels/standards are expected. This complex aim is broken down into the following objectives.

1.3.2 Objectives of the Study

- To explore the nature and depth of misalignment between knowledge processes and the creation of sustainable TVET learning environments to justify the need for establishing the much-desired synergy.
- To identify critical and possible ways and means for establishing synergy between knowledge processes and creating sustainable learning environments meaning determining critical issues/aspects without which synergy between knowledge processes and sustainable learning environments will not be possible.
- To reflect on conditions conducive for optimising synergy between creating sustainable learning environments and knowledge processes in TVET.
- To inquire about inherent risks and threats that may hinder the achievement of synergy between knowledge processes and sustainable learning environments with the purpose of suggesting mitigating circumstances.
- Provide evidence of the success of mechanisms employed to synergise knowledge processes and sustainable learning environments in this study.

1.4 LITERATURE REVIEW

Ismail's (2019) study in Kurdistan Region investigated the effects of poor TVET policy and the lack of creating proper teaching-learning conditions in the TVET sector. Data was generated from 22 policymakers and policy implementers. The findings revealed the fundamental reason for the underdevelopment of the TVET sector is the lack of government involvement in creating effective policies and strategies to develop the TVET sector as a recognisable institution. As a result, the Kurdistan government has shortcomings regarding the TVET sector as a means to eradicate poverty and minimise high unemployment. It should be considered that the short-sightedness in developing human capital would pose long-term challenges for the Kurdistan government since unskilled citizens would halt employment and economic growth.

Chakroun (2019) underscores that work-based learning, specifically related apprenticeship, is gaining momentum in a global debate on how TVET and the significant function it plays in national sustainable development goals. The Inter-Agency Group on TVET (IAG-TVET) stated precisely that work-based learning relates

to all aspects of learning in a work environment. The report emphasises that Work-based learning in numerous forms, as well as in-service training for apprenticeships and internships, must be advanced as a matter of urgency. The European Union advocates for new skills and recognises the crucial role work-based learning, business education, and partnerships play in socio-economic development. In the same way, the African Union's continental strategy for TVET aims to drive youth employment, emphasising the critical role the business sector plays in determining the skills needed in the economy (AU, 2016).

Buthelezi's (2018) study expresses that the massive institutional, structural and curricular changes TVET in South Africa have experienced over the last fourteen years as part of complex changes, the Findings revealed a lack of compatibility between curricular reforms and the inability of TVET lecturers to adapt to change had hampered TVET development in post-apartheid South Africa.

Roberts and Frick (2018) indicate that leadership and management in the TVET sector have become unclear and distant in South Africa. The findings revealed that the absence of leadership and management had created conflicting priorities for leaders at the TVET colleges. Leadership development in the TVET sector is essential in addressing these challenges. Until now, in South Africa, there are no leadership development programmes for leaders in public TVET colleges. As a result, the South African TVET sector is in crisis.

Musyimi et al. (2018) explored the implications of China's Belt and Road Initiative in enhancing vocational education quality and employment rates in Kenya through a collaborative educational partnership program known as the Kenya-China technical and Vocational Education and Training (TVET) project. The findings demonstrated that the Kenya-China TVET Project has significantly improved Kenyan TVET classrooms with up-to-date equipment to meet industrial standards, enhancing essential skills and developing several collaborative opportunities with Chinese corporations. Early performance indicators suggest that the project significantly contributes towards increased self-employment and growth in Kenya's manufacturing sector.

1.4.1 Theoretical Framework

This study used bricolage as a theoretical framework to guide the complexities associated with synergising knowledge processes and creating sustainable TVET lecturer learning environments. Using bricolage is based on its ontological and epistemological underpinnings that are consistent with the complex realities of knowledge-creation processes and the diverse needs of industry for sustainability. For instance, bricolage advocates that reality and/or the truth and, therefore, knowledge-creation are not monolithic but complex and, as such, have multi-theoretical and multi perspectives on nature and origins (Sumsion, 2014). To unravel and understand these complexities (of knowledge-creation processes, lecturer development at college and industry levels as well as sustainability, a compatible critical discourse analysis (CDA) that is considerate of multiple levels of communication from the text (verbal and non-verbal) through associated cognitive and discursive practices to social structures that evolve there from, become imperative (Van Dijk, 1993). CDA is also sensitive to issues of power differential realities. This will thus help me deal with power differential realities between college(s) and industry, if any, that are embedded in the participants' discourses about knowledge-creation processes for sustainable lecturer development.

1.4.2 Operational Concepts

The purpose of the operational concepts is to identify and illustrate the significance in the context of this study. The rationale is to underscore and provide meaning regarding synergising knowledge-creating processes in the TVET sector: sustainability, sustainable learning environments, and synergy and knowledge processes.

Sustainability is ingrained in different concepts, all of which have rightful claims to legitimacy. *Sustainability* is deeply rooted in social, economic, and environmental aspects (Ly, 2022). In this study, the concept of sustainability is explored to the extent of determining how can the creation of knowledge processes in a TVET college can be synergised with industry demands to enable the sustainable development of TVET college lecturers.

Sustainable learning environment*s* become significant in this study as it emphasizes teaching and learning practises within the ecosystem of college(s) and

Business/ Industries with regards to the utilization of resources in the competency and skills development of lecturers and artisans (Stephen & Festus, 2022).

Synergy is the concept that underpins this study because it requires TVET colleges Business/ Industries, Department of Higher Education and Training (DHET) and SETAs to work together in creating a combined effect that is greater than the sum of their separate parts. The various stakeholders need to draw from each other strengths and resources to derive more excellent value (Abdullahi & Othman, 2022).

Knowledge processes are a critical component in this study as it addresses the broader societal issue of how knowledge is created in building capacity within the college(s) and business industries to address youth unemployment and build more excellent competencies and skills amongst lecturers and artisans (McAndrews & Ha-Brookshire, 2022).

1.5 RESEARCH DESIGN AND METHODOLOGY

Chapter three deals with research methodology and design. It explains in more significant detail how the underpinnings of bricolage frame the study and are used for the analysis of empirical data. Chapter two discusses more information about the theoretical framework and justification. The approach preferred in this study is qualitative since more and deeper understandings were sought about the extent to which knowledge processes for lecturers sustainable learning opportunities. An exploratory case study design principle was found to be most suitable for this study because it is more descriptive in nature, inclusive, explorative, and circumstantial in its intent and seeks to create a deep and meaningful narrative of explored phenomena (Baxter & Jack, 2008). The intention of using a case study method is to obtain rich, deep and meaningful insights into what participants view their understanding of the synergy of knowledge processes and the creation of sustainable TVET learning environments. The participants with diverse perspectives and knowledge from TVET college(s) and industry provided rich information. Thus, their multiple views and theoretical (knowledge) backgrounds are imperative. This study was conducted in one of the TVET colleges in the Free State, where the required permission for conducting this study was obtained.

1.5.1 Selection of Research Participants

This study sought deep and meaningful insights about the envisioned synergy between knowledge processes and sustainable TVET learning environments from participants with diverse, relevant background knowledge and experiences. The lecturer participants were selected purposefully on the basis that they have substantial experience in the sector, both in the industries and at colleges, seniority that gave us the promise of rich information about the questions the study raised, their voluntary willingness to participate in the study and finally that they also took part in the survey that served as the umbrella project to this study. Additionally, participants who owned businesses related to the focus area of this study were identified and approached for possible participation. The other information was obtained through the engagements with critical stakeholders invited and who attended the TVET project seminar arranged as part of the umbrella project. Eight lecturers from the engineering-related disciplines of the college served as the research site in the current study; two senior managers were responsible for quality assurance and the programmes at the college.

1.6 DATA GENERATION AND INTERPRETATION

The data were generated through focus group discussions with lecturers and with college management and leadership team, and reflection sessions post the seminar and during administering survey tools. The focus group discussions and reflection sessions served to confirm or clarify the data from the survey in far as it pertained to the research site. The techniques used to delve deeper into the information obtained from the participants through focus group discussions and reflections were brainstorming and the free attitude interview technique principles. Detailed justification regarding the appropriateness of these techniques is clarified in chapter three. Suffice it to say, Hugé and Mukherjee (2018) view the free attitude technique as a nominal group technique whereby the researcher provides participants with one or two open-ended question(s) to facilitate a meaningful discussion to obtain and generate meaningful data. During the data generation process, the researcher requested the participants write their ideas in brief bullet points before the debate. This allowed the participants to reflect on their input constructively. After that, each participant was allowed to share their input, and other participants had the opportunity to raise

questions to gain clarity. Audio recordings of each data generation process were taken to ensure validity, reliability and trustworthiness.

Van Dijk (1993) illustrates the essence of critical discourse analysis that emphasises dominant relationships of selective groups and institutions as they interrelate in written or verbal communication. A distinctive component of this analysis is the relationship between power and discourse and the forms of access to public discourse for distinct social groups. Ideally, we need the `cognitive interface' of models, skills, experience, behaviours, beliefs and ideologies and other social representations of the social mind to associate power and discourse in a meaningful way, which also relates to the individual, social, and micro- and the macro-levels of social structure. The study thus uses the socio-cognitive critical discourse analysis at textual, cognitive and discursive practices levels as a tool for data analysis.

TVET lecturers could benefit from understanding their strengths and weaknesses, which will enable them to close the knowledge gap in acquiring the essential skills and expertise that would enrich their teaching experiences. Learners may benefit by achieving curriculum outcomes that position them more adequately for workplace demands. TVET managers could help by implementing and managing curriculum outcomes with clear aims and objectives and coaching and developing TVET lecturers. The business community could also benefit by employing more productive learners when entering the company. This could further embed trust and collaboration and foster a working relationship between TVET and business that enhances sustainability.

1.7 VALUE OF THE RESEARCH

The value of this study may benefit TVET lecturers in understanding their strengths and weaknesses, which may enable them to close the knowledge gap in acquiring the essential skills and expertise that could enrich their teaching experiences. Learners may benefit by achieving curriculum outcomes that position them more adequately for workplace demands. TVET managers might benefit by implementing and managing curriculum outcomes with clear aims and objectives and coaching and developing TVET lecturers. The business community may also benefit by employing more productive learners when entering the company. This could further embed trust and

collaboration and foster a working relationship between TVET and business that enhances sustainability.

1.8 ETHICAL CONSIDERATIONS

Throughout the process of directing this research study, ethical issues were considered by the researcher (Roberts, 2015). This study has observed and adhered to all the ethical problems. Permission was obtained from The University of the Free State's Research Office, the DHET, Motheo TVET College Bloemfontein, TVET lecturers and students at the TVET Motheo college, and a participant from the Business Sector. Once all institutions granted permission, all participants were given a consent letter stating their anonymity and confidentiality would not be disclosed. The consent letter also emphasised the purpose of the study and the rules and protocols that govern it. Participants freely and willingly decided to participate and signed the consent letter. The consent letter further notified participants that they had the right to withdraw from the study at any stage if they wished, that the study was only for education and that they would receive no monetary benefit for their participation.

1.9 LIMITATIONS

The study was conducted at a TVET college and a business based in Bloemfontein. It was impossible to include a broader range of participants due to accessibility limitations and time constraints. I am a business person based in Bloemfontein and assist the Manufacturing, Engineering and Related Services Sector Education and Training Authority (MerSETA) in placements of students with regards to gaining practical experience in the workplace. As such, participants might not have freely disclosed information to the researcher bearing in mind that the researcher assists TVET colleges from time to time. To overcome this challenge, the Research Supervisor attended all interview sessions to ensure credibility, reliability and trustworthiness in data generation.

1.10 CHAPTER OVERVIEW

The purpose of **Chapter one** is to provide the orientation and background on synergising knowledge processes for creating sustainable learning environments.

Chapter two presents the literature review for synergising knowledge-creation and sustainable learning environments in TVET college(s).

Chapter three demonstrates the methodology and design for generating data for synergising knowledge-creating processes for sustainable lecturer learning environments.

In **Chapter four**, the study presents analyses and interprets data for synergising knowledge-creating processes for sustainable lecturers' learning environments.

Chapter five reveals the findings, conclusions and recommendations for synergising knowledge-creating processes for synergising knowledge-creating methods for sustainable lecturers' learning environments.

1.11 CONCLUSION

Chapter one demonstrates how this study explores the synergising of knowledge processes in a technical and vocational education and training college with industry demands for sustainable lecturer learning environments. The purpose of this chapter was to provide the orientation, background and introduction to this study. Furthermore, this chapter defined the research problem and the critical research questions which guided this study.

CHAPTER 2
LITERATURE REVIEW FOR SYNERGISING KNOWLEDGE PROCESSES FOR THE CREATION OF SUSTAINABLE LEARNING ENVIRONMENTS

2.1 INTRODUCTION

This study explores mechanisms to synergise knowledge-creation processes for TVET lecturers and sustainable learning environments. This chapter reviews the literature on knowledge-creation strategies, sustainability and synergy. That is, to explore the extent to which the processes through which knowledge is created and facilitated are synergised internally and externally for sustainability purposes. The intention is to identify and contribute towards strengthening the envisioned synergy where necessary. To this end, the chapter discusses and justifies the choice and use of bricolage as a theoretical framework that underpins the study. It defines operational concepts to ease readership and includes them in the establishment/development of the envisioned synergising mechanisms. The chapter also considers related literature from other international, continental, regional and local contexts from which lessons are drawn.

2.2 THE THEORETICAL FRAMEWORK

This section discusses bricolage as a theoretical framework under the following headings to justify its appropriateness to this study the historical origin of bricolage, tenets principles/objectives/formats of bricolage, ontology and epistemology of bricolage, rhetoric, the relationship between the bricoleur researcher and the participants.

The complex nature of this study, as may be traced from the research question, regarding attempts to synergise industry and TVET college's knowledge-creation processes towards enabling the sustainable development of TVET college lecturers, required the adoption of a theory and or an approach sensitive to issues of power differential realities. The theory proven to have expressed application in diverse

disciplines in ways amenable to the contextual and situational factors. Bricolage proved to be appropriate especially in view of its theoretical and contemporary uses (Gbadegeshin, 2018). The power differential realities encompassing the TVET sector in engineering in this case, may not be limited to economic and academic issues as the relate to the industries / business and TVET colleges respectively. The premium placed by the broader social and environmental aspects are equally crucial in this regard especially when we consider realities of depletion of natural resources () posing threat to the future generations.

In this study, the notions of complexity theory as espoused by Mason (2014:3) were instrumental to our understanding of bricolage as depicted by Gbadegeshin (2018). In particular, the aspects of complexity theory namely, interaction, feedback, connectedness, and emergence (du Plessis, 2021) resonate well with the tenets of Bricolage with the exception that Bricolage appear to be explicit and forthright with issues of power which, in this study permeate all aspects of the TVET sector. The study focuses on for instance issues of leadership and governance, collaborations / partnerships, curriculum, resources as well as development. Also see chapter 4 in this regard. Gbadegeshin (2018) illustrate the multiple ways bricolage has been used in research, in ways that include use as form of reasoning, design, methodology, intellectual, creative scientific practice and assuming nature of conceptual and empirical research.

2.2.1 The Historical Origins of Bricolage

The French word *bricoleur* relates to a handyman or handywoman who utilises the tools accessible to accomplish a task. This means that a person who must repair, improve, or create something (handyman/woman) in response to a problem needs to analyse the situation to identify appropriate tools and resources they can access to execute their tasks (of solving the problem). Similarly, this study will identify and synergise knowledge-creating processes in industries/businesses and TVET colleges to develop sustainable and responsive lecturer learning environments. The knowledge-creation processes that may be accessible for lecturers in the business/industry and offered by the technical trainer may not always be in line with or within the scope of the college and vice versa. The quality of training available and

accessible for TVET lecturers may need to be reviewed in line with current developments (Denzin & Lincoln, 2000).

Bricolage understands research as a power-driven action (Denzin & Lincoln, 2000). This suggests that bricolage is sensitive to power issues and recognises the possible effects of power differential realities on attempts to address shared social problems. To this end, Claude Le´vi-Strauss (1966) advises that the "researcher-as-bricoleur concentrates on the interpretation of his or her position in the sphere of reality and the social locations of other researchers and the ways they influence the creation and understanding of knowledge." This means that as a researcher, one needs to conduct critical reflection (Kemmis, 2008) through which one considers one's strengths and available opportunities towards responding to the problem at hand. This also suggests that a researcher-bricoleur, in their analysis of the internal and external situations, locate other researchers with whom they can partner. In other words, the researcher-bricoleur does not abandon their vision on the bases that it is overpowered and dominated but explores alternative avenues that support it. Thus, the researcher develops substantial navigational capital (Yosso, 2005). In the same way, in this study, power differential realities are inherent in that the knowledge-creation process for TVET lecturers resides in the academic realm and the industry/business spheres that pursue different primary objectives.

Bricolage is submerged in complexity relative to our world (Kincheloe & Steinberg, 1993). In reality, it is based on an epistemology of complexity. The relationship between research and the realm of social theory can demonstrate one facet of this complexity. Social theory is also consciously or unconsciously grounded entirely in world observations. Subsequently, the theory is a cultural and linguistic relic; its understanding of the object and observations are intertwined from the historical perspectives that have influenced it. In this process, bricoleurs relate to the concept that theory is not a description of the world but a rationalisation of our relation to the world (Kincheloe & Steinberg, 1993).

2.2.2 Tenets/Principles of Bricolage

Discourse cannot be separated from power relationships and the effort to construct specific meanings and genuine distinctive voices. Bricoleurs cautiously consider

power operates to treat the data deriving from typical academic or political-economic homes. The deceptive way this process operates is a testament to the saying that “power works best when it is not recognised as power. Power creeps in on little cats’ feet to accomplish its regulation and discipline of various individuals and groups”. By seeing the world through common and collective culture and language, we lean towards seeing experiences and events in the same way as individuals with the most power, which shapes our consciousness the way they would like us to. Nevertheless, as we oppose such a practice, we are often unaware of this occurrence bricoleur acknowledges that given numerous contexts, discourses, and power relations, what a researcher considers as fact could have been rather fundamentally different. In this situation, a bricoleur can determine what alternative facts could have been produced given the reality of different contexts, discourses, and power associations in the knowledge-production process (Bruner, 1996; Capra, 1996; Giroux, 1997; Hoban & Erickson, 1998).

The fundamental reason for choosing bricolage in this study as the theoretical framework is that it emphasises the insights and experiences of the participants, which in reality, transcends into the realm of complexity. The use of bricolage in this study cultivates, harvests and harnesses on the vast diversity, culture, experiences and psychological perspectives from which participants provide their views on how the synergy between knowledge-creation processes and sustainable learning environments can be realised to enable TVET colleges to attain their public mandates; therefore, the suitability and relevance of bricolage is to create the object using a complex framework. During this process, consideration is focused on the direction of processes, relationships, and interdependences among the participants due to their experiences of the phenomenon, interpretation and the aspects of power dominance relationships which result in multiple perspective narratives (Kincheloe, 2005).

The values of Bricolage’s multi theories and multi-perspectives form an essential lens in exploring the synergy of creating knowledge processes and sustainable TVET lecturer learning environments. It is apparent that cultures direct teaching and learning environment discourses. Consequently, creating knowledge processes excludes structures and people in developing a holistic and inclusive learning environment. Accordingly, this study foresees the value of including TVET managers, lecturers, students and business partners in providing experiences that identify the gaps in the

synergy that form the misalignment in determining inclusive knowledge processes which could positively contribute to sustainable learning environments whilst meeting the expectations of workplace demands. The ontological and epistemological contexts bolster the argument that knowledge processes are unaffected. This study aims to have a say and add a voice in changing the processes and structures to create much-desired synergy (Cortese, 1999; Hall & Tandon, 2017; Le Grange, 2008).

2.2.3 Objectives of Bricolage

The main objective of using bricolage is to analyse and uncover solutions to complex problematic areas that confront TVET college. The application of bricolage requires bricoleurs to find nuances using available resources and identify contradictions within strategic policy formulation and disparities in strategy implementation. The reflections on the participants' experiences and insights unearth the demise within the TVET landscape. Firstly, the scope entails ascertaining the gravity of disorientation and lack of coherence relating knowledge processes and the creation of sustainable TVET learning environments, thereby building a bridge that assemblies and connects knowledge processes to the creation of sustainable TVET learning environments as an interphase towards attaining high-quality TVET lecturer and student outcomes.

Secondly, critically interrogate the characteristics and perils that may impede the formation of synergy between knowledge processes and sustainable learning environments.

Thirdly, to use all possible resources, intellectual property, experiences and insights of the participants as the centrepiece in developing synergy between knowledge processes and creating sustainable learning environments.

Fourthly, the aim of utilising bricolage is to provide sound recommendations on what and how participants experience and feel to develop implementation plans that inspire and nurture synergy concerning knowledge processes and sustainable learning environments (Karunaratne, 1997; Lomax & Parker, 1996; Young & Yar-brough, 1993).

2.2.4 Research Method of Bricolage

The Research method in bricolage is a concept that has added respect to the more rationalistic expressions of the term. Bricoleurs, in their awareness of the complexity of the research process, regard the research method as engaging, which is far more than procedure. In this analysis approach, bricoleurs understand the research method as a validation technology, implying it is a technique of upholding what we support, what we know and how we know it. Therefore, the edification of researchers requires that everyone take a step back from learning research methods. Such a step back delivers value in providing a conceptual distance that produces a critical consciousness. Such a consciousness negates the passive admission of externally imposed research methods that implicitly attest to the approaches justifying knowledge that are decontextualised and reductionistic (Denzin & Lincoln, 2000; Foster, 1997; McLeod, 2000).

2.2.5 Research and Bricolage Relationships

Researchers immersed in rigour value the significance of ‘philosophical research’ using bricolage. The philosophical consciousness method assists the bricoleurs in supporting their partiality as researchers in a manner that enables the intersection of concepts such as researcher ‘invention’ and researcher ‘discovery’ (White & Cooper, 2022). The bricolage constructs philosophical research into the margins between the social world and the descriptive representation of it. These facets of philosophical research assist the bricoleur in underscoring the ethical, epistemological, ontological, and political aspects of the research process and the knowledge it produces. Such undertakings might be described as a form of research concerned with conceptual interpretation; for example, what does it mean to be present in history? How do researchers initiate the route of delving into the dynamics? How do researchers conceptualise these features that shape the research process and the knowledge it produces? How do social-theoretical choices and assumptions affect these issues? All of these questions point to the role of science as, first and foremost, a cultural activity (Fletcher, 2020). Hence, bricoleurs are unbound from reductionistic principles in ways that transition their moves, not to an anything-goes practise of research, but

rather to an authentic meticulous, cognisant multi-perspectival way of exploring the world we live in (Bridges, 1997; Foster, 1997; Morawski, 1997).

Bricoleurs are exploring the nature and depth of the social production of knowledge comprehension and human subjectivity in this philosophical mode of inquiry. Considering the aspects of this development process assists multi-perspectival researchers in deciding and constructing the methodological, theoretical and interpretative instruments required to focus on the picture of the world that transpired from it. From the framework of philosophical enquiry, the bricoleur recognises that the objectivist view of knowledge presumes that meaning in the world occurs independently from an individual's experience (Nyembe, 2020). Nevertheless, in an objectivist context, the research act simply includes identifying external objective veracity and reflecting it in the research narrative. Its concurrent misrepresentation of such a nature is precisely what the bricolage tries to avoid (Cronin, 1997; McLeod, 2000; Varenne, 1996).

2.2.6 The Founding Principles

Bricolage is constructed to assist researchers in appreciating how meanings in the research process are often impressed upon by a monologic that challenges recognising the multiple forces at work in the meaning-making process. The multi-methodological element of the bricolage embraces philosophical research and allows bricoleurs to provide insights into the theories that shape the inquiry process – assumptions often ignored in more mono-logical forms of research. However, these philosophical insights would be an essential facet of the curriculum to educate determined researchers. The rule for configuring data into knowledge is, "Are they employed consciously? Philosophical forms of research systematically ask such questions of the research process. Research reports without such narrative understandings are naive and unworthy of being labelled rigorous. In reductionistic mono-logical forms of research and curricula for preparing researchers, such philosophical issues are rarely addressed" (Bridges, 1997; Kincheloe et al., 1999; O'Sullivan, 1999).

2.2.7 Interpretation of Bricolage

Bricoleurs shoulder the accountability that comes with the interpretative process. Knowledge production always encompasses multiple facets of selection, and these selections of methods, theoretical frameworks, and interpretative approaches must be maintained (Boswell et al., 2019). Bricoleurs become specialists in determining other researchers' preferences and clarifying their own choices to make sense of a phenomenon. The attention to selection principles in choosing interpretation guides brings bricoleurs to the question of validity (Pratt et al., 2022). Discarding positivistic notions of internal and external validity, bricoleurs pursue innovative ways of justifying their interpretative choices. Therefore, bricoleurs foster a set of flexible criteria and conservative principles for selecting specific interpretations over others (Gabriel, 2004; Villaverde, 2004; Willinsky, 2001).

2.2.8 Application of Bricolage

Freeman (2007) asserts that epistemological bricolage enables “How do policymakers come to know what they know? What do they think of learning? And how does that inform what they do?” In the qualitative, empirical study, public health officials demonstrated scientific and institutional, leaning towards socially situated epistemological strategies or rationalities”. Firstly, a key element of what they did was “mending together,” bringing together and factually making sense of various information sources and experiences, generating something new from what they have developed. Secondly demonstrating that policy formulation is knowledge composition and how learning may be understood as a process of epistemological bricolage.

Madajova et al. (2017) contend that bricolage relates to utilising a combination of available resources as a cornerstone of focusing on opportunities or challenges, which is centred on innovation within for-profit social enterprises functioning in resource-constrained environments. The social enterprises link through bricolage in the processes in a way that enables them to use available resources and innovative products and services development. As a result, bricolage has a positive impact allowing innovation, which has a long-term benefit on enterprises' sustainability.

Cleaver (2017) investigates the processes concerned with institutional bricolage; various current development elements draw our attention to collective action, involvement, governance, natural resource management, political ecology and wellbeing. It synthesises these to acquire new understandings of why and how people act to manage resources and how access is secured or denied. A variety of case studies ranging from the management of water (Zimbabwe, India, Pakistan), conflict and cooperation over land, grazing and water (Tanzania), and the emergence of community management of forests (Sweden, Nepal) demonstrate the context-specific and generalised characteristics, nature and depth of bricolage and the subsequent challenges for development policy and practice.

Phillimore et al.'s (2015) study investigated how diversity in Europe has become increasingly complex, causing challenges for governments to provide adequate healthcare for the influx of migrants. However, earlier studies of health in diverse cities in European countries have primarily implemented an ethnonational focus. This study considers bricolage in providing insights into the complexity of city diversity. It offers a meaningful and multi-faceted appreciation of everyday health practices in diverse circumstances and the need to support suitable healthcare delivery for migrants.

2.3 OPERATIONAL CONCEPTS

In this section, I define and discuss key concepts to clarify what they mean in the context of this study. The purpose is to ease readership and to facilitate the comprehension of what it practically means to synergise knowledge-creating processes in the TVET sector.

2.3.1 Sustainability

In a British book, Blueprint for Survival, Kidd (1992) states the word "sustainability" first came to use in 1972 from the perspective that describes man's future. This continued to be the case when the term was used again in 1974 in the United States to explain and represent a "no growth" economy.

According to Hajian and Kashani (2021), the definition of sustainability has always been examined by experts. In 1972, definitions emphasized restrictions on ecological systems, carrying out purposes such as absorption and recycling of waste of anthropogenic behaviours, with the subsequent problems of improving social, educational, health, and employment. In 1987, sustainable development was defined as “development that considers the needs of the present day without compromising the capacity of future generations to meet their own needs.” In 2019, it was defined as fulfilling the needs of current and future generations, dependent on the appropriate human, natural, and economic capital circumstances to provide for human welfare.

Sustainable development has become an extensively established objective for human society in the 21st century. The concept of sustainable development came to light in 1987 with the publication of *Our Common Future*, which strongly recognized sustainability as a vital component of international development. Because of inequalities that had frequently been increasing among nations, increasing poverty, especially in developing countries, diminished the ozone layer, causing global warming, reducing natural resources, jeopardising some species of animals and plants, and triggering water and air pollution. As a result, sustainable development came about as an endeavour to change the way of thinking about the planet. Against this backdrop, the concept of sustainability is favoured instead of growth. Growth is believed to indicate only a quantitative aspect of countries without considering other qualitative elements such as education, health, and equality. The argument is that growth is a quantitative boost on a physical scale, whereas sustainability refers to the improvement or unfolding potentialities. This research analyses why and how the concept of sustainability has evolved, how it should be conceptualized, and whatever should be done to make it work.

According to Foster (2001), The origins of the term sustainability are so profoundly entrenched in fundamentally diverse concepts, each of which has valid claims to legitimacy. The evolution of multiple meanings of the word is traceable to each writer’s context, for example, the social, economic, and environmental (Hockert, 2001). In this study, the concept of sustainability is explored in the context of TVET colleges’ knowledge-creation processes in line with their corresponding business/industry partners. TVET lecturers’ capacity, capability and conditions in developing and

providing adequate graduates ready to meet the high expectations of workplace demands (Brydges et al., 2022).

Hockert (2001) explored the sense of environmental transformation and related it to the broader sphere of social responsibility and corporate sustainability. The study investigated how environmental management and cooperate strategies grow into a practical business and business plans effectively to execute sustainability for present and future needs. The balanced scorecard was used to interpret their sustainability in business actuality. The findings revealed firstly that integration of environmental and social sustainability into the economic aspects is needed practically to strengthen the pillars of longevity.

The significance of Hockert's (2001) study determines that there is a need to integrate Environmental, Economic Social aspects and to forge and strengthen sustainability. These two components working together side by side have relevance to this study for TVET, specific is engineering as a business in this study.

The engineering department will integrate the environmental aspects, social aspects and economic aspects of the business unit to make it sustainable; in other words, the engineering as a business unit turns out to be sustainable. As in this case, the business unit has a business strategy that aligns and is derived from the corporate strategy. In this case, it would be the TVET strategy where the study takes place.

To this end, the business unit strategy is informed by several aspects which determine its performance which is highlighted by Hockert (2001) referring to the balanced scorecard, which is a framework intended to balance strategic developments with financial progress, enabling decision-makers to gain a more vigorous view of how business unit strategy is performing. The balanced scorecard framework links the business strategy to strategic planning with daily management (Suri & Lakhanpal, 2022).

The overall TVET strategy needs to focus on matters that enable sustainability fortitude; if their actions are irresponsible, for example, dumping waste from the engineering processes outside of the legal framework, harms society, causing an undesirable social impact. On the other hand, if costs are not effectively managed in the engineering process, it will shrink the revenue base and, thus, becomes economically challenging to maintain sustainability.

These tasks, duties and levels of accountability cannot be performed by just one person, e.g., the corporate manager; it is for this reason that why the engineering business unit needs to interact we experts from various functions within the corporate structural ecosystem to ensure alignment towards the vision, mission, goal and objective of the corporate business.

The role of human resources is to assist the business unit in achieving its corporate strategy and goals by essentially recruiting and developing people and overseeing their performance (Adillah, 2022). Engineering operations management involves analysing and optimising operational challenges utilizing scientific methods. This enables the engineering process to maximize value and develop systems and processes for continuous improvement.

Financial engineers blend, design, research, and implement innovative financial mechanisms for profitable market/consumer use (Fatras et al., 2022). The legal department ensures the engineering process adheres to *laws* and ethics and is implemented appropriately to ensure employee safety (occupational health and safety), and public safety must be considered (Balcerzak & Sieradzka, 2022).

Based on this reasoning, it is fair to conclude that an engineer may not have this expertise within these functions. For this purpose, the Engineering business unit must get support from people with various expertise from diverse perspectives (Meadows & Parikh, 2022). All these functional components form part of the performance management systems underscored by the balance score card which allows for integration to be established, and the business strategy can be consolidated and sustainability may thrive (Hockert, 2001).

This study recognises that sustainability is interdependent and transformative. It is incumbent on TVET colleges' management to take on the responsibility to ensure that TVET lecturers are adequately and consistently trained to maintain high student achievements. In the same way, businesses cannot act in isolation from the TVET sector. Business should be included in the formation of TVET lecturer development. While the business environment is constantly changing based on innovation and market dynamics, TVET lecturers and students must keep up-to-date with these changes to ensure that upskilling and proficiency are maintained. TVET lecturers and students should be deployed in the industry as part of the teaching and learning

process. Societal sustainability becomes more visually and tangibly apparent when TVET graduates become more employable, which has positive spin-offs in eradicating unemployment, poverty and crime, ultimately contributing to economic growth.

In addition, sustainability was first believed to be a strategy to prevent ecological disasters stemming from the extreme commercial exploitation of sources and the worsening of the environment. Nowadays, the concept has been extended. It has first-rate economic and social convolutions. The assessment of financial techniques in many countries has proven that fast financial growth precipitated critical concerns from the perspective that sustainability consisting of social, economic and environmental aspects should work collectively to achieve the most significant impact.

Oliver et al. (2021) emphasise the need for sustainability policy intervention and a simultaneous need for the evolution of knowledge systems to inform more practical policy action. While there are many new policy targets relating to net zero emissions, social and economic sustainability challenges remain; cities, regions, and national governments are battling to develop transformational policies to achieve them rapidly. Policies and knowledge systems are needed to address the speed and scale of sustainability challenges. These comprise entrenching systems thinking literacy, mainstreaming participatory policy frameworks, expanding the capacity to undertake transdisciplinary research, more adaptive governance, and continuous organisational learning. The nuances should guide the critical path and actions the public and the private sector take in addressing the global sustainability challenges.

The meaning and relevance of sustainability in this study can be illustrated in these three fundamental areas, firstly collaboration between the Motheo TVET College and the local Bloemfontein business community should be strengthened in such a way that they join hands to create learning and employability opportunities that are directed towards sustainability aspirations and goals (Webster et al., 2017).

Secondly, the TVET college needs to provide courses relevant to the industry needs within the specific location. Suppose courses are designed generically. In that case, the skills gap will widen within the industries and sustainability and growth will be hindered as it would disadvantage TVET graduates and industries.

Thirdly, education for sustainability is a globally accepted belief which seeks to support and develop sustainability skills and responsiveness throughout a learner's

educational pathway. Therefore, Motheo TVET College needs to develop avenues of learning that are consistently evaluated in line with local, national, regional and international industry needs (Mazzotti et al., 2007).

2.3.2 Sustainable Lecturer Learning Environments

Sustainable learning environments can be defined as resources and tools that TVET managers, lecturers and students use for teaching and learning. The most commonly used resources in the teaching and learning environment are chalkboards, calculators, textbooks, computers and study guides. Khoza (2012) recommends that such tools used in communicating learning can be expressed as a teaching and learning resource. Resources can be divided into three mechanisms which are hardware (machines), software (carriers of information) and ideological-ware (theoretical knowledge) (Khoza, 2012; 2013). Furthermore, Solomon (2009, p. 50) states that "books and its supplements, kits of hands-on materials, and software for computer-assisted instruction are referred to as published curriculum materials."

Hardware resources are machines or tools available in teaching and learning, offline and online (Khoza, 2013). The use of Technology in Education (TIE) and Technology of Education (TOE) assists students in promoting their understanding (Khoza, 2013a). Thus, Technology in Education (TIE) is any teaching/learning resource one can see and touch (Khoza, 2012). Choi-Koh's (2010) study discovered that the use of computers without the lecturer's support resulted in students/learners not understanding geometry because if a student could not sketch geometrical diagrams, the student would not be able to draw these graphs and charts on a computer. This signals that TVET lecturers first need to be computer literate and that students need to understand the subject material as a prerequisite to using computers as a learning tool.

Software is "any teaching/learning resources produced for hardware to display data or communicate teaching" (Khoza, 2012, p.1). This suggests that software and hardware work in combination to communicate learning. Therefore, software becomes an essential teaching tool that helps students understand the content (Solomon, 2009). Similarly, TVET managers need to understand the role hardware and software play in the way they communicate with lecturers; for example, if TVET managers make use

of e-mail as a form of communication, they need to ensure that lecturers have access to e-mail and that lecturer understand that e-mail is a form of official communication. Additionally, TVET lecturers should also be capable of using e-mail.

Ideological ware is resources that are not always visible such as teaching strategies and theories used during the teaching process (Khoza, 2012). TVET managers need to equip lecturers with the necessary skills that will allow them to understand curriculum content, conceptualise and scrutinise subject material and present it to the student in such a manner that they can understand and master the learning content.

According to Khoza (2012), sustainable learning environments are anything that facilitates/initiates learning or any person or thing that communicates learning. Khoza (2013) directed a case study on university lecturers who were in the process of using the online environment in the teaching of their modules. The study examined the hardware/tools/machines/objects used in education. The findings uncovered that learning should not be about technology (hardware/software) but rather about ideology. So therefore, TVET managers need to ensure that lecturers are seen as their most valuable resource, as they are accountable for imparting knowledge and understanding to the students.

Sammon and Becton (2001) state that business and TVET college partnerships inject much-needed resources into colleges, empowering learning and contributing to lecturer development and administrators' effectiveness. Strategic partnering could support TVET lecturers and prepare students for better job opportunities in the 21st century. Moreover, Karimidizboni (2013) identified that workforce development is one of the most decisive human resource management tasks, significantly affecting other management performance aspects. TVET lecturer's competency is instinctive in ensuring a sustainable learning environment for students. Therefore, it is equally essential for TVET managers to attract and retain high-calibre lecturers. Furthermore, they must be developed and trained with systems and processes. Its policies ensure that they are efficient, which strengthens the argument that if TVET lecturers use computers in teaching, TVET managers should ensure they are computer literate and have an excellent ability to teach using computer hardware and software.

2.3.3 Synergy

As a rule, synergy is the interaction of two or more agents to create a combined effect more significant than the sum of their individual effects (Zhou et al., 2016).

