Searching for the Technology in Universities of Technology

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ABSTRACT

Higher education in South Africa has been the scene for dramatic changes during the last fourteen years of the new democracy. The cleanly divided domains and roles of higher education institutions made way for a chaotic situation that was eventually resolved by the creation of three different kinds of universities. Universities of technology as previously vocational training institutions gained academic legitimacy with the title of university and the right to deliver postgraduate outputs. The problem that arises out of this new order is the claim that technology defines the uniqueness of a university of technology. The public image of the five universities of technology in South Africa is analysed in order to validate this claim.

CATEGORIES AND SUBJECT DESCRIPTORS

K.m [Miscellaneous]

GENERAL TERMS

Management, Economics, Human Factors.

KEYWORDS

Technology in university of technology; technological knowledge; higher education; philosophy of technology education framework; higher education framework.

1. INTRODUCTION

The backdrop of any discussion of education in the South African context is the political changes that started after the first truly democratic election in 1994 and that still continue to this day. With the changes in political order in South Africa came the will to change the social order of the country and its people, an agenda aptly described by the slogan: “a better life for all”¹. Significant historical events such as the Soweto uprising [35] made education an important aspect of the struggle for freedom in a country marked by the segregation and discrimination of whole groups of people and lead to sweeping reforms to unite the country’s disparate and fragmented educational environment. This process started in the early 90’s as an initiative of the National Union of Metalworkers in conjunction with the Congress of South African Trade Unions (COSATU) [1], and is still not completed. The deliberate efforts in the new democracy to redress the inequalities of the past are visible in many sectors of the country, including the higher education landscape. A particular and very visible example of this can be seen in the changed structures of higher education institutions which in the previous dispensation were delineated as universities and technikons. These institutions now find themselves labeled as traditional universities (TU), comprehensive universities (CU) and universities of technology (UOT) [15]. The latter of these creations, universities of technology, enjoy substantial attention by way of debate and is the focus of this paper.

Du Pre [9] argues that technology is the qualifying factor for a UOT and adds that its purpose is to “make knowledge useful”. Winberg [40] in turn calls for a “epistemology of technology”. This call is, however, not easy to answer. One reason for this difficulty is the possibility that philosophy is not seen as technology [36] and another reason is the lack of clarity on the meaning of the term technology. This leads to an inherent identity crisis, which is apparently resolved by the claim that UOTs are different from traditional universities. The problem with this solution is that UOTs may know internally what that difference is, but it is not apparent in their public image.

In the international context technology is viewed as a critical component of national education development. This is

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⁴ The slogan "A Better Life for All" has been the call of the African National Congress in its election campaigns since 1994
evidenced in the number of countries that have examined, and established, the role of technology in national education. Examples of these are the New Zealand Education Department [24] and the Technology for all Americans project [17].

The technology focus of the South African government is readily seen in the outcomes of the curriculums of the lower bands of the South African National Qualification Framework (SANQF). Its role and place in the qualification programs of higher education is, however, not as clear, even when considering the occurrence of professional engineering degrees and information and communication technology (ICT) courses.

The purpose of this paper is to explore the place and meaning of technology in the South African UOT context. The debate over the existence of a UOT came to an end with its creation as a new kind of higher education institution. This significant step was to the benefit of technikons because it provided the much sought after academic legitimacy that comes with the designation of university. What is left unclear though is the meaning of the term technology in this context. A new chapter in the debate is therefore needed with the goal to examine and contextualize technology in the operative domain of UOTs. This will in part follow on Du Pre’s [9] work as well as set the scene for answering Winberg’s [40] call for an epistemology of technology.

The remainder of this paper is structured in two parts. The first part is a broad overview of the aspects of technology as it relates to education on a national and international level. The scope for this part is very wide and an in-depth analysis is not possible. The aim is therefore to show that the topic of technology in education, both on the level of child education as well as higher education, has, and still is, enjoying tremendous attention. Furthermore a brief historic overview of education in South Africa will provide the needed context for the rest of the paper.

The second part is more specific and focused in that it examines the public image of UOTs. The aim is to discover how UOTs market itself to the “outside world” and is therefore used as an indicator of identity. The point is that school leavers, who have already been exposed to an organized and rationally designed curriculum on technology, will be seeking to further their education in technology. UOTs seem to be the ideal place of study for these students. These institutions are, however, new to the scene in terms of identity and still fall back to the vocationally focussed products of their previous state of existence, namely technikons. The question that is raised is whether UOTs in relation to technology brings new understanding or whether it is the same thing with a new name.

