

Globally Competitive and Locally Relevant: The Third Mission in South Africa and a Review of the Technology Stations Programme at Tshwane University of Technology

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Abstract

Universities are expected to produce graduates that are globally competitive while remaining locally relevant. The third mission in South Africa is an important instrument through which the Tshwane University of Technology attempts to remain locally relevant. In particular, the technology stations programme is aimed at strengthening and expanding the mutually beneficial links between universities of technology and small medium and micro enterprises (SMMEs). The objective in this paper is to review the technology stations programme at the Tshwane University of Technology. The analysis disclosed the contribution of the technology stations to the SMME economy of the electronics and chemicals sub-sectors.

1. INTRODUCTION

Universities are expected to prepare graduates for, among others, employability, able to deal with complexity and uncertainty, able to meet the challenges of globalization, and create an approach to higher education that stimulates technological innovation. Tshwane University of Technology (TUT) uses its technology strength to contribute to the promotion of technology-led entrepreneurial activity. In particular, the technology stations programme contributes to the competitiveness of small medium and micro enterprises (SMMEs) in the electronics and chemicals sub-sectors.

The technology stations programme is a product of the Department of Science and Technology (DST) policy objectives (DACST, 1996). The DST's policy is aimed

at strengthening and expansion of mutually beneficial links between universities of technology and SMMEs. In particular, the policy objectives of the department are aimed at improving the competitiveness and innovation capacity of SMMEs in selected sectors of the economy. Accordingly, the DST's programme is aimed at establishing and maintaining a sustainable system of technology stations which are competent providers of technology transfer and related services. Through this programme the DST wants to influence the universities of technology to orientate more research and development outputs towards the needs of the SMME sector.

While it is important for universities to be globally competitive, equally important is that they remain locally relevant. The objective in this paper is to explore the third mission in South Africa by reviewing the technology stations programme at the Tshwane University of Technology (TUT). In particular, the paper explores the specific cases of two technology stations, viz, the technology station in chemicals (TSC) and the technology station in electronics (TSE). The paper is organized into three sets of material. The first section of material provides a general context for this study. The second strand of material focuses on the technology stations programme and provides an overview of the workings of the two technology stations. The material in this section is drawn from the official documents, such as annual and quarterly reports of the technology stations. While official documents yielded considerable information about the functioning of the technology stations, they did not reveal enough data about the context within which they operate. In response to this information gap, focused interviews were conducted with key participants in the policy environment, technology transfer and SMME development. The interviews were conducted between September and November 2007. Accordingly, the final strand of material examines specific issues that emerged from interviews.

2. THE GENERAL CONTEXT

The South African economy is undergoing rapid transformation from its origins as a primarily resources-driven complex towards a form which seeks to become increasingly knowledge-based (Maharajh, 2008; Maharajh and Motal, 2008). This transition is being undertaken within a context of rapid insertion into the global political economy whilst simultaneously seeking to redress the inherited inefficiencies and associated legacies of apartheid capitalism. A significant demand in this evolution is the requirement for large numbers of highly skilled and technically competent human resources. It is expected that the transformation of the South African economy will increase productivity, enhance national competitiveness and contribute to generally improving the quality of individual lives.

The challenge of creating relevant and appropriate knowledge-based economic and social strategies which will seamlessly ensure the application of science-led innovation as a driving force in the transformation of the national economy has however, not been fully overcome. Further, critical questions arise when understanding what kind of technological capability exists in the country which can be focused upon as a unique comparative advantage in the quest for an accelerated pace of technological change.

The higher education sector in South Africa is also undergoing rapid transformation away from its roots in reproducing the apartheid capitalism towards building the new South Africa (Maharajh and Motala, 2008). The universities are expected to ensure that they produce research, technologies, skills and capabilities that contribute to social and economic development of the country. Further, universities are increasingly expected to produce entrepreneurs, innovators, and managers who can lead and advise in the area

of technology-based and science-led innovation, research and development, commercialisation process, and establishment of high-tech companies (Ndabeni, 2007). If they are successful, as normative policy would suggest, the country is likely to see a marked increase in knowledge-based entrepreneurship, a development that will create a substantial demand for knowledge workers with cutting-edge expertise who can move across industries and occupations and within occupations. Overall, the emphasis is on strengthening the critical role of universities as a new engine for further growth, particularly in the SMME sector through, *inter alia*, technology stations programme.