The quest for synergy encompasses the management of most large companies. Cross-sector organizational teams are set up to build on critical account plans, direct product development, and adopt best practices. The significance of sharing knowledge leads and builds human capacity to meet organisational objectives, and processes and procedures effectively are standardized. Organizational structures are assigned to give the organisation a competitive edge in the global economy (Goold & Campbell, 1998).

For synergy to be effective, it requires a strategic direction (or vision) that gives people the nucleus to channel their *positive* energies together to realize a shared vision and goals. synergy will be impeded from gaining momentum if people have Resistance to change. Corporate culture conflicts. Slower decision (Pozoukidou & Angelidou, 2022; Zeng et al., 2007).

Synergy becomes easier to enhance employee motivation and satisfaction. It encourages harmonisation between managers and employees; furthermore, synergy cultivates a sense of place and belonging among organizational people (Gachui, 2022). Peres et al. (2022) specify that synergy occurs when an interaction of components produces an outcome more significant than the effect that would have resulted from simply adding up the effects of each aspect. *synergy* happens when a combination of aspects produces an effect or result that is said to be “greater than the sum of its parts.” The specified synergy occurs when the interaction of components creates an outcome more significant than the effect that this more remarkable than simply adding up the components of each aspect.

The Engineering business unit outcomes or results working together in engineering towards the vision and mission should be greater than simply bringing them together by simply adding the various functional inputs by merely adding (four functional areas 1 +1+1+1, giving an output of 4) by no means it must be the result, it should produce an output of 5 due to the inherent qualities from each partner that server they must all pull together towards one goal this is added benefit of strengthening synergy (Peres et al., 2022).

Furthermore, Meijer (2005) suggests synergy comes about when two or more organizations work together to create a combined effect that is greater than the sum of its separate parts. TVET colleges and industries can work together; for example, engineering lecturers and students can gain practical experiences through internships; workplace readiness programmes from industries return deploy artisans to TVET college(s) to the guest lecturer or enrol in part-time programmes to improve their theoretical knowledge (Abdullahi, & Othman, 2022).

The United Nations Educational, Scientific and Cultural Organization (UNESCO) strategy for TVET (2016-2021) encourages a sound government approach to TVET that better ties and brings into line relevant policy areas, including education, employment, industrial and economic development, and social policy. It calls for the formation of cooperative ventures with the private sector. The strategy highlights the need to include personal sector contributions to the national TVET funding strategies. UNESCO plans to construct national, regional, and sectoral stakeholder programs to facilitate industry sector participation and interaction between education and the workplace. The TVET sector, in conjunction with industry partners, needs to be externally focused so that they meet each on the same pathway in creating synergy partnerships towards a shared vision of addressing poverty, employment and inequality in society (UNESCO, 2016).

Iron-Baba (2022) states that TVET is an essential and vital program to create demand-driven manpower for sustainable industrial and technological progress and national development. The study aimed to explore the present situation to appraise the availability of manpower in Katsina State craft village. A research question was used to conduct the study. The survey research design was employed from December 2021 to April 2022. The sample was made up of five (5) lecturers from the Automobile Technology section, Five (5) instructors from the Electric and Electronics section, and eighty (80) students (40 students from each section) in Katsina state crafts village, Katsina state, Nigeria. The TVET lecturers and students were chosen using a random sampling method. Four (4) experts validated a questionnaire for data collection. The findings revealed that TVET policy reform issues and TVET-industry partnership provide a shared vision and objectives in working together to address societal needs. This study suggests that TVET and industries cannot work in conflict with each other for the pursuit of their interest and the fight for power and resources must not come in

the way offing deterring them off the path that by synergising their effort jointly will be more effective in addressing social, economic and social needs (Ibrahim & Nashir, 2022).

Auta (2022) investigated the gap between what the industries want and what the specific institution's TVET institutions of higher learning produced in the lack of employability skills. The study utilized a mixed methods design, and the participants comprised 439 construction industry employees with different roles and years of experience. Questionnaires and interviews were used to collect data, and standard deviation was applied to analyse the quantitative data. Thematic analysis was utilized to analyse the qualitative data. The study's findings pointed out that personal characteristics, teamwork skills, practical communication skills, problem-resolution skills, leadership competencies, and technological skills were essential to foster synergies with TVET and the construction industry.

2.3.3.1 The leading role synergy plays in creating sustainable learning environments

(a) Shared Vision, Values and Goals

The organisation’s vision, mission statement, core values, strategic objectives, goals and targets allow people to find purpose and direction in achieving organizational success. Goals and targets are levers that motivate employees to perform at a high standard; conversely, a shared goal needs to be complemented by clear roles and responsibilities; it is essential to assign the right people at the right place, doing the right thing at the right time to ensure they perform optimally. When team members have clear roles and responsibilities for themselves and others, the risk of overlapping or confusion in tasks and duties is mitigated. It is likely that when a team deals with challenging situations and achieves successful outcomes together, the teams embark on a journey of learning from each other rich experiences. As a result, belief and confidence may become more entrenched, promoting synergy within the team, which may contribute towards sustaining a stronger work ethic (Almandoz & Lee, 2022).

(b) Leadership and Followership

Effective leadership is a synergetic action. Leaders depend on followers; this dependency is interchangeable and dynamic in pursuit of achieving organisational success. Good leaders can communicate messages through storytelling.

In this way, they can share their personal experiences and situations they have dealt with in the past so that followers learn through their encounters; it also promotes an open and transparent environment whereby active listening is encouraged; in the same way, employees can share their knowledge and skills which may enable them to learn and grow from these experiences together (Senge, 1990).

It could also foster greater synergy between leaders and followers and improve the effectiveness of how they approach and overcome the challenging situation as one cohesive team. It may be more critical for leaders to understand followers than for followers to understand leaders because the leader should ultimately take responsibility for poor performance and employee development and ensuring employees and constantly trained to deliver sustainable results (Arnold, 2022).

(c) Trust, Respect and Compassion

When every employee works and connects with trust, respect and compassion, everyone may believe their impact is as valuable as the next person – and vice versa; therefore, each person may give their best work in becoming a high-performing team. A compassionate individual will be aware of the effect of their action on others. As a result, everyone will put in their entire ability and collectively to attain synergy (Redd & Suggs, 2022; Yukelson, 1997).

Maintaining and amplifying synergy is a continuous learning process and must be appropriately managed. It is not a target you arrive at and just stop; it is an ongoing journey upon which the leader and the team must continually work together to reach the purpose and ambition. Effective communication is critical to creating and sustaining synergy, and a component of it is conflict resolution. An effective team has the emotional intelligence and maturity to resolve disagreements by discovering and managing the best possible solution and placing learning outcomes into precise, actionable steps planned, implemented and measured, despite differences in skills,

beliefs, strengths, weaknesses and abilities. For synergy to flourish in an organization, a positive team culture as a foundation is vital, whereby organisational learning is nurtured (Leithwood, 2021).

(d) Positive Environment

Maintaining and amplifying synergy is a continuous process and must be appropriately managed. It is not a target that you arrive at and just stop; it is an ongoing journey that the leader and the team embark upon together and must continually work together to reach the purpose and ambition. Effective communication is vital to creating and sustaining synergy, and a component of it is conflict resolution. An effective team has the emotional intelligence and maturity to resolve disagreements by discovering and managing the best possible solution, despite differences in skills, beliefs, strengths, weaknesses and abilities. Transferring knowledge encourages engagement and dialogue for synergy to flourish in a learning organization (Senge, 1990; Woodard & Agha, 2022).

2.3.3.2 Critical factors in establishing synergy towards sustainable outcomes

A study by Tapaninaho and Heikkinen (2022) reveals that the circular economy (CE) requires organisations to reconsider their value construction and stakeholder engagement relationships. Although value creation in a CE business is typically understood from a company-centric viewpoint, the article uses stakeholder theory to conceptualise value creation as an interactive, systemic pursuit, including multiple stakeholder relationships. The study used a case study of the CE business development of a Finnish energy company. It offered innovative insights by categorising five joint value-creation activities: sharing the CE narrative, co-creating knowledge for political decision-making, developing the industry, creating local CE ecosystems and enhancing the business model. In addition, the multidimensional value concept acknowledges multifaceted, subjective stakeholder value expectations and facilitates the engagement of stakeholders in joint value-creation endeavours. The findings determined that the stakeholder relationship perspective on CE business

value creation enables the creation of synergy as an essential component to advance CE business and sustainability.

Jin et al. (2022) investigated how the Crowd Innovation Space Ecosystem (CISE) can explore the combination of innovation, entrepreneurship, evolution, and investment. Based on synergetic, this paper describes the agent interactions and subsystem synergy of the CISE, investigates the co-evolution mechanism of the CISE and the development inclination of the agents in the CISE through simulation experiments, and studies the effect of synergy on the operation scale of the CISE through empirical analysis. The findings discovered the following: (1) The synergy between financial support and entrepreneurial services leads to the evolution and development of the CISE, and the synergy has a positive influence on the operating scale of the CISE; (2) The CISE should focus on enhancing the quality of financial support and the efficiency of entrepreneurial services, making sure the joint development of financial support and entrepreneurial service, boosting internal operating mechanisms, and achieving high-quality development; and (3) Small and micro start-ups, as a result, depending on the CISE, with the assistance of entrepreneurial services provided by MMS service platforms and financial support provided by financial institutions, to enhance the external environment, integrate resource endowments, and improve core values, thereby promoting business model innovation and sustainable development.

Agusdinata (2022) illustrates that effective implementation of solutions to reach the United Nations (UN) Sustainable Development Goals (SDGs) is dependent on utilising synergistic interactions among SDGs and active commitment among a diverse group of societal stakeholders. This paper offers a framework and case study for design and engagement methods in which the university takes the lead in co-creating SDG solutions. The model supports university-led efforts by leveraging three elements: (i) inherent synergies across SDGs; (ii) types of solution identification, design, and implementation; and (iii) methods of stakeholder involvement and interactions. Using a combination of Human-Centred Design (HCD) and Shared Action Learning (SAL), the study provided a case led by a large, public, research-oriented university on how different stakeholders contributed to the co-creation process to find solutions. Based on the experience of 50 students over four years in support of SDG execution in Indonesia, the proposal leveraged synergies within SDG 1, 2, and 5 (related to increasing income-generating power for women and indigenous people) and SDG 7

(use of solar energy for fish preservation and crop processing). During the process, collaborations with stakeholders took place during design workshop courses, community consultations, mentoring and internship programs, partnering with companies and local universities and government, site visits, and immersions in local communities. The HCD-SAL model created a system for monitoring impacts across all stakeholders, particularly how the projects assisted increase communities' economic well-being. The model provides a framework for universities to develop authentic stakeholder engagement and support for finding and improving SDG solutions for future sustainability.

Kholiavko et al. (2021) indicate that interdisciplinary sustainability analysis involves an in-depth study of relationships between different economic entities and identifying investment facets of developing relations between them. The Quintuple Helix Model enabled the analysis of interactions and mutual influence between universities, industry (business), government, civil society and the natural environment. Within the Quintuple Helix Model, the crucial role in the development of the economy is given to knowledge and its transmission between the different subsystems of the Model. The higher education subsystem occupies a special place in the Model due to the following reasons: 1) within the educational activity, universities and colleges train highly qualified personnel for employment and participation in the economy; 2) within the extracurricular activity, universities and colleges advance new green consciousness of students that is crucial for further sustainable development of the economy; and 3) within the research, universities and colleges nature innovative renewing technologies and environmental-friendly technologies. Universities and colleges offer students the transmission and circulation of sustainable knowledge in society and business. Therefore synergy becomes a critical pillar of higher education (universities and colleges), business (industry), government, and public (civil society) to be able to produce a foundation for sustainable development of the economy, develop the level of environmental protection, decrease the CO_2 emissions, allow for the rational use of exhaustive resources, generate new green products and raise the standard of living of the country's population, which creates a fertile ground for sustainability to thrive.

Atah and UKah (2021) investigated how the relationship of synergy and collaboration amongst businesses and educators could create sustainability in Universities in Cross River State, Nigeria. A descriptive survey design was used in this study. The

population sample consisted of business education, and data was generated through a structured questionnaire based on the findings, conclusion were made while the following recommendations were made. The results revealed that business educators should collaborate with industry to provide students with more opportunities for practical industrial work experience and prepare them for actual work situations; Business education should be involved in international partnerships to improve the quality and the value of the education system; business education should identify with others individual, associations and others organization in order maximize substantiality opportunities.

Rudhumbu (2022) conducted a study which investigated challenges encountered, strategies used as well as opportunities accessible for the effective implementation of the TVET curriculum in colleges in Botswana. The findings revealed that the government make efforts to facilitate synergies between TVET colleges and industry, therefore making more funding available in conjunction with creating more opportunities for skills development through collaboration between industry and colleges were prospects that could lead to improve the implementation of curriculum sustainability.

Zakaria et al. (2022) identified that the crisis of the COVID-19 pandemic had remodelled industries into becoming more sustainable, human-centred, and technologically adaptive. The sustainable education model contains three pedagogical components: knowledge, skills, and technology. As a result, sustainable knowledge is the core of education with synergies industries' demands. Therefore, TVET education forms the gateway together with forming solid partnerships with industries that enable human capital growth, contributing to sustainable employment.

Tsado (2022) emphasises that TVET is one of the critical pillars of national transformation and contributes to the socio-economic development of Nigeria. The study heightens awareness of the precipitous outburst of the COVID-19 pandemic, with led to a considerable interruption in the educational system in Nigeria. The disturbance triggered an unprecedented gap in the teaching and learning of TVET. Therefore, the main thrust of this study was to underscore the issues and challenges TVET education faced during the COVID-19 pandemic. The findings discovered there is a need for the TVET, sector, industries, and government to work in synergy to

improve the effectiveness of teaching and learning, including the need for advancements in online learning for future sustainability.

The primary purpose of this study is to flesh out ways and means of establishing synergy between knowledge processes and creating sustainable learning environments so that intended TVET public mandates are attained. It isn't easy to achieve synergy, which synergises knowledge processes and creates sustainable learning environments, because both knowledge processes and sustainable learning environments are dynamic and complex. The envisioned synergy needs to be guided towards attaining public mandates; conversely, public mandates evolve with time and vary.

Witges and Scanlan (2015) suggest that, as a result, creating synergy among team members could be a helpful strategy in enriching the work environment. The findings revealed that a lack of synergy is apparent as a result of the following identified issues, (1) a lack of group cohesion; (2) misalignment in understanding process execution; and (3) a lack of training which is resulting in inefficiency and posing a risk in achieving long term sustainability. The study revealed that nursing leaders would derive added value by better understanding the benefits of adopting a culture of synergy as leaders within their work environment.

Brennan’s (2014) study identified the four synergetic factors within the TVET Sector that are making a meaningful contribution to meeting the needs of highly skilled professionals in all job clusters in Canada, i.e., (1) decentralised decision making; (2) collaborative partnerships with industry; (3) attentiveness to the needs of students; and (4) innovative leadership.

Understanding the techniques that produce synergy assists in increasing success in everyday life, commerce, science, economics etc. Empirical evidence in many areas demonstrates that assortative information matching increases the probability of achieving synergy. The origins of synergy characterise and foster a surge in information content or negentropy of the system and its power to produce efficient and effective work (Jaffe, 2017).

The significance of synergy in this study is essential in establishing the extent of the gaps in knowledge processes and the creation of sustainable TVET learning

environments to recommend solutions that ascertain the desired synergetic approaches future.

2.3.4 Knowledge-creating Processes

Berkvens et al. (2014) assert that the knowledge processes refer to teaching and learning and can be viewed from a three-dimensional perspective: the student, society, and subject. Firstly, the student clutches onto learning because it gives opportunities for better jobs and builds competencies and skills. Secondly, society flourishes since students become participating members and better understand society's values. Thirdly, the content taught mirror what society considers to be necessary. TVET managers and lecturers have a huge obligation in the formation and development of students in the quest to become valued and skilled members of a future society.

Furthermore, Berkvens et al. (2014) suggest that the aspects of what learners ought to be able to learn are determined by the aims and objectives, which should comprise societal values, subject matter and possibilities for student growth. In the South African context, the knowledge process contains aims and objectives that focus on broader societal needs, subject content, and student needs, which are fundamental in attaining optimised skills development. However, the South African knowledge processes in teaching and learning have looming sustainability concerns because it falls short of providing adequate guidelines on student outcomes. TVET managers and lecturers can easily be misinformed and perplexed due to their understanding of learning outcomes. This could lead to significant discrepancies in how different TVET colleges utilise learning outcomes.

Bond (2011) proposes that students' success is the main objective, and all educators should perform essential responsibilities in the advancement of teaching and learning. Instead of pausing their personal development and waiting to gain workplace experience, TVET lecturers should take proactive steps to gain knowledge and skills. This will enable them to develop faster and practically deal with teaching challenges. This argument establishes the need for TVET lecturers to gain constant on-the-job training to grow faster and deliver quality lessons more professionally.

Kennedy et al. (2009, p.4) highlight that many knowledge processes speak directly to "learning outcomes that must be capable of being assessed". This suggests that when writing learning outcomes, there ought to be six learning outcomes for each module taught. Furthermore, learning results must be precise and clear and relevant. This emphasises the necessity for TVET lecturers to provide clear direction, ensuring a synergetic relationship between what is taught and what is learnt. To reinforce this notion, Motshekga (2011) implies that it is essential to assess learners for attained learning outcomes; formative and summative assessments become critical. Formative assessment (assessment for learning) is a component of learning when learners are considered to gather relevant information. This indicates that TVET lecturers should be there to support, if required, without necessarily grading learners (it regularly takes place during the learning processes). Summative assessment (assessment of learning) is a summary of the formative assessment of their learners' achievements of learning outcomes; TVET lecturers are grading their learners (it often takes place at the end of learning processes) although it is imperative for learning outcomes to be assessed from a learning standpoint, it is similarly essential that TEVT manager is in a position to evaluate the TVET lecturers' outcomes to create synergy between what is taught and what is learnt. As a result, the effectiveness of teaching and learning can be evaluated to ascertain the gaps in the TVET lecturers' ability to teach effectively.

2.3.5 Justification for Synergizing Knowledge Processes for Sustainability

The study from Nicaragua suggests that synergy between public-private partnerships, TVET colleges and community-level networks enables greater possibilities in providing youth employability and community development (Webster et al., 2017). Similarly, a Ugandan study points to the critical role of TVET college education in developing and producing high-quality and competent individuals capable of competing with other emerging economies (Moses, 2016). Thus, it becomes understandable why Martin and Eisenhardt (2001) consider synergy as the cornerstone for corporate strategy in multi-business organisations. Raihan (2014) seem to support this view by suggesting that synergy leads to specifics of relevant practical skills needed for industrialisation, which in this study encapsulates social, economic, and environmental realities.

Consequently, this study considers competent TVET graduates with the competitive advantage to be essential agents of and for sustainability in its economic, social, and environmental aspects (Liu & John, 2016). Intricate interdependencies influence this view among the three pillars of sustainable development (Patel et al., 2022).

The pace of change, be it economic, environmental, social or a combination of any two or all three pillars, intensifies complications in realising synergy and potentially compromises sustainability if not mitigated appropriately. This reality is exemplified by the following phenomenal changes globally.

2.4 THE POSSIBLE CAUSES OF MISALIGNMENTS AMONG KNOWLEDGE-CREATING PROCESSES

This section considers the challenges that compromise the alignment of knowledge, creating a process for TVET lecturer development. It unravels critical factors that weaken or counteract the attempts towards synergy. The essential aspects include leadership, curriculum, TVET lecturers' professional development, teaching and learning resources, and work-based integrated learning.

2.4.1 Leadership

Leadership offers an organisation a vision that impels it in a particular direction (Mayfield et al., 2015). For instance, a vision about the sustenance of a good employee base (e.g., lecturer retention) would necessarily focus also on better and improved conditions of employment and or service, such as market-related remuneration (Shabane et al., 2017), quality and responsive staff development, staff morale, positive organisational culture, team building (Graban, 2016). On the other hand, La Cock (2017). asserts the ineffectiveness of TVET leaders in their ability to articulate a clear vision and mission and to inspire and lead TVET lecturers are damaging to the TVET organisation, TVET industry stakeholders and society at large. The implication drawn from TVET lecturers' responses is that TVET leaders are not offering support and opportunities for self-development. Therefore, holding TVET lecturers to high-performance standards will make it difficult.

Hallinger's (2011) model amplifies a holistic illustration of how TVET lecturer knowledge is interdependent and co-exists within an open system. Whilst TVET lecturer knowledge is entrenched through theoretical and practical expertise directed at learner outcomes, TVET lecturers and managers need to take more leadership responsibility and accountability in the process of planning, managing, organising and implementing curriculum design and content that is executed through a broader and deeper understanding of the macro-environmental context namely; community expectations, institutional systems, business enterprise and Government legislation (Bossert et al., 1982; Leithwood et al., 2010; Mulford & Silins, 2009). Furthermore, the inability of TVET managers to inspire belief in TVET lecturers relates to them not taking responsibility for the significance of decision-making and the unprofessional manner in which they lead them. As a result, TVET lecturers could lose the credibility and legitimacy of their Leaders (Lie, 2018).

Badenhorst and Radile's (2018) study focused on the challenges currently facing the TVET Systems due to a lack of synergy causing disintegration and misalignment in creating sustainable TVET learning environments. The most pertinent issues highlighted were the inadequate leadership and management skills of TVET lecturers in numerous facets of teaching and learning, amongst which were apparent limitations in their proficiencies to meet capabilities essential for effective lecturing. The findings highlighted the desperate need for collaboration and assimilation of power and capacities to bring about a shared leadership vision to challenge poor performance at the institutional level of the sector that seriously needs more effective outcomes.

Leadership provides analytic and strategic analysis of the internal and external environment to facilitate smooth adjustments and possible transformation to the envisioned change, should such arise. Leadership principles, as explained, affect the TVET colleges and Industries alike. Various leadership styles influence an organisation's direction; the most commonly used are Transformational leadership crafts a vision for their followers and influence change through inspiration and motivation (Brookes et al., 2014). Transactional leadership endorses compliance via rewards and punishment (Odumeru & Ogbonna, 2013). Autocratic leaders typically make choices based on their thoughts and judgments and seldom accept advice from followers (Van Vugt et al., 2004). Democratic leadership, also known as participative leadership or shared leadership, is a leadership style in which group followers take a

more participative role in decision-making (Bhatti et al., 2012). The bureaucratic leadership style is renowned for red tape. Inflexible rules, standardised procedures, and rigid division of labour and responsibility symbolise bureaucratic leadership. Decisions are taken in a strict and often pyramid-based hierarchy (Carnevale & Stivers, 2019).

Remington and Marques (2020) illustrate bureaucratic/red tape leadership structures tend to be rigid, inflexible and unsupportive in addressing TVET lecturers' experiences in teaching and learning. The one distinct aspect of bureaucratic systems is that it does not respond to human needs, emotions or values. That is why the perception of TVET lecturers is that they feel unsupported by their leaders.

Teaching needs abundant knowledge and the aspiration to teach; it also entails having a genuine grasp of motivational techniques, leadership and conflict resolution skills, human psychology, and the aptitude to think on one's feet. TVET lecturers should act like classroom managers and therefore expected to demonstrate managerial competencies (Klar, 2012).

These competencies are embedded in knowledge, skills, behaviour and attitudes needed to be effective in a wide range of learning environments. A lack of understanding from TVET lecturers and the failure of management to consider student interest demonstrate a lack of management capacity (Hellriegel et al., 2005).

Leadership requires TVET lecturers to be shaped regarding mentoring, coaching and assessment to ensure that they teach according to expected standards. TVET lecturers should embark on more peer-to-peer learning, allowing colleagues to tap into the intellectual capability of more knowledgeable/expert lecturers (Badenhorst & Radile, 2018).

The role of the TVET lecturer forms the cornerstone in achieving synergy in creating effective knowledge processes and sustainable learning environments due to the following reasons; (1) The TVET lecturer is perceived to pose dual attributes such as a proficient, expert educator, with outstanding business or industry skills (Blom, 2016); (2) TVET lecturers must understand the intended and attained curriculum outcomes thoroughly. The focus should be directed towards adequately preparing students for the world of work by embedding the needs and expectations of business and industry (Boud, 2001); (3) TVET lecturer awareness and responsiveness to the TVET

environment and framework is vital to success in teaching, together with understanding the student context. Learner-centredness is therefore critical for meaningful learning since TVET students' competencies are at different stages of physical, mental and social development compared to school students (Lucas et al., 2012); and (4) vocational pedagogy aims to strike a balance between the conceptual and practical aspects, which comprises of creativity, critical thinking, communication and collaboration with the determination to inspire performance-related and ethical disposition traits in students which will enable them to become effective responsible citizens' (Lucas et al., 2012). Therefore, vocational pedagogy requires the use of various forms of knowledge, extracted from both non-empirical (conceptual) and empirical (situated in everyday life) spheres, for curriculum to foster both knowledge development and occupational progression (Gamble, 2009).

Hassan (2015) emphasise that TVET lecturers must provide learners with leadership skills. They argue that leadership in learners are attributes such as directing ability and the ability to create processes in knowledge and synergy innovation and technology that would equip learners to use creative thinking, improve performance, take responsibility and foster motivation. The phenomenon further reinforces this narrative that TVET learners are the future leaders that require these competencies to formulate strategies that will inform how organisations would participate and compete in the economy.

TVET leaders are required to demonstrate management competencies in their positions (Smith et al., 2011, p.6) illustrate that "for organizations to achieve their objectives and goals as effectively as possible, it is vital that Leaders focus on four fundamental areas which involve planning, leading, organizing and controlling." "These features or competencies have to be deeply rooted in individuals performing managing functions to achieve productivity, enable efficiency and effectiveness" (Smith et al., 2011, p. 6). This highlights the need for all leaders and managers to be trained to understand these fundamental competencies to enhance their performance. Furthermore, Kanyane (2016) suggests that inadequate leadership could harm the organisation's culture, whereby TVET lecturers and students may experience despondency and a lack of motivation in teaching and learning practices. Leadership skills are critical at every level and across different functions of the colleges to create a high-performing environment.

Ngubane (2018) indicates that TVET leaders are expected to be managers in the modern learning environment. Therefore, high standards of management skills are essential in creating high standards for TVET lecturers to provide a corridor of success for student achievement. TVET leaders lack a clear vision and rationale that includes defined standards and goals for TVET lecturers to achieve. In managing TVET lecturers, they ought to focus on lecturer development, ensuring that TVET lecturers are adequately skilled and trained to accomplish their tasks in driving the vision. They must continually evaluate the curriculum content and standards through collaboration and teamwork to bring about change where necessary.

Kim et al. (2019) suggest that influential TVET leaders lack focus on the quality of the content deliverables and established high expectations for TVET lecturer outcomes by monitoring and assessing these outcomes regularly. In managing a quality process, TVET leaders will be able to improve on the quality and make recommendations to TVET lecturers, who will, in turn, respect managers on the basis that they have expert knowledge.

Sutton (2017) suggests that TVET leaders must ensure that students are placed at the centre of daily learning. In addition, a practical focus on collaborative problem-solving and building a community is needed. Furthermore, a lack of a common goal exists between the achievements of the student outcomes and industry and community expectations. The TVET leaders need to manage these interdependent clusters as a standard feature of their engagement to ensure an optimised learning climate. Furthermore, TVET leaders cannot foster and inspire motivation, job satisfaction and teamwork amongst TVET lecturers and other staff members, e.g., administration staff that support the TVET leaders and lecturers with administration functions. Therefore, collective knowledge and understanding would synergise all operational staff to work together towards the common goal (Demissie. 2017).

2.4.2 The Curriculum

A curriculum can be described as a canvas of knowledge-content or subjects, and education is the method by which these subjects are communicated to students by the most valuable process. The TVET sector management and TVET lecturers are responsible for ensuring that this progression is executed effectively. Furthermore, the

curriculum draws on all the experiences TVET colleges use to realise the objectives of education (Arulsamy, 2010; Rao, 2010).

The curriculum is determined and characterised by three fundamental components. Firstly, the intended curriculum comprises the rationale or basic philosophy featuring a curriculum. Secondly, implement a curriculum that links to the perceived interpretation by its users, especially TVET lecturers. This further embraces the operational process of teaching and learning, the curriculum in action. Thirdly, attained curriculum embodies the scope of experimental or learning experiences students perceive. TVET managers and lecturers must work jointly in realising a smooth operational process for the ultimate benefit of the students (Hoadley & Jansen, 2012; Van den Akker et al., 2003).

Papier (2012) reflects on the vital role that relevant curriculum plays in creating a constant pedagogy high-quality vocational knowledge/skills system. In examining vocational pedagogy, the paper emphasises the need to develop TVET lecturers with a vocational pedagogy that strengthens the validity of designing relevant and appropriate curricula for developing TVET lecturers.

Mdladlana (2005) states that curriculum is the interface of focused strategies developed by educators to achieve learner outcomes. SAQA describes the curriculum as the development of learning that reflects a given society's ethical norms and beliefs. SAQA believes a curriculum should be more rigorous than a syllabus because it includes all teaching and learning practices entrenched in the education system's objectives and goals.

The curriculum requires monitoring, evaluation, funding and investment. A curriculum is a documented and organised plan that is relevant and includes specific characteristics of the subject matter and the method aligned to aims, objectives, evaluation, resources, and management. Akoojee and McGrath (2008) argue that experts mostly use the curriculum in their field in two ways: to recommend a comprehensive plan for the learner’s attainment and achievement and to limit a field of study (Lutaaya, 2017).

Therefore, the National Certificate (Vocational) (NCV) curriculum has to adequately address the deficiencies of knowledge and skills through innovative programs to ensure NCV graduates can be employed, self-employed or embark on furthering their

education options. Shortcomings in the understanding of content material and the notion of unqualified lecturers, in addition to the slow tempo of curriculum adaptability and implementation, are the leading causes of creating undeveloped graduates. TVET lecturers fall short of the knowledge specified in the curriculum. Therefore they cannot deliver quality content of the intended curriculum, and students are deprived of high-quality learning outcomes (Hearne, 2018; Lutaaya, 2017).

Taylor (2011) believes that the NCV curriculum was implemented too soon. Spillane (2005) identifies poor administrative structures, while Gamble (2010) highlights that poverty is the driving cause for the poor delivery of the NCV curriculum (Lutaaya, 2017; Stumpf et al., 2009).

The Green Paper (DHET, 2012) states that universities do not generally enrol graduates, irrespective of the student's good marks. The challenge with the NCV curriculum is that it is not affiliated with higher education programs. As a result, students may not find TVET Education attractive enough to pursue.

Rijal's (2020) study revealed that the progress of the TVET curriculum is a challenge since it is highly centralized; the findings indicate that the TVET curriculum is not well-matched and outdated with the skills required in industries. The inability to prepare skilled graduates for employment is the overriding issue due to the inflexibility and slow rate at which curriculum changes occur. As a result, the TVET curriculum cannot meet the current and future expectations of industries.

Soyemi and Soyemi's (2020) Nigerian study exposed a wide gap between the current TVET curriculum implemented and the industry trends. The results demonstrated that only 62% passed through further skill acquisition training that created employment opportunities 14% were trained before admission for the TVET programme. In comparison, 24% were able to learn on the job. This illustrates that the current TVET curriculum taught is not aligned with industries' skills needs and, as a result, falls short in addressing the socio-economic conditions of the country.

Mbewe's (2020) study provided insights into challenges causing the failure of TVET institutions to translate the syllabi into classroom actions efficiently. The finds revealed that this is due to a lack of TVET lecturers not following syllabi instructions, the time allocated for workplace-based experiences, the contact time allotted for the subjects, and practical's not being implemented as recommended. The disregard of TVET

lecturers in using guided teaching and learning resources, the study further discovered that teaching and learning emphasised theory at the cost of practical skills.

Buthelezi's (2018) study indicates that the South African TVET system has suffered significant institutional, organisational and curricular challenges over the last fourteen years. Due to a lack of compatibility between curriculum, students and TVET lecturers' will to the reform. Tensions exist between the perceptions of how the vision is experienced from the side of the lecturer and students and how the national vision is implemented concerning skills development.

2.4.3 The TVET lecturers' Professional Development

Globally, TVET lecturers' development is regarded to be critical in an extensive array of contexts. TVET lecturers must be adequately trained as professional service providers, offer career advice and work placement, manage administrative tasks, transform training packages into training curricula, and evaluate the training outcomes. Furthermore, TVET lecturers' development should be accessible, designed and implemented to enhance students' teaching and learning resources and make appropriate use of available learning technologies (Guthrie, 2010).

According to the policy on professional qualifications for lecturers in TVET, qualified TVET lecturers in South Africa must have a thorough knowledge base of their subject of specialisation. They must be professionally competent to efficiently manage teaching and learning environments (SA, 2013).

TVET lecturers must be consistently trained and familiar with the workplace demands of Business and industry to enable them to facilitate teaching and to learn in such a way that it equips students for the workplace. Professionally qualified TVET lecturers must have expertise in at least three spheres, specifically academic or subject matter knowledge, pedagogy, and workplace qualifications and experience (Lloyd, 2008; McBride et al., 2009; Smith & Grace, 2014).

From a South African perspective, TVET lecturer development should focus on three types of knowledge centres, namely, theoretical and disciplinary knowledge that is internal to the TVET structure, which ought to ensure trained competence and

execution standards of the TVET lecturer and practical or workplace knowledge, which involves learning in the workplace (SA, 2013).

The TVET lecturer training deficiencies were documented in the Green Paper on Education and Training (SA, 2012). The Green Paper established that TVET lecturers lack technical workplace experience, knowledge, and pedagogical training (SA, 2012). In addition, Wedekind (2016) supports the narrative that many TVET lecturers must undertake appropriate studies to upgrade their qualifications. Furthermore, more significant TVET lecturers within the South African TVET college sector work without a professional teaching qualification that meets the national minimum requirements (Van der Bijl & Oosthuizen, 2019). Due to inadequate training, most TVET lecturers have problems with teaching skills (Manyau, 2015).

TVET lecturer teaching training qualifications in the field of education often governs how efficiently TVET lecturers can facilitate and learn subject content knowledge with students; on the other hand, workplace qualifications and experience groom individuals for specific types of work, with a robust focus on practical applications, as a consequence TVET lecturers who have inadequate workplace training may therefore not understand the importance of preparing students for working in the industry. Moreover, these TVET lecturers may lack the experience from the industry needed to integrate real-life situations into classroom learning (Manyau, 2015; McBride et al., 2009).

Munishi and Emmanuel (2016) state that employers in Tanzania are currently highly disturbed about the lack of employable skills among technical education graduates, given that they undergo competency training in specialised fields which equips them with the proper knowledge, skills and attitude. The main issues have been incompetent lecturers regarding teaching ability; it is critically essential that general knowledge and skills are acquired and career guidance and support are provided in their development from higher management structures. Furthermore, these challenges have been constantly fuelled by weak growth and unfavourable educational policies and reforms.

Badenhorst and Radile's (2018) study focused on the challenges currently facing the TVET systems due to a lack of synergy causing disintegration and misalignment in creating sustainable TVET learning environments. The most pertinent issues highlighted were the inadequate leadership and management skills of TVET lecturers

in numerous facets of teaching and learning, amongst which were apparent limitations in their proficiencies to meet capabilities essential for effective lecturing. The findings highlighted the desperate need for support, collaboration, assimilation of power and capacities to bring about a shared leadership vision to address TVET lecturer development needs.

Additionally, Ra et al. (2015) indicates that most Asian member countries are presently faced with a lack of skilled labour, jeopardising their further economic development. To address this issue, it is vital to improving the TVET system. The paper further suggests that TVET management should implement master programs to enhance their teaching competence in the Asian community. The report presents a comprehensive framework to address TVET lecturers' shortcomings.

Manyau's (2015) study in the North-West Province assessed TVET lecturers' teaching capabilities and skills development management and investigated synergic strategies that could improve their competencies. The findings revealed that TVET lecturers are not provided with sufficient development programmes/courses which would enable them to teach at the required level. Furthermore, TVET lecturers lack planning and understanding of the TVET philosophy within the South African context and are not motivated to upgrade their skills.

Additionally, Mgijima (2014) suggests ongoing professional development of lecturer learning in TVET colleges is now becoming a strategic imperative of the South African Government. The findings show that more than 50% of TVET lecturers require further professional development. In ranking order, the need is paramount in the following competency areas: understanding of the TVET context, including the need for a clear policy and implementation of learning environments; the practice of information and communication technologies; knowledge of and adaptation diversity of students; ability to reflect critically and being knowledgeable about the demands that will be made on their learners in the workplace.

Clayton (2013) states that of all education sectors, TVET is mainly linked to Australia's economy due to the industry's dependence on the training the sector provides. In TVET, the lecturer ensures new and existing graduates acquire the necessary skills to meet industry needs. Therefore, continuous TVET lecturer development is vital in meeting this objective.

2.4.3.1 Workplace integrated learning

The fundamental role the TVET sector plays is providing training and essential skills leading to the creation of artisans, technicians and other skilled individuals who can become entrepreneurs and be self-reliant; and ensuring young men and women have an intelligent understanding of the increasing complexity of technology. This suggests that TVET is a type of education given to individuals to grow their creative capacities for the benefit of humanity. The ultimate goal of TVET education is to wage war against ignorance and illiteracy to develop competent human resources for economic and social development (Oviawe et al., 2017).

Ismail and Mohammed's (2015) Nigerian study suggests that TVET graduates are not prepared and empowered with the employability skills required by the industries. As a result, they are not ready to enter the workforce. In an analytical review of Electrical Technology Education in what is taught and learnt, the findings revealed that the TVET lecturers gave less attention to practice-based learning that provides skills needed in the workplace. As a result, there is a lack of integration of employability skills such as problem-solving and decision-making, lifelong learning and competencies among the graduates.

