Curriculum Engineering: A South African Case

Kem Ramdass
University of South Africa, Department of Mechanical and Industrial., Florida Science Campus., South Africa

Abstract--**Constructive alignment of curricula in terms of content, formative and summative assessments are imperative for student success in higher education and career pursuit. The development of curricula in an open distance learning context also considers notional hours and credits through institutional guidelines. All formal qualifications are approved by the Council of Higher Education and registered with South African Qualifications Framework, therefore cognizance is taken of portability of qualifications and learning pathways. Articulation is an important facet of curriculum development with regards to student learning progression from undergraduate to postgraduate studies. Curriculum review and the review cycle considers comparability, response to Higher Education Qualifications Framework (HEQF), national and international benchmarks, professional bodies such as the Engineering Council of South Africa (ECSA), Sector Education and Training Authorities (SETA), student and employer feedback and market trends. The institution follows a team approach in curriculum development with consultation from all internal and external stakeholders. In view of the theme of the conference which has a focus on technological innovation a range of resources are provided to create an enabling environment for students to be successful in their studies through open distance learning. Curriculum implementation evaluates the financial viability, alignment to the vision and mission of the institution and market penetration as well as the pedagogy and technology applicable for the qualification. This paper aims to evaluate a curriculum in open distance learning (ODL) in terms of programme offering using a case study methodology.**

I. INTRODUCTION

In an Open Distance Learning (ODL) context, it is imperative that an attempt to define the immediate receiver of ODL education. The University worked on the premise that it was catering for the mature individual who did not have the facilities to attend classes regularly, that is the working individual. However, this notion is changing progressively, as the organisation caters for students directly from school. There is a diverse student range of students from a diverse range of backgrounds. In this instance, the institution enables students that do not meet the admission requirements to enter higher education through bridging programmes. There are short learning programmes for students that intend to upgrade their skills. The backbone of ODL is the information/communication technology platform that forms the heart of organisation. I provide some detail regarding in the next paragraph.

II. LITERATURE REVIEW

Technological innovation – the backbone for ODL education

The digital era is bringing about fundamental changes in all aspects of education. It is changing the role of teachers who are the primary source of content knowledge and the role of students who ought to be ardent listeners. Technology enables both the teacher and the learner to discover new sources of knowledge more cheaply from authentic sources. The application of knowledge was done and demonstrated through experiments, task orientation and problem solving in order to validate the mastery of theories studied. The education system fails societal requirements when solutions are bound within the classroom. Thus universities are required to expose students to the world of work. There is a real potential for ICT to add value to the education system through simulation. New methods and models on learning and innovation, entrepreneurship, creativity, and collaboration both nationally and internationally are enabled through ground-breaking technological advancements. It is important to note that this is applicable to all educational institutions, both ODL and face to face institutions [16]. In terms of institution differentiation, the institution practices the ODL pedagogy through a blended approach.

Garrison [4] alluded that distance education is moving into a post-industrial era where there is characterization to personalize the educational transaction. This is attained through two-way communication of learners in the context of the community. Teaching and learning practice at the institution is underpinned by theory and affords the intellect necessary for effectual action [4]. The institutional structures create an enabling environment that guides the educational decisions to efficiently facilitate the learning experience within the context of distance education. However, this may not be sufficient, therefore theory must provide a comprehensible collation of pertinent variables and correlations to direct both practitioners and researchers in this field of distance education.

Numerous deliberations and reflections were postulated in the formulation of ODL pedagogy by a number of authors such as Keegan [9], Garrison [4], and Moore [10]. It was mentioned that the literature in distance education gave emphasis on the influence of technology between groups and generations of distance education provisions. However there were deliberations on how proprietorship, transfer modes, syllabuses, instructions as well as the changing roles of academia and the “students” transformed over decades [7]. It is noteworthy that the selection of teaching strategies was based on epistemological principles and postulations concerning how learning occurs, ranging from teaching as

transmission, to transactional to transformational. Embedded in these three meta-frameworks are different learning theories such as behaviourism, cognitivism or rationalism, constructivism, constructionism, social constructivism, connectivism, and other hybrids models of learning theory. The next important aspect in ODL is the pedagogy, which is discussion in the next paragraph.