The paper concludes with comments that will serve as the opening remarks for a debate on the role and meaning of technology in the context of UOTs. This will in time result in a broader debate on the role of technology in all of South Africa’s different higher education institutions.

What is Technology and Technological Knowledge? Mitcham [23] describes technology as the making and using of artefacts by humans. The glossary of the International Technology Education Association’s (ITEA) Technology for All Americans Project (TIAAP) describes technology as: “the innovation, change, or modification of the natural environment to satisfy perceived human needs and wants” [16]. The New Zealand Ministry of Education [25] in turn describes technology as: “a creative, purposeful activity aimed at meeting needs and opportunities through the development of products, systems, or environments”. Knowledge, skills, and resources are identified as key to help solve practical problems. This and other attempts at definitions and descriptions of technology (see for example Hansen and Froelich [14]) emphasizes the making of artefacts and the role of humans in this process. To settle this definition will steer the paper in a philosophical direction and will inhibit its purpose. In order to promote the debate the definition of technology is taken from as wide a perspective as possible providing that the emphasis on human making for human needs is strongly maintained.

Knowledge forms an integral part of the discussion on technology and its place in education. The Committee on Technological Literacy lists the dimensions of technological literacy as knowledge, ways of thinking and acting, and capabilities [26]. The link between technology and knowledge is not a new concept [20]. McCormick [22] describes procedural and conceptual knowledge as part of this technological knowledge. Table 1 shows the technological knowledge framework developed by Compton [5] for the New Zealand Ministry of Education.

The framework shows the extremes of the spectrum of knowledge in technology. The value of this framework in the current discussion is in the context it provides for thinking of technology and knowledge in education. An institution such as a UOT can, for example, orient itself in this structure with regards to the level of academic discourse it wants to participate in. On the other hand this framework is useful to guide the wider debate on the general place of technological knowledge in the activities of higher education.

Table 1: Technological Knowledge Framework [5]

<table>
<thead>
<tr>
<th>Social knowledge</th>
<th>Resource knowledge</th>
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</thead>
<tbody>
<tr>
<td>Description</td>
<td>Understanding of the social and physical environment of any technological development or site into which a technology is to be embedded. It includes knowledge of appropriate ethics, legal requirements, cultural or domain protocols and the personal/collective needs of the end-users and technologists</td>
</tr>
<tr>
<td>Knowledge Type(s)</td>
<td>Explicit and tacit descriptive conceptual, prescriptive device and evaluative procedural</td>
</tr>
</tbody>
</table>
2. THE CONTEXT: THE SOUTH AFRICAN EDUCATION STRUCTURE

The South African Department of Education (DoE) is mandated by the government to oversee all matters pertaining to education. In this capacity, it formulates policies, creates laws, and executes the government’s desire for an education system that exists to serve all of the citizens of the country equally. Towards this goal, the SANQF was designed to facilitate the coordination of lifelong learning amongst a variety of public and private institutions of learning [31]. The SANQF, under the auspices of the South African Qualifications Authority (SAQA), is subdivided into three bands: general education and training (GET), further education and training (FET) and higher education and training (HET). The following four subsections give a succinct overview of the SANQF and briefly identify the role of technology education within this landscape.

2.1 The South African National Qualifications Framework

The responsibility of SAQA is to oversee the development and implementation of the SANQF [31]. Figure 1 shows the structure of SAQA. In the task of standards setting and quality assurance Education and Training Quality Assurance bodies (ETQAs) are created to represent the interests of professional stakeholders. In the case of higher education the Higher Education Quality Committee (HEQC) fulfils this role. The purpose of the framework is to “improve the coherence of the education system” as well as “facilitate the articulation of qualifications” [33]. An overview of the structure of the SANQF can be seen in Table 2.

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### Table 2: SANQF

<table>
<thead>
<tr>
<th>Band</th>
<th>NQF Level</th>
<th>Qualification Type</th>
<th>Sublevels</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Higher Education and Training (HET)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate</td>
<td>10</td>
<td>Doctoral Degree</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Master’s Degree</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Bachelor Honours Degree</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Bachelor Degree Advanced diploma</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Advanced Certificate Diploma</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Higher Certificate</td>
<td></td>
</tr>
<tr>
<td>Postgraduate</td>
<td>4</td>
<td>Further School / College /</td>
<td></td>
</tr>
</tbody>
</table>

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The SANQF does not directly address any issues pertaining to technology or for that matter the content of learning programmes. Its purpose is to ensure a “single qualification framework for a diverse system” [33]. Amongst the goals of the framework are social transformation, high knowledge and high skills, and articulation and portability.