Munishi and Emmanuel (2016) state that employers in Tanzania are currently highly disturbed about the lack of employable skills among technical education graduates, given that they undergo competency training in specialised fields which equips them with the proper knowledge, skills and attitude. The main issues identified are less importance placed on general knowledge and skills and lack of career guidance at higher training levels.

Gamble (2016) states that skills are the driving force of labour market currency, defined in terms of competence profiles that seek to link educational qualifications directly to the workplace. The paper draws on a recent empirical study of labour processes in four industry sectors in South Africa to show why work-related knowledge needs to be foreground knowledge not just in terms of its applied qualities but as a fundamental ingredient of technical systems complexity.

Mensah et al.'s (2013) Ghanaian study examined the trends of TVET training in emerging countries as a National Human Resource Development (NHRD) approach. The findings first revealed that the TVET sector plays a significant role in skills

development, focusing on developing the human capital potential required to meet workplace demands and address the challenges of increasing employee participation. Secondly, the informal TVET segment must play a significant role in creating and aligning knowledge processes that address individuals' skills and recognise it as a gap towards creating sustainable learning environments.

Van der Bijl and Taylor's (2016) article demonstrates the findings of an industry workplace experience project comprising TVET lecturers in South Africa alongside new legislation and the awareness that college lecturers' industry-related skills are in question. It underscores the nature of TVET lecturer industry-based workplace learning and the internal dynamics of its application in the college and employer environment. The article offers the background on workplace-based education for TVET lecturers and the disparities of workplace learning with methods used for students. While students are exposed to workplaces to give them orientation and initial skills for future careers, workplace-based learning for a lecturer is intended to advance knowledge process development competencies.

Globally, evidence indicates that offering workplace exposure for TVET lecturers and students assists in bringing the classroom curriculum into closer configuration with the skills requirements of the industry; it further inspires TVET lecturers and students to perform better and, to a large extent, builds long-term relationships between TVET colleges and industry. That is why various SA Government Policy Documents consisting of the National Skills Development Strategy have recently underscored the significance and importance of workplace exposure for TVET lecturers and students (Kgobe & Baatjes, 2014; Schwalje, 2011; Van Rooyen, 2016; White Paper on Post-School Education & Training, 2011).

2.4.4 Teaching and Learning Support Materials and Resources

Inglis and Aers (2008) describe teaching and learning (knowledge process) as an appropriate noun with several meanings that are difficult to communicate effectively without first adding a qualifying term. There are various types of teaching and learning philosophies and methods. Some philosophies define and explain motor learning that serves as the basis for motor skills development.

In other cases, in some teaching and learning methods, emphasis is placed on social skills development. However, the main artery is academic learning, the cognitive teaching and learning representations and information processing models that describe and explain the development of personal knowledge about the content matter we teach and learn in the classroom. The expression academic is a colourful adjective that communicates “in one sense something about the nature of the thinking and remembering processes a student must engage in to interact with classroom academic demands successfully. In other words, in addition to simply acquiring information in the form of vocabulary, facts, or concepts, these building blocks for the personal knowledge process must be organised in a manner consistent with the epistemological demands of the subject matter being taught, “it is readily apparent that academic learning is quite different from social learning or motor learning, which also plays a major role in students' efforts to adjust and cope with the demands” (Phye, 2004, p. 520). There is a need to find a suitable funding strategy to address severely underfunded provinces. It further disadvantages students' learning outcomes already plagued by high unemployment and poverty (Bowden, 2016).

Furthermore, manpower is a vital resource of organisations that plays an essential role in performance and profits; managing costs, employees’ training and linking with up-to-date environmental and technological changes are several substantial advantages of human resource planning. Currently, organisations determined that to be successful worldwide; there should be worldwide human resource managers and staffing planning. Integrated relationships between planning and information have enhanced and implemented the necessary information systems in organizations. The DHET must use these principles to identify that TVET managers and lecturers are essential resources in implementing the TVET curriculum. There is currently a massive gap in the use of human resources, tools and TVET managers’ and lecturers’ understanding of learning content that hinders productivity and optimisation efficiencies in teaching and learning (Karimidizboni, 2013).

Albashiry et al. (2015) investigated teacher collaboration's capability in TVET colleges to enhance the synergy in internal and external dependability. The study illustrates how four teams from different TVET colleges restructured their programs methodically and relationally to make improvements. The findings suggested that TVET lecturers

lacked systematic teaching and learning approaches to create sustainable learning environments efficiently.

Chinedu et al. (2015) state that higher-order thinking skills should be essential to teaching and learning, especially at the TVET level. Thinking skills lessons should be part of the content taught for students to be able to solve problems individually, cooperatively and creatively. Firstly, TVET lecturers must know relevant techniques for teaching higher-order thinking. The paper critically scrutinised existing practices teaching higher-order thinking skills in design and technology education. Some critical features mentioned were the concept, inferences, visualisation, and schemas to draw the correlation to higher-order thinking. The suggestions for practice change were made regarding the development of TVET lecturers' teaching practices (Aina & Ogegbo, 2022).

The learning process can be separated into two broad segments. The first relates to learning environments that are internal to the learners. Although this is the part where the potential to advance learning outcomes is the main objective, it is undoubtedly the extent that is most difficult to influence. The second is external to the learners. People learn through the five senses, and the role of each varies from person to person. The following predicts the type of learning from the five senses; Taste: 1%, Touch: 1.5%, Smell: 3.5%, Hearing: 11%, and Seeing: 83%. The illustrated guidelines for using Information and Communication Technology (ICT) in the TVET Sector; (1) let learning outcomes propel the process of technology as choice technology is only an instrument; hence TVET lecturers must use technology as an element of a comprehensive instructional plan; (2) endeavour to combine technology into teaching and curriculum design and implementation; (3) utilise technology to move the emphasis from teaching to learning; (4) be willing to adapt as the role of the TVET lecturer is not the only basis of information; and (5) use technology to change the emphasis away from low- level cognitive tasks to higher order thinking skills (Raihan & Shamim, 2013; Sultana, 2022).

Raihan and Shamim (2013) further explored why South Korea's TVET system excelled compared to Bangladesh in terms of ICT practices. The findings highlight some features which make the Korean system superior to (1) outstanding infrastructure of ICTs in TVET organisations; (2) adequate financial support; (3) accessibility of software for TVET learners; (4) far better internet speed for uploading and

downloading e-learning materials; and (5) well-trained TVET lecturers and support staff. On the other hand, TVET organisations in Bangladesh suffered as (1) 75% of people live in rural areas and most of the TVET organisations are not established in these areas, thus (2) Bangladesh's financial crisis prevents TVET investment, (3) lack of updated software, (4) inadequate broadband internet TVET classrooms, (5) a lack of ICT skills amongst TVET lecturers, scarce motivational mechanisms to improve the interest to learn. Also, (6) the lack of training of TVET lecturers on ICT is a significant blockade to advancing the quality of the TVET organisation.

Broad (2016) offers empirical data as a consideration to highlight the concept of "knowledge in motion" and that workplace learning philosophies are used as a conceptual framework to assess the Continuing Professional Development (CPD) activities of vocational teachers. This method is applied to showcase how TVET lecturers use CPD to evaluate and transfer vocational knowledge from occupations to classrooms. The findings were summarised in five themes: (1) The range of CPD engaged with by vocational teachers; (2) the limitations of propositional, explicit knowledge; (3) engaging with and capturing tacit knowledge; (4) managing the temporality of vocational knowledge; and (5) networking within and to the occupation. The findings revealed that vocational knowledge is disseminated and networked. This conceptualisation makes it possible for some of the ways TVET lecturers can, through CPD activities, to move vocational knowledge from occupations to classrooms to achieve a more sustainable learning environment (Chakroun, 2019).

Gleason et al. (2011) illustrate the following multi-faceted knowledge processes that could be used by Motheo TVET College in developing sustainable learning environments.

2.4.4.1 Classroom-based active-learning strategies

Cooperative learning suggests that learning has a clear social component and that learning from peers plays a significant role in developing a student's cognitive ability. Collaborative learning encompasses five major philosophies. Firstly, there is a positive interdependence, whereby no individual student can do an entire project well. However, together in a group, they can jointly attain more critical goals. Secondly, individual accountability refers to every group member being accountable to the group;

the importance of peer assessments often is utilised to allow for individual grading outside single project-based grades for the entire group. Thirdly, promotive interaction inspires individual students to facilitate each other's efforts within the group. The fourth element is intentionally focusing on social skills and developing leadership qualities in student development, which will assist in fostering group cohesion, enabling sound communication and developing conflict management skills. The fifth aspect is deliberate group processing, whereby groups must intermittently evaluate their performance and improve their learning processes (Wang, 2020).

Problem-Based learning (PBL), founded by McMaster University in Canada, PBL grants students with real-world, open-ended issues to solve. Traditional lecturers are not involved in this process. The process starts with giving small groups of students a real problem to solve. Students then must ascertain what knowledge they currently have and what knowledge or concepts they need to acquire to solve the problem. Students are self-directed and accountable for structuring their learning, with academic staff operating as guides or resources in assisting with information. According to Xu (2022), PBL is a valuable technique for enhancing student learning and competency.

Team-Based learning (TBL) relates to a large-class, case-based teaching and learning strategy that includes the development of multiple teams within a class and using course concepts to solve problems. TBL has four vital tenets: (1) teams must be strategically shaped and managed effectively, (2) students must be responsible for their achievements and their level of involvement in the team, (3) students must be constantly assessed for performance and receive construct feedback, (4) teams must be formed with the vision that enables learning and team development. According to Haefeli (2022), TBL has been effectively implemented in many disciplines.

Case-Based learning is an overall active-learning strategy similar to PBL and TBL because it applies real-world learning applications. This technique is usually used with large classes and rarely considers group work. In case-based learning, cases often are preceded by an allocated reading and/or a mini-lecture. At the same time, classroom time is mainly focused on cases that contain the application of content and consequent class discussions (James et al., 2022).

2.5 INHERENT RISKS AND THREATS IN SUGGESTED POSSIBLE SOLUTIONS TOWARDS SYNERGISING KNOWLEDGE PROCESSES

Vacuum is a word more interrelated to Physics, expressing some lack. It finds its suitable meaning in tangible entities and industries like mining, mechanical engineering, and education. This term can similarly be applied to the subject of leadership. Lack of leadership skills can be attributed to the vacuum of guidance, direction, and support motivation, which will lead be the most unfavourable situation within the TVET Sector. Leadership vacuum can develop to be the most severe vacuum of all because of its long-lasting outcomes. However, the vital question is finding the actual cause of the leadership vacuum in the TVET Community to prevent the self-destructive propensity to ascend from complacency and lack of leadership development (Ungar, 2015).

Leadership vacuum takes place and indicates that organisations are suffering from it; display some of the effects of lack of leadership, which can be noticed as follows: (a) People working in silos with little support and collaboration among individuals; (b) Lack of energy and low levels of synergy between teams; (c) People generally working together, however ineffectively, inefficiently or without clear aims and objectives; (d) Over-all sense of poor directives leading to no considerable development and growth direction; (e) Absence of respect for leaders, blame gaming, inadequate motivation lack of cohesiveness toward drive collective goals; and (f) Conflict between groups and their leaders as each seeks constrained resources and a position of higher status and control (Osland & Wang, 2014).

Ineffective leadership abilities and skills can lead to the demise of an organisation. Consequently, on the other hand, competent leadership capabilities form the foundation for the success of an organization. According to studies conducted by CIPD, around one-third, which means 36% of leaders of others, do not receive any training to play their role effectively (Lee, 2003). Other research studies have also shown that organisations fail to retain staff because of the perception that they do not have adequate leadership development opportunities (Salicru, 2017). Many organisations these days talk about developing leadership abilities among employees; however, few reward leadership development. There are many reasons and

weaknesses on the part of organisations that limit them in developing well-groomed leaders (Ashford & DeRue, 2010).

The main reason behind the reality of the leadership vacuum is that organisations operate with a distinctive thought that leadership is about the title or being at the top of a hierarchy. Nonetheless, it is imperative to understand that leadership is a way of behaving far from designation. Organisations make a colossal mistake when they try to develop leadership skills only in senior managers, leadership skills and development need to permeate throughout an organisation. Thus, it is also essential for organisations to invest in people who can provide the most significant value to the organisation before arranging any development program for them (Collins & Porras, 2008).

Another reason for creating the leadership vacuum crisis in organisations is the complexity of leadership that the organisation crafts. Instead of providing the critical talents with growth priorities and clear metrics to understand their potential to lead, organisations develop complex competency models that postulate diverse competencies across diverse leadership styles, which, instead of establishing clear guidelines for leaders with a clear roadmap, make them confused using complex structure is another reason why people trying to grasp all these competencies are unable to get even a single one with excellence. Organisations in such circumstances do not diagnose the real needs of leadership. They do not focus on the purpose of leadership or what the job demands, which eventually results in investing in the wrong leader at the wrong time (Ashford & DeRue, 2010).

Moreover, organisational culture is an additional constraint that hinders leadership development. The organisational culture essentially comes from its senior managers/leaders. For employees to develop leadership potential and competency, the support of their immediate manager/leader is critically important. These reasons limit leadership development in an organisation, consequently creating a leadership vacuum (Groves, 2007).

2.5.1 Inherent Risks in Synergising Leadership

A study by Badenhorst and Radile (2018) reveals that TVET managers and lecturers are not demonstrating fundamental Leadership competencies, ultimately leading to the fragmentation and degeneration of the entire TVET system. The implications of poor organisational Leadership may weaken the TVET system to perform productively, effectively and efficiently.

Barr and Attrey's (2017) study reveals that TVET leaders may not be able to establish a cooperative work environment, as they lack strong interpersonal skills that enable them to build bridges and sustain beneficial interactions within the industry. The negativity associated with poor Leadership would permeate the organisational structure and chain of command. Inadequate Leaders' behaviour can damage the work environment and quality of partnerships outside the TVET organisation.

Demissie (2017) states that TVET leaders are unresponsive to the challenges they face in teaching and learning, and this could be problematic in that the manifestation of conflict, poor job satisfaction and demotivation amongst TVET lecturers and students would grow to the extent where it breaks down the social and operational structure of the TVET institution.

Van Niekerk (2012) states that TVET college leaders appear to lack the expertise in creating knowledge processes that define, develops and entrenches vision building, creating values for lecturer and learners coupled with incoherent communication methods, which adversely affects their propensity to lead and nurture a progressive TVET system.

Cravalho's (2014) study was to reflect on the experiences that cultivate and advance synergy with a team of TVET lecturers and TVET leaders. The participants in this study assisted in exploring the definition of the synergy between TVET lecturers and TVET leaders. The objective of the case study was to identify the characteristics that have enabled and reviewed the barriers encountered and how the group worked to overcome them. Aligned with the study's two primary research questions, the literature reviewed and the data collected and analysed indicated three synergy threads. The threads identified to nurture synergy within the group are (1) environment fosters synergy, (2) people foster synergy, and (3) passion fosters synergy, which was lacking seriously between TVET lecturers and TVET leaders. Therefore, it can be concluded

that an inherent risk exists, hindering the achievement of synergy within this group of participants.

2.5.2 To Understand Inherent Curriculum Risks and Threats that may Hinder the Achievement of synergy Between Knowledge Processes and Sustainable Learning Environments

If curriculums are outdated and lack the marketplace requirements of the economy, this is attributed to the methodology. Students are often theoretically assessed and lack the essential needs for employment. This is causing economy is instability in the economy due to the lack of skills supply (Kedir & Geleta, 2017).

TVET curriculum is perceived to be difficult for many students and lecturers; it is considered to be too academic. Nkoe and Bisschoff (2005) indicate that curriculum implementation requires restructuring and replacement. Before any new curriculum is implemented, evidence-based research should be done to determine the relevance of such a curriculum in refining necessary skills in the country. Various scholars hold the view that the TVET curriculum was instituted without sufficient input and involvement, and all stakeholders, especially industry experts, widened the gap into

Curriculum problems include misunderstanding the significance of curriculum and syllabus outline and the gap between them, together with rapid and unsupported change occurring in the structure of levels of courses. These challenges include poor quality of curriculum materials, the uncertainty of what is expected of TVET lecturers, a lack of understanding of TVET lecturer teaching experiences, and lack of informed leadership in change management innovation initiatives (Papier & McGrath, 2008).

Curriculum development for TVET colleges is viewed as a national competency, which allows not having enough scope for institutional innovation (Terblanche & Bitzer, 2018). This comprises curriculum customisation for National technical Education (NATED) and National Certificate (Vocational) (NCV) programmes (Papier, 2017; RSA, 2013). It was previously highlighted, by Littledyke (1997), for example, that an over-prescriptive curriculum and an instrumental, bureaucratic leadership style may hinder the process of curriculum development. And make the effectiveness of translating policy into action less likely.

Organisational unlearning and organisational relearning are vital aspects of dynamic knowledge management. Organisational unlearning optimistically shape active knowledge management by eliminating outdated and useless knowledge, while organisational relearning positively affects dynamic knowledge management by attaining knowledge. Organisational unlearning and organisational relearning have synergies in active knowledge management. The literature strongly indicates that TVET institutions teach an outdated curriculum, resulting in poor learner achievements that inadequately prepare them for the workplace. This dilemma forms the basis for a strong argument that the TVET sector needs to unlearn how knowledge is disseminated. Embracing more relevant knowledge repositories is paramount in synergising the implementation and management of knowledge processes (Zhao et al., 2013).

When TVET managers and lecturers ratify the curriculum plan jointly, curriculum implementation is tangibly used. This implies that TVET managers and lecturers should be involved in the curriculum design on an ongoing basis. Curriculum implementation change involves constant evaluation concerning behaviours, practices, philosophy and values to improve the quality of learning.

Kigwilu and Akala (2017) determined that underutilisation and inadequate facilities and resources, such as libraries and course textbooks, hindered effective teaching and learning in these TVET colleges.

Muge et al. (2019) Kenyan study revealed that there is a risk for TVET institutions not restructuring their curriculum to be more amenable to the dynamic needs of the industry to enable the absorption and integration of graduates in the job market. This places graduates at a disadvantage and does not the high unemployment crisis in the country.

The finding of Amado's (2019) study exposed that lack of training materials, insufficient practical skills training, lack of collaboration with industries and poor curriculum designing as factors that impede the growth and sustainability of the TVET Sector.

Siwela's (2017) study indicated that inadequate accessible resources, funding, lecturer training, available buildings, in flexible curriculum hinder the implication of the TVET college's ability to attain successful curriculum outcomes.

The study by Hondonga and Ramaligela (2020) highlighted TVET funding, the overall high cost of financing TVET, the lack of commitment by stakeholders, the poor image of TVET, the lack of public budgetary allocations and a lack of research and proactive responses to TVET challenges as the most hindering factors that dominate the effectiveness of TVET sector curriculum.

2.5.3 Inherent Risks in Synergising Lecturer's Learning Environments

Reeve (2016) asserts that TVET lecturers must sufficiently prepare students to live and work in the 21st Century. This preparation comprises providing students with sound knowledge and skills in the studied discipline and developing an instruction-based understanding of contemporary educational thinking and practices. The objective of this paper was to explore problem-solving, critical thinking, communication, collaboration, and creativity areas whereby teaching methodology needs refinement. Still, TVET lecturers have bad teaching experience in these areas. Therefore, TVET learners would be inadequately prepared for 21st Century workplace. Furthermore, it is critically vital that TVET lecturers are adequately trained and have the experience to sufficiently impart relevant knowledge to prepare students for work opportunities in the 21st Century. Poor TVET lecturer capabilities create future employees inadequately designed for workplace needs (Hoadley & Jansen, 2013).

The professional development of TVET college lecturers is a central aspect of achieving success in the sector. In its report, UMALUSI (2014) established that most of the TVET lecturers are inadequately prepared to deal with the academic and social needs of vocational teaching.

In addition, Marhaya et al. (2015) conducted a study in the Vhembe District of Limpopo. The research aimed to engage lecturers in the TVET colleges in four focus areas: sustainable learning environments, Assessment of student learning, Portfolio Development and Evaluation of Teaching and learning. The findings revealed that TVET lecturers had an insufficient grounding in teaching as most of them were recruited directly from industries. This risks TVET lecturers' abilities to understand and impart theocratical curriculum content.

Van Uden et al.'s (2016) study explored TVET lecturer experiences who worked with their teams on fostering student engagement. The learning history method was used to acquire those experiences and simultaneously invigorate learning within the participating teams. The findings revealed that TVET lecturers could better engage their students by expanding their repertoire to include more engagement-related activities. Furthermore, TVET lecturers found it challenging to address and debate their disagreements. This strongly indicates that optimised synergy among TVET lecturers would impede their ability to perform as a team and negatively impact their creation of a sustainable learning environment.

The lack of mentoring in the TVET lecturer development may hinder the developmental process between individuals or groups. The implications of deficiencies in mentoring may stagnate the path for continued TVET Lecture development skills and competency; it is also regarded as a course for social transformation (Van der Bijl, 2015). Mentoring can thus be functional at various levels of an institution, ranging from formal programmes to self-reflection and self-monitoring. On a professional level, mentoring joins a person into the profession and, on a broader level, integrates a person into a specific socio-cognitive paradigm (Van der Bijl 2015). An absence of mentoring becomes visible when individuals feel unsupported and less involved, and their relationship with their peers and management is disengaging (Mmako & Schultz, 2016).

2.5.4 Inherent Risks in Synergizing Lecturers' Learning Environments

The Mail and Guardian (2018) first states that almost 50%of TEVT lecturers in South Africa are unqualified or underqualified. Secondly, of the 50% qualified, 35% are school skilled, and only 15% are TVET qualified. Thirdly, roughly 55% of all TVET lecturers lack workplace-based experience; fourthly, approximately 45% are teaching for less than five years.

Papier (2009) associates underqualified lecturing staff and lecturers' actions as significant factors linked to poor-quality academic performance. In 1994, the TVET college sector acquired a framework whereby defined teaching qualifications were not stipulated criteria in recruiting and appointing TVET college lecturers. However, they were entailed to teach (Papier, 2008). Due to the inadequate and efficient professional

avenues for TEVT Lecturer development in the vocational education and training fields, TVET colleges often had to employ lecturers from industry (Nene, 2017).

Yet, many of these lecturers did not have teaching qualifications and only had qualifications relevant to technical fields supported by workplace experience and knowledge (Papier, 2008). DHET (2012) revealed that, firstly, this situation had not improved, and the majority of TVET lecturers had not acquired a professional qualification; secondly, on the other hand, lecturers with teaching qualifications had limited or no industry experience.

Whilst the regional education departments required a teaching qualification for TVET lecturers, this goal became problematic as only a few higher education institutions provided professional qualifications for TVET lecturers. In cases whereby these qualifications were obtainable, the programmes had shortcomings in orientation, leading to philosophical deliberations about education and training and their alignment to curriculum design and classroom practices (DHET, 2012); as a result and various qualifications fell away with the formation of the new NQF, as they had been designed using the revoked Norms and Standards for Educators (DHET, 2015b; DoE, 2000).

This implies that TVET lecturers have to serve inadequacies relating to their ability to teach effectively based on their qualifications. As an illustration, this infers that TVET lecturers have attained qualifications intended for school educators. Still, the qualifications they obtained do not focus on competence, knowledge, or skills needed for working in the technical and industrial specialized fields (Papier, 2008).

Although, in certain circumstances, universities and universities of technology have adapted teacher qualifications to make them fit for working in vocational education and training settings. This has added more complexity and discrepancies in how TVET college lecturers are equipped, frequently resulting in ineffectively TVET lecturers' capabilities (Buthelezi, 2016; Nene, 2017).

In 2008/09, the DoE undertook a massive drive to provide TVET lecturers with extensive training to deliver and assess the new NC(V) programmes within an outcomes-based orientation (DoE, 2008). This attempt was negated, and TVET lecturers who undertook the training were later employed. This raises the question, how effective would they be in delivering the curriculum in the class if they did receive training room? Booysen and Du Plessis (2008) supported Nieman and Monyai's

(2006) view that the TVET lecturer training is inconsistent, incoherent that will result in poor learner outcomes.

The major problem with this situation is that the transformation of the TVET sector would be constrained (the introduction of the new NC(V) programmes) TVET leaders assume that lecturers would be capable of implementing the recent changes when in reality, they are ill-prepared (Akoojee & McGrath, 2008).

The low expectations associated with TEVT vocational education and training largely reflect how lecturers are perceived. For example, Buthelezi (2016, p. 203) suggests that TVET lecturers often have “feelings of being undervalued and looked down on”. From an empathic point of view, it sadly indicates that TVET lecturers lack job satisfaction and are heavily burdened. This advances the narrative the students we pick up on this and may raise doubt about TVET lecturer competency and may bring about the best learning experience for the student.

Papier (2009). revealed that 37 per cent of TVET lecturers had workplace qualifications and experience, 14 per cent of TVET lecturers only had a workplace qualification without any academic or teaching qualification, whilst 4 per cent also had an academic qualification and 12 per cent had a workplace qualification with a teaching qualification. Many TVET lecturers have entered, and continue to enter, the South African TVET college sector without an official teaching qualification. The lack of a formal teaching qualification suggests that college lecturers must develop their teaching competencies elsewhere (Van der Bijl, 2015). This brings into question the inability of TVET managers to develop TVET lecturer capability in developing their capacity to teach effectively.

Manyau’s (2015) study in the North-West Province indicated 78 per cent of lecturers have no teaching qualification. A total of 11 per cent of these lecturers had a diploma in education, while 4.4 per cent had an Advanced Certificate in Education or a Postgraduate Certificate in Education. This supports the argument that due to inadequate qualifications and training, it is clear that most lecturers have problems with their teaching skills, as 50 per cent of the participating lecturers required training in teaching strategies.

The lack of mentoring may hinder TVET lecturers' professional development. The implications of deficiencies in mentoring may stagnate the path for continued TVET

Lecture development skills and competency; it is also regarded as a course for social transformation (Van der Bijl, 2015). Mentoring can thus be functional at various levels of an institution, ranging from formal programmes to self-reflection and self-monitoring. On a professional level, mentoring joins a person into the profession and, on a broader level, integrates a person into a specific socio-cognitive paradigm (Van der Bijl, 2015). The absence of mentoring becomes visible when individuals feel unsupported and less involved and their relationship is disengaged (Mmako & Schultz, 2016).

TVET lecturers must maintain expertise in TVET pedagogy, including industry competence and workforce enhancements. Industry exposure enables TVET lecturers to evaluate the efficacy of their skills and competencies. It creates a platform to foster self-development through direct and indirect actions in both learning environments, the institution and the workplace. Self-development and self-empowerment for learning will empower individuals' awareness and wilful responsiveness to changes in their specific areas of specialization (Choy & Haukka, 2009).

The central blockades that hinder TVET lecturer professional development are time constraints for industry experts, industries in Malawi seeking payment, insurance/indemnity, and lack of acceptance of industrial attachment as a formal mode of staff development. Weak industry collaboration in Zambia broadened the gap between the knowledge of TVET lecturers and the technology levels in the industry. To improve industrial attachment, the cost-sharing benefit between industry and the TVET sector needs constant upgrading and meriting it is an accepted mode of staff development (Okaka, 2003).

2.5.5 Inherent Risks in Synergising Resources

Funding allocations are disproportionate concerning high enrolments, which inevitably led to most TVET colleges being underfunded, which is not sustainable in the long term. Additional funding resources must be injected from more segments of society to place TVET colleges on a solid growth path if it has to successfully deliver high-quality student outcomes (Dundar et al., 2017). Funding of TVET colleges has been inequitable and inadequate.

Presently, the baseline used for the conditional grant mirrors historical allocations to TVET college education, which clearly illustrates that funding is far too low in the Northern Cape, KwaZulu-Natal, Limpopo, Free State and North West provinces. On the other hand, reallocating the pool of accessible funding equitably to all provinces may disadvantage TVET colleges in provinces where in the past, more reasonable budgets were allocated to these TVET colleges (Hondonga & Ramaligela, 2020).

Amedorme and Fiagbe's (2013) study indicates that TVET in Ghana faces fundamental challenges in creating substantial learning environments. The main matters of concern range from the inadequate number of technical institutes available in the country, diminishing resources facilities and materials/resources for training students, and insufficient specialised and insufficient TVET lecturer training. The study concludes that students will not be adequately prepared for workplace demands unless these areas are improved.

Albashiry et al.'s (2015) study illustrated that learning about knowledge process formulation creating in sustainable TVET learning environments is critically essential for TVET managers' needs to maintain and enhance the quality and relevance of their educational programs. The case study was conducted in developing countries. The findings revealed that TVET managers appreciated the need for Professional Development Arrangement (PDA) but lacked senior management support. Unfavourable working conditions and a high employee retention rate impede the PDA educational development programs.

Diminishing outputs from TVET colleges in South Africa have been attributed to inadequate teaching and learning resources, an urgent need for capacity development, lack of proper basic learning support materials, lack of suitable student support services, inappropriate programmes and poor organising of efforts. The government's endeavours will have to be enhanced with investments from the local government, the private sector, the NSF and the SETAs to bridge the gap in providing much-needed resource capabilities (Assefa, 2019).

It is widely accepted that most TVET lecturers lack theoretical or practical knowledge and skills. Therefore, it will make it difficult to expect high-quality learning outcomes with the current crop of insufficient human resource skills (TVET lecturers). There must

be a definite need to develop human resource capacity as a central pillar in the evolution of knowledge processes.

Movere, the critical aspect hindering teaching and learning processes is the use of TVET non-professionals in managing TVET matters. Ibeneme (2007) indicated that many administrators of TVET programmes at the policy-making level are not TVET-trained individuals and thus do not appear to understand the needs of the programme, which therefore poses problems as the deployment of human and material resources become ineffective implementation, evaluation of TVET maintain and developing TVET strategy (Okorocha, 2012).

TVET students, in most cases, undertake theoretical courses without sufficient practical application. As a result, some students lack practical training on IT equipment due to lacking these resources (Nzeako, 2005; Okwor, 2007; Oliver, 2002). Furthermore, TVET lecturers, to a large extent, also, are not adequately trained in the use of Information Technology (IT). Thus, it becomes problematic IT cannot be integrated into teaching and learning processes (Kennedy et al., 2017).

Ngubane-Mokiwa and Khoza's (2016) South African article reveals that innovative teaching and learning are based on student-centred teaching and learning strategies. Doors of entry for students to study in the fields of Science, Technology, Engineering and Mathematics (STEM) have been inequitable due to traditional teaching and learning strategies. These strategies tend to marginalise students with disabilities who can effectively learn in environments that appropriately and innovatively integrate technology. Observation findings showed that understanding prior practices and current TVET lecturer technological competencies are identified as areas of development of the TVET technology integration model. The article recommends that traditional TVET lecturer teaching and learning strategies be more integrated to provide for all students without excluding the disadvantaged and marginalised.

Noravian and Irvine's (2014) paper reveal that students who enrol for engineering degrees are primarily white males. The article highlights the need for the quantity and quality of engineers globally. Therefore, educators need to do two things. Firstly, they must explore all talent and attract a wide range of individuals across demographic and ethnic profiles that are underrepresented in engineering. Secondly, educators should restructure engineering education so that learners initially experience what engineers

do daily. The paper also emphasises that almost forty per cent of four-year engineering graduates began their introductory studies at TVET colleges.

Guimei and Clayton (2016) highlight the collaborative initiative undertaken between New Zealand and China to optimise synergy between creating sustainable learning environments and knowledge processes in TVET by improving joint programme development and enhancing TVET student outcomes in both countries. Because of gaps often found in the misalignment between policy formulation and classroom implementation, a critical activity framework model was used to evaluate when, how and at what point the disconnect occurs. The paper identified the performance indicators used to measure TVET lecturer outcomes and institutional success. A lack of flexibility in sufficient practical tools used in classrooms caused the gap between policy development and teaching and learning experiences.

Buli and Yesuf's (2015) paper for emerging countries revealed that whilst it is essential for learners to understand and demonstrate functional competencies, there is not enough business and management content, e.g., leadership, entrepreneurial, decision making, communication and innovation skills. This signifies a distinct gap in what learners are taught and the additional requirements needed in the workplace.

Borsoto et al.'s (2014) study examined the relationship between Outcomes-based Education (OBE) implementation in terms of practices and its contribution towards conducive learning environments at the Engineering Department of an Asian University. The results revealed that OBE is being implemented as a practice within the learning environment. Faculty staff members, jointly with the students and concerned authorities, have to identify the needs of the students to provide possible solutions and actions to improve the implementation of the learning environment. The recommendation of conducting seminars and training amongst all role players is needed to boost aligned engineering graduates who are fit for the workplace.

Hui and Cheung's (2015) Hong Kong study suggest that TVET colleges focus on designing knowledge processes and forming sustainable TVET learning environments to develop specific skills and knowledge for particular careers. This aim contrasts with the expectations of a knowledge economy that requires more generic educational outcomes in an ever-changing and evolving labour market. The findings revealed that in designing relevant knowledge processes, TVET lecturers should be able to adapt

to a more encompassing definition of learner outcomes that includes an assessment to the extent where cultural literacy is incorporated as part of the content taught. Cultural literacy is an individual's worldview, ways in which people interact, values, norms, etc. As a result, there is a need for TVET lecturers to plan, implement and facilitate classroom activities that will enrich both learning and development, which will provide the TVET learner with knowledge, skills and experiences that will equip them adequately to adapt to the workplace demands.

Buli and Yesuf's (2015) study in Ethiopia investigated the attributes of understanding the entrepreneurial intention of TVET students and highlighted the aspects to empower TVET youth and adults to consider and pursue the viability of entrepreneurial initiatives. 107 TVET students participated in the study using surveys and questionnaires as a research method. The findings indicated that EI should form part of the methodology, and content should be designed and implemented to address the content needs such as proper decision-making, entrepreneurial negotiations, leadership, critical thinking and the need for technological creativity and innovation. These skills will give TVET learners a greater understanding of becoming self-employed and encourage them to become more self-empowered (i.e., starting up their businesses).

Sauffie et al.'s (2015) paper consider the transformation of TVET colleges in modelling future leaders. The determination is made that to achieve this objective, more synergic efforts must be made in how knowledge processes are implemented to prepare highly competent students in the space of technical skills and knowledge whilst shaping students into credible leaders as industries demand individuals with both good technical and leadership skills.

Gamede et al.'s (2017) South African study explored entrepreneurship education's role in TVET colleges. Qualitative research methods were used to generate data from 311 TVET lecturers. The findings demonstrated that entrepreneurship management programmes are essential in formulating holistic and sustainable content; however, policymakers should consider learners' different social, economic and technical backgrounds in creating sustainable learning environments.

Yunos et al.'s (2016) Malaysian study reveal that employment escalating participation within the unchanging workforce with the current structure could result in a decline in

sustainability. The involvement of all stakeholders mainly influences, Whilst in TVET education, the sustainability of a sector. These participatory stakeholders are universities, industries, government and community. This study explored how a (TVET) Lecturer's Education Programme can be sustained in the 21st Century. The findings demonstrated that challenges faced by the stakeholders encompass the lecturer's outlook towards learning; the perception of the society on TVET as having an inferior standard of education; lack of partnerships between the TVET Institutions and industries; inadequate pragmatic policies in improving the quality of TVET lecturer programmes.

2.5.5.1 Inherent risks in synergising industry-based work-integrated learning

Devi et al.'s (2013) study in India revealed it is essential for TVET colleges to provide courses that are relevant to the industry needs within specific locations and that if courses are designed generically, the skills gap will widen within the industries and sustainability and growth will be hindered as it would disadvantage TVET graduates and industries.

Pylväs et al.'s (2018) study regarding the socio-cultural method of workplace learning and guidance demonstrates that vocational expertise also develops from external support through participation and guidance in everyday interfaces between the contexts of education (TVET lecturer environments) and the workplace. The findings demonstrate that individuals with eloquent cognitive skills (e.g., problem-solving skills) mixed with cutting-edge social skills, self-awareness and self-regulation are perceived as vocational experts. The apprenticeship training was believed to draw upon an all-embracing learning environment to facilitate an apprentice's vocational development by offering access to authentic work tasks and collective support by experienced workers. However, the lack of time, resources and pedagogical methods were found to hamper individual guidance and reciprocal workplace learning between apprentices and experienced workers. The workplaces offered rich learning possibilities for those apprentices with solid self-regulatory skills.

Okoye et al. (2016) examined the causes impeding proficient craftsmen, apprentices and artisans from a graduate from TVET colleges in Nigeria. The results suggest that a synergistic breakdown exists in TVET lecturer motivation and training; inadequate

funding, poor facilities and poor implementation contribute to an interruption in the TVET system and consequently widen the gap between business and social needs.

Van der Bijl and Taylor (2016) explored the relationship between industry workplace experiences involving TVET lecturers in RSA TVET colleges concerning the legislative framework and the notion that the TVET lecturers' industry-based skills are inadequate. This narrative indicates that TVET lecturers do not constantly engage in workplace learning due to a lack of formal structures and requirements supporting this need. That of workplace learning for TVET lecturers is different from that of students. The findings reveal that the lack of formal structures hinders the synergy of TVET lecturers and workplace learning from improving their knowledge of practice and teaching skills.

Ayonmike and Makere's (2014) Nigerian study investigated the challenges in creating favourable conditions for the best possible synergy that fosters sustainable learning environments and knowledge processes in TVET colleges. Data was generated from sixty TVET lecturers using the Chi-Square Goodness-of-Fit Test to verify the results. The findings revealed that learner outcomes had been adversely compromised due to poor funding, inadequate resources and proper training material. These issues pose a severe problem to learner outcomes because learners are of the view that when they graduate from TVET colleges, they are empowered and enriched with the necessary skills, knowledge and experiences to fulfil workplace demands whilst the reality exists amongst the business community, that learners are not adequately prepared. Bearing this in mind, TVET graduates become demoralised and disillusioned when entering the labour market.

In the same way, a Nigerian study conducted by Idris and Mbudai, (2017) revealed that TVET students are perceived as incompetent to meet industry needs due to inherent risks and threats that hinder the achievement of synergy between knowledge processes and sustainable learning environments.