III. INSTITUTIONAL PEDAGOGY

The institution caters for a wide range of students, ranging from school leavers that have matriculated to people who are over 60 years old, to working class people, to prisoners and so forth. These are some of the diverse backgrounds that are accommodated, which promulgates the vision of the institution in the core business areas of teaching and learning, research and community engagement. The institutional community has adopted the blended learning approach as a pedagogy in open and distance learning which is seen as important because it has potential to lead to more personalized education, better intellectual scaffolding, increased time on task, and better opportunities for students to pace their own learning processes. The blended learning model can enhance teacher-student interaction, increase student engagement in learning, and add flexibility in the teaching and learning environment [5]. One of the major reasons for the adoption of this pedagogy is the ability of the institution to cater for techno-savy as well as students who do not have the resources for online learning, thus increasing access to education to the rural communities of Africa and South Africa, thereby "shaping futures in the service of humanity." The diversification of teaching and learning pedagogy is driven by, amongst others:

- Recognition of the educational limitations of historical models of distance education delivery (described by one College as requiring a paradigm shift from purely transmission styles of teaching and learning to interactional styles involving critical interactive learning where students are encouraged to engage and interact with content on a much deeper level);
- Expanded teaching and learning options available, largely driven by developments in use of ICT in higher education globally;
- A need for greater flexibility to accommodate the divergent requirements of teaching different disciplines, as well as varying characteristics of students enrolled across different programmes. The university is governed by numerous policies and procedures, therefore it is appropriate to mention the curriculum policy variable that must be considered in the development of curricula.

IV. INSTITUTIONAL CURRICULUM POLICY

The Curriculum Policy provides the framework for all curriculum related matters in the University. As a point of departure, the definition of curriculum from an institutional perspective is perspective: " The policy defines curriculum as a set of learning experiences constituting a qualification or module. It includes key aspects of teaching and learning such as:

- What is learnt – content
- Why is it learnt – rationale and underlying philosophy
- How it is learnt – process
- When it is learnt – structure of the learning process
- How the learning will be demonstrated in creative ways and achievement similarly assessed."

In the context of the institution curriculum may be defined as planned learning experiences in which the student is exposed to content that is underpinned by rationale of philosophy through a structured process, in which the outcome of learning is demonstrated via assessment methodologies. This is aligned to both national and international benchmarks in terms of policy requirements. The pedagogy enables alignment with the divergent student force requirements, bearing in mind the Higher Education Qualification Sub-Framework (HEQSF) and South Africa Qualification Authority (SAQA) requirements. The institution is also working on its language policy in certain programmes, however, it is suggested that communication and content be in English as the organization is part of the global economy. The reason English is suggested is multifold, and the reasons are listed as follows:

- The institution deals with a global international audience
- Industrial Engineering application is international
- Industrial engineering text is international
- Industrial Engineers need to meet ECSA requirements on an English platform which affects accreditation.

Perhaps on the long term, other languages may be considered which must be sanctioned by the relevant bodies, however the world of business communicates in English.

The institution is constituted of 8 colleges which have distinctive foci, however all colleges are required to adhere to the stipulated principles which provide a broad enough scope for the regulation of curriculum development. The policy is administered across all academic programmes inclusive of non-subsidised and non-professional programmes as well as vocational and co-operative education programmes.