Technology is not directly mentioned in the framework and it would be presumptuous to do so even indirectly. What is clear is that at least two kinds of educational streams are included namely theoretically oriented (labelled as degrees in HET) and vocational (labelled as diplomas in HET). This is the chasm that the SANQF in essence wants to overcome and is expressed in the issue of articulation between these two streams. Whether an institution aims its education programs at being primarily vocational or primarily theoretical is not critical, what is important is the ability for learners to cross this divide. The next sections will show how the curriculum descriptions of the pre-university education bands have positioned technology, as well as the absence of such an initiative by UOT’s.

### 2.2 Pre-university Education

The adoption of the outcomes based education (OBE) philosophy has revolutionized school education in South Africa [7]. After ten years of work a measure of stability is being achieved with the outcomes for each learning programme established and the first groups of learners to emerge from the pre-university education bands.

Technology is a well defined part of the content of these bands. In the GET band technology enters the scene as a learning programme, that is integrated in the learning programmes of each grade [32]. On the FET band technology is refined into six separate learning programmes [34]. These are agricultural technology (focusing on technological processes used in agriculture and the farming environment), civil technology (focusing on concepts and principles in the built environment and on the technological process), computer applications technology (focusing on the effective use of information and communication technologies in an end-user computer applications environment in different sectors of society), electrical technology (focusing on the understanding and application of electrical and electronic principles), information technology (focusing on activities that deal with the solution of problems through logical thinking, information management and communication, and on the development of computer applications using current development tools), and mechanical technology (focusing on technological processes from conceptual design through the process of practical problem solving for the improvement of the different mechanically related processes, services, systems and the control thereof used in the production and manufacturing of goods). These subjects are available for selection from Grade 10 to 12 of the learner’s studies.

Although an in depth discussion of these subjects fall outside the scope of this paper, it is important to emphasize the fact that in preparation of a learner for higher education (or for the labour market) technology enjoys substantial attention. This of course directly affects universities, and specifically UOTs, since it is these students that will be looking for a continuation of a technologically-oriented study career.

### 2.3 University Education

As noted earlier, higher education in South Africa has undergone tremendous change during the past few years. The DoE is responsible for executing the government’s vision for a system that is fair and open in terms of educating the citizens of the country. In that capacity it created the three types of universities, namely TUs, CUs and UOTs [15]. Kraak [19] ascribes the creation of UOTs to political pressure more than a “planned policy evolution from the state”.

The most significant result of the redesign of higher education is the creation of the UOT. The roots of this new type of institution are found in a strong historical relationship between education and technology [21]. Winberg [41] describes three phases of the development of UOT’s as: educating for the needs of industry, imitating universities and rediscovering technology. The argument is clearly toward a growth from a vocational-oriented education towards that of critical thinkers [41].

The traditional and original intention of technikons was to equip students with hands-on skills for the workplace. This emphasis gave technikons the reputation of being practical as opposed to the strictly theoretical purpose of universities. In addition to this, the entry requirements between universities and technikons were different: a school leaver needed a university exemption to prove a certain level of academic aptitude to be admitted to a university, whilst technikons had lower entry level requirements.

### 2.4 International Trends

South African researchers are not alone in the quest for an understanding of technology and its place in education. On the international front a significant body of work is being done by researchers on the question of technology education. These initiatives is as far reaching as that of small former British colonies [29], European countries [27] and finally large developed countries such as the United States of America [18]. The efforts of these researchers have bearing on the search for the meaning of technology in the educational context. A comprehensive overview is beyond the scope of this paper, but certain issues, such as a definition of technology and the place of knowledge in technology, is of relevance (see above).

### 3. WHERE IS TECHNOLOGY IN THE SOUTH AFRICAN CONCEPTION OF A UOT?

Philosophers have contributed greatly to an understanding of the conceptual dimensions of technology and researchers from an array of disciplines added to the debate on technological
knowledge. All of these results are critical in the discovery of what the South African conception of a UOT is.