TVET lecturers who lack industry exposure, experience and qualifications must obtain skills training and access to workplace qualifications such as trade testing. For TVET lecturers to receive access to trade testing, legislation should be put in place to open up trade test prospects that remove processes that block them from qualifying as artisans (Van der Bijl & Oosthuizen, 2019).

Many students who graduate (Nated, N6) do not have diplomas due to a lack of industry experience. These students have acquired a theoretical/academic background. However, they lack practical experience. It may not be the case that industries do not choose to absorb them; however, the number of graduates outweighs the spaces available in the industry. Industries need the capacity and resources to provide training to ensure that employees perform at the high expected standards whilst focusing on productivity, efficiency, effectiveness and customer satisfaction. Therefore, the inherent risk arises due to imbalanced output graduates that cannot be placed for employment in industries (Banks, 2017).

Students can move from college (s) to industries; however, in industries, safety risks exist. Full-time employees benefit from insurance coverage when injuries occur, which is not the same for students. As a result, an inherent risk could arise because industries may not want to take on the burden of liability should injuries to students/Graduates occur in the workplace (Rudolph et al., 2020).

Competition in today's education system emphasizes student outcomes (pass rate N6). Performance is measured against the number of students who graduate, which can be described as healthy as competition. In the same way, industries compete with each other for added profits and the need to attract highly skilled employees to perform better. Therefore, competition becomes more complex and more divisive for the common goal. It becomes a risk, as the industry may not want to collaborate in teaching what is recognised as academic. When the focus is on who can be e more productive in attaining better profit margins, the risk is the balance between both contexts. The context also differs because in the majority of townships and rural settings, considering our history in South Africa, there is a high prevalence of vandalism and destruction of property; the question then arises, how do you share the use of resources with particular communities, when they cannot take care of their own. It is a cause for concern which leads to resultant risk (Okanović et al., 2021).

2.6 EVIDENCE OF SUCCESS REGARDING SYNERGISING KNOWLEDGE PROCESSES BETWEEN INDUSTRIES AND COLLEGES FOR SUSTAINABLE LECTURERS' LEARNING ENVIRONMENTS

2.6.1 Evidence Success Towards Synergising Leadership

TVET leaders/managers ought to lead by crafting a clear vision and rationale with well-defined standards and objectives for TVET lecturers to achieve. In managing TVET lecturers, they should concentrate their efforts on TVET lecturer development, ensuring that TVET lecturers are adequately skilled and proficient in executing their responsibilities in driving the vision. Through fostering relationships and teamwork, they must constantly evaluate the curriculum content and standards to bring about transformation and innovation where necessary. Students form part of the group that a TVET leader/manager is ultimately responsible for managing. TVET leaders/managers should take on the responsibility of embedding a supportive climate and culture that is conducive to teaching and learning success, as well as shaping the learners' cognitive, physical, emotional and mental characteristics for learners to achieve the best possible outcomes (attained curriculum) (Du Plessis & Mestry, 2019).

2.6.1.1 Developing a culture of hospitable education

TVET leaders/managers should ensure that learners are placed as a centre of learning daily. Therefore, they need the support of disadvantaged communities to ensure that the learner has the support at home to make learning effective. In so doing, the TVET leaders/manager has to orientate parents and manage the community's expectations concerning the vision, rationale and societal benefits of learning. Effective TVET management should focus on collective problem-solving and building a college community for learning; they also should problem-solve situations that may arise, such as intervening in cases where blame-shifting occurs between parents, community leaders and lecturers and vice versa. There should be a mutual goal between the learner's achievements, community and Lecturer expectations. The Leader/Manager needs to bring these three interdependent groups together as a common aspect of their engagement to ensure an enhanced learning climate (Loo & Sutton, 2020).

2.6.1.2 Promoting leadership in others

Effective leadership from the TVET leader/manager would encourage teamwork among lecturers and other staff members, for example, administration staff that support the college management and lecturer with administration tasks. In that way, shared knowledge and understanding would synergise all working staff to achieve a common goal. It will also improve proficiencies and time management and make stakeholder management for the TVET leaders/managers much more accessible; as a result, TVET leaders/managers would be in a better position to manage the policies and standards as set out by the Department of Higher Education in the implementation of the curriculum process (Mothapo, 2019).

2.6.1.3 Refining leadership instruction

Efficient TVET leaders/managers concentrate on achieving quality content deliverables, set high standards for Lecturer outcomes and monitor and evaluate these outcomes regularly so that they become specialists in the technical functionality and requirements of the curriculum implementation enhancement. In managing the quality levels, TVET leaders/managers will be able to improve the quality and make recommendations to the lecturer. This indicates that the lecturer, in turn, may value and appreciate TVET leaders/managers because they have expert knowledge (Waddington, 2018).

2.6.1.4 Leading People, Data and Processes

TVET leaders/managers need to be proficient in managing all resources, financial and physical and human, that are provided. They have an added responsibility of engaging with external stakeholders, for example, meeting with trade unions on collective bargaining and implementing the policies that the Department of Higher Education and trade unions have decided. TVET leaders/managers need to be provided with continuous information and feedback regarding the challenges/barriers in implementing curriculum daily to act immediately in solving processes-related problems (Mori, 2019).

2.6.2 Evidence of Success Towards Synergising Curriculum

Studies performed by Berkvens et al. (2014), Carl (2012), Hoadley and Jansen (2013), and Kelly (2009) indicate the formulation of subject content is dependent on the subject topic that is taught from a practical, experimental and subject knowledge standpoint. These studies also emphasise that curriculum implementation should begin with what knowledge (subject knowledge) needs to be understood by the student and what subject substance needs to be taught as per the intended curriculum, which means that subject matter and subject knowledge are central components of the intended curriculum process. Similarly, subject content must be well-balanced, relevant (not outdated), planned and organised (Berkvens et al., 2014). These studies clarify that TVET managers and lecturers should jointly understand the subject matter they teach as part of the intended curriculum suggesting that content can be described as an approach whereby it fosters knowledge and performance curriculum and builds a TVET sector knowledge capability (Hoadley & Jansen, 2013).

Setiawan and Agus's (2017) Indonesian article draws attention to achieving low carbon efficiencies and resource effectiveness in the global economy. As a result, green jobs require green skills. Therefore, the implementation of green skills in TVET Institutions is becoming an essential need. The authors conclude by proposing and suggesting a green skills framework that incorporates (1) the development of soft and hard skills; (2) the development of green skills in the development of knowledge content; and (3) the development and integration of a green skills framework within the existing curriculum to advance the skills of TVET lecturers and ensure that learners are well informed of the importance of green growth in the workplace.

When TVET managers and lecturers ratify the curriculum plan jointly, curriculum implementation is tangibly used. This implies that TVET managers and lecturers should be involved in the curriculum design on an ongoing basis. Curriculum implementation involves constant evaluation concerning behaviours, practices, philosophy and values to improve the quality of learning continuously.

The purpose of Jabbari's (2015) Tehran study was to identify technical education required by industries. Four manufacturing companies participated, totalling 198 individuals in this study. The findings revealed that knowledge needs to be refined to

meet each industry's needs and expectations in embedding synergy between the TVET sector and the industry.

Alagaraja and Arthur-Mensah's (2013) study in Ghana revealed that TVET colleges must constantly improve and enhance the synergy in content and methodology to ensure that learners are employable and the skills, knowledge and competencies learned to align with the needs of the labour market. This indicates that a gap exists in terms of the rapid changes that occur in the workplace that is not coherent in terms of content taught at a specific time. It reinforces the need to review curriculum design constantly and implementation so that there is a synergy between what is taught and what is expected. Gamble (2016) states that training and skills are the essential competencies required for learners to perform at maximum potential in the marketplace. TVET colleges need to ensure that curriculum design not only focuses on quality requirements as technical and functional expertise is also required to adapt to the vast complexities, which indicates that TVET colleges are not providing learners with the adequate practical skills needed to meet the workplace demands.

2.6.3 Evidence of Success Towards Synergising Lecturers' Learning Environments Through IQMS and I-WIL

Papier's (2012) article reflects on the vital role that effective teaching and learning plays in creating a constant pedagogy and high-quality vocational knowledge/skills system. In examining vocational pedagogy, the paper emphasises the need to develop TVET lecturers with a vocational pedagogy that strengthens the validity of designing relevant and appropriate curricula for developing TVET lecturers.

Effective teaching emerges from the understanding of both the Lecturer and the learner. It is critically important that TVET lecturers are offered opportunities to train and have the experience to impart relevant knowledge to sufficiently prepare students for work opportunities in the 21st Century (4th Industrial Revolution). Good TVET lecturer capabilities create graduates/future employees that are adequately prepared for workplace needs (Hoadley & Jansen, 2013).

Additionally, Grosch's (2016) paper indicates that most Asian member countries presently lack skilled labour, jeopardising their further economic development. To

address this issue, it is vital to improving the technical and Vocational Education and Training (TVET) system. The paper further suggests that mutual TVET lecturer master programs and degree for Asian countries could enhance their teaching competence in the Asian community. The paper presents a comprehensive framework for addressing TVET lecturers' shortcomings.

Furthermore, Diep and Hartmann's (2016) article indicates that ensuring quality in TVET lecturers plays a fundamental role in achieving sufficient and adequate skilled employees in this environment. The article recommends a proposed model of pedagogical competence of TVET lecturers in the context of sustainable exploration. The model presents a system of vital competencies within their cross-influences, based on necessary knowledge/skills and experience, which TVET lecturers should acquire to embark on a journey of continuous learning throughout their careers, not only to meet the expectations of the profession in a rapidly changing world but also to contribute to building sustainably sound economies.

Maurice-Takerei and Lisa's (2017) article presented at the United Nations Educational, Scientific and Cultural Organization (UNESCO) emphasises the magnitude of cultivating and nurturing a knowledgeable, capable, adaptable and flexible workforce that engages in constant learning. The findings revealed that in understanding and preparing for such a proficient workforce, TVET lecturers must take responsibility for their learning and development in creating sustainable learning environments. TVET lecturer development that is focused on knowledge, skills, adaptability and flexibility will strengthen and improve the TVET teacher workforce, as this is an essential component of the entire TVET system.

2.6.4 Evidence of Success Towards Synergising Lecturers' Learning Environments Through IQMS and I-WIL

Moses et al. (2017) state that the scarcity of vital skills in local and global labour markets has been the systemic cause of high youth unemployment, thus constraining economic growth, employment and income. Consequently, several countries embrace vocational education as the answer to this problem. Subsequently, the strategic goal of vocational education is grooming the graduates with skills, knowledge, competencies and proper attitude for the world of work whereby graduates can work

self-reliantly or be recruited in the labour market whereby significant contributions can be made in the areas of productivity, national income and global competitiveness.

Rojewski et al. (2014) provide insight into the importance of TVET education/courses becoming a global necessity. Specialised skills in apprentice training, engineering and business management and technology provide opportunities for career advancement. Therefore, the TVET community must remain relevant by implementing a framework that meets these needs and shapes and guides synergistic approaches in a volatile and evolving economy. The proposed framework includes three key elements (1) career navigation, (2) work ethic and (3) innovation that can support TVET outcomes so that we can provide sustainability in the 21st Century workplace.

Rashidi (2013) seeks to explore the collaboration in the National Dual Training System (NDTS) in Malaysia that pursues the example of the Dual Training System in Germany. The decisive goal of the collaboration is to harvest highly competent TVET graduates for the workforce pertinent to the needs of the industries of Malaysia. This research identified several key factors that form the framework for dual-system collaboration. The specified key features are a) goal setting, b) partnership development, c) collaboration management, d) impact of teaching and learning and competence, and e) evaluation of collaborative performance. The results indicated that developing partnerships, partnership management, and learning and skills development is critical in forming a collaboration framework.

Jin's (2017) study aimed to ascertain the progression of TVET graduates within the workplace. It was established that skills training allowed graduates to enter the labour market; however, they lacked professionalism in understanding the workplace culture. As a result, TVET graduates must be micro-managed and do not progress into management and leadership roles in the short and medium term. There is a definite need for TVET learners to acquire career competencies and an understanding of the workplace culture and the level of professionalism that is needed in terms of their behaviour in the workplace to ensure long-term employability and career development.

Spöttl and Loose (2018) state that rapid and complex technological changes demand competencies that respond to uncertain changing needs. Therefore, we can no longer depend on an analysis of only the present competencies needed at the workplace and then use this analysis to formulate TVET lecturer learning and teaching environments.

These dilemmas force us to reach beyond this platform into the work process and create learning environments that can deal with today's uncertainty at the workplace. This requires a transformation towards a work-process orientation which leads to the question of how TVET lecturer environments could be improved to address current and further work-based competencies.

The attainment of workplace skills is understood universally as an essential driver of economic and technological advancement. The vital role of TVET in enabling skills development for countries globally, is socioeconomic and technical development which contributes to the increasing value attached to TVET. TVET education equips individuals with skills, knowledge and attitudes for real employment opportunities (Oviawe et al., 2017).

TVET is an all-inclusive term referring to those characteristics of the educational process, the broad spectrum of education, the study of technologies and associated sciences, and the acquisition of conversational skills, attitudes, understanding and knowledge relating to occupation in numerous sectors of the economic and social life. Therefore, the role of TVET is…

1) to play an essential role in general education;
2) an avenue of preparing students for occupational fields and successful participation in the world of work;
3) striving for lifelong learning and preparing to become responsible citizenship;
4) a vehicle that drives environmentally sound sustainable development
5) a process of facilitating poverty alleviation.

(UNESCO, 2001)

Alves et al. (2014) draw attention to the pivotal implementation steps UNESCO has taken in Sustainable Development with the TVET sector in forging partnerships with various stakeholders mainly intended to reflect a great range of implications, affairs and issues. Entrenched in the UN programme, the critical issue is a need to develop initiatives within the TVET engineering programmes that are concentrated on enhancing a technical workforce that is competent in designing and constantly developing sustainable processes, products and services; thus, it is becoming more critical for engineers to continuously learn new skills in a multi-facet work setting to

think critically and be problem solvers, to drive value, productive and efficacy within the workplace.

Khaled et al. (2014) explored how hands-on simulations are used in vocational education, which is not always clear. Pedagogical-didactic approaches in hands-on simulations are poorly formulated from a learning theory perspective. However, the finding revealed that if hands-on simulations are clearly defined and incorporated into TVET lecturer environments, it could positively impact building practical and professional competencies needed in the workplace.

Sada et al. (2016) paper suggest that Critical-Thinking Skills (CTS) are a vital prerequisite in the contemporary world of work. However, forming CTS among technical college students in Nigeria is making little impact on students as they are currently being taught “traditional” rote learning methods, which do not cultivate the building of skills. Therefore, a new teaching method is required that emphasises learning, understanding, and measuring skills rather than rote learning. TVET lecturers unanimously agree that CTS can improve the learning experiences of students’ learning methods, including concept mapping, critical probing workshops, and systematic approaches. PBL could adequately prepare students to become better problem solvers in the workplace.

TVET lecturers and students may acquire the relevant skills, experience and competency if they have not been exposed to working in real-life environments. Conversely, TVET lecturers and students who have frequent exposure to the industry draw several advantages, including:

a) Expanding on up-to-date industry knowledge, skills and experience through exposure to industry professionals.
b) Gaining a better understanding of industry needs and determining the strengths and weaknesses of the TVET college curriculum concerning changes in industry demands (Clayton, 2012; Schüller & Bergami, 2008).
c) Enhancing their capacity to link the theory and practice stipulated in the curriculum to their application in industry and are to present pertinent examples during a teaching in the classroom.
d) Fostering and strengthening sustainable networking opportunities to develop a more critical view in shaping their teaching and learning experiences.

The principles that lead to a comprehensive synergy between TVET lecturers' industry exposure are:

1) **Planning** comprises improving a TVET college Policy on industry placements for TVET lecturers, a budget, precise plans for recruiting host employers, assigning and replacing TVET lecturers, and creating an evaluation mechanism that enables consent reporting on their experience.
2) **Preparation** involves assisting TVET lecturers in drawing up individual programmes, matching TVET lecturers to suitable workplaces, orienting host employers and making the necessary logistic and administrative arrangements to ensure proper training process management.
3) **Engagement**, devoting time in the industry to meet with practitioners of the occupations for which the TVET lecturer is training college learners, analysing equipment, systems, technology and procedures, and performing pre-arranged work assignments; an engagement may vary in length from a week to several months, however, in most cases, a record should be kept in the form of a logbook or journal of what was done, when and to what extent.
4) **Post-engagement reflection**, through which the TVET lecturer writes up their experience in the shape of reports to college and company management, detailing what they have learned from that experience, formulate a plan for integrating the learnings into classroom teaching and the college curriculum design for future learning and proposes some ideas for future, follow-up engagements.

It is critically essential that TVET managers create a structure and framework that encourages TVET lecturer exposure to take place as part of the TVET college Policy, which could motivate, energises and inspire TVET lecturers learning; they could learn a lot more about changes, technological development, industrial systems, machinery and processes and feel more enthusiastic about sharing their learning experiences more creatively and confidently (Smith, 2016).

Additionally, TVET lecturers must have a theoretical foundation from which to draw subject-specific knowledge. Theoretical wisdom is knowledge wisdom of the first source and is the most exact form of knowledge. Theoretical knowledge is a higher form of knowledge than practical knowledge because it considers the first causes of

knowledge origins (Moodie, 2002). Therefore, it becomes fundamentally important that TVET lecturers are initially qualified in academic or subject matter knowledge, pedagogy, and workplace qualifications, which form the building blocks in enhancing workplace place skills deficiencies (Lloyd, 2008; McBride et al., 2009; Smith & Grace, 2014).

Skills training through industry exposure can work effectively by drawing knowledge acquired from theoretical foundations. Work-based learning may empower TVET lecturers to implant the value of experiential learning and strengthen the centrality of ethical and professional practice (Hyland, 2010).

TVET lecturers who lack industry exposure, experience and qualifications must obtain skills training and access to workplace qualifications such as trade testing. For TVET lecturers to receive access to trade testing, legislation should be put in place to open up trade test prospects that remove processes that block them from qualifying as artisans (Van der Bijl & Oosthuizen, 2019).

2.7 CONDITIONS CONDUCIVE TO SYNERGISING KNOWLEDGE PROCESS TOWARDS CREATING SUSTAINABLE LECTURERS' LEARNING ENVIRONMENTS

2.7.1 Conditions Conducive for Synergising Leadership Knowledge Processes

TVET leadership primarily focuses on teaching and learning processes in such a manner that the development of the learners is most important. The role of TVET leaders is to ensure that supportive and nurturing environments are created for TVET lecturers, students and industry partners, which is a core characteristic in enabling aggressive growth and development, therefore leadership is not attached to the position that is held; however, it is actions that are taken to enhance the aching and learning experiences (Juntrasook, 2014).

TVET leaders are expected to achieve high-quality learner outcomes in the modern learning environment. Therefore, exceptional management skills are required in creating high standards for TVET lecturers to provide a pathway for the success of student achievement. TVET leaders should make a clear vision and rationale with clearly defined means and goals for TVET lecturers to attain (Diop, 2020).

They should focus on development, ensuring that TVET lecturers are adequately skilled and trained to drive the vision. Through collaboration and teamwork with the industry, they must constantly assess the curriculum content and standards to bring about change where necessary. TVET leaders are responsible for developing a climate and environment conducive to learning and shaping the learners' cognitive, physical, emotional and mental attributes for the learner to achieve the best possible outcomes (Okon, 2019).

Effective TVET leaders should create and maintain strong relationships based on cooperation, respect for diversity and commitment to the success of all individuals. They build and use networks and partnerships to advance organizational goals and rely on relationships to manage conflict and change. They facilitate teamwork and collaboration, make decisions, and solve problems through a shared effort (Mengistu, 2020).

TVET leaders must uphold high ethical standards and practices at all levels of an organization. They must communicate expectations through policies and procedures that promote ethical behaviour. Good TVET leaders are creative, support continuous growth in their direct reports, and encourage continuous process improvement. The most important is, making difficult decisions and accepting accountability for their actions and those who report to them (Chisi, 2018).

2.7.2 Evidence of Success Towards Synergising Curriculum

Paryono (2017) illustrates the importance of the TVET system in driving sustainable development. Priority must also be placed on renewed and sustained transformation if TVETs are to achieve their global potential in influencing sustainable development. The findings emphasise the integration of a relevant curriculum, learning content, learner achievement, policies and practices as the cornerstones in revitalising and creating sustainability within the TVET sector.

As a result, if the curriculum is outdated and irrelevant, learning outcomes are primarily jeopardised, and students are mainly disadvantaged (Fullan, 1989; Marsh, 1998). Furthermore, the curriculum is regarded as a "plan for learning", which also encompasses how curriculum matters should be interpreted, understood and shared.

In addition, Van den Akker (2010, p. 180) addresses these issues with the illustration of a spider web to ensure ease and understanding of curriculum design, implementation and evaluation, i.e., (1) Rationale/vision – articulating the precise reasons why TVET managers and lecturer are implementing the specified curriculum (2) Accessibility – understanding the physical, economic, financial and cultural characteristics influencing the implementation of the stated curriculum (3) Aims/objectives towards managing the implementation of curriculum and content. What management capability and content material are TVET managers using to develop and inspire lecturers to improve their performance to manage the implementation curriculum? (4) TVET lecturer role – how do TVET lecturers facilitate teaching in curriculum implementation? (5) Location/grouping, what mechanisms do TVET managers use to evaluate the performance of lecturers in implementing curriculum? (6) Time – what processes or creative activities are used to implement the curriculum? (7) Resources – what tools and methods are TVET lecturers using in implementing the curriculum? (8) Assessment – how are TVET managers and lecturers assessing the implementation curriculum?

2.7.3 Evidence of Success Towards Synergising Lecturers' Learning Environments Through IQMS and I-WIL

Axmann et al. (2015) demonstrate an analytical framework for assessing TVET lecturer training systems. It takes an all-inclusive approach, providing a conceptual framework that government agencies and TVET Institutions could use as a tool to appraise the internal efficiency and rationale of their lecturer preparation programmes, as well as assess the dynamic capability of the system to foresee and respond to the needs of both employers and students. This framework examines the contemporary imperative for high-quality TVET lecturing training systems that are valuable, creative, equitable and innovative and that support the national and local strategy to improve productivity, employment and social inclusion. It is provided to help governments and institutions deal with the challenge of preparing TVET lecturer teaching ability to equip the next generation with the skills and capacity to continue learning that they will need throughout their working lives.

Furthermore, Diep and Hartmann (2016) indicate that ensuring quality in TVET lecturers plays a fundamental role in achieving sufficient and adequate skilled employees in this environment. The article recommends a proposed model of pedagogical competence of TVET lecturers in the context of sustainable exploration. The model presents a system of vital competencies within their cross-influences, based on necessary knowledge/skills and experience, which TVET lecturers should acquire and take responsibility for continuous learning throughout their careers, not only to meet the expectations of the profession in a rapidly changing world but also to contribute to building sustainably sound economies.

Compared with Germany, the South African DHET and the TVET Institutional Leadership are articulating a clear and decisive TVET lecturer teaching policy framework that purposefully addresses TVET lecturers' teaching ability. This may address one of the root causes producing poor student outcomes, as teaching needs an abundance of knowledge and the aspiration to teach; it also entails having a genuine grasp on motivational techniques, leadership and conflict resolution skills, human psychology, and the aptitude to think on one's feet. TVET lecturers should be trained to act like classroom managers and therefore expected to demonstrate managerial competencies (Klar, 2012).

These competencies are embedded in knowledge, skills, behaviour and attitudes needed to be effective in a wide range of learning environments. A lack of understanding from TVET lecturers and the failure of management to consider student interest demonstrate a lack of management capacity. As a result, management training is essential in creating sustainability and addressing TVET lecturers' shortcomings (Hellriegel et al., 2005).

Smith's (2010) study explored the lack of degree-level courses designed in Zambia's TVET sector that prevented progress in sustained TVET development. These circumstances have deprived TVET staff for years and have restricted their professional development. In addressing this, a pilot project involving a British Higher Education Institution delivering a degree programme, in-country and in-service (part-time), was proposed by senior TEVT staff. Some seven years after the commencement of the initiative and with three courses having successfully been completed, this research reveals firstly, whilst it is vital to evaluate the scope of

qualifications provided constantly, Secondly TVET lecturer development programmes are a critical component in enabling the transfer of knowledge processes that empowers students for future workplace demands.

Malaysia recognised that the lack of TVET lecturer competencies hindered their teaching ability. Therefore, the Singapore Institute of Technical Education is training their TVET lecturers using a competency-based curriculum (CBC) and authentic learning approach using the TPCK model (Technological, Pedagogical, Content, Working Knowledge) as a solution to develop TVET lecturer competence. The use of this model creates a strong case for the implementation of clear policies that are directed towards TVET lecturer capacity building (Paryono, 2015).

Kenya's primary barrier to achieving TVET success is poor TVET lecturer performance. Career counselling strategies and the adoption of proper orientation for TVET lecturers have been implemented as a solution to direct TVET lecturer development. This could be a practical approach as TVET lecturer performance is a problematic issue experienced worldwide. Implementing career counselling as an intervention may be beneficial. It will allow TVET lecturers to reflect on their strengths and weakness, receive feedback from TVET managers and develop actionable steps towards self-development (Njoki, 2014).

Dickson's (2017) study concentrated on a teaching and learning methodology project focused on teaching and learning quality issues at a TVET Academy in Kurdistan, Northern Iraq. A needs analysis exposed that the academy's TVET lecturers were mainly skilled in technical content areas rather than in pedagogy. However, by its very definition, teaching and learning in TVET must consider active learning and practical training at the centre of its vocational purpose. Moreover, technical and pedagogical skills are inherently linked since a TVET lecturer cannot effectively pass on technical skills without the necessary pedagogical skills. The project intended to improve the TVET lecturers' pedagogical skills to include more active learning strategies and practical work. The project findings revealed that the lecturer's pedagogical skills have moved towards using more active teaching strategies.

2.7.4 Evidence of Success for Synergising Resources

Attaochu and Egbita Ugbalu (2013) investigated the quality assurance of TVET lecturers. 60 Participants were surveyed in the study. The findings showed that improvement programmes were needed to review suitable learning environments. Secondly, a supervising committee should be set up to ensure the curriculum is relevant regarding the content taught. Thirdly, small business management combined with entrepreneurial training should be incorporated. Fourthly, TVET programmes should be based on well-equipped workshops for skills enhancement and courses. Short seminars should be frequently organised to address shortcomings and improve TVET lecturers' quality of teaching and learning.

Kirk (2008) states that knowledge processes involve acquiring and receiving information, and its meaning is directly associated with what is taught and learnt. Classroom learning must be practical, and lessons should be assessed on how students engage in their learning based on how well they participate. Educators must organise activities so students can explore for themselves or share within groups. Other teaching and learning strategies involve peer evaluation, whereby pupils can reflect on their learning outcomes at the end of the lesson; this can be referred to as 'metacognition, "thinking about their knowledge processes".

Educators are also required to know students 'learning styles', which can be auditory – some students enjoy sitting and listening; visual – these students take in visual images and kinaesthetic – which suits students who can't sit still. 'Kinaesthetic' implies 'learning by doing', generally recognised as the best way of learning. Differences in students' learning styles are synthetic, as all three styles are required for various purposes. Students cannot start 'learning by doing' until they have been "told what to do and why (auditory), and seen an example (visual)" (Inglis & Aers, 2008, p.123).

Schueler et al. (2017) emphasise the need to implement a framework to monitor and evaluate the justifications for expenditure within the TVET sector. Schueler et al. (2017) underscore the need to ensure that the resources in terms of equipment, tools and financial support are allocated correctly to create sustainability within the TVET sector so that the return on investment (ROI) is justified in providing learners with the relevant skills that are suited within the labour market and that wasteful expenditure does not occur.

Additionally, the DHET (n.d.) emphasise the need for all TVET students to be able to learn how to read, write and solve mathematical problems. These competencies will enable them to apply scientific principles to succeed in their careers. The National Centre for Careers and Technical Education Research puts the spotlight on and highlights the importance of integrating reading, writing and mathematical literacy as the cornerstones for learning within the TVET sector in the quest to create sustainable learning environments.

2.7.5 Conditions Conducive for Synergising Lecturers' Learning Environments

2.7.5.1 Work-integrated learning

The purpose of Jabbari's (2015) Tehran study was to identify technical education required by industries. Four manufacturing companies participated, totalling 198 individuals in this study. The findings revealed that knowledge needs to be refined to meet each industry's needs and expectations in embedding synergy between the TVET sector and the industry.

Chua and Jamil's (2014) Malaysian study states that technological knowledge processes are directly connected to productivity, enhanced performance and superior quality. Technology integration in the TVET knowledge processes is anticipated due to the high application of technical knowledge and technology applications. Knowledge process frameworks that give flexibility and provide dynamic strategies to TVET lecturers enable them to improve the teaching and learning process. This study investigated the impact of field specialisation variation on the level of knowledge process gains. The study revealed that despite the significant variation and multiple perspectives of specialisation existing among TVET lecturers, specialisation contributes to improved knowledge process enhancement.

Baraki and Kemenade's (2013) provides an overview of the TVET Programme methods/mechanisms on teaching/learning outcomes in a developing country. The findings reveal that outcome-based TVET reforms built on Total Quality Management (TQM) frameworks could improve teaching/learning outcomes in developing countries by enhancing awareness, coordination, integration, flexibility, participation, empowerment, accountability and quality culture.

Okoye et al.'s (2015) Nigerian article reaffirms the importance of holistic and Competency-based sustainable knowledge content for TVET learners. Okoye et al. (2015) conclude that "CBT" will encourage self-employment and address individual industry requirements.

2.8 CONCLUSION

This chapter explored components and aspects impacting the synergy of knowledge-creation processes for TVET lecturers and sustainable learning environments. Furthermore, the use and justification of bricolage as a theoretical framework were discussed in this study. The rationale for using operational concepts was established, and the use thereof as illustrated. Moreover, this chapter considered relevant literature from other contexts to showcase the factors influencing the synergy of knowledge-creation processes for TVET lecturers and sustainable learning environments from internationally continental, regional and local points of view.

CHAPTER 3
METHODOLOGY AND DESIGN FOR GENERATING DATA FOR SYNERGISING KNOWLEDGE-CREATING PROCESSES FOR SUSTAINABLE LECTURERS' LEARNING ENVIRONMENTS

3.1 INTRODUCTION

This study aimed to explore mechanisms that could ease synergy between knowledge-creating processes at TVET colleges with those happening at relevant industries, businesses, and other stakeholders to create sustainable TVET lecturer learning environments. This chapter presents the methodology, design and data generating process utilized in determining how to synergise knowledge-creating processes for sustainable lecturer learning environments.

3.2 METHODOLOGY

This section considers the critical paradigm that resonates with the researchers' point of view regarding the reality of un – and or under-synergised knowledge-creating processes for TVET lecturers' learning environments with a focus on sustainable development goals. This section justifies the relevance of the critical paradigm based on its ontological and epistemological stances concerning the purpose and or aim of the study.

3.2.1 The Critical Paradigm

Critical paradigm's ontological stances resonate well with the claim the study makes regarding the reality or the truth about the TVET lecturers' learning environments in SA and this study. The critical paradigm ontology influenced make truth claims on the nature of TVET lecturers' learning environments existence of their defining power differentials (Moon & Blackman, 2014).

3.2.1.1 Ontology

According to Petersen (2022), the critical paradigm emphasizes social justice matters. It seeks to focus on political, social, economic and environmental problems, which tend to connect with social oppression, conflict, struggle, and power structures at all levels at which they might exist since it pursues to change politics, i.e., challenging social oppression and improving social justice which is referred to as the transformative paradigm (Denzin & Lincoln, 2000).

The study resonates with critical paradigm underpinnings on social justice and power structures at different levels. The study claims that TVET lecturer learning environments are marred with inherent power differential realities that subtly and, in some cases, overtly perpetuate social injustice practices; this is the case when one considers that TVET colleges in SA, and by implication, the TVET lecturer learning environments, were and are still affected by the effects of power differential realities that continue to prevail (Seremba, 2022). This is also the case because knowledge-creation processes for TVET lecturers take place in places that inherently compete more than they complement. For instance, training and development occur at colleges, some of which are not well-resourced, and others at industries and businesses that may be better equipped and resourced. In these instances, power resides among others on resources, yet in other instances may be an unbalanced emphasis on goals, e.g., profits (economic) versus academic in ways that compete in antagonizing ways.

Consequently, the inherent and mostly subtle antagonistic competition that emerges from such power differentials advertently favours the social injustice of South Africa's past and derails redressal (Demertzis et al., 2022). This argument holds because the equitable and or equal distribution of knowledge through sustainable TVET lecturer learning environments continues to be mystified and thus remains a 'myth' with the result of maintaining the status quo that fails to meet the envisaged SA dream through TVET colleges (Quan-Baffour & Akpey-Mensah, 2022). The unfortunate outcome then becomes a competition instead of complementing and entanglement among social goals, *e.g.,* academic and economic goals of the colleges and industries/businesses, in this case. However, the apparent misalignments among colleges, industries, or other counterparts persist because of the attributes of power differentials that perpetuate social injustices.

3.2.1.2 Epistemology

Epistemology describes how we come to know something and how we know the truth or reality (Taylor, 2022). To this extent, in this study, knowledge is multi-perspectival and multi-theoretical; this is based on the reality that TVET lecturers' learning environments are potentially fully or partially exposed and offered by different segments with apparently different points of emphasis and or interest. For instance, the economic sector, i.e., industries and business, will be more inclined to economic perspectives, while the academic might be more to social perspectives. In the absence of environmental perspectives and where there is an imbalance among these perspectives, sustainability is likely to be compromised. Accordingly, knowledge-creating processes for TVET lecturers' learning environments should bring about knowledge that adequately balances the sustainability aspects of reality. Thus, knowledge may result from respect, observance and engendering sustainable learning in all that pursues balance, equity, and equality (Wulf, 2022).

3.2.1.3 The appropriateness of the critical paradigm

The appropriateness of the critical paradigm for this study is traced from the assumptions drawn from the main guiding research question, which are then related to the underpinnings as discussed. These assumptions/inferences arose from the attempts made to explain the purpose of the study and are essentially versions of the problem/aim from the participants' points of view.

The complexity of the reality claims made about TVET lecturers' learning environments may not be overemphasised (Sebola, 2022). The propositions/inferences from the study's main research question, *How can knowledge-creating processes for TVET lecturers' learning environments be synergised for sustainability,* emphasise this complexity and further justifies the appropriateness of critical paradigm for this study. In the first place, the question calls for *communicative spaces where relevant/key role players in TVET lecturers' learning environments will consider intersubjectivities emanating from role players' divergent perspectives and theoretical positions for synergy purposes.* These intersubjective communicative spaces essentially serve to accommodate diversity, differences of opinions, perspectives, and theoretical positions. The diverse views are considered equally and

interrogated/analysed to their logical conclusion providing tangible and practical evidence where necessary (sources on communicative/intersubjective spaces).

The *second* inference drawn from the question is that TVET lecturers' learning environments are not immune to contesting power differential issues in their diverse academic, economic, technical, and environmental contexts. This suggests that it is imperative for these learning environments to foreground sustainability issues around and on which to rally their synergy. To this extent, emphasis should be on striking a balance among environmental, social, and economic realities lessons or mitigating the inherent risks brought by power differential realities that may subtly or overtly promote social injustice. In this regard, the study questions how the depletion of natural resources like the ozone layer and fossil energy sources happened if not traceable to imbalances among the economic, social, and environmental aspects (Lingeshwaran et al., 2022). Global warming is one phenomenon that is arguably traceable to excessive power wielded by humans over non-human entities with disregard for environmental sustainability (Cronin, 2022).

The *third* inference suggests that TVET lecturers' learning environments as intersubjective communicative spaces are obliged to commit to producing more public goods without compromising the future generations in ways that exceed the [algebraic] sum of their efforts. In this regard, the study sought to derive lessons from what could be the reasons for the increasing unemployment rate among TVET college graduates in SA (Makgato, 2022). The question solicited by the observation of this situation assumed that the number of college graduates produced far exceeded the sum of the capacities of the college campuses, only to add to costly unemployment. In the final analysis, the unemployment rate could not be viewed differently from the social injustice of the past. The issue then became whether this could be traced to the foci of synergies created among the different role players.

The three inferences/propositions connected the study to the critical paradigm foci on social justice, equity, and power differential realities.

The use of a critical paradigm fits this study because of the diverse participant representation from various social structures within the TVET and business sector. These participants reflect and reveal meaningful insides into their struggle and power relationship experiences (Guba & Lincoln, 1989). Through this study, the researcher

wanted to create opportunities for the participants to change and improve their lives, underscoring the need to use a critical paradigm (Miller, 2019).

According to Cohen et al. (2007), the critical paradigm is based on impartiality and social equality and not only accounts for societal behaviour. The objective is to liberate and remedy inequality and encourage sovereignty in society. Therefore, this study focuses on synergising the creation of knowledge processes in a technical and vocational education and training college with industry demands for sustainable lecturer learning environments. Using the critical paradigm could transform TVET sector learning environments to provide synergy in creating knowledge processes to achieve its public mandate (Korir & Erastus, 2022).

3.3 RHETORIC

The critical paradigm provided the study with the vocabulary to use when writing and speaking with the participants and through the report (Porter, 2022). The notions of power differential realities and how they manifest in the spoken and written language as well as social injustice-related issues that emanate from and/or are associated with the practices and thinking of those in positions of power, became more evident. The study notes the importance and role of language in entrenching imbalances in and through learning environments.