V. RESPONSIVENESS TO CURRICULUM

Refers to the awareness of societal expectations in view of national and international contexts. The curricula are context based, taking into account institutional context, national context, and international context which all provide opportunities and challenges. One of the major challenges is the fact that students do their basic and secondary education in a vernacular language, and when they attend university, it becomes difficult to adjust to the English language. Therefore academic literacies was introduced, which tried to bridge the

gap between universities and secondary education. However, the impact was not able to improve retention and pass rates of students. The comprehensiveness of curricula responds to the character as a comprehensive ODL institution that encapsulates a variety of offerings from vocational to certificates, diplomas and degrees. This character of responsiveness is seen in the "openness" in providing a platform for students in higher education (HE). The carefully planned curricula are structured to ensure a reasonable chance to success for "under-prepared" students through academic literacy programmes as well as a longer period of time for the completion of a qualification, for example the maximum period for a student doing a national diploma in a face to face institution is 5 years, and at the ODL institution it is 8 years. In addition, if the student does not meet the university admission criteria, they are given additional modules for a specific period of time and then allowed to enter the mainstream qualification. Therefore the institution is able to give all students a chance for success. There is recognition of prior learning policy (RPL) that enables students to develop a portfolio of evidence that entails their learning through practice that is evaluated and provides "status" to the applicant to enter the higher education landscape.

Responsiveness also includes, but is not limited to the higher education regulatory framework in South Africa and internationally. In this regard each qualification/module is developed with HEQF/HEQSF and SAQA guidelines. Responsiveness to the local context includes skills development, diversity, equity, redress and increasing access to students through the extended curriculum. The institution's vision clearly alludes to striving "towards" being "*the* African university in the service of humanity," therefore it is part of Africa and will promote African thought, philosophies, interests and epistemologies through inquiry, scholarship and partnership.

A. Student-centredness

The student is considered the centre of the entire learning process and is encouraged to become ambassadors for the institution through feedback on curriculum experiences. Students are invaluable in the development of curricula as current epistemologies and prior learnings as well as cognisance of experiences and expectations are an integral part of curricula.

B. Accountability

All departments are accountable to the institution for the adherence of policy and processes prescribed for academic integrity and teaching and learning quality.

VI. CURRICULUM STRUCTURE

The alignment of curricula as envisaged by the HEQF as well as internal coherence is imperative in the curriculum structure. The development of curricula in an ODL context also considers notional hours and credits through institutional guidelines. All formal qualifications are approved by the Council on Higher Education (CHE) and registered with South African Qualifications Authority (SAQA), therefore cognizance is taken of portability of qualifications and learning pathways. Articulation is an important facet of curriculum development. Curriculum review and the review cycle considers comparability, response to Higher Education Qualifications Framework (HEQF), benchmarks, professional bodies, SETA's, student and employer feedback, market trends. The institution follows a team approach in curriculum development with consultation from all internal and external stakeholders. A range of resources are provided to enable students to be successful in their studies. Curriculum implementation evaluates the financial viability, alignment to the vision and mission and market penetration as well as the pedagogy and technology applicable for the qualification. The Recognition of Prior Learning (RPL) policy provides guidelines on the recognition of prior learning. The work-integrated learning (WIL) policy is also an integral part of curriculum development.

A. Quality assurance

Programme accreditation is granted by the HEQF with the aim of assuring the quality of the qualification while internal and external evaluations determine compliance with the objective of continuous improvement. The responsibility for this function is distributed to the relevant structures such as programme co-ordinators, HOD, School Directors, and executive deans of colleges. College tuition committees evaluate the appropriateness and readiness of proposals. College Boards approve proposals and submit to the Senate Tuition and Learning Support Committee on the basis of the College's academic and strategic plan.

B. Envisaged Impact

The policy aims to ensure that curriculum policy will provide a coherent transformative impact in the development of curricula in its endeavor to affect the effectiveness of the process of delivering responsive education to students. The policy is aligned to the tuition policy, assessment policy and other policies to a greater or lesser degree (Curriculum policy).

The above principles or prerequisites for successful pedagogy also serve as pointers for reflection in ODL pedagogy. In addition the following points provide a general guiding background for the proposed principles to guide and shape pedagogy at the institution.

Empathy – in the context of ODL it is imperative to understand the student through an attitude that is favourable in the teaching and learning process and prevents formal rigidity in the process.

Clarity of focus – is an important ingredient that is attained through explicit curricula that aims to develop competencies as proposed by heutogogy.