In order to formulate a South African understanding of the notion of a UOT it is necessary to look beyond the philosophical discussions and intellectual creations of the academics. The fact that these institutions have already been established, and have been in existence for more than 2 years, gives an opportunity to examine what they themselves are saying with regards to themselves. This section asks questions on where technology can be found in the South African UOT.

To facilitate this question, an analysis of the different vision and mission statements of each UOT was conducted and is discussed in the following sections. In addition to this the faculty structure was also examined to get a public view of what these institutions say about themselves.

### 3.1 Can Technology be Found in the Public Statements of UOTs?

Collins and Porras [4] describes an organization as consisting of the two components of a guiding philosophy and vivid picture. The guiding philosophy is described as “a system of fundamental motivating assumptions, principles, values and tenets”. It is also said to come from the early leaders who originally shape the organization. The tangible image on the other hand consists of a mission and a vivid description. The purpose of the tangible image is to “focus people’s attention on a certain goal” and is described as “bold, exciting and emotionally charged”.

This framework makes it possible to provide guidance to the leaders of UOTs in the creation of a guiding philosophy for their institutions. Fortunately the seminal work of Du Pre [9] has set out a philosophical perspective targeted at the creation of UOTs in South Africa and is fit for the purpose of a starting point of the effort as a whole. At the same time the top management of UOTs are faced with “selling” this new idea to prospective students.

This section reports on an analysis of the vision and mission statements of the five South African UOTs. The analysis took into consideration that the newness of the UOT idea and the reality of mergers place all these institutions in the beginning phases of a corporate lifecycle. The specific life cycle phase of UOTs is hard to determine, but considering that these new institutions result from mergers it could be placed on Hanks et al.’s [13] expansion or consolidation phase. The phase prior to this is generally the start-up phase and the phase immediately after this is the maturity phase. The analysis made use of the Collins and Porras [4] framework to identify first the guiding philosophy and second to see the tangible image of each UOT. The purpose of this analysis is to determine the vividness and inspirational role of UOTs as they appear to public scrutiny, as well as to find the place of technology in this image. The data for the analysis was gathered directly from the institutional websites.

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### 3.1.1 Guiding Philosophy

The guiding philosophy is measured against the aspects of core values and purpose (see Table 3). The critical metrics here is the clarity of the values as it relates to the role of technology and the way in which the purpose is an expression of this belief.

### 3.1.2 Tangible Image

The tangible image is the mission of the organization so that its efforts are clearly focused. If the guiding philosophy presented an abstract view on the “what” aspect on the organization then the tangible image presents the “how” and...
therefore the practical realization of the vision. The critical
metric in this analysis is the ability of the tangible image to
inspire those that read it. The mission was examined for its
ability to clearly express how the vision will be achieved and
again the role of technology is sought out. Furthermore, the
motto was examined for emotive language as an indicator of
the desire from the UOT to inspire people. The mission and
motto is for the five institutions are presented in Table 4.

Table 4: Mission and motto

<table>
<thead>
<tr>
<th>UOT</th>
<th>Mission</th>
<th>Motto</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPUT</td>
<td>To develop and sustain an empowering environment where, through teaching, learning, research and scholarship our students and staff, in partnership with the community and industry, are able to create and apply knowledge that contributes to development</td>
<td>Not directly observable</td>
</tr>
<tr>
<td>CUT</td>
<td>To deliver high-quality appropriate science, engineering and technology academic programmes supported by applied research; engage with the community for mutually beneficial development; attract and retains expert staff and supports their development and wellbeing, and forge strategic partnerships</td>
<td>Thinking beyond</td>
</tr>
<tr>
<td>DUT</td>
<td>To serve the needs of developing societies within a dynamic global context and to enable quality teaching, learning, research and community engagement by providing quality, career-focussed education, and promoting a values-driven ethos, sustainable partnerships with industry, community and society, excellence in applied and relevant research and, empowering staff and students to succeed and ensuring institutional sustainability.</td>
<td>Not directly observable</td>
</tr>
</tbody>
</table>

The three aspects common to the missions are that of a
community involvement or relatedness, research and, of
course, teaching. The role of technology is not as clear as can
be expected of a UOT. One of the roles of technology is
capsulated as the content of what is taught (TUT), but more
generally it takes the form of the purpose and aim of applied
research (CUT). Apart from this the mission statements do not
explicitly identify a university as a UOT. A motto was found
at three of the five institutions and the emotive quality only
really applies to that of TUT and VUT.