3.4 RELATIONSHIP BETWEEN THE RESEARCHER AND THE PARTICIPANTS

The participants in this study were the students, lecturers, and management team members in engineering studies. The purpose was to establish how knowledge-creation processes synergised in each discipline. It was necessary to work with one college with its six campuses because the context would be the same. The variability might be in the disciplines, based on their different natures. The researcher is reasonably familiar with the situation or geographic location of the college because he also worked in businesses and industries in the same area where the college is situated. Essentially, the researcher's experience in local businesses/industries relating to the focus of this study originated from the same area and subsequently challenged the researcher.

Consequently, the drive to seek a comprehensive understanding of the situation among the relevant stakeholders became paramount. The researcher has not had the opportunity to work for the college and had no preferential issues except understanding how knowledge-creating processes for lecturers were synergised. As seen from the profiling of participants below, most were from the racial group, though not by design. The reality of the matter in this regard was that the said racial group constituted the majority at the college.

3.5 RESEARCH CONTEXT

3.5.1 Situatedness

There are three TVET colleges in the FS province where this study is located. The FS province's geographic location concerning the other provinces in SA and its vast agrarian areas, which incidentally incorporate two of the campuses of the research site in this case, makes it an interesting situation to consider synergising knowledge-creating processes for sustainable lecturer learning environments.

3.5.2 The Research Site

The research site selected in this study is a TVET college situated in one of the Provinces of SA. This college has three campuses in the metro municipality's central business district and three satellites in nearby town areas. Two campuses are situated closer to residential areas where most students reside, some 8km and 70 km from the CBD. The student population serviced by these campuses and the three satellites are mainly from the previously and dominantly black populace. The college has approximately 30 0000 students. The curriculum foci included business studies and engineering programmes (DHET, 2021/2022).

The history behind the locations and resources at these campuses reminds one of the social inequities that seem to persist. The campus, 70 km from the CBD, has in front of its main entrance informal brick-making sites owned by some residents. Initially, the campus was a teacher training college, not a TVET college. This campus and the other satellite, some 60km from CBD, are situated in areas once designated as part of the

former homelands for two different African groups, namely the Batswana and Basotho, respectively. The areas are known for lack of water catchment areas in line with the land allocation during apartheid times. This is a significant indicator of the subtle and unintentional perpetuation of social injustice because the college and the small informal businesses do not seem to collaborate for mutual sustainable development.

3.5.3 Research Participants

According to the survey, to which this study was a sub-project, indicates that for the province where the TVET college in this study is situated, there were 79 lecturers from the engineering-related studies who participated. 31 of the 79 participants were lecturers at the TVET college selected as this study's research site. This made a total number of 31 lecturers (i.e., population) out of which the study selected (sampled) participants to respond to this study's research questions voluntarily depending on their availability, willingness to observe ethical standards, and their interest. Accordingly, the information about the eight 8 lecturer participants on this research site included their demographic information, viz., three female and five male, and seven black and one white with experience in the TVET sector as lecturers at colleges and their involvement with industries/businesses ranging between five and 10 years. The purpose of the selected information was to understand the extent to which lecturers were involved with other stakeholders for their technical and professional development. See chapter four for more details. The information provided related to areas of interest in synergising knowledge-creation processes for sustainable learning environments for these lecturers.

The study sought to understand the synergy of knowledge-creating processes concerning a specific context. This site's situation may not represent the entire TVET college sector in SA. It may, however, apply to colleges with contextual similarities, like having campuses in both inland but relatively less affluent areas and a somewhat larger populace in rural areas with pockets of historic and subtle social injustice-related settings. Thus, the purpose warranted soliciting views from people with diverse but comprehensive information about this case. To this end, the opinions of students who are beneficiaries of learning and whose future sustainability was at stake needed to add a voice.

Similarly, the lecturers and representatives of the marginalised small businesses and industries potentially responsible for imparting knowledge were critical. To have a comprehensive view, the management, expected to have more experience and exposure to the settings, was considered imperative. It was thus necessary to purposely select the participants on the basis that they would help realise the purpose outlined and would be available to contribute voluntarily to the study (McMillan & Schumacher, 2010).

3.5.4 Selected Participants

The qualitative data was generated from the eight (8) TVET lecturers, among whom were HOD and Senior Lecturers, who offered the study opportunity to draw from their experiences about their learning and development internally and from the industries. There were also two (2) TVET managers, one a quality assurance manager and two programme managers. The strategic roles and significance of the lecturer's development may not be emphasised. The other important consideration was these managers' growth from lower levels of the TVET sector, their experience with the industries, their experiences and knowledge of the transformation that TVET colleges underwent and are currently undergoing, and their current responsibilities and practical contributions in this regard. The study managed to attract one small to medium business owner whose availability was mainly due to the proximity of his business to one of the college campuses. According to Patton (2002), qualitative sampling is the selection of participants who comprehensively understand the study. It is with this in mind that I have selected participants who have several years of experience in their respective fields of expertise to provide rich and meaningful insights from multiple perceptive to insights on how best can synergising knowledge-creating processes for sustainable lecturer learning environments be achieved (Block et al., 2022).

3.5.4.1 The Researcher

The researcher has a record of working in the private sector in business and industry as a general manager and management consultant in engineering, respectively.

During my tenures in these positions, I have always been amazed by the relatively scant way the businesses/industries relate and engage with the academic sector on matters of common interest. My concern has been the apparent exclusion of small to medium business enterprises/industries from such engagements. I could only imagine the impact that each small to medium business/industry and academic sector (colleges) would potentially have on their respective progress and growth. The issues, though, appeared to me to be more about competition foci that, most of the time, seemed to disregard the future at social and environmental levels. Accordingly, I pondered the effects of synergising knowledge-creating processes for sustainable lecturer learning environments for these contexts that ultimately led to this study.

3.5.4.2 First Senior Manager

The present TVET Quality Assurance Manager is a black male with three years of experience in his current position. He has many years of experience in the TVET space and occupied the role of lecturer for two years and nine years as a curriculum officer in his tenure.

As a Quality Assurance Manager, he is responsible for ensuring the values of (1) democracy and inclusivity, transparency and impartiality are promoted at the college and (2) Embedding the philosophies of equity, and gender equality, coupled with empowerment. Implement and evaluate quality management practices that are dependable, reliable and consistent at all touch points/structures within the college. Ensure that robust evaluation measures are aimed at monitoring, reviewing and evaluated to advance all practices and procedures of the college, nurture, and enable the sustained development of staff at all levels as individuals and teams to meet changing needs and to deliver a quality service, take active steps to assist students in achieving their potential, Make the best use of resources and develop a culture of sustainability (Matabane et al., 2022).

3.5.4.3 Second Senior Manager

The Current TVET manager is a white male with six years of experience in his current position. He has widespread experience in the TVET sector, with an additional 22 years

occupying roles of lecturer and senior lecturer teaching digital, electronic and industrial communication coupled with mathematics and science. His key performance is the following: (1) enable the effective supervision and development of the TVET programme development, consistent monitoring, research and valuation of all programmes offered at the college (2) Establish and implement the project(s) in accordance with the work plans and engaging with partners and related stakeholders at all stages (3) Analysis and enhance the skills training to stimulate youth employability (4) Develop and Support partnerships with business, civil societal groups, DHET and Seta's to advance Skills Training for youth employability (Oosthuizen et al., 2022).

3.5.4.4 S-M Enterprise Owner

The business owner started his business in 1997 in the Free State Province with limited resources and built a reputation over the years as one of the finest autobody repairs with being awarded premium flagship approvals, namely (Mercedes Benz, Volkswagen, and Audi). He has been awarded recognition by being the finalist for the 2018 SA Productivity awards and runner-up for the Old Mutual and Rapport business competition. His business, over the years, has and still offers artisan training through MerSETA. He is passionate about developing talent and providing employability for previously disadvantaged people in the community.

3.5.4.5 The Lecturers

The (8) lecturers chosen to participate in this study come from diverse cultural, ethical and gender backgrounds, with unique teaching expertise and experience. These elements contributed to bringing rich and meaningful insights to the study. Lecturers are at the heart of teaching and learning; they play a critical role in achieving quality learning outcomes.

Van den Akker et al. (2009) suggest that rationale is a sequel to why particular subjects and content are taught. Consequently, this requires subjects and content to be assessed in the teaching process. Furthermore, Berkvens et al. (2014) affirm lecturers' reflections on rationale should be grounded on three all-encompassing concepts: personal, content, and societal rationale; hence, it is vital that lecturers reflect on these

three perspectives to recognise and appreciate the reasons as to why they are teaching.

In teaching the curriculum, the rationale/vision is shared into three segments: personal reasons; societal reasons; and content/professional reasons (Berkvens et al., 2014). Personal reasons for teaching place the individual lecturer at the centre of teaching and learning in their respective specializations. Therefore, the rationale/vision for teaching should be supported by an environment that assists the lecturer and learners in generating their distinct attributes. When lecturers and learners produce and develop knowledge, it becomes of personal significance. Furthermore, Schiro (2013) implies that personal meaning refers to knowledge that varies from person to person and has personal meaning to every individual. Personal reasons empower lecturers to distinguish whether they are taking into account societal, professional or content reasons in the way they teach, which makes it clear that personal reasons form the basis of societal, content and professional reasons based on individual choices lecturers make.

Societal reasons embrace society as the focus of teaching and learning (Schiro, 2013). In the teaching and learning environment, it is described as a competency/integrated/horizontal curriculum (Bernstein, 1999). The competency curriculum refers to subjects categorized around a specific learning discipline. A competency curriculum generates knowledge from a regional basis instead of a global source of knowledge. Therefore, lecturers teach to provide learners with achievements. Subsequently, society acknowledges learners who achieve more.

Professional/content reasons are the rationale/vision that sustains a discipline/profession as the cornerstone for teaching and learning. The shaping of a teaching vision is called performance/collection/vertical curriculum (Bernstein, 1999), suggesting that the cognitive sphere becomes more significant than other spheres. The cognitive sphere is utilized to assess the learners' application of specific learning material, comprising the performance curriculum, which divides all subjects and divides them into stand-alone entities (themes). A performance-based curriculum requires learners to be evaluated according to international content standards. Therefore, the lecturer's teacher and learning outcomes must be geared towards promoting learners' achievements.

3.6 RESEARCH DESIGN

The design underwent numerous transformations, and it can be argued that it is an enduring assessment of its distinctiveness role in society (Yee & Bremmer, 2011). For instance, design is understandably responsible for creating some of the world's problems, e.g., unsustainable means of consumption. Considering this apparent reality, this study considered adopting a bricolage methodological design to enable transcending disciplinary boundaries to interrogate complex and multifaceted problems regarding synergy among knowledge-creating processes residing in contexts (disciplines) with potentially contesting but supposedly complementary goals.

3.6.1 The Methodical Bricolage Approach

Consistent with methodical bricolage, the inquiry in this study purposed to understand the synergy of knowledge-creating processes as it is and least as I, the researcher, position. What appeared to be desirable in this study was for me, as the researcher, to circumvent precise research protocols and develop differentiation by combining methods, methodologies, theory, and philosophical positions in creative ways. The idea is to challenge this study's readers and target audience to consider the issues of synergising knowledge-creating processes for sustainable TVET lecturers' learning environments differently. In Wibberley's (2017) words, unexpectedly and irregularly, by cautiously considering the data to be collated, which in this case involved data from the survey, meetings with TVET college managers and business representatives, focus discussions/reflective sessions with study leaders as well as individual follow-up engagements with the business owner involved in this study as well as with the TVET quality assurance manager.

3.6.2 Exploratory Case Study Design

A qualitative exploratory case study research design is the most appropriate for this study because it is more descriptive in nature, inclusive, explorative, and circumstantial in its intent and seeks to create a deep and meaningful narrative of explored phenomena (Baxter & Jack, 2008). A case study is an extensive exploration of a bounded system which, in this case, are acts/actions relating to synergising

knowledge-creating processes to sustain the TVET lecturers' learning environments (Creswell & Garrett, 2008). Additionally, Cohen et al. (2011) add that case studies assist in understanding issues better than demonstrating them from a theoretical perspective. Using a case study design intends to obtain rich, deep, and meaningful insights into what participants view their understanding of the synergy of knowledge processes and the creation of sustainable TVET learning environments. This study was conducted in one of the TVET colleges in the Free State, where the required permission for conducting this study will be obtained.

3.7 METHODS

3.7.1 Processes and Procedures

Following the successful defence of the proposal for title registration with the UFS' Committee for Title Registration, I requested permission to conduct research with the university's Ethics Committee, the DHET and the TVET college where this study took place. See approval letters of the said permissions attached as annexures. I subsequently planned for data collection with the identified and available participants through the relevant office and officials of the research site, i.e., TVET college of interest in this case. For each engagement, participants were informed about the purpose and aim of the study. They were requested to participate voluntarily per the ethics approval prescripts outlined later in this chapter. All participants were subsequently asked to sign consent forms (see attached copies) and agreed to use the audio recorder for this study's purposes. The planned data collection methods included the following: focus group discussions, reflection based on information from group discussions, meeting with senior managers, local business owner(s), follow-up discussions with identified participants from focus group discussions as per the reflection, Observations of work at workshops and incubator as well as informal engagements with supervisors and observations of work in practice at local business workshop/repair centre.

The following diagram below illustrates the processes and procedures:

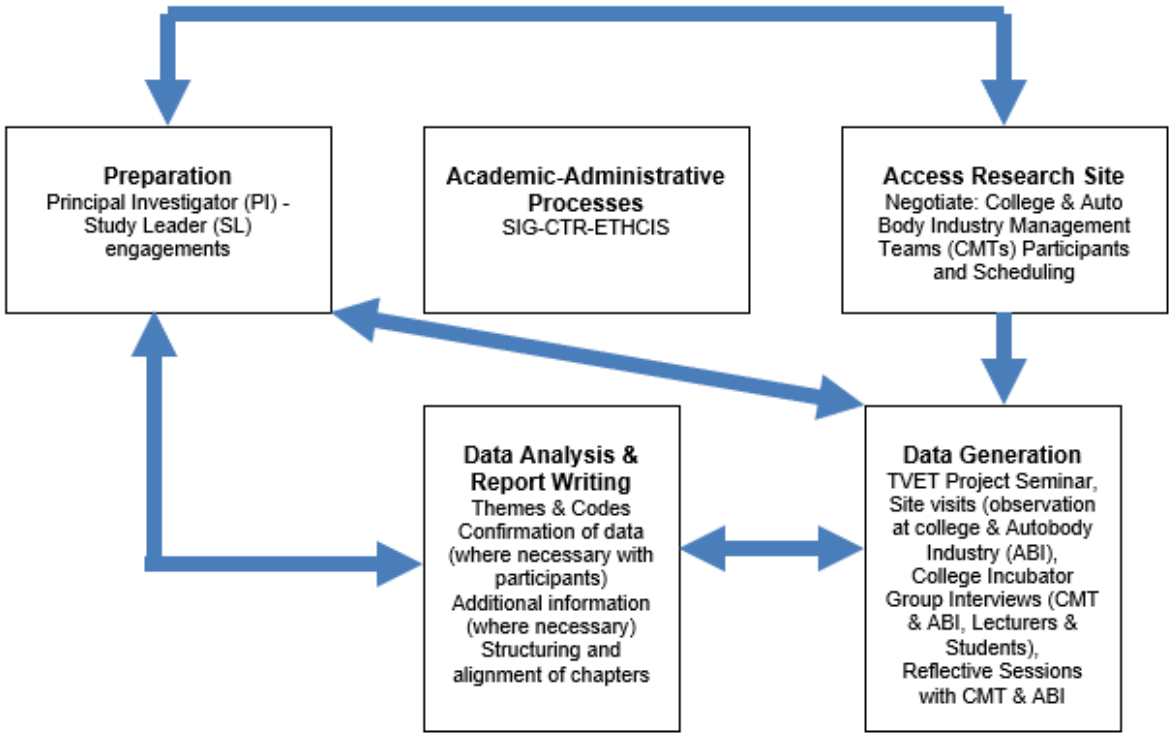

Figure 3.1: Processes and Procedures

3.7.1.1 Survey

This study sought to understand the extent of synergy among key stakeholders' efforts on TVET lecturer development and as such delved deeper into the relevant pronouncements made by the mega project. The Mega Project was a national survey conducted in conjunction with various universities and TVET colleges. The Mega project examined the Technical and Vocational Education and Training environment concerning boosting quality Engineering Study education and training prospects in South Africa (Teis et al., 2022). This study identified participants from one TVET college that was part of the survey in Free State Province, that had a population of 79 participants, i.e., FS TVET colleges population for the Mega Project. The identified TVET college had total of 31 participants according to the table below:

Table 3.1: Research Participant Breakdown

Number colleges in the survey project	Number of participants (ERD)	Subjects / Disciplines	Number per programme		
			NATED n = 22	NCV n = 7	Skills n = 6 (two programmes)
3	31	Science	10	0	2
		Engineering (electrical, Mechanical and Civil)	11	2	4
		Drawing / Drafting	1	0	0
		ICT	1	0	0

Additional information about these participants was that 24 were lecturers, 3 heads of department and 4 Senior lecturers participated in the survey from the research site of this study. There was a need to validate prevailing challenges regarding the alignment between perspectives, theory and practice facing their pedagogical teaching methods. The survey provided useful information regarding the quantitative aspects relating to lecturers' professional development that warranted in-depth understanding. For instance, on the work-integrated learning (WIL) and work-based education, the report indicates that engineering lecturer participation in WIL, 54.8% indicated to have not participated in WIL while a significant number of participants did not participate in the question on WIL (Teis et al., 2022, p.108).

Interesting observations borne from the survey results arrived at through the use of SPSS that warranted further comprehension is illustrated by table below.

Table 3.2: Research Observations

	Category / Variables from the mega project survey tool	Cramer's V	Appropriate Significance	Implications
1	Qualifications	0.465	0.000	V>0.3
2	Area of specialization	0.540	0.000	V>0.3
3	Post-graduate Qualification	0.320	0.175	V>0.3
4	Training offered	0.339	0.998	V>0.3
5	Trade test	0.364	0.995	V>0.3
6	I-WIL	0.419	0.011	V>0.3

(Extracted from the survey report (Teis et al., 2022)

The results suggested that the entire population of the TVET engineering lecturers who participated in the survey, perceived the six categories / variable as having strong

bearing on their professional development, on both the technical and academic aspects of their work. For instance, the data suggested their development in the areas of specialisation was useful while the trade test was moderately associated with their development. The study thus sought to understand the reasons why and how post-graduate qualification was perceived as being moderately influential to professional development when qualifications were almost very influential. The interest that arose related to but was not limited to, the need for understanding the resources and opportunities provided for professional development, why would post-graduate qualifications be perceived as moderately useful while industry-based work integrated learning (I-WIL) was perceived as very useful. To understand the reasons for all these questions the study was necessary on a smaller scale and to delve deeper into the issues.

3.7.1.2 Focus group discussion

(a) With lecturers

A focus group interview was held with the (8) lecturers to gain some understanding based on their views and experiences of the lecturer's learning environments and how knowledge processes were synergised. It also served as a base on which to build the reflective questions with the senior managers and industry/business representatives, which would afford us the prospect of obtaining differences in beliefs, thoughts and opinions together with finding common points of view from the lecturers (Cohen et al., 2011). A focus group interview collected data from participants' responses (Truong, 2022). During the focus group session, I asked questions to all the participants and encouraged dialogue and opposed to just constructing questions and expecting responses (Cohen et al., 2011). The focus group interview aided me in collating differences in opinions from individual participants at the same time. Participants spontaneously voiced their thoughts and ideas, which was valuable to me in determining how significant concerns affect their behaviour in different ways; as a result, common themes emerged. The focus group sessions were conducted in a responsive environment where participants were encouraged to speak freely and were not deterred from expressing true feelings (Abeza et al., 2022). Data were generated, audio recorded, and minutes were taken, which helped me determine the most

significant issues affecting their experiences. My supervisor attended this session to ensure the focus group session was conducted as intended and experienced the session as it transpired.

(b) With students

Puig and Evenson (2022) indicate that semi-structured interviews are guided through open-ended questions, with other questions evolving from conversations between the participant and the researcher. Therefore, I created an environment and atmosphere for the participants to respond freely and openly, allowing them to reflect on their learning experiences effectively and thought-provokingly. Using case studies and semi-structured interviews helped me generate essential data. Semi-structured interviews were conducted face-to-face between the researcher and the participants. My supervisor also observed the interview sessions (McMillan & Schumacher, 2010). This made it possible for the interview was comprehensive, using open-ended questions to gather data on how the participants perceived the world and how they related to and constructed logical measures in their own lives (McMillan & Schumacher, 2010). An audio recorder was utilised throughout the interview sessions, and minutes were taken to collect and analyse the data.

3.7.1.3 Reflection-based information from focus group discussions

This reflection was based on the information obtained from the group discussions with the lecturers and students. The purpose was to check for areas of convergences and or divergences (patterns) about the response given to the questions asked. This eased the process of identification of themes and or constructs. This suggests that the reflection process is not just looking at a superficial level but investigators' nature and depth lecturer's actions, why behaviour in a specific manner and the implications that will shape their future actions before the data generation process, i.e., interview and focus groups. All participants were given a reflective activity to enable them to introspect their experience, thoughts and feelings around synergising knowledge-creating processes for sustainable lecturer learning environments. The importance of using Reflective activity is that it provides enhanced power of control over experience

whereby thought processes expand our reasonable control on experience, and it is through reflection that we can carry out a rational method of inquiry (Farahian et al., 2022). Therefore, the reflective activity added value because the lecturers were prepared for the robust discussions; on the other hand, it assisted the researcher in addressing the study's objectives. The researcher assisted the supervisor in developing the questions (Bubnys, 2022).

3.7.1.4 Meeting: Senior Managers and S-M Enterprise Owner

The main objective of this session was to obtain TVET college management and business perspectives and to corroborate or refute the information obtained from focus group discussions and reflection sessions regarding synergising knowledge processes for sustainable TVET lecture learning environments. I attended the meeting with the researcher, the two study team leaders, two TVET college senior managers, one from quality assurance, the second from programme management, and one local business owner. The meeting afforded us the opportunity and flexibility to generate rich and thick data because we could engage and interrogate issues to their logical conclusions using FAI and brainstorming techniques (Cohen et al., 2011; McMillan & Schumacher, 2010).

3.7.1.5 Observations: work in process confirmations and further information

The purpose of the visits to college workshops and the incubator was to understand the opportunities created in respect of synergising knowledge processes for sustaining TVET lecturers' learning environments. We needed to have a practical view of what was happening at the TVET college concerning respective business/industry counterparts to understand the extent to which the incubators, as conceptualised, synergise the knowledge processes between.

3.7.1.6 Follow-up sessions: clarifications and confirmations

The purpose of follow-up meetings and discussions with participants' business owner(s) and senior manager(s) was to gain more information and clarify issues that

emanated from our observations during site visits relative to the information obtained from and through other modes of data generation used in this study. The follow-up sessions were also reflective in providing senior managers and business participants opportunities to learn from the experiences of down-line staff and students, the college and the requisite industries.

3.8 TECHNIQUES

3.8.1 Brainstorming

We used the brainstorming method because it enables the participants to engage jointly in problem-solving, using their creative ideas, thoughts and experiences, which they openly shared. The researcher encouraged each participant to reflect aloud and offer as many ideas as possible grounded on their diverse knowledge and experiences. The concept of brainstorming itself is not a hard thing to comprehend. The session integrated the challenges, inherent risks, solutions and conducive conditions relating to the objective of synergising knowledge-creating processes for sustainable lecturer learning environments. As a result of the robust discussions, common themes emerged, such as Leadership, Curriculum, Lecturer Development, Teaching and Learning Resources, and Work-integrated Learning as the main drivers impacting synergy from thriving (Camacho & Paulus, 1995).

3.8.2 Free Attitude Interview (FAI)

The principles of Meulenberg-Buskens' (1996) free attitude interview (FAI) were helpful as a technique to interrogate the main research question in pursuit of generating data (Tlali, 2013). This means that multiple questions involving clarity-seeking and follow-up questions were used to discern a deeper understanding of the meaningfulness of the envisioned synergy. Habermas (1987) and Wicks and Reason (2009) advise the importance of creating intersubjective communicative action under such circumstances. These intersubjective spaces also allow for participant observation as a method of generating data. Jorgensen (1989) indicates that participant observation is used when the researcher engages with people in everyday life whilst generating data. It is a unique method of exploring rich, complex,

problematic, and challenging experiences, views, and feelings of participants' activities in their natural environments. This allowed me also to be a participant so that I can gain a deep understanding and contribute to creating synergy between knowledge processes and the creation of sustainable TVET learning environments. Audio recordings were used and transcribed with permission from the participants to ensure that data was analysed adequately.

3.9 DATA ANALYSIS

3.9.1 Organising Principles

The data were organised according to the research objectives and related research questions, which were done to ensure that the study responded to the main research question from which the sub-questions were derived. In that way, the aim and objectives would have been responded to, as promised. This would be the case because the questions asked were used to derive the corresponding objectives similarly that a hypothesis responds /to or attempts to answer the investigative question.

The following step were used to classify the information obtained from the participant's responses to the questions according to the constructs or themes created/developed based on the apparent and/or actual meanings the information shared/expressed suggested. We engaged in this learning process through reflection and critical reflection. To mitigate the possibility of imposing our thoughts and ideas on the information that appeared unclear to me (us), I reverted to the sources of such information for clarity and further probing. This happened during the follow-up meetings or engagements.

3.9.2 Critical Discourse Analysis (CDA)

Following the categorisation or classification of data according to the objectives and/or secondary research questions, as well as clarifying unclear sentiments embedded therein, I (we) checked for data that insinuates the prevalence of power differential realities in various forms. This was done to inform the observations that needed to be

conducted on-site, i.e., at workshops and incubators for confirmability, to further inform our findings based on the data generated. To this end, we relied on Van Dijk's (2001) notions of critical discourse analysis that studies how social power abuse, supremacy and inequality are performed.

Critical discourse analysis (CDA) embraces any acceptable approach to realise the aims of specific CDA-inspired research. In other words, many CDA researchers tend to use qualitative methods, as well as taking into consideration analysis of the social, political, historical, and intertextual contexts. The rationale for using CDA in this study is that participants originate from various backgrounds and have different roles and responsibilities within the context of the TVET, Business, MerSETA, Government, and DHET sectors. Therefore, power and discourse would be tension within their relationships (Barker et al., 2018).

Van Dijk (1993) illustrates the essence of critical discourse analysis that emphasises dominant relationships of selective groups and institutions as they interrelate in written or verbal communication. A distinctive component of this analysis is the relationship between power and discourse and the forms of access to public discourse for distinct social groups. Ideally, we need the `cognitive interface' of models, skills, experience, behaviours, beliefs and ideologies and other social representations of the social mind to associate power and discourse in a meaningful way, which also relates to the individual, social, and micro- and the macro-levels of social structure. Therefore, in this study, it found that using the socio-cognitive critical discourse analysis at textual, cognitive and discursive practices levels as a tool for data analysis deemed to be the most appropriate.

3.9.3 Analytic Bricolage

Using principles of bricolage, I then made sense of the meaning and insinuations from the information analysed. To this end, the guiding principles are the extent to which the college, based on the suggestions of the analysis, considers using resources, skills, and knowledge to resolve challenges or enhance knowledge processes for sustainable lecturers' learning environments. This principle extends precisely to the multiple available perspectives and theoretical positions offered by industries/businesses and the college towards realising the much-desired sustainable

learning environments. At this stage, the findings regarding the construct/theme are made or suggested, and critical consideration is also given at the level of the objective/secondary research questions.

3.10 TRUSTWORTHINESS

The conceptions of and about the synergising of the knowledge-creating process for sustainable TVET lecturers' learning environments are a reality to be constructed in this study. They are bound to differ from one context to another. However, this does not suggest that it may be pursued because much as the study does not purpose to replicate the qualitative aspects hereof, the realities proffered by the data from the survey may also apply to other contexts like the one in this study (Stahl & King, 2020). For this reason, it became prudent to consider trustworthiness in respect of perspectives of credibility, dependability, conformability and transferability (Guba & Lincoln, 1994).

3.10.1 Credibility

In this study, multiple methods were used to generate data and facilitate data corroboration and analysis. The study considered the survey, group discussions, reflection sessions, and follow-up meetings with relevant participants. The purpose was to ensure that the findings are closest to the reality (Stahl & King, 2020) of synergizing knowledge-creating processes for sustainable lecturers' learning environments. Through this process, the study identified key elements and/or processes through which the envisioned synergy could be achieved. See chapter 4 for more information. Apart from data corroboration, the analysis attempted to juxtapose the underpinnings of critical theory, sustainability theory and synergy during the analysis stage to strengthen the findings that are drawn.

3.10.2 Transferability

A relatively comprehensive, not exhaustive, description is provided in respect of the situation and circumstances of the research to indicate possible contexts in which the

findings of this study may find expression. It is worth noting that transferring findings to similar contexts should be to expand understanding of the findings relating to synergising knowledge-creating processes for TVET lecturers' sustainable learning environments (Cohen et al., 2011; Graneheim & Lundman, 2004). The description of sustainable learning environments as empowering, geared toward functional knowledge and meaningful participation in society is explained in Chapter 2.

3.10.3 Confirmability

The DHET (2018/19) Report apportions the causes for continuing high youth unemployment rate in South Africa to structural factors, spatial marginalisation and poor matching of training and skills to employer demands. To this end, the study considers structural factors like having the same college campuses in different geographic areas with varying levels of economic advantages as instructive. The spatial marginalization, in this case, we conceive as being associated with the historical situation with the deliberate allotment of land to the former homelands, where the two campuses are situated, based on environmental and economic limitations. The mismatch between training and skills to the benefit of the powerful employers to the subjugation of society makes the reality of the situation of this college even starker. The remaining question relates to how the college can derive synergy from this reality in ways that successfully respond to the social needs and not just the employer (economic) needs confronting these campuses.

Additionally, Global trends point to the reality of unsuccessful attempts to integrate training into job creation and place hope on the outcome of South Africa’s new strategy, i.e., the Human Resources Development Strategy (II) for technical and vocational education, that may have done so. However, the increasing unemployment rate among graduates in recent years may be the contrary. Further blame is placed on the long-neglected curriculum reform that, in turn, requires investing in staff training and development, infrastructure, and equipment. To these extents, the attempts to synergize knowledge-creating processes for sustainable lecturers' learning environments strove to bring us closer to the reality espoused, consistent with the notions of mutual dependencies among social, environmental, and economic sustainability.

3.10.4 Dependability

The study relied on reflective sessions with the study leaders and two technology education lecturers in the Departments of Mathematics, Natural Sciences and Technology Education to dependability, to read and react to the notes and write-ups to ensure consistency with the relevant paradigmatic and theoretical imperatives about this study. In some instances, the reflective sessions led to the need for further engagements with participants at the college and the industry/business participant. This contributed to a large extent to my being careful about what I recorded as fact and what I set aside as researchers' interpretive comments about the data (Stahl & King, 2020).

Additionally, the follow-up engagements with the participants also helped the researcher clarify aspects of the data generated during the focus group discussions, including the information obtained from the survey (Hasan, 2021).

3.11 ETHICAL CONSIDERATIONS

To comply with ethical requirements and standards, the researcher exercised caution, gained trust and practised control in a study to enable and optimize a high level of data generation. According to Graziano and Raulin (2013), it is vital to understand whether participants have the right to participate. Furthermore, they have the right to withdraw at any point in time. Price (2009) identifies ethics as a branch of philosophy concerned with human character and conduct, a system of morals, rules and behaviours. Participants in the study were fully briefed regarding their role, enabling them to decide whether they wanted to participate voluntarily.

Before conducting the study, I applied for and was granted ethical clearance from UFS. This study is a sub-project of the mega project on TVET that the School of Mathematics conducts, Natural Sciences and Technology Education of the UFS. It abided with all ethical considerations determined for the mega project in terms of the following:

I obtained permission to engage participants from TVET colleges where this will take place.

I requested and obtained consent for participation from all participants: college- and industry-based participants associated with the respective TVET colleges. I was open and transparent about the aims and objectives of the study; the participants were also assured of the strict handling of the data. Their views, opinions and perspectives were handled with the utmost respect and used only for this study. Audio recordings were used in interview and focus group sessions to ensure the validity and reliability of the data generated. All participants received and signed consent forms to indicate that they were participating of their own free will without any form of compensation, particularly financial remuneration.

3.12 LIMITATIONS AND DELIMITATIONS

TVET lecturers may benefit from understanding their strengths and weaknesses, which may enable them to close the knowledge gap in acquiring the essential skills and expertise that would enrich their teaching experiences. Learners may benefit by achieving curriculum outcomes that position them more adequately for workplace demands. TVET managers could benefit by implementing and managing curriculum outcomes with clear aims and objectives and by coaching and developing TVET lecturers. The business community could also benefit by employing more productive learners when entering the company. This could further embed trust and collaboration and foster a working relationship between TVET and business that enhances sustainability.

3.13 CONCLUSION

Chapter 3 illustrated and set out the research methodology and design used in the study. Furthermore, the chapter defined the research paradigm, the research strategy, and data generation methods and discussed, along with trustworthiness data analysis, ethical factors were outlined.

CHAPTER 4
PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA FOR SYNERGISING KNOWLEDGE-CREATING PROCESSES FOR SUSTAINABLE PROFESSIONAL DEVELOPMENT OF LECTURERS

4.1 INTRODUCTION

This study is about understanding the TVET college context and how its various areas of specialisations and disciplines can be synergised for enhanced knowledge-creation processes. This chapter presents the analysis and interprets data in pursuance of the need to synergise knowledge-creating opportunities and processes for sustainability in the TVET colleges. The data is organised according to the study's objectives and further into constructs in accordance with the common features emerging from the data consistent with the literature. For analysis purposes, the presentation of data is preceded by information that serves to make informed judgements from literature, policy positions and theoretical perspectives that resonate with but are not limited to notions of synergy and sustainability. The presented data under each construct are analysed critically based on their textual meanings (where necessary), cognitive implications of the text messages and, subsequently, their social implications. Finally, for interpretation purposes, the information obtained or arrived at from the analysis is then related to the principles of Bricolage, the theoretical framework to make some findings.

4.2 NATURE AND DEPTH OF MISALIGNMENTS BETWEEN KNOWLEDGE PROCESSES AND THE CREATION OF SUSTAINABLE TVET LECTURERS' LEARNING ENVIRONMENTS

The study's first objective sought to understand the nature and seriousness of alignments and/or misalignments among opportunities and processes responsible for creating knowledge in the TVET colleges and related industries and/or businesses. The data generated from discussions suggested the need for alignment among

leadership, curriculum, lecturers' professional development/lecturer learning environments, work-integrated learning and teaching and learning support materials and resources to sustain TVET colleges' lecturer learning environments.

4.2.1 Leadership

Leadership offers an organisation a vision that impels it in a particular direction (Mayfield et al., 2015). For instance, a vision about the sustenance of a good employee base (e.g., lecturer retention) would necessarily focus also on better and improved conditions of employment and or service, such as market-related remuneration (Shabane et al., 2017), quality and responsive staff development, staff morale, positive organisational culture, team building (Janes et al., 2020). Leadership provides analytic and strategic analysis of the internal and external environment to facilitate smooth adjustments and possible transformation to the envisioned change, should such arise. In this sense, leadership become flexible and inclusive. It is amenable to, appreciates and respects the diverse ways/approaches to work performance without losing focus on the organisation's vision, mission and values. It is thus capable of instilling a sense of co-ownership of the values and vision to ease the achievement of objectives. Depending on the context, it can be transformational, transactional, bureaucratic, autocratic or democratic (Leithwood & Jantzi, 2005).

Leadership principles, as explained, affect the TVET colleges and Industries alike. Various leadership styles influence an organisation's direction; the most commonly used decisions are taken in a stringent and often pyramid-based hierarchy (Carnevale & Stivers, 2019). Bureaucracy, also called red in organisations, is a specific type of organisation characterised by complexity, division of labour, permanence, professional management, hierarchical structure control, and strict chain of command. Rigid, inflexible processes and systems in their best form, bureaucratic/red tape organisations are formal and impersonal, focusing on rules rather than relationships to foster employee and stakeholder support and collaboration, leadership styles are most autocratic, and communication is top-down as opposed to being inclusive. The decision-making and control protocols are definite and include mainly high-ranking senior managers/leaders. These high-ranking officials control decisions about the establishment's vision, aims and objectives, including financial, human resource, or

policy related, and a few retain power. A bureaucratic organisation exists in public and private institutions (Hickson & Pugh, 2018).

The value of employees in a bureaucratic organisation is fixed, as to how meticulously an individual executes their tasks, and adherence to company policy is seen as critically important. Individual decision-making and creativity are restricted. Bureaucratic organisations are modelled around the notion that an establishment should function like a well-oiled machine (Dekker, 2019).

However, in the case of this study, there seem to have been issues/challenges relating to leadership that may be attributable to an inadequate synergy between industries and TVET colleges from the participants' points of view. The survey results indicated that out of the 31 lecturers who participated, three (3) were at the HoD level, and four (4) were at the senior lecturer level. Additionally, the results indicated eight (8), i.e., nearly 26% of these 31 lecturer participants, indicated no formal teaching qualification, while seven (7), i.e., 23%, did not respond to this question. On another related question on related formal qualifications, eighteen (18), i.e., 58% of the lecturers, indicated that they did not have formal qualifications. This suggested the dire need for relevantly qualified lecturers from who future leadership of the college and possibly the TVET sector would be drawn.