Tempo and workload – is based on the premise that students would develop the capacity to resolve real-life

problems in terms of planning their tempo and workload as ODL is based on an 'openness' in allowing for the application of different abilities of people. The objective of this paradigm is the notion of pacing oneself in the accomplishment of teaching and learning process.

Pedagogy as development – is considered as an educational and developmental process in terms of knowledge, skills and attitude through engagement from both student and teacher with motivation as a key ingredient in the process.

Awakening curiosity- authentic teaching and learning – is focused on the design of curriculum that invokes curiosity in the learning experience.

Planning and structure: balanced coherence and integration – it is imperative that there is constructive alignment in the design process. The pedagogical structure therefore refers to the systematic and ordered learning experiences in all contexts.

Monitoring and evaluation- a coherent and integrated structure to the learning experience includes careful planning of formative and summative assessment opportunities that provide for reflexion throughout the learning process.

C. Ensuring implementation of the policy

In order to adhere to the curriculum policy for the development and review of curriculum the university has provided for the relevant structures and agency for the implementation of the curriculum policy. This structured approach enables accountability and responsibility to ensure that the highest authority in the academic environment – the VP academic ensures a diligent process. Academic development (AD) needs to drive the curriculum development and evaluation process because AD has the capacity and the resources to manage the process. In addition AD would be able to host workshops that would enable training in curriculum development.

The Directorate of Strategic Planning and Quality Assurance (DSPQA) conducts scheduled reviews on scheduled programmes as per the programme qualification mix. The principles of curriculum development are followed in the development of new programmes, while all programmes are required to go through a review process following the team approach, meaning colleagues are harnessed from different departments to complete a questionnaire regarding the programme. The university conducts workshops and is currently hosting the International Conference on Distance Education (ICDE) conference regarding the delivery of ODL programmes.

In addition, the Strategic plan 2015 revisited point 1 focuses on the revitalization of the Programme Qualification Mix (PQM) in conjunction with teaching and learning which covers the following issues:

- The simplification and stream lining of the PQM
- The review and development of curricula promotes creativity, innovation and graduates that should be sufficiently prepared for the world of work.
- The development of an integrated student support model
- The revision of assessment processes and practices that create balance between formative and summative assessment in the view of constructive alignment
- The conceptualisation and contextualisation in the implementation of an ODL teaching and learning model.

D. Council on Higher Education underlying principles on curriculum

The propositional curriculum structure is underpinned by principles that imbibe the full student body in the transformation of higher education that is responsive, appropriate and consistent.

- **Fitness for purpose**: The focus here is on access for success through additional formal time that meets the requirement of providing a supportive and preparatory role in bridging the gap of secondary and higher education. The second issue is mastery of curriculum and learning experiences that add breadth for the enhancement of graduate attributes.
- **Flexibility**: The objective in this instance is the accommodation of diversity in the educational context. The curriculum design advocates flexible parameters in terms of starting points and progression pathways due to the divergent levels of preparedness among students.
- **Diversity of pathways and duration***:* It is imperative that formal time in undergraduate qualifications be specified in terms of academic years to meet funding and planning imperatives as well as the variation in the levels of preparedness among students.
- **Design based on the needs of the majority of students**: The view here is based on increasing formal time by one year where equity, success and throughput would be improved as confirmed by curriculum analysis.
- **The curriculum must accommodate different levels of preparedness**: The notion here is the accommodation of the divergent levels of preparedness among students through flexibility and comparability in the structure of programmes in terms of national and international benchmarks.
- **Flexibility in institutional implementation within a common adoption of the proposal**: Flexibility in the structure would address the variant needs of students as well as equity of outcomes and graduate quality.
- **Extra curriculum space to be used for augmentation, not increasing the volume of content**: The focus here is on flexibility as institutional accountability in terms of output and outcomes.
- **Curriculum enhancement must be provided for**: This looks at efficiency and effectiveness of curricula in the enhancement of graduate attributes.
- **Putting student learning first:** Student centred curricula through flexibility should enhance the student experience in terms of outcome quality [2].