As an image to the public none of the elements addressed
creates a particular view of what a UOT is or does. One
possibility reason for this is that these institutions rely on their
names to create enough of a drawing card for interested
students. In addition to this is the nature of the naming of
qualifications (for example BTech: Computer Systems)
presented at these universities. This uniqueness in itself
provides a level of identification for prospective students.

3.2 Can Technology be found in the Faculty Structures of UOTs?

This section looks at the faculty and departmental structures
as described by the institutions under examination.

During data collection each UOT’s homepage was visited
to capture information on the naming of its faculties and
departments. The reason for this was the clarification it brings
with regards to how the different UOTs differentiate
themselves by way of structure. In addition to this, the name of the faculty or department provides a partial internal view of technology held by the UOT.

Table 5: Faculty names

<table>
<thead>
<tr>
<th>UOT</th>
<th>Faculty Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPUT</td>
<td>Applied Sciences, Business, Education and Social Sciences, Engineering, Health and Wellness Sciences, Informatics and Design</td>
</tr>
<tr>
<td>CUT</td>
<td>Engineering, Information and Communication Technology, Health and Environmental Sciences, Management Sciences</td>
</tr>
<tr>
<td>DUT</td>
<td>Accounting and Informatics, Applied Sciences, Arts and Design, Engineering and the Built Environment, Health Sciences, Management Sciences</td>
</tr>
<tr>
<td>TUT</td>
<td>Economics and Finance, Engineering and the Built Environment, Humanities, Information and Communication Technology, Management Sciences, Science, Arts</td>
</tr>
<tr>
<td>VUT</td>
<td>Applied computer science, Engineering and Technology, Management sciences, Human sciences</td>
</tr>
</tbody>
</table>

Table 5 is a summary of the various faculty names as found on the websites of the UOTs under examination. A significant absence of the term technology as well as an overwhelming use of the term science is noted. Although it would be speculative to explain this phenomenon without deeper analysis, it could be said that, in terms of the naming of a UOT faculties, technology is viewed as the application of science. Technology as a term though is not found, except for its occurrence in ICT.

4. DISCUSSION

The search for technology is in essence the search for the meaning of technology in a certain context. The thought leaders of the idea of a UOT lay claim to the identifying feature that technology brings. The issue then of what the meaning of technology as for UOTs, is a question of critical importance since the operation and strategic direction of a particular kind of higher education institutions affects all others. In part academic drift Kraak [19] describes this situation and suggest that higher education institutions end up being competitors instead of partners in the education goals of South Africa.

The debate on creating a UOT was lively as many commentators spoke in favour as well as against this type of institution (see for example the summary by Reddy [28]). Du Pre [9] stands out as an important thought leader in favour of UOTs and his work can be regarded as seminal in the context of the debate. Du Pre’s work is representative of the tireless efforts of an organization named the Committee of Technikon Principals (CTP) that played a key part in the creation of UOTs. As a statement Du Pre’s work is taken up in various forms in at least two formal publications [9, 10] and most papers participating in the UOT debate cite his work or that of the CTP’s (see for example Thathiah and Schauffer [36] and Imenda [15]). This notable work and the position it has in the domain of UOTs therefore forms an important part of the analysis.

A thorough examination of this seminal work as well as its influence in the formation of UOTs falls outside the scope of this paper. What is presented here is a short overview of the main points made towards its role as a guiding philosophy. The most distinguishing feature of this work is the very inspirational statement of the purpose of UOTs as “making knowledge useful” [9]. This in itself could qualify as the kind of motto that creates a tangible image. Another feature which stands out very clearly is the claim that the distinguishing factor of UOTs is that of technology. Seen in a critical light the proposed definition of a UOT is not fully developed except for the emphasis on the aspects of creating and managing technology. In addition to this, the definition of technology is cast in an applied science guise, thereby excluding any possibility that technology can be distinct and separate from science.

What is clear from the analysis this far is that the role of technology is paramount. The term occurs with enough frequency in the mission and vision of these institutions to support the intention to be an institution that teaches technology. The problems occur when the analysis goes deeper towards the faculty name level where technology is suggested to be applied science. Authors such as Kraak [19] and Reddy [28] states the vocational task of technikons as also that of UOTs. A reasonable connection between vocational education and applied science can be made and the analysis supports this view. UOTs therefore can be said to hold the view that technology is applied science.