Our attempt to understand the situation better led to two separate meetings being held, and one question the meetings interrogated was based on the participant’s experiences of college leadership's role in synergising knowledge-creation processes. The intention was also geared toward establishing whether in-house lecturer training arrangements or opportunities were created to share experiences and expertise. The question was interrogated using brainstorming and principles of free attitude interview to deepen understanding of the situation. The first meeting was with eight lecturers from the following disciplines: Operations and Project Management, Financial Management and Economics for Levels 2, 3 and 4, Print Making, Graphic Design, Early Childhood Development, Arts and Science of Teaching/Educational Development and Hairdressing. The second meeting was with two senior managers and a business owner from one local S-M company that operated within the automotive industry. According to their profiles, the eight lecturers we met who had between 5 and 15 years working at the institution appeared to be sceptical about the

leadership practices when coordinating the college work with respective businesses/companies. Comments made by two lecturers that seemed to sum up their concerns were:

Table 4.1: Leadership-related misalignments between college and businesses/industries knowledge processes and the creation of sustainable TVET lecturers' learning environments

Data Set	Participants	Participants' views	Category/Constructs	Consolidate view
Focus Group Discussion (L)	Lecturers	"The problem is that we are *not getting enough leadership and support from our superiors."* "There is too much *red tape*…. We also do not have *access to the Principal* of the college."	Support Leadership Direction Access Communication Administrative Developmental Misaligned goals	Synergising leadership limitations
Focus Group Discussion SM and SME Owner	Senior Manager Artisan and Business Owner	"Well, if I can just maybe say something, there's a *leadership vacuum* somehow, a very big one." "I have not seen any leadership from TVET Management, including business, in any way."		
Reflection (SMs and CMs from other colleges)	Senior Managers	"Working with industries for purposes of student and lecturer development is not easy… not only because of *possible misalignments* in goals but *also administratively."*		

Comments made by two lecturers that seemed to sum up their concerns were that the phrase '*leadership vacuum*' from the manager that seemed to corroborate the lecturers' experience about *not getting enough leadership* suggests inadequacies in the leadership provided. Furthermore, the data suggested a strong view and cry for college executive leadership support at lower and/or lecturer levels, hence the notions of a *leadership vacuum* and poor leadership as espoused by the Quality Assurance (QA) manager.

This was a strange call because the management is mainly concerned with strategic management and leadership issues (Dess et al., 2003). The suggestion thus seems to be that there was also a need to pay attention to the organisation's internal environment and not only to the external that is often associated with the strategic issue. Also, the issue relating to '*too much red tape*', the prevalence of which was frequently raised by the participants (6), suggested that the leadership style from which the red tape may have been derived was because of the dominance of bureaucratic leadership style that may have been preferred.

By extension, should the organisation experience a leadership *vacuum and too much red tape*, such an organisation is likely to struggle to build high-performing teams. Such organisations are bound to be exclusionary/one-sided (not inclusive) and are most likely to suppress or ignore employee interests and rights (Boin et al., 2016). Such organisations are often too hierarchical and likely to experience low staff morale. The main reason for these adverse effects on such organisational arrangements may be traced to the rigidity and limitation associated with their inability to accommodate diversity. This may deny such organisations the wealth of knowledge and experience from internal stakeholders' multiple perspectives and multiple theoretical positions they have. This has the potential to deny the organisation, in this case, the TVET college, the ability to establish synergy by aligning the diverse leadership and management traits created by the said 'vacuum', thereby boosting staff morale and maximising staff productivity that translates into quality college graduates.

Other SA TVET contexts from two provinces tended to confirm the challenge confronting synergising leadership.

Bricolage (multiple leadership) perspectives with inherent power differential realities that require constant and continual balancing off, the differentials that may not be limited to but essentially focus on the economic, socio-cultural aspects, i.e., academic, societal, ideological, and environmental elements to ensure synergy between key stakeholders for sustainability.

4.2.2 Curriculum/College Programmes

Synergising curriculum/learning programmes and respective industries' work programmes facilitate ease of access to both institutions' requisite facilities and resources for both lecturer and industry staff development (Arulsamy, 2010; Hoadley & Jansen, 2012; Rao, 2010; Van den Akker et al., 2003). Synergy, in this sense, enables effective and efficient shared use of resources for lecturers' sustainable professional and technical development (Berkvens et al., 2014). The affected parties, namely colleges and industries, share the obligation on an equitable and negotiated basis (Mothapo, 2019). The terms of reference that govern the synergy are well publicised and communicated with the constituencies, which in turn pledge their commitment, involvement, and support (DHET, 2012)

Studies performed by Berkvens et al. (2014), Hoadley and Jansen (2012) and Kelly (2009) indicate the formulation of subject content is dependent on the subject topic that is taught from a practical, experimental and subject knowledge standpoint. These studies also emphasise that curriculum implementation should begin with what knowledge (subject knowledge) needs to be understood by the student and what subject substance needs to be taught as per the intended curriculum, which means that subject matter and subject knowledge are central components of the intended curriculum process. Similarly, subject content must be well-balanced, relevant (not outdated), planned and organised (Berkvens et al., 2014). These studies clarify that TVET lecturers should understand the subject matter they teach as part of the intended curriculum. This suggests that content can be described as an approach that fosters knowledge and performance curriculum and builds a TVET sector knowledge capability.

The survey results regarding lecturers' attendance of short learning programmes in the last five years were thought to have affordances for keeping lecturers up to date with the recent curriculum changes and/or to strengthen academics accordingly. 22 out of the 31 (71%) participants indicated to have not attended short learning programmes in their areas of specialisation. The results also indicated that of the 24 participants who attended in-service training workshops, 18 were assessors, 2 were facilitators, 1 PMI, 2 were OBA, and 4 were Civil contractors.

Despite this, the situation of this study indicates that concerns exist in the working relationships between the college and industry regarding lecturer development, especially concerning relevant and current technical skills. This was noticeable from the input provided by the participants. Three separate meetings were held, one with eight lecturers, another with two Senior Managers and a Business Representative and the third meeting with two second-year TVET students. The following data reveals the concerns raised relating to the matter of curriculum:

Table 4.2: Colleges and businesses/industries curricula misalignments of knowledge processes with the creation of sustainable lecturers' learning environments

Colleges and businesses/industries curricula misalignments of knowledge processes with the creation of sustainable lecturers' learning environments				
Data Set	Participants	Participants' views	Category/Constructs	Consolidated view
Focus Group Discussion	Lecturers	"The main issue is that we **have an outdated curriculum** teaching our students." "The **slow rate at which curriculum changes."** "We, as lecturers, are **not involved** in any consultation regarding curriculum design. We should have an input."	Not responsive to current needs Rigid/Less flexible Exclusionary/Non-participatory Reactive	Counter sustainability
Focus Group Discussion	SM and SME	"There **is a vacuum** whereby we have outdated curriculum being taught." **"**I am **not up to speed with what is taught in the classroom**; however, I see graduates coming for employment, and I can say that **there is a gap**. "Especially when it comes to technology and new repair processes."		

Student		"I think we are taught with old stuff and not what is used in business every day."		

The textual message from the participants suggests that what is being taught in the classrooms in the engineering NATED programme is 'outdated', suggesting that it is not relevant to current situations. Also, that the business representative is not 'up to speed,' i.e., up to date, with what is being taught suggests the need for being involved especially noting his observation that the TVET graduates seem to lack currently needed technological skills for which he identifies a gap. The Manager refers to this technological knowledge 'gap' as a 'vacuum' existing in their set-up.

Perception of the outdated curriculum is relatable to the divorce between industries and colleges (see section above).

It could be asked if it is justifiable for one who does not know what is happening in classes to make a judgement and claim of the existence of a 'technological knowledge gap' from persons seeking employment. Similarly, it can be asked if it is justifiable to claim that the curriculum is 'outdated' when one making a claim has not been exposed to what the industry that supposedly is up to date is doing. Technological developments are dynamic and changing at an alarming rate, especially during the Fourth Industrial Revolution (4IR), with the result that is most likely to be impactful on underdeveloped and developing countries (Holman et al., 2020). The reality that the participants were addressing the issues of relevance and responsiveness from their respective comfort zones/perspectives did not only point to the 'us and them' less valuable consideration but also perpetuated the deepening of competition as opposed to complementary approaches to the issues at hand, mainly because both have the students' development at heart.

While competition has its benefits, it also has serious drawbacks. In this case, the large number of students who could not find placement at industries to complete their diploma qualifications would persist longer despite the availability of businesses/industries that may only be brought 'up to speed' through communication with them by the affected nearby colleges. The sad thing is that the NATED programmes do not articulate higher qualifications without a diploma (Matshoba,

2019). In this sense, a community of underqualified and under-prepared students is being continually created.

The participants' varied perspectives on the curriculum's relevance and currency depicted the challenge's depth and seriousness. However, they pointed to the same issue: a possible lack of synergy between TVET colleges and Industries. For instance, the manager described that as “a vacuum” that could mean a complete absence of what is being referred to, in this case, a synergy between the curriculum (what is being taught and colleges) and the work done at industries. The business representative sees that as a knowledge ‘gap’ while the lecturers complained about an ‘outdated curriculum’ and the slow rate at which changes occurred.

As a result, if the curriculum is outdated and irrelevant, learning outcomes are primarily jeopardised, and students are mainly disadvantaged (Fullan, 1989; Marsh, 1998). Furthermore, the curriculum is regarded as a "plan for learning", which also encompasses how curriculum matters should be interpreted, understood and shared. In addition, Van den Akker (2010, p. 180) addresses these issues with the illustration of a spider web to ensure ease and understanding of curriculum design, implementation and evaluation, i.e., (1) Rationale/vision, articulating the precise reasons why TVET managers and lecturer are implementing the specified curriculum (2) Accessibility, understanding the physical, economic, financial and cultural characteristics influencing the implementation of the stated curriculum (3) Aims/objectives towards managing the implementation of curriculum, content. What management capability and content material are TVET managers using to develop and inspire lecturers to improve their performance to manage the implementation curriculum? (4) TVET lecturer role, how do TVET lecturers facilitate teaching in implementing curriculum? (5) Location/Grouping, what mechanisms do TVET managers use to evaluate the performance of lecturers in implementing curriculum? (6) Time, what processes or creative activities are used to implement the curriculum? (7) Resources, what tools and methods are TVET lecturers using in implementing curriculum? (8) Assessment, how are TVET managers and lecturers assessing the implementation curriculum?

Curriculum implementation change involves a constant evaluation concerning behaviours, practices, philosophy and values to achieve continuous improvements in

the quality of learning; if not given the proper attention, it may eat away at the social and structural foundations of the organisation (Gapultos, 2017). This becomes significant as current curriculum gaps and practices appear distant concerning business/industry requirements. Equally, this procedure or manner of doing things could deny the integral viewpoints in bricolage's multiple perspectives and theoretical stances that require consideration for intricate circumstances similar to this situation.

4.2.3 Lecturer's Professional Development

This section considers data at three levels of professional development opportunities in line with what the lecturers are expected to do. First, the school-based opportunities are offered through an integrated quality management system (IQMS); second, the school-based work-integrated learning through which lecturers assess students' performance; and third, industry-based work-integrated learning.

4.2.3.1 Integrated Quality Management System (IQMS)

The Integrated Quality Management System (IQMS) acknowledges employees' contributions to the general performance of the institution or the employer. This acknowledgement comes in financial (economic) and development opportunities while increasing chances of promotion. Thus, IQMS, which is appropriately implemented, increases the employees' opportunities to be promoted and thus earn a better living. It simultaneously challenges or motivates employees to learn new things and share knowledge and experience with their junior colleagues. In this sense, it affords opportunities for sustaining the institution. In the absence of IQMS or similar performance management systems, staff tend to relax and pay less attention to core business demands to the extent of rendering the institution dysfunctional and of benefit to the clientele. IQMS motivates staff to work efficiently and effectively, with the possible result being the economical use of resources. Thus, the inappropriate implementation of IQMS or lack thereof, poses a potential challenge to productivity and staff morale. It, therefore, requires to be embraced and implemented fairly and equitably. The non-involvement or inadequate engagement of staff in IQMS

participatory processes should be a severe concern for both employers and employees.

The survey results about this research site indicated that 22 of the 31 (71%) engineering lecturers who participated in the survey did not attend any short learning programme in the last five (5) years. There were also concerning issues picked up during the process of administering survey questionnaires from other TVET colleges regarding the role of IQMS as a lecturer development opportunity which compelled the need to probe these negative sentiments in this research site. Thus, our attempt to establish the extent to which the purpose of IQMS was achieved in responding to lecturers' needs regarding their professional development, the survey results and seminar reflections with various key stakeholders in the TVET sector unearthed information depicted in Table 4.3 below.

Table 4.3: Colleges IQMS knowledge processes related misalignment with the creation of sustainable lecturers' learning environments

Colleges' IQMS knowledge processes related misalignment with the creation of sustainable lecturers' learning environments				
Data Sets	Participants	Participants' views	Category/Constructs	Consolidated Views
Focus Group Discussion	Lecturers	"I've never been in any training…Our *own training is just neglected,* and it is affecting our development." "IQMS focus on the 1% increase as opposed to the development aspects of the lecturer." "Outdated curriculum that does not speak to industry needs."	Dependency Competing interests Inadequate Personnel Growth/Development	Competition
Focus Group Discussion	SM and SME	"A diploma is adequate for teaching what you are employed to teach. It is a minimum requirement." "From my side, training is linked to what the industry requires, so		

		if we are not getting the training, it's a problem."		
		"Specific programmes only, not that much in our engineering programmes."		

In their responses, lecturers claimed that they have "never been on any training…" and that their "*own training [was] just neglected* and it [was] affecting [their] development" This statement associates training with development, which could be skills and academic aspects. It was not disturbed by other participants. The indications are that lecturers do not take their development as their responsibility; instead, they burden the college or industries, and their development may regress or remain stagnant. Therefore, we may have a cohort of lecturers dependent on employers and cannot progress in the college/industry structures.

The comment concerning the outdated curriculum suggests that should a shift occur, changes in the curriculum bring that about. If that situation arises, the curriculum should be updated to reflect the change. Some of the changes may require slight adjustments; however, for example, if a change occurs in Industries and not the college or vice versa, a situation of rigidity may emerge, which would cause a challenge that destabilizes the Synergised TVET lecturer's Continuous Professional Development.

The Multiple perspectives of Lecturers/Apprentices/Lecturers could be enriched if designated spaces are allocated as they would be able to share teaching and learning experiences and support each in a unified manner.

The performance aspect gives them a 1% increase, and the other component considers development that can be attained internally or externally. The IQMS is inherently imbued with power differential realities associated with the distinction it places on the development of human capital in lecturers (Cornelissen & Smith, 2022) compared to the monetary value, however, limited to the 1 % of salary increase, which will differ from person to person. Apart from the subjective nature of measuring performance quality, the demands for developing lecturers' development may be relatively high and expensive. Notwithstanding these challenges, IQMS establishes a

balance between lecturers' developmental needs and their abilities to perform the work expected of them by the institution and, ultimately, the community/society.

4.2.3.2 Work-integrated Learning (WIL)

Work-integrated learning occurs when lecturers go to technical schools to assess their students' teaching capabilities and when they do the same at the workshops at the places of work associated with the student's qualifications. The purpose of WIL is to allow students to actualise their acquired requisite skills, knowledge, and values relevant to their profession and vocations. Without WIL, it becomes difficult for TVET college graduates to attract employment opportunities from prospective employers. This also denies the lecturers opportunities to observe and learn different and/or new aspects and approaches relating to their profession. Similarly, the artisans at their places of work miss the opportunity to learn from their academic counterparts. Essentially, the industry/business – TVET college partnership that actively engages at this level increases chances of synergising knowledge processes and thus potentially contributes towards the sustenance of lecturer development.

The survey results on industry Work-integrated learning (I-WIL) for this research site established that the majority, 26 out of 31 (84%) of lecturers who participated in the study, had experience in I-WIL. In comparison, 16% did not have I-WIL experience. 35% of the 26 lecturers' experience was in electrical engineering, 15% was mechanical engineering related, and the other 15% was in civil construction. It was essential in this study to verify these comments with management, business and students to ascertain views regarding synergising the colleges, businesses or industry (WIL). The information from our reflection meetings with TVET college managers, lecturers, and local business participants separately aimed to establish the extent to which college lecturers and artisans got involved in I-WIL. Data presented in Table 4.4 from these participants painted a picture and a response to the extent to which their engagements were meaningful.

Table 4.4: Industry Based Work-integrated Learning (I-WIL) knowledge processes related to misalignments with the creation of sustainable lecturers' learning environments

Industry Based Work-integrated learning (I-WIL) knowledge processes related to misalignments with the creation of sustainable lecturers' learning environments				
Data Sets	Participants	Participants' views	Category/Constructs	Consolidated Views
Focus Group Discussion	Lecturers:	"There's no programme that allows us to do I-WIL; I have never experienced it." "We have never gone to industry, so it's a **huge gap** when what is done in industry and what we teach in the classroom." "I ***work freelance in industry***. T***hat's how I keep the information and the students relevant***, is by staying in the industry; otherwise, eish, I would have a problem." " In the workplace, there are new trends every day; we are falling behind back ***we don't have industry exposure***."	Experiential learning opportunity I-WIL- IQMS Disjuncture	Negative influence on the sustainability of learning environments
Focus Group Discussion	Manager Business Participant	"*We don't have definite programmes for every course*. We need to put more structures in place." "I was never approached to participate in any (I-WIL) programme. However, I will be happy to do so."		

The data presented suggest that lecturers from the identified disciplines were not allowed to work with and learn from their counterparts (artisans) in the respective industries. Similarly, the artisans may have lost the opportunities to work with and learn from lecturers. Among the reasons, they pointed out, was the 'absence of programmes aligned with the work done in industries, which is clearer from averments such as "…no clear programmes" and "…was never approached for I-WIL programme." These

views from both the manager and the local business representative are amplified by the lecturer(s) who despite their apparent willingness to network with Industries and businesses, they felt being left behind, thus creating a “huge gap” between colleges and industries. The survey analysis for this region and the study area shows a relatively large number of lecturers who have not been exposed to industry-based work-integrated learning.

Based on the above, the data suggests that there is an absence of mutual benefit in respective industries and TVET colleges, whose work programmes are significantly (un)synergised, lecturers’ development of requisite technical and or discipline-specific skills are being denied, the capacity to shape lecturers’ methods and learning materials is being impeded, and the gap between curriculum and ‘real life’ work demand appears to be apparent. Therefore, the inference from this interpretation above is that TVET lecturers will be unqualified because they will be denied the opportunity to develop their technical skills. Similarly, artisans in industries will continue to have limited pedagogical skills they need to mentor students who come for training from colleges which ultimately means lecturers who are not competent to lecture at the TVET colleges (DHET, 2013). By working in silos, as in this context, opportunities for maximizing productivity (for TVET colleges, industries and communities they serve) that far exceeds the sum of the production of both lecturer and Artisans are compromised. This is because the produced graduates will not meet industry and societal needs, contributing to the emergence of social ills like unemployed graduates in SA (Hondonga & Ramaligela, 2020).

The synergy required between colleges and industries appears to be denied the opportunity to develop their competencies from a rich repository derived from the multiple perspectives and theoretical positions of Artisans and lecturers from diverse technical and pedagogical backgrounds.

Apparently, a lecturer's workplace-integrated learning (WIL) is missing and presents a significant gap in the synergy between industries and TVET colleges. Participants seemed doubtful and uncertain about the current status quo and position regarding organising and implementing (I-WIL).

4.2.4 Teaching and Learning Support Resources and Materials

Teaching and learning resources that may not be limited to the traditional and primary resources necessary for teaching consist of commonly used resources in the teaching and learning environment: chalkboards, calculators, textbooks, and study guides. Khoza (2014) proposes that whatever tool is used in communicating learning can be referred to as a teaching and learning resource, however modern and innovative technologies, e.g., computers, robots, and Virtual Reality (VR) in education (Martín-Gutiérrez et al., 2017), have an effect of helping improve learning individually and most importantly collectively—using multiple resources and media when teaching has the potential of multiplying (synergistic) their positive impact on teaching and learning (Batiha et al., 2020). The alarming rate at which technology evolves suggests that those bound to use them for productivity and achieving set goals must be kept up-to-date with their advancements. In the same vein, the resources updated on regular bases increase the chances for the institutions to remain relevant and responsive (Alamo et al., 2020). Adequately resourced colleges have a better opportunity to prepare students and lecturers adequately for the job market (Tribble, 2020). The same goes for industries that train their artisans in line with the advancements in the college sector.

Multiple teaching and learning resources in TVET college(s) allow students to learn in workplace situations. Connecting theory with practice and executing practical tasks to learn about a profession in the actual workplace allows TVET learning to be exclusively practice-based (UNESCO, 2020). Teaching and learning resources can enhance the responsiveness to the needs of students, employers in both public and private sectors, and broader societal and developmental objectives in the TVET sector (DHET, 2013).

With the rapid changes in globalization, TVET college (s) are no longer limited to marketing students for job opportunities in specific geographical areas. As a result, students are demanding the inclusion of technological resources in their teaching and learning environment (i.e., 3D Printers, Robotic, E-Learning, Cutting Edge Machinery, etc.) to advance their innovative and creative skills, knowledge and competencies in becoming better prepared to pursue available employment prospects globally (Ndlovu, 2017).

The circumstances of this study indicate that challenges appear to be visible regarding inadequate teaching and learning resources at the college, which infers that teaching and learning resources at the college may not be adequate in terms of what business/industry requires. This was evident from the responses given by the participants. Three separate sessions were conducted, one with eight lecturers, another with two Senior Managers and a Business Representative and the third session with two second-year TVET students. The following data (Table 4.5) indicate the participants' concerns regarding the college's scarcity of teaching and learning resources.

Table 4.5: Resources knowledge processes related to misalignment with the creation of sustainable lecturers' learning environments

Resources knowledge processes related to misalignment with the creation of sustainable lecturers' learning environments				
Data Sets	Participants	Participants' views	Category/Constructs	Consolidated Views
Focus Group Discussion	Lecturers	"The current teaching resources that we are using are also outdated in the classroom compared to the industry." "Nothing else except textbook." "I don't teach some aspects of the textbook because we don't have the proper equipment to use."	Resources unsupportive of progression in learning	Sustainability derailing
Focus Group Discussion	SM and SME	"Yes, I agree we do not have the right equipment." "My perception is that students are trained on very old technology."		
	Students	"No, we don't. We only use the textbook; we don't even get study guides."		

The textual response from the participants suggests that teaching resources were outdated compared to industry and that certain sections of the learning content could not be taught due to a lack of teaching resources. Suy (2020) made a similar

observation in a study *Supporting technical and Vocational Education and Training (TVET) for Industrial Development in Cambodia*. Also, the business representative highlights his perception that students are trained on very old technology. Mulenga and Chileshe (2020) similarly observed in a study regarding the appropriateness and adequacy of the teaching and learning resources and students' Industrial Attachment in Public colleges of TVET in Zambia that it brings to light the importance of business in playing a significant role in informing and participating in the teaching and learning processes. The data generated from all participants involved in this question suggest a consensus from which one can infer that colleges may be experiencing severe challenges relating to the adequacy and relevance of resources. The data indicate that TVET college students/graduates and lecturers will continually miss the opportunities to learn with relevant and responsive resources.

Consequently, the much-anticipated synergy between colleges and industries will continue to erode. Furthermore, there seems to be a void in the availability and access to these resources that may widen the gap between offerings at colleges and industries. The gap also negatively affects the possibility of bringing together multiple perspectives and theories from industries and college personnel for quality TVET teaching and learning.

4.3 OPPORTUNITIES FOR SYNERGISING KNOWLEDGE PROCESSES FOR THE CREATION OF SUSTAINABLE LECTURERS' LEARNING ENVIRONMENTS

The study's second objective sought to identify or determine the available mechanisms to facilitate synergising knowledge processes for creating sustainable lecturers' learning environments. The question we sought to respond to in this regard was what mechanisms are there in the industries/businesses and the college(s) that you are aware of that can be utilised to bring about synergy towards sustainable lecturers' learning environments? Again, the responses to these questions were themed according to the elements characterising the nature of the misalignments, starting with leadership.

4.3.1 Synergising Leadership

Synergising leadership derives strength from the richness of diverse leadership competencies, traits, and characteristics of leaders. It enables the interaction between the characteristics of people with the complex demands of the situation of the target society and further affords opportunities for the emergence of new leaders (Stogdill, 1974). The leadership that arises from such interaction tends to transcend the bounds of leadership endowed with a power that potentially deprives others of the opportunity to grow. In essence, synergising leadership is about the consolidation and convergence of peoples' diverse capabilities toward responding to the demands of the situation. Once established, synergising leadership can be exercised/operationalised in its diverse and multiple perspectives, such as an instrument of goal achievement, differentiated role, interaction effect and structure, to mention a few.

Furthermore, the corresponding multi-theoretical positions, such as interaction-expectation, humanistic, environmental, and/or personal-situational theories, are practised according to the situation demands. The synergising leadership engenders a thorough and thoughtful analysis of the situation, in this case, the TVET sector, and the audit of the characteristics of the people involved in the sector, *i.e.,* from colleges and industries. The purpose is to attempt to align and match peoples' attributes with the demands of the situation (TVET sector). Through this process, requisite leadership that emerges is essentially a shared leadership, whereby multiple stakeholders such as the TVET sector, DHET and Business/industry participate as equal partners mutually influencing and directing the shared vision/mission and goals of the TVET sector (Day et al., 2004; Pearce & Conger, 2003). Shared leadership is a collaborative team process whereby the team collectively embraces leadership functions (Bell & Kozlowski, 2002).

The advantages/role of shared leadership includes participating in collaborative decision-making, influencing and supporting other stakeholders, fostering motivation, and jointly taking responsibility for outcomes (Carson et al., 2007; Hoch & Dulebohn, 2013; Pearce & Conger, 2003). The synergising effects of collective leadership are evidenced in its ability to create results/outputs greater than the sum of individual input efforts (Wong et al., 2014).

Thus, Synergetic Leadership enables a shared vision and common goal towards generating open environments that embrace new ideas and multiple perspectives to blossom where everyone (including lecturers) contributes to their full potential. Synergetic Leadership is reflective, promotes critical thinking, and creates pathways for constructive exploration of new formations, shared assumptions, shared perspectives, and shared ways of achieving and monitoring performance outcomes (Deardorff & Williams, 2006).

The table below depicts data from the different data sets giving the popular averments among the participants about issues discussed. The FAI technique confirmed the information when the researcher needed to verify his understanding.

Table 4.6: Synergising leadership for knowledge processes and the creation of sustainable learning environments

Synergising leadership for knowledge processes and the creation of sustainable learning environments				
Data sets	Participants and Contributors	Views	Category Constructs	Overall views
Focus Grou discussion (L)	Lecturers	"Our leaders need to give up a platform to express yourself; in that way, they can support us more in improving our skills." "We need better access to our leaders." "We need clear reporting lines and chain of command."	Open communication Building Internal/External Partnerships Organisational Structure Dissemination of information Job Satisfaction Ownership	Limited/inadequate
Focus Group discussion (CMT and B/I)	Manager	"We need more **clear guidelines** on what information should be taught and how it should be taught on an **ongoing basis** to provide support needed."		

	Business Participant 11	"TVET leaders need to involve business so that we can assist in bringing more practical knowledge into the system. I have been in business for 20 years, and I'm situated about approximately 4km from the TVET college, and I was never contacted to get involved. I will be more than willing to get involved."		
Reflections and Discussion sessions	Senior Managers and HoDs (Other colleges and stakeholders)	"TVET colleges should take the lead to *consult and persuade key local industries' representatives who may have influence as members of the TVET colleges' advisory boards with a purpose to also derive benefits for lecturers' professional development from industries*." "We [TVET colleges] need to change our mindset! We must take responsibility and go to these companies... [and] put more effort … We don't know, for instance, what these companies [around the college] are doing because we do not go to them!" "Once a year, we hold a meeting with business and industries as a relationship building to build trust with them."		

The data generated suggested a need for ‘platforms’ or multilevel communication forums to allow those at lower levels to express their views directly with their leaders, *i.e*. those who occupied senior positions. This notion was expressed in different ways, like ‘having more access to leaders’ and the need for ‘clear communication’ and ‘guidelines’ as well as ‘support’. In addition, a need for businesses and industries to ‘play a bigger role’ was emphasised.

These suggestions tend to advocate for a more collaborative approach to dealing with problems and lean towards influencing leaders to consider the ideas and views from the lower ranks of the institution(s). To this extent, lower-level staff needed recognition as part of the leadership but still considered the role of those in senior positions as leaders.

The suggested inclusion of industries and/or businesses and the more significant role they play means an even more rigorous analysis of the situations of both businesses and colleges and the characteristics of the groups of people and individuals in both situations. These processes will not be immune to power differential realities and, as such, need to be handled with great circumspection. The value of bringing the two broad groups together is thought to be potentially worth the process. It attempts to draw learning from multiple perspectives and theoretical positions brought by the participants from diverse backgrounds.

4.3.2 Synergising Curriculum

Synergising curriculum potentially integrates economic, social, and environmental aspects of development in lecturers' learning environments in various forms and stages. It endeavours to exponentially optimise the outputs and outcomes in ways that consider balance, equity and/or equality among the key pillars for sustainable development. In this sense, the synergising curriculum is essential for sustainability focussed; it facilitates synergy among relevant and affected sectors of colleges and businesses/industries (Sohaimi & Senasi, 2020). It is inclusive while keeping pace with critical changes that take place in the sector. This makes it flexible and futuristic to accommodate new developments that strengthen the attainment of the core purpose of teaching and learning, in this case, lecturers’ learning environments. Additionally, the synergising curriculum facilitates efforts geared towards meeting industry needs,

increasing the possibility of student employability and leading to improved articulation with higher education institutions (Terblanche, 2017).

In our attempt to understand what and how necessary and possible means for establishing the desired and envisioned synergising curriculum can be found, we considered data from different data sets as depicted in Table 4.7 below:

Table 4.7: Synergising curriculum between knowledge processes and the creation of sustainable learning environments for lecturers

Synergising curriculum between knowledge processes and the creation of sustainable learning environments for lecturers				
Data Sets	Participants	Views	Category/Constructs	Overall views
Focus Group Discussion - L	Lecturers Civil	"The curriculum is outdated in both NATED and NCV programmes. Curriculum review must take place immediately." "We should be involved in the curriculum development because we can share our experiences I'm teaching Educational Development. More clarity is needed on whether I'm teaching the outcomes based or CAPS or OBE." "What we taught in the classroom is different to what happens in the industry, so we should align these things." "The curriculum taught to us should include more practical work so that we can understand better."	Relevance Responsive Inclusive Sharing Futuristic Flexibility Clarity Alignment Practical and Theoretical Consultative	Sustainability Focus
Focus Group Discussion – SM and	Senior Manager	"We are currently consulting with the Department of Higher Education to make sure that we have a current updated curriculum for all courses."		

S-ME	Business	"I'm not too sure on all the aspects that is taught, but technology is changing every day, so if we are consulted, we can give input."		

The column on the categories/constructs in the table above provides the essence of each statement in the data and considers the context of the data sets. For instance, the lecturers felt that there was a need for their involvement in discussions about the curriculum, especially because, in their view, they could 'share [their] 'experiences' and keep abreast with the industry-college curricula alignment endeavours confirmed by the senior manager and business enterprise participants, that of ensuring that they 'have a current updated curriculum for all courses' to which businesses/industries can give input to keep pace with fast-paced 'technology changes' that takes place very frequently, i.e., 'every day'!

The inferences and thinking drawn from the participants' view, e.g., the column on views, suggested the 'categories' and/or 'constructs' indicated under the relevant column of the table above. For instance, our interrogation of the statement of facts by the Senior Manager and the Business Enterprise Owner and participants in the study, respectively that "*we are currently consulting with the Department of Higher Education to make sure that we have a current updated curriculum for all course*s" and "*I'm not too sure on all the aspects that is taught, but technology is changing every day, so if we are consulted, we can give input*", suggested the thinking and inferences that the synergising curriculum (a) is essentially responsive and relevant hence the need to update the current curriculum; (b) processes are consultative and inclusive of key stakeholders' perspectives and experiences; (c) is flexible and futuristic to be amenable to the ever changing demands in technology as dictated by economic, social and economic changes; (d) embraces the integration of practical and commensurate theoretical components for the enhancement of teaching and learning; and (e) engenders opportunities for sharing of experiences, knowledge and skills for the sustenance of lecturers learning potential.

To this extent, synergising curricula serve a critical role in bringing together diverse perspectives and theoretical positions based on their commitment to social, economic,

and environmental aspects, not only for the present but also for future generations. In this sense, synergising curriculum affords opportunities to contribute towards redressing prevailing imbalances and inequities brought about by misalignments between knowledge processes and creating sustainable lecturers' learning environments. It offers opportunities to motivate lecturers to learn and teach for and towards constitutional principles of inclusivity, social transformation, and equity. Synergising curriculum earnestly led by commensurate synergising leadership promises blurring boundaries between industries/business and corresponding TVET colleges through sharing and programmes of exchanging skills, knowledge, and values through creating sustainable learning environments for lecturers and, by extension, their artisans and apprentices' counterparts.

Evidently, as espoused, the synergising curriculum is developed from multiple perspectives and theoretical positions regarding the knowledge processes toward creating sustainable learning environments for lecturers. The multiplicity emanates from the specialisations and competencies derived from all relevant affected stakeholders whose considerations are exposed to and honed through rigorous communicative and intersubjective engagements among the affected role players. The values of keeping the rigorous synergising curriculum spaces also ease the processes of equitable access to resources supporting the implementation of the curriculum. To this end, synergising curriculum essentially reduces the alter, adapt, and use of the un- and under-utilised resource, like knowledge, skills, and material equipment, to respond to the challenges experienced, in this case, regarding the sustainability of TVET lecturers' learning environments.

4.3.3 Synergising Lecturers' Learning Environments

The opportunities for synergising knowledge processes for sustainable lecturers' learning environments manifest in many facets and formats, mainly due to the uniquely complex nature of the sector. The complexity is partly because lecturer development resides in different learning environments that somehow compete more than they complement. These learning spaces include inhouse/institution-based learning through processes like PDP and IQMS, the work-based integrated learning that is both professional (school-based) and technical (industry/business based).

4.3.3.1 Synergising the Integrated Quality Management System (IQMS)

The table below provides information obtained from focussed group discussions and critical reflection engagements with management team members and business participants. It also considers the views expressed and shared with the survey team members during administering survey tools.

Table 4.8: Synergising IQMS as communicative action for the creation of sustainable lecturers' learning environments

Synergising IQMS as communicative action for the creation of sustainable lecturers' learning environments				
Data Sets	Participants	Views	Category/Constructs	Overall views
Focus Group Discussion	Lecturers	"Offer *specialized courses* and workshops to *improve skills*." "…afford *regular training* that is *linked to what the industries require*." "*Freelance in the industry* that's how [to] keep the information and the students relevant; we should have *structured programmes that provide for this*; that way, we can improve our skills."	Developmental Alignment Initiative acknowledgement and recognition	Alignment Inclusivity Collaboration
Focus Group Discussion	Senior Manager Business Participant	"Much more programmes and training solutions, especially the practical aspects, are necessary." "To engage in a structured programme that offers lecturers training opportunities."	Practical Goal-directed	
Reflections	HoDs, lecturer and Managers	"Do it [IQMS] right, self-assessment, supervisor assessment, peer involvement." "Have a structure where we sit together and address issues that affect us, not only when there is a problem."	Participatory Inclusive Multi-perspectival Intersubjective Communicative space	

The data suggest the need for more relevant structured learning programmes and TVET-related qualifications that help ease the work and relationships between the colleges and the industries. These programmes are viewed as having the potential to respond to, as ‘training solutions’ to the existing challenges experienced by lecturers and artisans. In particular, regular challenges about skill sets and practical aspects.

The suggested ‘regular training solutions’ may indicate the need for sustainability in the sector. Similarly, the views in respect of being structured also included the need for alignment between what is offered at colleges with the needs of the clientele for who students are being trained, namely the communities and industries.

Inclusion and collaboration of representatives from key stakeholders in the TVET sectors, namely TVET colleges, universities, industries and communities, is to be at different levels from local, i.e., individual college, to cluster (professional community of practice) to district/region and province. Such inclusion allows participants to be exposed to and learn from their perspectives and theoretical positions.

Continuing Lecturer Professional Development essentially refers to all learning intended to improve and advance professional expertise through acquiring knowledge and learning new skills outside those obtained during primary training. The lecturer's importance is learning that leads to value-added practices and individual and professional growth. The learning may arise through formal, informal or in-practice interventions (Desimone, 2009; Postholm, 2012).

For lecturer, learning new and innovative competencies broaden their knowledge, skills and personal abilities to effectively execute professional and technical responsibilities (Friedman & Phillips, 2004). Which positively impacts sustained progress in students' academic, personal and social learning outcomes (Timperley et al., 2007).

In addition, by keeping lecturers up to date with developments in their areas of specialisation, the new knowledge and skills improve practice. Continued Professional Development (CPD) may also improve an individual’s performance and open more opportunities in career path for promotion in terms of future growth aspirations (Collin et al., 2012; Fraser et al., 2007; Kennedy, 2005; Muijs & Reynolds, 2017).

CDP is diverse in nature. Workshops, conferences, college courses and attending specific training are examples of interventions that can shape their progress in gaining new knowledge. Also, it Is the responsibility of both TVET college Management and TVET lecturers to take (CDP) seriously and identify informal, informal and practical courses and programs that will drive and embed the culture of development (Desimone, 2009; Kennedy, 2014; Postholm, 2012).

Developing communities of practice, such as peer-to-peer learning, mentoring, coaching and feedback from colleagues or experts, would assist Lecturers in their development journey, whereby lecturers will be better placed to understand their strengths and weakness. As a result, a constructive development plan could be implemented (Desimone, 2009; Kennedy, 2014; Postholm, 2012).

For instance, Artisans who visit lecturers at colleges individually and in clusters/circuits can provide workshops for lecturers on newly introduced and innovative ways of doing things/working (Friedman & Phillips, 2004) and similarly, lecturers share knowledge and experiences on how to provide pedagogical assistance to students (Timperley et al., 2007).