VII. DISCUSSION AND RESULTS

A. Programme selection and evaluation

The programme that would be introduced in 2017 from the College of Science, Engineering and Technology called the Diploma in Engineering Technology: Industrial. As the research calls for critique, the document is evaluated in terms of enabling and constraining factors in the practices, theories and concepts in relation to the programme. Luckett's model is used due to an epistemically diverse curriculum in order to provide a critical analysis of the programme. The 4 spheres of knowing are considered, namely foundational competencies which concerns the knowing of disciplinary knowledge, practical competence which entails knowing how – the application of disciplinary knowledge, personal competence which concerns learning through reflexivity, and reflexive competence, which entails the development of meta-cognition through thinking epistemically, contextually and systemically [11].

Luckett's model provides clear articulation in terms of knowledge progression in a South African context in higher education where it is developed through experiences of an epistemically diverse curriculum. The building blocks of knowledge start from a disciplinary context and leads progressively to epistemic knowledge building which is of extreme importance in the engineering discipline. It may be seen as progressive in nature and aligns students and lecturers as agents in the process of re-contextualisation. The process of knowledge building enables (re)interpretation, reconstruction, re-contextualisation through cultures, power relations and socialisation in the curriculum. Luckett's view of the curriculum is aligned with Toohey [17] in the 5 step process that entails the discipline-based approach, performance and systems based approach, personal relevance approach, cognitive approach, and the socially critical approach. Toohey mentions in his final stage of development that the goal of graduates is to attain a level of self-realisation in a social context. This entails that students should understand, critique, develop arguments and defend positions. The aim is to take autonomous action to eradicate social disparities. Luckett and Toohey's model draw on the social character of knowledge assimilation as the focus on the epistemology of curriculum provision at the institution.

It is clear that effective curriculum development requires a systematic understanding of the strengths and weaknesses of students that come from a diverse range of backgrounds and that it would not be possible for HE to be able to handle such diversity. It is important to note the pass rate, especially in Engineering through ODL, which is approximately 15%. Therefore it is suggested that students be given an additional year in the new structure with the view of assisting students to cope with the workload and improve throughput. It is observed from this evaluation that the curricula are overloaded with disciplinary content which is counterproductive in engineering programmes. In this case, regular evaluations need to be conducted to determine relevance in the curriculum. It is important to note pedagogical development from an ODL perspective in structural changes to curriculum reform. It was observed that existing curricula presume that students possess the background knowledge to be successful in their studies. Curriculum designers find themselves in a challenge to be innovative in maintaining curriculum coherence as the major challenge is our pass rates especially in the engineering programmes [15].

The evaluation suggests that there is a relationship between the object of the study and form of knowledge that is produced. Bernstein mentions the shift from knowledge in the field of production to re-contextualisation in curriculum development is determined by the laws of nature that consist of physics and chemistry. Thus the knowledge comes from the knower with incremental changes through new experiments and justifications. Extrinsic pressures ensure that the curriculum is internationally competitive and that there is no compromise in any way [11].

Knight [12] mentions that curriculum should take on the process approach due to its complexity. The point in reference is that the curricula in this programme is coherent and progressive in nature and is appropriate to novices. As in the case of engineering, there seems to be a malalignment between the outcomes and content. Due to the very nature of the development of outcomes, the focus is often lost as to the core of the curriculum. Thus, "the process approach puts the casuistry and hypotheticals of outcomes in their place, and brings questions about good learning to the fore" while aiding good teaching and learning in the field of engineering [12].

It is noted that the curriculum structure is seeking to create balance in content, assessment and envisioned learning outcomes through interaction with the subject matter with a view of encouraging insights and reflection [8]. The elements of the curriculum influence and interact with each other through the notion of constructive alignment and synergy that links between the constructivist understanding of students in appropriate learning activities [3]. In addition, it has been noted that soft skills have become a prerogative in the workplace and considered as part of the curriculum. Key competencies are becoming fundamental to curriculum development which is prominent in this qualification [13]. Archer's [1] critical realism theory advocates the development of heuristics and its application in the engineering environment that faces continuous change. It enables the tracking of changes through time through epistemological means.