5. FRAMEWORK FOR DEBATE

The term university has a generic meaning in the South African context in that it denotes a place of higher learning. The specific identification of the institution comes from secondary labels, such as the distinguishing factors in the design of higher education between a theoretical way of learning and a more practical approach [12]. Imenda’s [15] analysis is instructive as it describes the nature of traditional universities as ideological and that of universities of technology as functional. The lines of the historical debate is thus based on the theory versus practice divide, and can be expressed as in the vocational character of first technikon and now UOT education. The SANQF furthermore supports this delineation with streams of education that focuses on vocational training and theoretical training.

The issue that this paper raises is that in the context of technology as an identifying characteristic, careful thought is needed about the meaning of the term. The call for an epistemology of technology [40] and the philosophical groundwork of Du Pre [9] suggest that the vocational positioning of technical education is too limited for a UOT and need to be broadened. This broadening of the scope of technology education is not found in the public image of UOTs and shows the limit that UOTs inherently place on themselves.

To enable the debate of the role of technology a framework for discourse is needed. Mitcham [23] developed such a framework. Mitcham’s framework (illustrated in Figure 2) consists of thinking about technology in four human and technological interaction modes: object, action, knowledge and volition. He uses these four models to introduce a “provisional” framework and broad definition of technology. The centrality of people to this thinking is seen by the inclusion of human beings as the role players in the making or using of technology, and finally the objects or artefacts represent the output of human effort. Internally humans hold knowledge about technology and also a will to use that knowledge.
higher level thinking about technology. Clearly shows a way to reconcile vocational training with technology does not feature at all as an aspect of the discourse question arises of whether universities should busy themselves the perspective on technology education is not in dispute, but the technology in South Africa. The Compton framework is a useful aid in exploring the aspects of technological knowledge presented in this framework.

6. A TECHNOLOGY FOCUSED DEBATE

Statements such as: “technology is the defining characteristic of UOTs” creates the sense that UOTs in general lay claim to the term and the domain. This is short-sighted given the data presented in this paper. The scope of technology as a domain of study cannot be owned by any one kind of higher education institution. The SANQF shows clear delineation between the theoretical and vocational streams of education and provides a means for articulation. What it does not do is prescribe which kind of institution is responsible for what stream. This leaves the door open for any type of institution to choose a stream or even both streams.

That the Mitcham framework allows for a vocational perspective on technology education is not in dispute, but the question arises of whether universities should bus themselves with purely vocational training. On the other hand science and technology does not feature at all as an aspect of the discourse on UOTs in South Africa. The Compton framework clearly shows a way to reconcile vocational training with “higher level” thinking about technology.

All the tools are in place to promote the debate on the place of technology in higher education in general and in UOTs specifically. The aspects of this debate can follow the following lines:

• To what degree is technology defined as a concept?
• What is the scope of technology discourse?
• What is the place and relation of science with technology?
• How useful is the Mitcham framework in thinking about technology in South Africa?
• Can a measure of cooperation as opposed to competition be achieved amongst higher education institutions?
• Who ultimately is responsible for vocational training and what is the role of technology in this?

A debate of this nature is best viewed as a journey that starts again at the beginning. This time though the beginning is not academic legitimacy, but the definition of technology itself. This should be the first great achievement of any debate on technology in the South African academic context.

7. CONCLUSION AND FUTURE RESEARCH

Technology in this context cannot in any useful sense be owned, but institutions such as UOTs can lead the way towards an integrated understanding of the role of technology and science in the country. There is no doubt that a healthy economy is very dependent on modern technology such as computers, digital networks, and the ability to build cities, genetic engineering, and so on. Humanity possesses great creative power and technology is one expression of this power. Where science aims to understand the world and the principles that define it, technology helps humans to exist in that world.

As was indicated earlier in this paper a broad view was taken with the express purpose to start a debate. One result of this attitude is the absence of a treatment on the role of CUs in this debate. This is an unfortunate side effect of focussing attention on UOTs. The reality of the matter is that CUs represents a combination of both the features of a TU and UOT and could perhaps represent the ultimate vision of where vocational and professional higher education meets. That, however, must and should be the topic of another paper that hopefully will flow from this debate.

An epistemology of technology lies at the core of the debate asked for in this article. This is a philosophical undertaking and must be, in part at least, attempted by those who would lay claim to the term. The tools described in this paper provide the means to do so. As a final word the end result of this debate is to bring about a significant shift from “making knowledge useful” to “making useful knowledge”.

REFERENCES