In this way, the synergising effect of professional development responds partly to the occupational health and safety-related risks associated with industries. In addition, synergising lecturer development affords opportunities to enhance the effectiveness of existing learning spaces for lecturers and artisans such as through IQMS processes (e.g., in-practice interventions), through accredited short learning programmes, diplomas and degree qualifications offered by industries and universities (i.e., formal education and training) (Desimone, 2009; Postholm, 2012). Furthermore, CPD also helps improve individual lecturer's/artisan's performance; it opens more opportunities in career paths for promotion in terms of future growth and aspirations (Collin et al., 2012; Fraser et al., 2007; Kennedy, 2005; Muijs & Reynolds, 2017).

4.3.3.2 Synergising Work-Based Work-integrated learning

Work-based integrated learning (I-WIL) engenders learning in and from practice. For TVET lecturers, the benefit from practice enables the development of professional (teaching and learning) skills (technical), methods and practices associated with the

subject being taught that are relevant in the workplace or industry settings (DHET, 2013). In instances where the synergy between the institutions prevails, I-WIL opens spaces and creates opportunities for Artisans and other skilled personnel to visit colleges to offer training (technical) to students and lecturers (Oosthuizen & van der Bijl, 2019). To this extent, and similarly, for artisans or industry personnel who go out to offer training (technical skills) to college students, I-WIL allows them to learn professional teaching and learning competencies of professionally qualified lecturers (DHET, 2013). Thus, synergistic I-WIL potentially contributes towards building institutional capacity and enhances responsiveness and relevance while mitigating the risks associated with occupational health and safety in industries. Learning in practice from artisans, lecturers, or skilled personnel affords exposure to reliable learning environments that stimulate creativity, problem-solving and critical thinking. For instance, problems experienced in the basic course of work challenge those performing it to use resources and even rubble available to make their tools to solve the problem. In this sense, I-WIL enables the integration of theory and practice (Batholmeus & Pop, 2019) while easing attempts for all parties (lecturers and artisans) to keep abreast of current trends and technological advancements (Clayton, 2012; Ireland et al., 2002). I-WIL also enable a better understanding of industry needs to influence teaching and learning at the TVET colleges (Clayton, 2012; Schüller & Bergami, 2008). In addition, I-WIL fosters and strengthens sustainable networking opportunities.

Table 4.9: Synergising I-WIL as communicative action for the creation of sustainable lecturers' learning environments

Synergising I-WIL as communicative action for the creation of sustainable lecturers' learning environments				
Data Sets	Participants	Views	Category/Constructs	Overall views
Focus Group Discussions	Lecturer	*"Industry-based exposure* will *close the gaps* in what is done in industry and what we teach in the classroom, yes, so we need it." "Work *closely with industries* so that we are in touch not only for us but also for the students."	Building TVET/Industry Working Relations Sustainability Ownership Professional/technical competency	Create spaces and opportunities for Professional Community of Practice.

		"…building relationships with businesses in our area is a starting point."	Problem-Solving Networking Innovation Built Inhouse Capacity	Transparent training
	Manager Business owner	*"Definite programmes* are needed in every course for lecturers and students' *hands-on experience*." "If we are involved in providing this experience, it's a good partnership because when we employ people, *we know what we are getting."*		
Reflections	CMT Members	"…structure of council [college boards] put key people, [from industries] as our councillors they may have influence." "…ability to get funding, to cater for qualifications, to launch, and get it ratified, ….and have the ability to review what you are doing."		

The participants' views appeared to agree regarding their response to the questions on opportunities and/or possible means available to use I-WIL towards synergising knowledge processes for creating sustainable lecturers' learning environments. Their views appeared to converge towards creating TVET lecturers' professional learning communities, including industries and businesses with which they collaborate. Their community of practice should have a transparent working relationship with all partners to the extent that they engage and network on problem-solving innovations towards building in-house capacity for sustainability. The notions of sustainability were particularly articulated during the reflection sessions as indicated by the agreed-upon contention that the college advisory board should consider including 'key people from industries/businesses' and to develop their ability to obtain funding, develop qualifications and review them. These views meant that the college should ensure that it is sustainable and should not overly depend on external assistance to build knowledge. The significance of this consideration further suggested and conceived colleges as being in a better position to establish centres for knowledge development with lecturers at the centre. The reality of funding as a potential power source tends to shift the balance towards industries and businesses. This situation tends to absurd the

value inherent in the rich knowledge that resides with and in the shared available learning spaces/environments. Incidentally, learning environments may not be there for competition but for collaboration; consequently, it can be argued that learning environments have the power to bring about unity and/or cohesion.

4.3.4 Synergising Teaching and Learning Resources

Teaching and learning resources that contribute to a synergy between two distinct institutions/organisations lend their development to and by the affected parties (colleges and industries). It is co-created and/or co-constructed to achieve an agreed-upon common goal and objectives. These materials and resources are consistent with, and cognisance of the possible changes the sector experiences and provide affordances for anticipating future changes. In essence encourages creativity and entrepreneurial capabilities (Batchelor, 2011). As such, equitable and equal participation and/or contributions of the role players from both institutions and at different levels are informative towards their (resources') development. Synergising teaching and learning resources facilitate the innovative and creative prowess of both lecturers and, ultimately, the students and apprentices they hope to develop (Reich, 2020).

In this study, the lecturers and artisans we engaged with had issues with the quality of teaching and learning material utilised in the colleges and the level of training the students received in some industries. This prompted us to establish more information by asking the participants the question, "*How can/do teaching and learning resources contribute towards synergy between TVET colleges and Industries?*". In response, we highlighted the following (Table 4.10).

Table 4.10: Synergising teaching and learning resources for the creation of sustainable lecturers' learning environments

Synergising teaching and learning resources for the creation of sustainable lecturers' learning environments				
Data Sets	Participants	Views	Category/Constructs	Overall views
Focus Group Discussion	Lecturers	"Some aspects [need] proper equipment to [teach]. We need more study gives laptops and projectors." "…need equipment, teaching tools and upgrading classrooms and workshops because we are teaching technical courses that need these resources." "Web designing needs industry-related subject matter and needs the tools to do it." "Incubators need to be more accessible as we are only allowed to use it for a limited time."	Appropriate equipment/study material Workshops/Classrooms Time/ Theory - practice alignment Safety and Security features Shared use of resources	
Focus Group Discussion	SM and SME	"Enough right equipment and learning tools; however, we also need to deal with the element of crime." "Industry on board, the college can also use the equipment on our sites. This can save on costs and maintenance."		

The data suggest a need for ICT equipment like projectors and laptops for teaching specific topics. In contrast, others may be taught at the industries where shared use of resources between the colleges and industries can be practised. The data gives an example of web design to suggest a movement between industries and colleges by the affected parties. The data further emphasizes the importance of teaching and learning material appropriateness for enhanced synergy. The view of 'proper' seems to extend to include the facilities like 'classrooms' and 'workshops' that need to befit the technical nature of the subjects being taught.

Some of the colleges we visited did not have workshops and classes like typical ordinary classrooms with no appropriate furniture and equipment befitting technical and/or practical subjects. This tends to question the attributes of the graduates produced by the colleges for the industries, especially in so far as it related to the practical skills. In the same vein, industries that limited the practical learning of students who were placed with them on clerical and domestic duties may have contributed to the limited skills that students needed in their areas of speciality (engineering).

The cumulative effect of such practices by both the colleges and industries is the creation of a community of underprepared clientele for the job market and, as such, contributes to the growing body of unemployed graduates.

The data suggest that a multi-layered collaboration between colleges and industries allows the development and implementation of synergising teaching and learning materials. It also means working across and between colleges and industries to share the use of scarce resources, facilities and skills to build a bigger pool. The pool of resources depends on the multiple perspectives and experiences of the role players with industry (technical) and college (professional) perspectives. The acquisition of knowledge and skills for all people, irrespective of gender, age, race or location, is significant. The use of multiple teaching and learning resources enables inclusion in providing flexibility and sustainability in TVET education in addressing the needs of our diverse student population.

4.4 CONDITIONS CONDUCIVE TO SYNERGISING KNOWLEDGE PROCESSES FOR THE CREATION OF SUSTAINABLE LECTURER LEARNING ENVIRONMENTS

4.4.1 Conditions Conducive for Synergising Leadership

Synergising leadership thrives under conditions that value the contributions of individuals in ways that do not inadvertently demean others. The conditions that embrace and embody collective wisdom may have directly or indirectly influenced individual excellence. The condition that puts a premium on and recognises the inherent contribution of the socio-economic and environmental influences on the

quality of input and processes leading to the outcome/output in ways that complement and promote cohesion and unity of purpose over the individual (Kretschmer, 2022). Synergising leadership thrives under conditions based on the shared vision and commensurate strategies geared towards sustainable lecturers' learning environments aimed at developing efficient and effective operational systems that contribute toward producing graduates imbued with innovative, entrepreneurial, and critical thinking capacities for sustainability (Ansell & Gash, 2018). To this extent, synergising leadership thrive best under shared communicative spaces derived from the rich multiple capabilities from diverse experiences brought through communicative action from economic (industries and businesses), social (communities and colleges) and environmental perspectives (Ekman et al., 2021).

Consequently, rigorous complementary communicative actions and conditions conducive to synergising leadership embody frequent critical reflective processes and methods that diagnose and mitigate inherent risks and threats promptly. This helps lessen power differential realities inherent in monitoring and evaluation processes (Kusters et al., 2018). Additionally, synergising leadership thrives under conditions appreciative of and intentionally develops the capacity for sustainability (Stumne, 2020).

Based on the realisation from the survey, the research site considered in this study was no different from many other colleges when it comes to the number of lecturers from who synergising leadership can be drawn, judging by the low number of lecturers per discipline, that indicated to have undergone regular training on industry based work-integrated learning, and professional teaching at TEVT colleges (Teis et al., 2022), the study sought to establish from the affected staff, the conditions that might be conducive for optimising synergising leadership for sustainable lecturers learning environments. Table 4.11 gives the most common (frequently expressed) views.

Table 4.11: Conditions conducive to optimising synergising leadership's efforts in creating synergy between knowledge processes and sustainable lecturers' learning environments

Conditions conducive for optimising synergising leadership's efforts in creating synergy between knowledge processes and sustainable lecturers' learning environments				
Data Sets	**Participants**	**Views**	**Category/Constructs**	**Overall views**
Focus Group Discussions	Lecturers	"Frequent information sessions with leaders for direction, guidance, and support." "We all should be involved in the decision-making and work together."	Value contribution of downline staff Supportive environment	Motivation Participatory decision-making processes

The text suggests the need for working environments characterised by meaningful engagements and interactions among key stakeholders and partners. The context in which the averments on "all should be engaged in decision making and work together" clarified goal-directed decisions regarding the sustenance of lecturers' learning environments. Environments that embody support and value their participatory communicative actions in decision-making tend to have had motivational effects on the lecturers' desire and aspirations for development; hence reference to "direction and guidance" was mentioned frequently.

These notions were also supported during the reflective session with the management of the college when referring to IQMS, that the sustainability of lecturers' learning environments commences with creating conditions that "*bring about a balance between performance and incentives*" associated with the system. To this extent, management considered conditions under which synergising leadership will thrive best as an instance of depowering potential that promotes complementary and synergising potential in leadership goals, objectives and activities toward lecturer learning environments. The conditions are characterised by mutual respect among the role players and value for their growth and development for institutional sustainability and generations to come. To this extent, the post-seminar reflection session with TVET college managers and HoDs arranged through the mega project's efforts revealed that synergising leadership will thrive under conditions where "research informs practice". Thus, research is necessary for synergising leadership because it

would potentially provide the much desired ‘information’ and influence the ‘direction, guidance and support’ alluded to earlier.

The desired participatory action-oriented condition for synergising leadership is inherently marred with power differential realities likely to emanate from contesting goals and operations between the college and her industries and business counterparts. To this extent, synergising leadership’s considerate attempts to level off the possible adverse effects of the differences will become pivotal. A thoughtful analysis of the situation and context within which the envisioned partnership operate will be informative and instrumental. Such analysis would understandably facilitate the creation of sustainable and communicative learning spaces for the development of lecturers by pursuing continuous alignment between work-based work-integrated learning and integrated quality management, i.e., performance management and recognition thereof. Consequently, flexible work-learning environments and/or service-learning communicative and intersubjective spaces are created. These spaces facilitate the movement of mutually dependent services and learning between college and industries and businesses through the programmed exchange of skills, information, and knowledge at different levels of the value chain, e.g., lecturers being trained at industries in preparation for the next module by artisans and vice-versa, artisans at colleges to improve their academic and transfer of skills (training/learning facilitation). To this end, synergising leadership create conditions conducive to the sustainability of lecturers learning environments using resources, skills, and knowledge available at its disposal, which is sometimes un and underutilised, to create a community of practice for the enhancement of technical and professional development. In this way, conditions conducive to synergising curriculum become relatively easy to pursue.

4.4.2 Conditions Conducive for Synergising Curriculum

Synergising the curriculum development process is a communicative action that depends on multiple experiences and knowledge of stakeholders and participants from diverse backgrounds. It requires conditions that are amenable to the accommodation of diversity. It derives its synergising prowess from public and legislative mandates like the constitution and requisite policy statements’ goals, values, aims and learning

outcomes. Therefore, conditions conducive to the synergising curriculum for knowledge-creation processes for sustainable lecturer development are inclusive, rigorous and goal-directed. To this extent, the conducive conditions reside in the participants' openness and commitment to sustainability. Lecturer learning and development provide hope for the institutions and the country's current and future socio-economic and environmental sustainability. Synergising curriculum conditions are characterised by learning activities and learning outcomes that resonate with the motivation of the beneficiaries and participants. Such activities are generally relevant and responsive to society's social, economic, and environmental needs, which synergising curriculum conditions provide for accordingly. In this regard, the synergising curriculum is ever-evolving and adaptable to the ever-changing demands and emphasises the centrality of lecturers' learning environments. In this sense, the condition conducive to the synergising curriculum is essentially transformative (Fullan, 1989; Marsh, 1998). The conditions conducive to synergising curriculum regard industries/business as essential and accords it critical considerations at different stages of the curriculum, from its design, implementation, monitoring and evaluation/review (Taole, 2013). The critical reflections thus accorded are thoughtful of the multiple and complex contexts of the different colleges, industries/businesses, communities and societies they purport to serve.

To answer the question on the "conditions that synergising TVET colleges' curriculum thrives or might thrive", which was clarified as conditions needed to promote the successful implementation of the TVET colleges curriculum, the participants expressed interesting views. Table 4.12 depicts the fundamental concepts from different meetings, workshops and seminars that were held.

Table 4.12: Conditions conducive to synergising curriculum toward sustainable lecturers' learning environments

Conditions conducive to synergising curriculum toward sustainable lecturers' learning environments				
Data Sets	Participants	Views	Category/Constructs	Overall views
Focus group discussion.	Lecturers	"Consistent participatory engagement among college and industries as well as key stakeholders." "Jointly determined agenda items for meetings and planning sessions (administrative and strategic issues): teaching, assessments, and reviews and related practices." **"We** should also have theory [offered mainly by colleges] and practical [offered mainly by industries] assessments which must be **reviewed regularly."**	Consistency Simultaneity (Interactions through students) Regular assessments Curriculum responsiveness Commitment to deal with negative status-oriented perceptions	Agreement Curriculum should promote college-Industry interactions. Flexibility
Reflective sessions	Management and Business participants	"Collegial and less class/status emphasising environment." "Shared responsibilities and accountability relating issues of safety, maintenance, and procurement of shared curriculum-related resources Insistent on the alignment of goals – academic and practical/ technical."		

Our probing of the sentiments shared by all the participants in the discussions established that it was imperative to have mechanisms in place according to which the taught curriculum would be assessed and evaluated for its responsiveness to the demands of the communities for which it is meant. To this end, the data generated suggested that 'consistent' reliable mechanisms acceptable and agreeable to the affected institutions were inevitable. In addition, the data suggested the importance of

the simultaneity of joint development, implementation, and assessment of implemented theoretical and practical aspects of the curriculum.

According to the notion of joint development, implementation, and assessment of the implemented curriculum, emerged views of dedicated representative teams and facilities, preferably at colleges having the capacity at strategic geographic positions to host the centre for this purpose. This view was consistent with the notion that the centre would rely on the shared use of facilities and resources. It would thus be respectful and considerate of the diverse and multiple perspectives the joint dedicated teams brought about.

4.4.3 Conditions Conducive for Synergising Lecturers' Learning Environments

TVET professional development has an immense role in synergising knowledge-creation processes in industries/businesses in conjunction with TVET college processes. Therefore, it is inherent in TVET lecturers' expected competencies as professional Teachers and skilled technical experts in their areas of specialisation (Simmons, 2022).

The ever-changing circumstances facing both the Teaching and technical aspects present a need for continuous development in both technical and Professional areas/ fields. TVET lecturer professional development should thus not be limited to their basics. TVET professional development is considerate of knowledge and is comprehensive of requisite principles that enable lecturers to be creative and innovative in their teaching, which should help them integrate knowledge gained through industries/Business based work-integrated learning (I-WIL) with modules and material to assist with knowledge-creation integrated learning for teaching purposes (Masoabi & Alexander, 2021).

Additionally, synergising TVET Professional development is inherently research lead for the effect that lecturers can conduct research which informs teaching practices in their areas of specialisation (Msibi, 2021).

In our discussion with the participants, we examined under what conditions TVET lecturer development could optimally contribute towards synergising knowledge-creation processes in TVET colleges, industries/businesses.

Table 4.13: Conditions conducive to optimising attainment of sustainable lecturers learning environments through Work Based Integrated learning and Personal development (IQMS)

Conditions conducive for optimising attainment of sustainable lecturers learning environments through Work Based Integrated learning and Personal development (IQMS)				
Data Sets	Participants	Views	Category/Constructs	Overall views
Focus group discussions	Lecturers	"Training and development opportunities will assist us [lecturers] in our [their] own development, especially when it comes to practical aspects [technical] of teaching." "Prospects to study further [improve professional and technical qualifications] …continues development to stay abreast with what is happening in industries." "We need to look at new ways of teaching [responsive, relevant curriculum] …new technology used in business." "TVET colleges should take the lead to consult and persuade: Motivate, empowering, positive outlook, hope."	Continues Training and Development of both Professional/Technical Relevance Currency Responsiveness Creative/Innovation Motivation	Increase Lecturer Competencies Providing opportunities For Lecturer Development Creating Substantial Learning Environments Research Capability
Focus group discussions	Manager Business Participant	"…development training for all lecturer research departments can helping us in looking at new ways of doing things." "Lecturer training and development, especially in upskilling current technologies used in business." "TVET colleges are like poorer cousins of universities on whom we depend for lecturer development [instil a feeling of being worthwhile, equity and equality, motivate]."		

		"There is no need for further development above diploma level especially because such are often irrelevant to TVET sector … a diploma is sufficient for teaching what you [the lecturer] have to teach and students to learn [developmental, progressive, value others' efforts]."		

From the text point of view, we extracted the constructs that appeared to be areas of convergence of their statements. For instance, continuous training refers to the technical aspects of a lecturer who needs to be developed in that area. Whilst "New ways of doing things" to that effect, we see training and development as a generally acceptable construct.

Similarly, participants' conceptions tend to converge towards the notion of relevance and responsiveness as depicted from phrases such as "Stay abreast, Current Technologies used in Business and new ways of doing things". From these constructs and following in-depth discussions, it became more apparent that participants had in common the general thinking (cognition) that focusing on these construct lecturer Professional Development will increase their competencies.

Developing their research capabilities may enable them to develop the skills and attributes necessary for creating sustainable learning environments. Emerging from this cognition was the need for designing and resuscitating lecturer development centres/clusters where lecturers from various colleges, in conjunction with their industry counterparts, share their professional development practices and develop training material that is beneficial to industry/business and college needs.

4.4.4 Conditions Conducive for Synergising Resources

The lecturer's ability to interpret available learning support material, including curriculum, eases students' achievement of expected outcomes. It also promotes lecturers' interest in developing learning material to improve existing ones. In this way,

learning materials remain current, relevant and responsive to the needs of the learners, businesses, and society in general. Furthermore, the development of learning support materials becomes a necessary condition for and adds to the agenda of the college-industries collaborations that also tend to contribute towards adequacy of requisite material. This situation is strengthened by the availability of functional systems of procurement, storage and efficient and effective use of materials such as libraries for books and ICT equipment. An efficient and effective funding model to cater to sensitive and expensive materials demands is paramount, especially for workshops and laboratories. Thus, college environments characterised by safety features may not be overemphasized (Mulenga & Chileshe, 2020).

We interrogated the participants' views in response to the question, *What conditions prevail or should prevail to optimise synergising resources for sustaining lecturers' learning environments?* The participants' responses that appeared to be common when we realised that no new information was forthcoming (Yang et al., 2020) are summarised and categorised in Table 4.14.

Table 4.14: Conditions conducive to synergising resources for the creation of sustainable lecturers' learning environments

Conditions conducive to synergising resources for the creation of sustainable lecturers' learning environments				
Data Sets	Participants	Views	Category/Constructs	Overall views
Focus group discussions	Lecturers	"Lecturers work to bring their subjects to life and make it interesting for my students." "Funding for getting the correct equipment." "Better relationships with industry and learn from the equipment they currently using." "What colleges teach aligns with what the industry is doing."	A committed and competent workforce Fit-for-purpose Shared Contribute to alignment	Reciprocity Creativity Synergy Sustain ability
Reflections	SMs and SMEs	"Align business goals and administrative function with college goals."	Relevance Responsiveness	

		"Ensure learning outcomes are relevant and responsive to needs…facilitate articulation to advanced levels." "Consider working flexi-hours to allow for development… benchmark with universities … incorporate research unit at colleges(s)." "Advisory board that is collaborative and inclusive and of influential persons who can take critical decisions and contribute tangible resources for learning."	Flexible Benchmarking Research led	

A closer look at the data, based on the contexts of its generation, could be summed up by the categories/constructs listed under the respective column in the table above. For instance, the notion that the suggested college advisory boards took various annotations during the discussion because of the implications of advisory against taking decisions that can be implemented. The main issue was the representative nature of the highest decision-making body of the college as a critical resource. The body comprises resource persons capable of contributing significant and tangible resources to be shared to sustain lecturers' learning environments at the college and the respective industry/business. Lecturer learning environments are couched on aligned goals and administrative imperatives from which emerges sustainable learning materials and learning outcomes capable of synergising knowledge processes between the affected institutions.

The inference drawn from the categories/constructs that emerged from the data suggests a need for resource-sharing collaboration between industries and colleges [reciprocity]. The creation of such collaborations needs to be founded on aligned programs/projects as may be set out from the diverse stakeholders' goals and objectives. The participants' thinking also suggests collaboration that creates spaces for the augmentation of resources and their cost-effective use [funds for correct tools].

The above thinking derived from the data suggests the emergence of a collaboration that has a common goal, that is, an alignment/consolidation of goals and interests of

the partners, that has a common purpose of developing responsive material to the needs of both the industry and the college and encourage shared use of resources in support of the common goal.

The emerging social structure is a collaboration inclusive of businesses/industries, colleges, and the community they serve. These bring with them to the collaboration their beliefs, knowledge and expertise that bestow on them the power to either dominate or be dominated depending on what is at stake. However, this power, in the participants' multiple perspectives, can enable the collaboration to succeed if not misused or taken for granted. The importance of accommodating that diversity is potentially enriching because it can be synergised through shared goals.

4.5 INHERENT RISKS AND THREATS

4.5.1 Synergising Leadership

Inherent risks in synergising leadership for sustainable lecturers' learning environments reside, among others, in the possible mismatches between the type of leadership practised and the personality traits of those being led or guided at a particular point in time. The appropriate application of leadership styles consistent with the issue or reality to be engaged with, as well as the personal attributes and perceptions of others, e.g., of lecturers, appears to potentially have a fundamental effect on the effectiveness of synergising leadership. This may be viewed as a risk of a leadership vacuum resulting in, among other realities, low staff morale characterised by a lack of energy and low levels of synergy between teams; people generally working together. However, ineffectively, inefficiently or without clear aims and objectives; an overall sense of poor directives leading to no considerable development and growth direction; absence of respect for leaders, blame gaming, inadequate motivation, lack of cohesiveness toward collective drive goals; conflict between groups and their leaders as each seeks constrained resources and a position of higher status and control (Brown, 2020).

Synergising leaders may find it challenging to balance their daily professional and technical roles of leading their institutions with building their capacities through further and continuous development (Liang et al., 2019). For instance, competencies

involving technology evolve rapidly, affecting leadership practices and requiring constant learning and application. Additionally, people may naturally be interested in exploring and learning from diverse situations that may result in them leaving their current posts. This potentially makes staff retention (Reddy et al., 2017). A big issue and risk for synergising leadership. The issue is that building new capacity in the place of lost staff may be costly, while simultaneously retaining competent staff may equally be costly and demanding for leadership.

As much as synergy is vital for production achieved through and with others, collaboratively, prevalent rife competition in the sector may distract the focus (Larson, 2010). The effects of the focus on competition, i.e., differential power realities, as opposed to complement, may have daunting results on the organisation/institution. Competition may devastate the public for who TVET colleges and industries are created. It can lead to challenges such as withholding opportunities from others who may have the potential to do even better and unproductive contestations over resources that should be shared for the public good. For instance, the scepticism of some industries about the quality of training offered at some TVET colleges versus the concerns raised by some TVET colleges about the currency of equipment and resources used by some industries that take college students for apprenticeship (Van der Bijl & Taylor, 2016).

Table 4.15: Risks potentially inherent in synergising leadership that may hinder optimising the creation of synergy of knowledge processes for sustainable lecturers' learning environments

Risks potentially inherent in synergising leadership that may hinder optimising the creation of synergy of knowledge processes for sustainable lecturers' learning environments				
Data Sets	Participants	Views	Category/Constructs	Overall views
Focus Group Discussion	Lecturers	"Communication-related limitations (mis- or ineffective communication), that informs us [college] how many students must we train."	Non-aligned conduct Accountability	Non-compliance

		"Prevalence of potentially negative personal traits – inconsistent handling of matters, differentiation between professional and unprofessional conduct." "Taken-for-granted issues, negligence, delayed intervention, and support, (in)effective prioritisation of issues."		Misalignment with policy directives Working in silos Competition
	Reflection sessions	"Working with industries for purposes of lecturer development is not easy because of • possible misalignments among goals and administrative functions • and accountability for the security of lecturers visiting industries."		

Views that work in conjunction with industries for lecturer development are not easy because 'misalignments among goals and accountability' suggested possibilities of non-alliant conduct influenced by entrenched beliefs in the technical goal being only about skills and not academics. That appeared to have resulted in lecturers' development being taken for granted or neglected instead of being viewed as having sustainability potential for the sector that synergises knowledge processes provided by both the college and industries/businesses. The data further suggested the prevalence of possible misalignment between the college/industries goal and the policy or legal mandate. This misalignment tends to be borne from non-aligned conduct that subtly tends to pursue the unfortunate historical use of technical institutions for creating wealth in ways demeaning to others. The misalignments and non-aligned behaviour resulted in work being performed in silos even where there was no need. This consequently defeats the opportunities to pool the synergising leadership prowess available for creating synergised and sustainable lecturers'

learning environment. Unless adequately mitigated, this risk potentially deepens power differential realities toward perpetuating social injustice to the disadvantage of lecturers learning and sustainability of the sector and colleges. The general views expressed regarding the inherent risks that potentially confront synergising leadership in this context were mainly associated with the persons in leadership positions and their perceived academic and technical roles and responsibilities.

4.5.2 Inherent Risks in Synergising Curriculum

Synergising curriculum's flexibility and adaptability depend on the policy makers', lecturers'/technical personnel, leadership competencies and capacity in current technical, technological, and academic advancements. Keeping pace with these is often difficult for people who continually search for better working conditions. The disadvantage of not having in-house capacity and competence results in outsourcing this critical communicative action to external service providers, compromising sustainability. The inherently deep-rooted competition for skilled and knowledgeable workforce between industries and colleges tends to put at risk the sustenance of creating lecturers' learning environments for the future of the college and supporting industries and businesses. Furthermore, the scarcity of synergising curriculum-related resources and materials, as is often the case for public colleges, has a potentially devastating effect on the provision of curriculum on sustainable bases. Another threatening issue for the synergising curriculum for creating sustainable lecturers' learning environments is the non-aligned and misalignments with the policy positions where such exists and/or instances where there is limited policy directive provided regarding the sustainability of lecturers' learning environments. Notably, limited avenues for articulating the curriculum tend to discourage the further development of lecturers.

The engagements with the college lecturers and management teams during the administration of the survey questionnaire revealed concerns about the irrelevance of the curriculum. We then needed to understand if the concern also applies to this research site. Our discussion with the participants considered the question, what risks and threats are inherent in synergising a college-industry curriculum for sustainable

lecturers' learning environments? Table 4.16 depicts some of the responses we considered critical in this regard:

Table 4.16: Risks and threats inherent in the processes of designing/updating curriculum through a synergised college-industry collaboration

Risks and threats inherent in the processes of designing/updating curriculum through a synergised college-industry collaboration				
Data Sets	Participants	Data	Categories/constructs	Overview
Focus Group	Lecturer	"For instance, from N1 to N6, there is no green energy, yet it [green energy] is a current issue." "Work-based experience it's only for one week." "Know how much one can really learn; we should have a longer time."	Keeping pace with the latest developments Relevance/Responsiveness Incoherences	Articulation as a condition for sustainability Supporting mechanisms
	Management	"We [colleges] do exactly what is done in the industry, but technology changes as time goes by… we [colleges] need to beef up [our systems]." "Structured programmes for the work-based experience." "College-industries/ businesses curriculum couched consistent with legislative imperative – e.g., competences of newly qualified teachers *etc*."		

Emerging from the different data sets, the participants appeared to believe that risks inherent in synergising curriculum included (un)availability of the structured programme. The contention with the programme was to ease lecturers learning at the industries to access sufficient support by and from relevant industries. This, in turn, meant that there should be enough time allocated for this because, often, the time was inadequate to learn something tangible. The other risks appeared to be associated with the high pace with which technology changes seemed to out-pace college capacity. This perception was common and was raised frequently during our engagements with the participants. The risk associated with legislative imperative included possible incoherences between what the curriculum offered and the national policy imperatives. In this instant, the participants pointed to the competences of newly qualified lecturers and the articulation-related challenges. The data further suggested that the lack of supporting mechanisms/systems also posed a risk for the realisation of synergising curriculum for sustainable lecturers' learning environments.

Synergising curriculum in this context appears to be a critical communicative action inclusive of key stakeholders capable of and willing to contribute their knowledge, skills, and competencies. It has the potential to serve as an inclusive tool and space for equalising power differential realities in recognition and accommodation of diverse perspectives and theoretical positions brought by the different participants. To this extent, synergising curriculum for sustainable lecturers' learning environments also allows the participants to research and learn from their practices at both academic and technical levels. The limited resources can also be identified and procured for designing, implementing, evaluating and re-designing the synergising curriculum on a sustainable basis.

4.5.3 Inherent Risks in Synergising Lecturers’ Learning Environments

4.5.3.1 Synergising integrated quality management system

Synergising IQMS is balanced on both the financial and performance/production imperatives undergirding the system for ensuring sustainable lecturers' learning environments. Inherently and depending on factors internal and or external to the college, the balance can be affected to the extent of shifting more towards financial at the expense of performance/productivity and vice versa. This is a risk that is likely to

affect the environment at the college negatively over time. The IQMS involves many people from the person being evaluated (self-evaluation). This peer may not necessarily have the same view of reality and/or knowledge development as the one being assessed. This supervisor comes to the evaluation table imbued with positional and knowledge power. In this sense, IQMS tend to pose a risk of losing hold of the balance envisioned in synergising IQMS.

Additionally, IQMS is a very subjective process. The long process may aggravate the subjectivity it will likely take before the final grade is considered. In the college context, where there is limited capacity and competence in the learning process's technical aspects, the IQMS will most likely compromise one component (e.g., technical) and lean more on the academic aspects. This is yet another risk inherent in IQMS and the sustainability of the lecturers' learning environments.

In our attempts to answer the question, *What risks and threats are inherent in a synergising IQMS for sustainable lecturers' learning environments?* The following summarised views emerged from our engagements with participants.

Table 4.17: Inherent risks and threats synergising IQMS for sustainable lecturers' learning environments

Inherent risks and threats synergising IQMS for sustainable lecturers' learning environments			
Participants	Views	Category/Constructs	Overall views
Lecturers	"I've never been on any training…Our *own training is just neglected,* and it is affecting our development."	Over-dependence on the other partner (dependency syndrome)	External forces driving change not affecting both equally
	"IQMS focus on the 1% increase as opposed to the development aspects of the lecturer."	Competing interests	
	"Outdated curriculum that does not speak to industry needs."	College-industry mutual influence (rigidity)	
Management	"Diploma is adequate for teaching what you are employed to teach. It is a minimum requirement."	Inadequate Personnel Growth/Development	
	"From my side, training is linked to what the industry requires, so if we are not getting the training, it's a problem."	Lack of Skills Acquisition	

	"Certain programmes only, not that much in our engineering programmes."		

In their responses, a lecturer claimed that "I've never been on any training…Our *own training is just neglected,* and it is affecting our development." This statement associates training with development, which could be skills and academic aspects. It was not disturbed by other participants. The indications are that lecturers do not take their development as their responsibility, instead placing the burden on the college or industries. As a result, their development may regress or remain stagnant. Consequently, we may have a cohort of lecturers who depend on employers and cannot progress in the college/industry structures.

Furthermore, the IQMS is designed to assist lecturer development and considers developmental areas and performance. The performance aspect gives them a 1% increase, and the other component considers development that can be attained internally or externally. The focus is not on the 1%. If that is the case in synergised TVET, lecturer CPD will focus on one aspect, which could lead to undeveloped and underqualified lecturers.

The comment concerning the outdated curriculum suggests that should a shift occur, changes in the curriculum bring that about. If that situation arises, the curriculum should be updated to reflect the change. This aspect requires lecturers who developed. Some of the changes may require slight adjustments; however, for example, if a change occurs in Industries and not the college or visa versa, a situation of rigidity may emerge, which would cause a risk that destabilizes the Synergised TVET lecturer's CPD.

The multiple perspectives of lecturers/apprentices/lecturers could be enriched if designated spaces are allocated as they would be able to share teaching and learning experiences and support each in a unified manner.

4.5.4 Inherent Risks in Synergising Resources

Synergising resources are equally and equitably shared between and among the key participants, i.e., those actively engaged in the communicative spaces created for

sustainable lecturers' learning environments. Often these resources are not easy to access due to, among other things, being costly, delicate, and very useful to the value chain/production. Their inherent risks include theft (crime), maintenance and operating costs. Some resources can also be health-and life-threatening and therefore require specialised training. Resource maintenance and sustainability are costly and may require specialised skill sets. The cost or economic factor potentially disrupts the cohesion and balance created in this context and warrants mitigation. In many instances, the designated spaces may not have the requisite resources. Accordingly, lecturers may be required to learn outside their everyday work environments and be exposed to health hazards that should also be paid for. On the other hand, synergising resources has the potential to help mitigate the risk posed by synergising IQMS above, in that among the role players could be an artisan with requisite industry-based skills and training and vice versa. This is not to say that there will be no power-related biases when this happens without thoughtful attention.

The table below presents the data we generated to respond to the question, *What are the risks and threats inherent in the teaching and learning support materials and resources that are likely to hinder the successful synergising of knowledge processes of colleges and industries for sustainable lecturers learning environments?* This was done against the survey findings that showed that 11 out of the 31 (35%) of the college lecturers in the engineering sciences-related studies indicated no industry-based work-integrated learning experience. Also, the survey established that 22 out of the 31 (71%) did not attend any short learning programme in the last five years of work from the time of administering the questionnaire. This was a course for concern as it posed a threat and or risk for TVET graduates expected to have adequate exposure to both the technical and pedagogical aspects of their training. We also viewed this situation as potentially unsustainable for the sector.

Table 4.18: Risks and threats inherent in synergising resources from colleges and industries/businesses for the creation of sustainable lecturers' learning environments

Risks and threats inherent in synergising resources from colleges and industries/businesses for the creation of sustainable lecturers' learning environments				
Data sets	Participants	Views	Category/Constructs	Overall views
Focus Group discussion	Lecturer	"Unadaptable resources/ equipment and technology." "Inherently inflexible and rigid workspaces not allowing for exchange among/between college and neighbouring businesses and industries."	Colleges/industries as crime-prone areas because of resources Inadaptable equipment to technology changes Wasteful/under-utilisation of resources Unwillingness to collaborate [mutual support]	Unsustainable utilisation of resources Non-entrepreneurial mindset
Focus Group discussion	Manager Business	"The major problem is also the element of crime where equipment is stolen, but we are busy working on it technology that is not adaptable to the technology used in the industry." "Industries not sufficiently on board, the college cannot access and use the equipment on their sites. This can save on costs and maintenance."		
Reflections	Lecturers, Management Research team	"Opportunities provided by the environment (small/ medium/informal enter-prises) seem to be taken-for-granted – focus on well-established businesses." "Difficulty to secure placement of students in industries and businesses – lead to incomplete qualification and competences."		

The risks and/or threats inherent in the synergising resources, as indicated by the participants' views in the table above, could be categorised into four main ideas. Namely, resources contribute towards making the communicative space envisioned crime-prone; the resources may sometimes be inadaptable to change, thereby requiring new ones to be procured frequently; inadequate skills and funds can contribute towards wasteful expenditure where equipment procured is not used because there is no one capable of using it; and lastly the unwillingness to work together due to the competition in the sector – in other words, where the economic aspirations outweigh the social and even the environmental needs. In this sense, synergising resources appear to contribute towards unsustainability in that lecturers will remain with limited skills and/or technical know-how, which is also a requirement for them to master, according to the competencies for lecturers. They must know/master their subject very well (Risan, 2022). Unless counteracted, the situation seems to continue not to engender entrepreneurial skills and attributes that would help curb the reportedly high number of graduates who could not be placed and, as a result, would not complete their qualifications.