The 280 credits Diploma programme is consonant and responsive to the institution's mission, forms part of institutional planning and resource allocation, meets national requirements, the needs of students and other stakeholders, and is intellectually credible. It is designed coherently, and articulates well with other relevant programmes, where possible.

The institution commits itself to the following:

- Quality education;

- Creating knowledge;
- Supporting access to a wide spectrum of academic and technological teaching, learning and research;
- Partnerships with our communities;
- Contributing to national objectives regarding skills development and economic growth.

B. Curriculum responsiveness in context of the programme

The qualification is responsive to the economy and society as it addresses some of the training needs indicated in the Higher Education & Training Framework for the National Skills Development Strategy (NSDSIII). Also, the qualification adheres to HEQSF in terms of appropriateness, coherence and consistency, articulation pathways and to facilitate access and transformation in higher education [14].

Skilled engineering technicians are required to meet the developmental needs of the country in all service, manufacturing and industrial production fields. Responsiveness to local context takes into account skills development, diversity, equity, redress and increasing access and the extended curriculum. The institution promotes African thought, philosophies, interests and epistemologies through inquiry, scholarship and partnership. The programme is responsive to international regulatory requirements through ECSA and recognized by the Dublin Accord. The Dublin Accord is an agreement for the international recognition of Engineering Technician qualifications.

The notion of responsiveness is complex in a curriculum perspective. Moll [18] alludes to the context of economic, cultural, disciplinary and learner-related. Essentially it is a response or answer 'to some state of affairs by doing something: X is responsive to Y by doing Z' Moll [18]. This qualification is primarily vocational, or industry oriented, characterised by the knowledge emphasis, general principles and application or technology transfer. The qualification provides students with a sound knowledge base in industrial engineering and the ability to apply their knowledge and skills to a career in industrial engineering, while equipping them to undertake more specialised and intensive learning. Holders of this qualification are usually prepared to enter a specific niche in the labour market. The programme is articulated such that it provides lifelong professional development as students are required to engage with complexity and changing technology in the engineering environment. The qualification is economically responsive to the economy and society as it addresses some of the training needs indicated in the Higher Education & Training Framework for the National Skills Development Strategy (NSDSIII). Skilled engineering technicians are required to meet the developmental needs of the country in all service, manufacturing and industrial production fields.

In terms of cultural responsiveness, the qualification alludes to the ability of engineers to communicate effectively, both orally and in writing within an engineering context to demonstrate knowledge and understanding of the impact of engineering activity on the society, economy, workplace and physical environment, and address issues by defined procedures. The 27 credit module is included in year one in the section of complementary studies specifically dealing with aspects related to the ability to communicate effectively at all levels both inside and outside the organization and be sensitive to cultural issues when dealing with society. The outcome is assessed through both summative and formative assessments.

The Diploma in engineering technology is responsive to knowledge discipline through engagement of students in "systematised forms of enquiry" that considers Luckett's model in all years of study. Academic staff possesses the disciplinary qualification and expertise for the programme and many are engaged with the scholarship for teaching and learning through research engagements. Students are facilitated in the way knowledge is produced in this discipline and the teaching-learning environment and pedagogy. There is a high degree of practical application of theoretical concepts in laboratories, simulated and real work environments. However, it is unclear as to the extent to which students understand and develop competence in discipline specific knowledge. It is evident that the development of research skills lack until third and four year of study in which students are expected to do research projects. It is imperative that research skills be introduced in the first year of study and act as a scaffolder in all years of study as per Luckett's model. Moll's suggestion of "close coupling between the way knowledge is produced" in the discipline and the way students are educated in the discipline would enable new knowledge in the field of engineering (Moll 2004).