On the other hand, it can be demonstrated that synergising resources is an embodiment of power differentials. For instance, the industries seem to be more powerful than the college, especially considering the averments that "college can afford safe costs on maintenance of some equipment" if they are on board, i.e., if they work with the college. Having said that, it may be interesting for the college to cost the academic and pedagogical content knowledge they bring to the communicative space. To this extent, the principle of using under and unutilised materials and resources to create something worthwhile and valuable becomes critical. The purpose should be to synergise knowledge processes to develop sustainable lecturers' learning environments.

4.6 EVIDENCEC OF SUCCESS

4.6.1 Glimpses of Success Regarding Synergising Knowledge Processes Between Industries and Colleges for Sustainable Lecturers' Learning Environments

4.6.1.1 Glimpses of success towards synergising leadership

Our *observations* and engagements with lecturers during focus group discussions and management and business participants revealed some promises of success towards synergising leadership for sustainable lecturers' learning environments. The college leadership and management arrangements appeared to be inclusive and considerate of diversity. This we noted during the *negotiation for access* held with the college principal and management team comprising different facets of the college, like finance manager, programme managers, and quality assurance. The college leadership team alerted and asked for an apology for the non-academic college council member who could not attend due to other engagements.

We also noted the representation of other campuses by their respective campus managers in the leadership and management committee. Furthermore, during the discussion, the college leadership outlined, among others, how the college collaborated with external partners, businesses and industries in the area at strategic and operational levels through the collaborative, potentially communicative action provided through the ‘incubator’ that focused mainly on developing entrepreneurial skills in various disciplines. Our observation and discussion in this regard resonated well with what appeared to be an important point during the reflection with the management team and lecturers on one of the participating colleges when and HoD and training centre (incubator-like model) manager advised that,

> *TVET colleges should take the lead to consult and persuade key local industries’ representatives who may have influence as members of the TVET colleges’ advisory boards with the purpose to also derive benefits for lecturers’ professional development from industries*.

4.6.1.2 Glimpses of success towards synergising curriculum

Our engagements with the participants through reflection sessions with colleges revealed what in this study is perceived as an opportunity and hope for synergising curriculum and research in Quality Council for Trades and Occupations (QCTO). The reason for this consideration for QCTO is mainly in its roles and responsibilities that resonate with this study, namely, research and knowledge development. The data in respect of our attempts to understand areas of success in the sector which the college can emulate towards synergising knowledge processes for the creation of sustainable lecturers' learning environments, the manager expressed appreciation for QCTO's curriculum that matches what the industries/businesses do which was apparently not the case for the other curriculum they offered. The manager's limitation related to the process of applying for funding specifically to offer the specified curriculum, not for lecturers *per se* but for students. In another reflection session, the participants called for research units to be established in the college as an institution of higher learning. To this extent, the discussions also considered if the training centres or incubators cannot be considered for this purpose, to which case the college should take the lead and organise a similar space.

4.6.1.3 Glimpses of success towards synergising lecturers' learning environments through IQMS and I-WIL

The data suggest that there are some opportunities for formal meetings between local businesses/industries. Also, see the discussion on synergising leadership above regarding the current research site. To this end, one college pointed out through its HoD that,

> *Once a year, [they] hold a meeting with business and industries as a relationship building to build trust with them*.

Further engagements with the college revealed that the college and the industries worked together and supported each other, especially at the workshops. According to the information, this may have contributed towards lessening the challenges of losing skilled workers (artisan-lecturers) to businesses. Furthermore, the college workshops were reportedly well functioning under the supervision of a knowledgeable person who

connected the college and requisite industries/businesses. Lecturers were reported to have had opportunities to interact with the affected industries on regular bases on matters extending beyond the college workshop capacities and skills, primarily focussing on the skills gaps identified through IQMS. To this end, the college claimed to integrate IQMS and I-WIL for lecturers consistent with the college programmes.

4.6.1.4 Glimpses of success towards synergising resources

The discussions in 4.6.1.3 and 4.6.1.4 above provide evidence of how limited resources in the form of skills and equipment can be shared to sustain lecturers' learning environments and how knowledge processes in the college and industries can be synergised. The study team leaders could share their experiences drawn from their walkabout in the workshops. They also observed and engaged the lecturers in their practice with students in the workshop. According to the evidence, the workshop logbook and pictures were made available for perusal and confirmation of what the audio records expressed. It can be deduced that with the help and involvement of QCTO, the incubator in the case of the research site in this study, or centre of excellence or training centre in other colleges can be turned into research and knowledge development spaces for lecturers who, in turn, will sustain the sector through the evolving knowledge they shall acquire. The notions of keeping lecturers' development at the lowest bare minimum are outdated and should be rejected.

4.7 CONCLUSION

This chapter presented, analysed and interpreted the data relating to need to synergise knowledge-creating opportunities and processes for sustainability in the TVET colleges. it organised the data according to the study's objectives and further into constructs in accordance with the common features emerging from the data consistent with the literature. For analysis purposes, the presentation of data was preceded by information that served to make informed judgements from literature, policy positions and theoretical perspectives that resonate with but are not limited to notions of synergy and sustainability. The presented data under each construct were analysed critically based on their textual meanings (where necessary), cognitive

implications of the text messages and, subsequently, their social implications. Finally, for interpretation purposes, the information obtained or arrived at from the analysis is then related to the principles of Bricolage, the theoretical framework to make some findings. Thus, clarity about the issues found through the survey were provided.

CHAPTER 5
FINDINGS, CONCLUSIONS AND RECOMMENDATIONS FOR SYNERGISING KNOWLEDGE-CREATING PROCESSES FOR SUSTAINABLE LEARNING ENVIRONMENTS

5.1 INTRODUCTION

This study sought to explore ways of contributing towards synergising knowledge processes between TVET college(s) and relevant industries/businesses towards sustaining lecturers' learning environments. The study assumes that appropriately trained lecturers are a critical component that potentially enhances the inevitable collaboration and partnerships among colleges and businesses/industries. This chapter considers the findings drawn from the interpretation of data in chapter 4. It makes conclusions that can be inferred from the findings to make suggestions toward synergising knowledge-creating processes for sustainable TVET lecturer learning environments.

5.2 THE AIM OF THE STUDY

This study aimed to explore ways for synergising knowledge-creating processes for sustainable learning environments for TVET lecturers. The purpose was to contribute to the discussions promoting learning transformation toward sustainability, i.e., social, economic, and environmental. Considering its complexity, the study aim was simplified into achievable objectives, which were subsequently used as organising principles for data collection and the first level for data analysis.

5.3 JUSTIFICATION FOR SYNERGISING KNOWLEDGE-CREATING PROCESSES FOR SUSTAINABLE TVET LECTURERS' LEARNING ENVIRONMENTS

The processes for teaching and learning are marred with a plethora of challenges and competing views. There is, for instance, a belief that industries provide better quality

learning than TVET colleges, and a counterargument to this also exists. The changes in the TVET knowledge development processes are also not immune to and divorced from changes in the political landscapes locally, nationally, and internationally. Equally, sustainability-related issues play a significant role and influence this sector's teaching and learning spaces.

5.3.1 Social Sustainability – Pandemics (COVID-19)

The COVID-19 crisis turned into an economic crisis. The extent of the coronavirus brought the global economy to its knees. The vast transmission of the virus promoted social distancing, which preceded the shutdown of financial markets, corporate offices, businesses, and social events. The aggressive proportion at which the virus was circulating, the worsened uncertainty about how bad the situation could get, the growing number of lockdown days, changes in global monetary policy decisions and international travel limitations acutely impacted the level of economic movement. Furthermore, the escalating number of COVID cases and soaring death cases led to a substantial increase in the global inflation rate, global unemployment rate, and global energy commodity index (Ozil & Arun, 2023).

5.3.2 Economic Sustainability: Fourth Industrial Revolution (4IR)

Estimates from the World Economic Forum in 2016 revealed that close to 6 million jobs would vanish if the 4IR took complete control. An assessment of the prior industrial revolutions (first, second and third) implies that many African countries could not gain as many were still under or coming out of colonial law. As a result, of poverty, and inequalities in many African countries, grappling with the 4IR would be a massive setback as the apparent loss of jobs to machines demonstrates damaging effects on ordinary people working in administrative positions. As a result, enduring the 4IR involves African governments determining favourable policy environments that foster technology implementation and innovation. African governments need to adopt modern technology to grow their economies whilst mitigating or reducing risks sparked by the advanced technological revolution (Shava, 2022).

5.3.3 Environmental Sustainability: Global Warming

Climate change is an ongoing change in weather patterns across the globe. It is a global hazard that is causing negative tensions in various sectors. Climate inconsistency is worsening the sustainability of diverse sectors worldwide. In particular, the agricultural sector's susceptibility is causing concerns globally, as adequate production and food supplies are endangered due to irretrievable weather fluctuations. Furthermore, it is threatening the global feeding patterns, mainly in countries with agriculture as a vital part of their economy and overall productivity. Climate change has placed the integrity and survival of several species at stake due to shifts in optimal temperature ranges—this hastening biodiversity loss by affecting the changing ecosystem constructs. Climate alterations add to the likelihood of food, waterborne and vector-borne diseases. Climate change also fast-tracks the enigma of antimicrobial resistance, another threat to human health due to the rising incidence of resistant pathogenic infections.

Furthermore, the global tourism industry is devastated as climate change impacts unfavourable tourism spots. Government commitment is crucial for the country's long-term development through strict accountability of resources and regulations through cutting-edge climate policy to mitigate the influences of climate change, as the threat has alarming implications for global sustenance.

5.3.4 Social Sustainability: #feesmustfall Movement for (De)Colonization

Southern Africa is gifted with plenty of minerals and natural resources. However, developing raw materials and minerals into commodities becomes expensive due to the destruction of the natural environment and poor governance. Besides, the environment is an essential local tourism revenue generator for sustainable livelihoods. Even though governance is important in ensuring sustainable development, there is conflict between the governance of capitalist political economies and how it interconnects with environmental protection and land use. This results in the contradiction between communities, civil society, government, and multinationals. The article contends that there is a need for governments should embark on an ecological reflexive governance approach that underscores solidarity, accountability, and networking according to the African Union and that is centred on the principles of

Pan-Africanism, African socialism, and the advancement of African unity. This will entail the African Union Commission to reconsider its position on mining development on the continent and train African governments on mining and land-use conflicts. Thus, the study argued for synergy among knowledge-creating processes in different sectors, e.g., colleges, businesses and industries, relevant SETAs and Public Offices (Government) to be based on the pillars of sustainable development (Bradu et al., 2022).

5.4 DISCUSSION OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This section discusses the findings, conclusions, and recommendations of each element and or attributes **embedded in and driving the knowledge-creating processes** that should be synergised for sustainable TVET lecturer learning environments, namely, leadership, curriculum, lecturer development, teaching and learning resources and work-integrated learning.

5.4.1 Synergising Leadership

The finding is the need for multilevel communication forums to afford opportunities to all role players to contribute to the institution's strategic direction, especially noting the rapid knowledge evolution from across the spaces some are not privileged to access. The strategic focus resonates with the balance among sustainability pillars, which the lecturer must help contribute towards. To this end, the synergizing leadership capacity inherent in it multi perspectival attributes that resonate with different leadership approaches in one space, imbued with skills, foresight projection capabilities to plan and prepare for current and future/unforeseen distractions like those identified earlier in the study (Iswahyuni et al., 2022).

The conclusion that can be drawn from the above relates to the inclusion and active participation of businesses and industries in the leadership core for sustaining TVET lecturers' learning environments at both colleges through IQMS or an equivalent programme still accessible to participants from industries and businesses as peers and collaborators to strengthen the technical expertise accordingly.

Thus, the study recommends synergising leadership that focuses on anchoring leadership synergising efforts on environmental, social and economic realities and aims at sustaining the gains of both colleges and industries through competent and adequately trained TVET lecturers. See chapters 2 and 4 for more information on synergizing leadership.

The conditions found conducive for synergizing leadership were participatory action-oriented conditions where values of mutual respect, commitment and good work ethic prevailed. The values would entrench the cohesion and commitment to the collaboration's complementary shared vision and mission. Equally important were the practical conditions supportive of research and learning that do not tie or limit lecturers' development to the basic minimum qualification as suggested by the data analysed. The conclusion drawn from this aspect was the need for a clear career path, mentoring and support for lecturers. The study recommends synergizing leadership's indulgence into research-based, research-led synergising lecturers' learning environments for sustainability (Esquer, 2022).

5.4.2 Synergising Curriculum

The synergising curriculum has the potential to bring together and document diverse perspectives and theoretical positions based on the commitment to social, economic and environmental sustainability. In essence, this can be done for lecturers' curriculum and will evolve accordingly with the changes taking place outside the college spaces. To this extent, the college is then capacitated to pass on current and responsive knowledge to the needs of society through to the students. It also follows from this logic that accommodating diverse perspectives on knowledge and knowledge creation is adequately facilitated. The issues about contestations and competitions between colleges and industries for limited resources are likely mitigated by lecturers synergising curricula (Bhengu, 2022). We can also conclude that through the development of synergising lecturers' curricula to sustain lecturers' learning environments, cohesion and collaboration are inevitable.

The study thus recommends the development of synergising curriculum for sustainable lecturers' learning environments. The synergising leadership effort's core agenda item becomes the synergising curriculum, as discussed in Chapter 4. In this

way, the synergising curriculum is co-constructed and therefore brings about a sense of ownership to all participants and potentially aids in mitigating the risks of being rejected by the implementers. Notably, as is the case with synergising leadership, the synergising curriculum makes use of and relies on what is available, un-, and underutilised curriculum-related materials and resources. It thus opens opportunities to accommodate other knowledge systems on equitable and/or equal bases depending on when such knowledge gets to be discovered (Matos et al., 2022).

In the same breath, the study's main finding regarding conditions conducive for synergising curriculum, are characterized by willingness to share available resources, especially scarce skills, knowledge, and equipment. The situation of the college under consideration provides an excellent example of shared resources between the campus from a historically well of and the campus from a historically disadvantaged situation, not by accident but by design. The study found that, unlike the campus in the metropolitan municipality, the campuses on what was formerly referred to as homelands appeared to resemblances of the past political geo-political era. There seemed to have been a need for the college to explore formal work arrangements with small businesses near one of its campuses. The geographic conditions and nearby businesses seemed to have opportunities for colleges to explore (Finlay et al., 2022). The study thus recommended exploring collaborations with small-medium enterprises in a similar way adopted for established big businesses. Support for such arrangement should receive equitable support consistent with provisions of the constitution in the case of SA.

5.4.3 Synergising Lecturers' Learning Environments

The main finding concerning the synergising lecturer's learning environments for sustainability is related to its possible effect to enhance the effectiveness of in-house capacity-building opportunities flowing from communicative actions like the IQMS. The possible inclusion of industry/businesses-based participants as peers and mentors for college lecturers on the technical and skills side of their development is potentially instrumental. This is because the artisans at industries-based staff can benefit from the communicative actions created through the synergising lecturers' learning environments. To this extent, it can be *concluded* that the synergising lecturers'

learning environments for sustainability are potentially mutually beneficial. Hence, the study recommends synergising knowledge processes by creating sustainable lecturers' learning environments where the synergising curriculum is at the centre (Sidiropoulos, 2022).

The study also found that synergising lecturers' learning environments, co-teaching, co-construction learning activities, and assessment are possible. To this extent, it can be deduced that synergising lecturers' learning environments for sustainability have the potential to facilitate alignment between industries/business programmes and the college's academic programmes. In this sense, it potentially mitigates the inherent risk of misalignments between goals, as was shown to be the big issue in Chapter 4.

Similarly, the afore-said sentiments apply to the industry-based work-integrated learning opportunities at the college's and industries' disposal. The data analysed identified the dire need for synergising lecturers' learning environments for sustainability to the extent of suggesting the condition conducive for its creation as being on the political and economic will of the college advisory boards. This aspect was found to connect this to the synergising leadership and governance essentially. It could be inferred that even the problem of placement could be dealt with satisfactorily through the synergising of lecturers learning spaces through the rigorous communicative action engaged in.

Regarding the conditions conducive to synergising lecturers' learning environments for sustainability, the main finding of the study was the need to develop research capabilities of lecturers to be able to contribute meaningfully to the engagements with their industries-based counterparts perceived to be relatively more competent or knowledgeable. The type of research should, as far as practicable, be consistent with the unique situations of the lecturer in this space with an equitable emphasis on both technical and academic (pedagogic) levels. This would facilitate the research-led aspirations picked up during the engagements with the college-based participants, not only in the college considered in this study. Consequently, the study recommends the establishment of research units or facilities like the centres of excellence or incubators in some colleges. The research facility should be a shared space for synergising lecturers learning environments for sustainability (Lundgren et al., 2022).

5.4.4 Synergising Teaching and Learning Resources

The data analysis suggested the need to co-create environments for developing and using synergizing teaching and learning resources and/or opportunities for sustainable lecturer learning environments. Also, see 5.4.2 and 5.4.3 above. The resources, in this case, may not be sourced from one side to balance off the power differential realities. The synergizing resources, in this sense, are understood to be co-owned. They may not be taken for granted because of the understanding that even the antiquated computers, outdated teaching content material and equipment that were moaned about during the site visits and engagements with participants, could be used to create something worthwhile. To this extent, it can be concluded that synergizing resources calls for and potentially motivates lecturers and other active participants in their development to be innovative and entrepreneurial. The importance of this attribute was also found to resonate with the development of lecturers' and their students' sustainability-related skills. That being the case, the study *recommends* that synergizing resources inclusive of skills, knowledge and values be encouraged to aid the lecturers' sustainability and entrepreneurial potential. Also, see synergising leadership and synergising curriculum discussed above (Tu et al., 2022).

5.5 SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

5.5.1 Synergising Leadership

The complexity of processes within the TVET Management structures needs to be simplified and effectively communicated to break the barriers of red tape down. It is suggested that a clear communication strategy and structure with an escalation matrix be formulated and implemented for TVET lecturers to access support from their Line Managers when required. A clear communication strategy must be developed and articulated to incorporate frequent meetings, workshops, courses, and road show to ensure that TVET lecturers receive adequate support (Ramongwane et al., 2022). A management structure with clear roles and responsibilities and reporting lines needs to be established to allow TVET Managers and Lecturers the opportunity to engage in a structured manner.

TVET managers must attend workshops and management and leadership courses to understand how to lead their subordinates. It is suggested that opportunities for one-on-one sessions be held at least once per month to ensure that TVET lecturers receive the support needed. TVET Managers should also provide feedback regularly to TVET lecturers on their strengths and weaknesses and implement development programmes for all TVET lecturers. TVET Managers also need to attend classroom activities to provide on-the-job training.

Policy frameworks should become the footprint in how TVET lecturers perform their teaching duties. Once TVET managers respond that policy frameworks are not disseminated in a structured way, it becomes a general management problem. To address this, TVET Managers must allocate time regularly to educate and conduct one-on-one training to ensure a structured information flow. The targets, goals, rationale, aims and outcomes should also form part of the TVET lecturers' performance management appraisals to consistently ensure that they are executing these policies according to the required standards (Debebe, 2022).

5.5.2 Synergising Curriculum

It is disturbing that an outdated curriculum has been taught in the TVET Sector. The DHET and the TVET Leadership must take responsibility and accountability in rectifying this matter as a matter of urgency. An Indaba with all stakeholders and subject matter experts, including TVET lecturers, should take place as an immediate course of action to rectify this situation and further implications to the detriment of economic and social growth for South Africa.

It is vitally important that TVET lecturers are included in curriculum design as they are at the forefront of teaching and learning practices. These practices must be updated and evaluated regularly to ensure that students receive a better education. TVET lecturers are a conduit in driving knowledge processes. Therefore their involvement is critical in curriculum design.

TVET curriculum designers should consider teaching business/entrepreneurial courses or programmes within the qualification scope. This could equip TVET Students with a greater understanding of the operations of a business that might

enable them to become entrepreneurs and not only seek formal employment opportunities as the only option (Saidu, 2022).

5.5.3 Synergising Lecturers' Learning Environments

Whilst it is evident that some TVET lecturers have embarked on self-development to enrich their learning experiences, the need for self-development should not be done on an ad-hoc basis. Rather it should form part of a TVET Lecturer's career path of development. Self-development should be implemented as a formal structure, and the TVET Manager and TVET Lecturer should be responsible for creating systematic action towards self-development. To foster self-development 360-degree feedback mechanism should be used to provide the TVET Lecturer with a comprehensive view of their current performance and development needs. On-the-job training should be conducted regularly to improve and harness TVET Lecturer skills. Additionally, peer-to-peer training should be implemented so that TVET lecturers can learn from one another (Fleming et al., 2022).

There is a need to establish strong partnerships between the DHET, the TVET Sector, SETA and business. The first step in building blocks is to identify who the business partners would be. From there, it is important to collaborate with these partners in fostering, building and nurturing a sustainable relationship where information sharing and a repository of information can be gathered, refined into knowledge and implemented into action (Elezi & Bamber, 2022).

5.5.4 Synergising Resources

A feasibility study needs to be conducted to assess the facilities, resources and equipment at TVET Colleges to identify the resource gaps. Once this understanding has been established, decisions can be made on funding requirements and opportunities within a business where practical training can take place without TVET Colleges making substantial capital investments. However, basic resources such as textbooks, equipment and classrooms must be available to ensure sustainable learning environments and prevent subjects from being taught at all whilst ensuring that all subject matter content is covered appropriately. The implementation of total

quality management (TQM) can assist on an ongoing basis in matching skills and resources required to drive continuous development (Alauddin & Yamada, 2022).

5.6 SYNERGISING EFFORT OF KNOWLEDGE-CREATING PROCESSES FOR SUSTAINABLE TVET LECTURER LEARNING ENVIRONMENTS

Based on the above, the study generates a synergizing effort diagrammatically to encapsulate the contribution towards the envisioned synergy.

Figure 5.1: Synergy - Part A

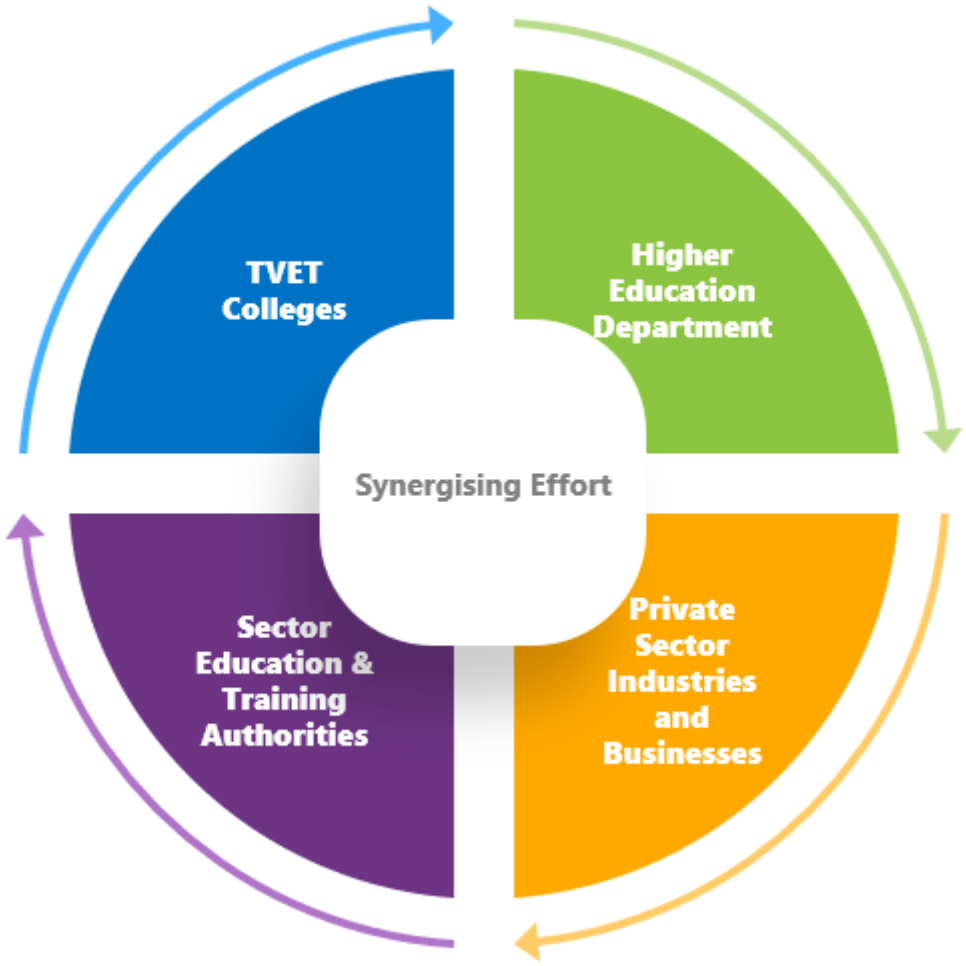

Figure 5.2: Synergy - Part B

The diagram suggests the need for creating lecturers' learning environments surrounded by diverse key stakeholders who participate actively in the space to bring about outputs that can synergise the various aspects of learning of the lecturers for sustainability purposes. The first part of synergy (Figure 5.1) illustrates active engagements between and among the critical components that constitute the synergizing effort, i.e., the space and/or learning environment depicted in the middle. The arrows at the end of each line joining the spheres represent the mutual engagement and flow of information, skills, knowledge and values among the spheres/key stakeholder. The synergizing effort further engenders exchanges through dynamic participatory processes among the TVET colleges and the Private Sector on the other end of the diagram. Thus, to a large extent, the synergizing effort serves to

disrupt stringent power-related barriers among the role players whose mutual engagement is paramount to national and global growth and development. These attributes seemed to emerge from the data analysed above and the problematic context where, in this case, a college brings together campuses marred with glaring deep-rooted inequalities from the two sites situated in inherent disadvantages and inequities lingering from the past. See the section in Chapter 3 for more information.

Figure 5.2 (the second part of synergy) brings to the discussion colour codes to depict the sector and the pilar it is most likely to be strong in/with. For instance, the social aspects of social sustainability relating to the education (academic) sector will be allotted a colour code that resonates with social sustainability. The economic sustainability of businesses/industries and public institutions like departments and SETAs are coded with colours that depict their environmental sustainability orientation or even a combination of colours. The idea was to say for a specific college. In light of their contextual realities, the situation analysis would facilitate the identification of such strengths and accordingly contribute to the synergizing effort. The representation of gears in Figure 5.2 is associated with the mutual dependencies when for instance, the synergizing effort rotates. The mechanical advantage and direct or inverse proportionalities can also be worked out and mutually agreed upon.

The bottom line is that the synergizing effort for sustaining lecturers' learning environments is core and should be the focus if knowledge-creating processes are to be synergized. The reason for that is based on the expectations that the TVET lecturers must have a good command of their areas of specialisation both at technical and professional levels.

5.7 LIMITATIONS AND DELIMITATIONS

The study focused on a TVET college with three campuses with unique contextual realities. It sought to find how these contexts can be brought towards synergy, noting the disparities from the past. While other TVET colleges in similar situations can consider this study's recommendations for learning purposes, the findings may not necessarily apply in all conditions, i.e., they may not be generalized. Not all 31 lecturers identified by the umbrella survey project took part in the qualitative data generation for this study. In this case, the study may have missed out on some critical

aspects of engineering-related studies. The eight participants chosen were meant to give the study a more representative view in that there were senior managers, small to medium business owners and lecturers. The survey already pointed out some involvement of relatively more significant, well-established businesses around the college, notwithstanding the difficulty of accessing them. The small-medium enterprises were visible and near one of the campuses, and the study needed to understand their relationship with the college if any.

5.8 CONCLUSION

Chapter 5 discussed the finding based on which conclusions are made and subsequently recommendations on synergising knowledge-creating processes for sustainable learning environments; the justification for synergising knowledge-creating processes for lecturers has adequately addressed, and the findings, conclusions and recommendations have been structured according to synergising Leadership, Curriculum, Lecturer Development and Teaching and Learning resources as well as a summary of results. The summary of findings, conclusions and recommendations draws us to a semantic representation of what the synergising effort of knowledge-creating processes might look like. The diagram is depicted in two figures (5.1 and 5.2) which are explained adequately. Furthermore, this chapter provides the limitations and de limitations of this study.

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APPENDICES

APPENDIX A: UFS ETHICAL CLEARANCE

Faculty of Education

11-Dec-2018

Dear **Mr Wayne David**

Ethics Clearance: **Synergising the creation of knowledge processes in a technical and vocational education and training college with industry demands for sustainable lecturer learning environments**

Principal Investigator: **Mr Wayne David**

Department: **School of Mathematics Natural Sciences and Technology Education Department (Bloemfontein Campus)**

APPLICATION APPROVED

With reference to you application for ethical clearance with the Faculty of Education, I am pleased to inform you on behalf of the Ethics Board of the faculty that you have been granted ethical clearance for your research.

Your ethical clearance number, to be used in all correspondence is: **UFS-HSD2018/1571**

This ethical clearance number is valid for research conducted for one year from issuance. Should you require more time to complete this research, please apply for an extension.

We request that any changes that may take place during the course of your research project be submitted to the ethics office to ensure we are kept up to date with your progress and any ethical implications that may arise.

Thank you for submitting this proposal for ethical clearance and we wish you every success with your research.

Yours faithfully

Prof. MM Mokhele Makgalwa
Chairperson: Ethics Committee

Education Ethics Committee
Office of the Dean: Education
T: +27 (0)51 401 3777| F: +27 (0)86 546 1113 | E: MokheleML@ufs.ac.za
Winkie Direko Building | P.O. Box/Posbus 339 | Bloemfontein 9300 | South Africa
www.ufs.ac.za

UFS·UV

Faculty of Education

07-Jun-2018

Dear **Dr Makakatela Mosia**

Ethics Clearance: **Investigating Technical and Vocational Education and Training landscape towards enhancing quality post school education and training opportunities in South Africa**

Principal Investigator: **Dr Makakatela Mosia**

Department: **Office of the Dean: Education (Bloemfontein Campus)**

APPLICATION APPROVED

With reference to you application for ethical clearance with the Faculty of Education, I am pleased to inform you on behalf of the Ethics Board of the faculty that you have been granted ethical clearance for your research.

Your ethical clearance number, to be used in all correspondence is: **UFS-HSD2017/1487**

This ethical clearance number is valid for research conducted for one year from issuance. Should you require more time to complete this research, please apply for an extension.

We request that any changes that may take place during the course of your research project be submitted to the ethics office to ensure we are kept up to date with your progress and any ethical implications that may arise.

Thank you for submitting this proposal for ethical clearance and we wish you every success with your research.

Yours faithfully

Prof. MM Mokhele Makgalwa
Chairperson: Ethics Committee

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APPENDIX B: PERMISSION FROM DHET (MOTHEO COLLEGE) TO CONDUCT RESEARCH

higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MOTHEO TVET COLLEGE

Ref: W.A David

Synergising the creation of knowledge processes in a Technical and Vocational Education and Training College with industry demands for sustainable lecturer learning environments

The College has evaluated your request and has decided to grant you permission to undertake the above research.

As part of your research it is noted that you will interview a sample of 20 lecturers randomly selected on your behalf from Bloemfontein Campus, Hillside View Campus and Botshabelo Satellite respectively. You are advised to obtain further permission from the participants before commencing with your research.

The topic of your research is of great interest to the College and will therefore be appreciated if you could share the findings of your research with the College upon completion.

Yours faithfully

Prof MDM Phutsisi

Principal| Motheo TVET College

Date: 19/02/2019

"The Gateway to Employability"

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APPENDIX C: APPROVAL FROM DHET TO CONDUCT RESEARCH

From: Nompumelelo Skosana <Skosana.N@dhet.gov.za>
Sent: Tuesday, 12 February 2019 11:37
To: Wayne David <waynedavid22@gmail.com>
Cc: Renay Pillay <Pillay.r@dhet.gov.za>; Refiloe Mohlakoana <Mohlakoana.R@dhet.gov.za>
Subject: RE: Ethical Clearance

Dear Mr David

Thank you very much for your prompt response. As I had explained on the telephone conversation this morning, please be advised that the Department only gives a permission letter when you are conducting research in ten or more colleges. You indicated that you will be visiting only one TVET college which is Motheo TVET College. Please take the attached Standard guide with you to the centre and refer them to the two clauses 5.3 and 5.4 on page 7 in case they demand a DHET letter.

We cannot send you an official response on a letter head, however you can print out this email conversation as well at the attached guide to present as proof of communication.

Please do let me know of any queries.

Kind regards
Ms Nompumelelo Skosana
Department of Higher Education & Training
Directorate: Research Coordination, Monitoring and Evaluation
Tel: 012 312 5300
Email: Skosana.N@dhet.gov.za
123 Francis Baard Street, Private Bag X174 Pretoria 0001

From: Wayne David [mailto:waynedavid22@gmail.com]
Sent: 12 February 2019 10:57 AM
To: Nompumelelo Skosana
Subject: Re: Ethical Clearance

Dear Madam,

Thank you for taking my call. As discussed I am a PhD student at UFS, doing research at Motheo TVET College in Bloemfontein only.

My Title:
Synergising the creation of knowledge processes in a technical and vocational education and training college with industry demands for sustainable lecturer learning environments

My Details,

APPENDIX D: EXAMPLE OF INFORMED CONSENT

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS UV

[redacted]

Full Name of
Participant [redacted]

Signature of Participant:
[redacted] Date: 15/03/2019

Full Name(s) of

Researcher(s): _____

Signature of Researcher:

APPENDIX E: LETTER FROM EDITOR

Carmen Nel
BA INFSCIENCE

EDITING SERVICES
072 377 5585
carmen@ufs.ac.za

CERTIFICATE OF EDITING (LANGUAGE / TECHNICAL)

This letter certifies that I have edited the work detailed below.

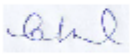
Title:

"SYNERGISING THE CREATION OF KNOWLEDGE PROCESSES IN A TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING COLLEGE WITH INDUSTRY DEMANDS FOR SUSTAINABLE LECTURER LEARNING ENVIRONMENTS"

by

Wayne Anthony David

Regards



Carmen Nel

28 Sept. 2023

APPENDIX F: TRANSCRIBED MATERIAL & THE MEGA PROJECTS' SURVEY TOOL


Combined Data 24May2019.docx


TRANSCRIPTS Objectives coded.dc


Transcript Seminar Focus Group.docx


TVET Survey 2018 final NT.docx


Data Motheo Flavius.xlsx

APENDIX G: INITIAL SPREAD SHEET & DATA ANALYSIS & INTEPRETATION GRID


Data analysis Framework for Chap

Data analysis grid informed by / developed from the excel spread sheet based on which common views and / or codes and possible implications and / or themes were identified.

DATA SET / CONTEXT:			
Objective 1: to determine / understand factors that negatively influence the sustainability of teaching and learning that should take place at TVET colleges that is consistent with the college legal mandates. (Understand factors influencing the sustainability of teaching and learning at both TVET and Industries) **Question:** What factors hinder synergy between industry and TVET college's knowledge creating processes?			
Lecturer Participants	**Participants' views in response**	**Common views (Codes)**	**Possible implications (Themes)**
2	One of the challenges that I feel that TVET sector has, is in terms of synergising curriculum and what Industry requires. … the slow rate at which curriculum changes		
Student 5	…we are preparing learners to be practitioners of tomorrow in terms of preparing children for early childhood development. Although when we look at them moving to NATED, the weakness, we find that our subject are not giving them the full qualification so that's where we find there is a shortage…	Internal support External Alignment between industries and colleges	Qualification offered does not minimum requirements for teachers (NQF Act)
6	Learners are expecting that we teach them that which is current, while the syllabus is still stuck on something in the past. … when they sit in their examination for instance the internal exam that I set that they're going to write when they come back now, they have to complete a lesson plan that is based on the National Curriculum Statement, however in class I taught them the CAPS lesson plan. Now it's confusing to them. …one of the threats that I think it's hindering the synergising between the TVET curriculum and Industry its lack of teaching resources within the TVET Sector		Suggest understanding that lesson plans are fixed and determined by policy vs. principle of tailoring teaching according to learners' needs that suggest a more flexible plan
2	… Our curriculum is so stagnant… the disengagement even between the same Government Institutions which is the Department of Education and the Department of Higher Education and Training whereby they are not being		Misalignments, limited engagement – may be there but does not seem to filter through

	able to relate what they are doing into what they are teaching the students what more for Industry that is in a competitive world.		to lecturers / lecture rooms: many possibilities exist as a cause e.g. communication, competence, shear disregard / defiance.
3	… Print Making is more like the father of Graphic Design… now the student is inking his line with a ruler and he's like, but Ma'am isn't there a way of doing this. We are gaining muscles here…. we really need to have engagement between and support, support to lecturers because at the end of the day the lecturers are the ones that engage a lot with students … In terms of equipment for instance, for my subject there is something called screen printing,… I feel like if we were able to do that it would help students more because that is something that is used in Industry a lot and it would help them if they were to start their businesses for instance or whatever. It would make it easier for them if they've got that experience. I think they are being deprived of a lot of experiences which would be very beneficial to them once they graduate and step into the real world.		Suggest a lecturer's perception that resources are antiquated also a need for support Authentic work experience can be eased by providing colleges / workshops with resources equivalent to the ones used currently in actual work places (Relevance, currency)
7	In order to make my life easier and to give a better education to our students I purchased my own laptop, and yes, in order to do the job because the students can't suffer because of not having equipment. I also took out a contract and I'm using my data as well because I do the PowerPoint Presentation and all that because we have to live because it's the new age, what do they call that, is the students of today they're technology educated so last year we started with Google Classroom and yes, so		Self-development

APPENDIX H: TURN IT IN REPORT

SYNERGISING THE CREATION OF KNOWLEDGE PROCESSES IN A TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING COLLEGE

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