The Directorate for Strategic Planning and Quality Assurance (DSPQA), as a major stakeholder of quality in the institution, and the Directorate for Institutional Research (DIR) perform evaluations on student responsiveness through electronic surveys regarding their experience on the curriculum. This is a new programme, therefore I cannot comment much on the experience of students. However, the programme may be amended as per student comments. At this stage, language may a constraining issue, but the proficiency in English would enable a student to be able to communicate in a global arena. Professional bodies that play a major role in curriculum development could enrich the student experience through expanded relevance and applicability through the development of communities of practice.

The curriculum is seen to encompass the entire learning experience of the student in view of transforming the student through the process approach into an industrial engineering technologist. The diploma provides a foundation that enables Mode 1 knowledge as described by Toohey (1999) as key concepts where students should develop a representative knowledge of the field; breadth rather that depth as well as propositional knowledge as per Luckett (2001). This is based on traditional cognitive learning that is discipline based that enables students to construct their understanding from content. The discourse changes in 3rd and 4th year levels to

enable students to apply themselves in practice through practical projects.

This new programme design serves the institution's objective to sustain excellence of academic programmes as it is in accordance with the new standard set by the professional body, a result of the new HEQSF and aligned to the framework. The 280 Diploma in Engineering Technology: Industrial supports the improvement of stature and quality of the scientific and technology programmes offered by the institution. As a distance education university in South Africa the programme will be part of a group of new Diplomas in Engineering Technology that will increase the institutional reputation and attract more international students, especially from Africa, leading to an improved international scholarly output.

This qualification provides aspiring industrial engineering technicians with knowledge to operate and improve industrial engineering processes in an efficient, safe and profitable manner. The qualification addresses objectives of the NQF by providing the technician qualification at NQF level 6.

Professional Engineering Technicians apply established and newly developed engineering technology to solve well-defined problems and develop components, systems, services and processes. They provide leadership in the application of technology and commercially effective operations. They work independently and responsibly, applying judgement to decisions arising in the application of technology to problems and associated risks.

In view of the fact that an international audience is considered, "Africanisation" of content is a difficult challenge especially in the engineering discipline. As the programme in question requires international standing through ECSA, the respective guidelines on curriculum offering are a prerogative. Cultural diversity will, in the context of the institution, always be a challenge.

A very important aspect that is of concern is the lack of work-based learning that was present in the "old" qualification. Due to the difficulty of finding placements for students (students struggle to find their own placements) the institution removed the component. The changing SETA landscape would assist in creating an enabling environment for student placements. The institution is in the process of developing laboratories for simulated learning, however this is not the real experience.

There are both formative and summative assessments. The final assessments of modules are through examinations which are required by the professional body.

VIII. CONCLUSION

In view of the aim of the paper, the qualification in question meets the needs of the respective stakeholders. There is provision for change in the implementation process and it is recommended that a follow-up study be conducted after the cohort of students has been through the educational process. This would provide valuable input in terms of response to the various stakeholders. The critique, from a curriculum alignment perspective provides a platform that enables students to acquire diverse kinds and complexities of knowledge and competency. This is achieved through the different years of study. It embodies Luckett's and Toohey's model of knowledge development through the various quadrants for an epistemically diverse curriculum.

The findings allude to significant aspects that require attention and further investigation however from an international perspective the programme meets the requirements of the relevant bodies. It is imperative that curricula are continuous evaluated for relevance in producing graduates that impact society and the economy. The students development is seen in terms of transformation through a logically thought of process which may be termed a process approach. The curriculum is engineered to respond to the requirements of national and international benchmarks. The rigidity of the conventional system of curriculum development exacerbates the developmental transition of the student through a myriad of policy issues. The allowance of an additional year will allow students more time to reflect on their knowledge through critical analysis. The discussions regarding the critique above are modest and subject to stimuli beyond the educational domain. The transitional process will vary among students and are based on generalisation. However in terms of curriculum re-engineering, the programme is constructively aligned to in all its facets to provide the necessary impact.

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