3. TECHNOLOGY STATIONS PROGRAMME

Technology stations are a result of the DST's policy objectives. The DST's policy dates back to the 1990s and is aimed at strengthening and expansion of mutually beneficial links between universities of technology and SMMEs through an appropriate intermediary structure in order to improve the competitiveness and innovation capacity of SMMEs in selected sectors of the economy (DACST, 1996). The aim of the DST programme is to establish and maintain a sustainable system of competent providers of technology transfer and related services at the universities of technology which are coordinated by the Tshumisano Trust.

The technology stations offer technology support and advice to low technology-based SMMEs in order to improve and graduate into high-technology SMMEs (CHE, 2008). The technology stations are governed by TUT through the provision of institutional, organizational and legal frameworks. TUT also provides leadership and strategic management capacity by introducing a management committee and appointing a permanent TUT management staff member as chairperson to manage and accept responsibility for the obligations of the TUT in the venture. TUT provides access to academic research and

development results suitable for transfer into SMME application and at the same time attempts to facilitate effective feedback mechanisms of SMME problems into teaching, learning and research through the involvement of students, subject to any intellectual property rights which may vest in such results. However, there was no evidence to show that technology stations were fully aligned to the formal teaching and research agenda at the university.

The Technology Station in Electronics (TSE)- was established in 2000 at the then Pretoria Technikon which in 2004 formed part of the new university of technology- operates in the electronics, electrical, and information and communication technology industries. The technology station utilises the competency and capacity of staff, students and the infrastructure of the University to contribute towards SMME development in the electronics sector. The objective of the TSE is to assist SMMEs in the specific industries of electronics and information and communication technologies (ICT) to improve their competitiveness and innovation capacity in order to become globally competitive in product design and development, automated electronic assembly of prototypes and small volumes, and rework solutions on assembled printed circuit boards. The technology station often has to produce actual prototypes of the final products that the firms would later reproduce on a larger scale. Through the practice of these downstream activities, the University is able to accumulate experience and know-how related to the actual production that occurs in real world industries.

Similarly, the Technology Station in Chemicals (TSC) was established in year 2000- at the then Technikon North West which in 2004 also formed part of the new university, viz, Tshwane University of Technology. The aim was to improve the competitiveness and innovation capacity of SMMEs in the chemicals sector as disclosed in the detailed discussion below.

3.1 Technology Station in Chemicals (TSC)

TSC was established to improve the competitiveness and innovation capacity of SMMEs in the chemicals sector. This is achieved through the participation of the Tshwane University of Technology in the transfer of technological knowledge as part of the University's technology innovation and technology transfer strategy for community development, entrepreneurship, and research and development. The activities of the TSC contribute to the development of low technology SMME companies which are expected to graduate into medium and high-tech SMME companies. Indeed, most clients assisted by TSC are micro and small businesses which use low technology. Accordingly, the TSC exposes the low technology SMMEs to high levels of technology. The majority of these SMMEs are located in the four provinces of Gauteng, North West, Limpopo, and Mpumalanga. They are all in the manufacturing business, employ between two and twelve people, and have a turnover of between R50 000,00 and R10 million per annum.

The TSC focuses on three technology platforms namely surface coating, essential oils, detergents and waxes. The specific services of the TSC include testing and analytical services, manufacturing interventions, product and process improvements, interventions related to applied engineering, and technology demonstrations. First, testing and analytical services refer to project intervention whereby a product or process has to be tested. Tests are conducted to determine the quality of detergents, and cosmetics compliance with national requirements. Second, manufacturing interventions is a technological activity where the station manufactures either a prototype product or any product for market testing on behalf of the client. Third, technological audits are conducted to trouble shoot the problem from its

symptoms. Most of the projects are preceded by trouble shooting to ensure that the intervention is correct. Fourth, product and process improvements refer to intervention aimed at making better the state of the product or process. Most of the intervention are undertaken to meet the South African Bureau of Standards (SABS) requirements. Fifth, interventions in applied engineering refer to improvements in the facility and processes used to manufacture the product. The intervention includes unit design and specifications. Finally, technology demonstrations refer to an activity that involves showing the client how a technology process is conducted. This includes demonstrations on product testing, machine operation and the use of proper protective equipment. In order to assess project for assistance, the station uses a modified technology and business audit model. On the one hand, the tool is used to assess the technical, financial, and marketing potential of the business. The needs assessment assesses the need for the intervention. Finally, the project costing model is used to assess the costs of the project.

3.1.2 Activities of technology station

The TSC focuses on low level technology SMMEs that manufacture paint, hair care products, and cleaning products, such as car wash n' wax, laundry detergents, bleach, antibacterial hand soap. The products usually do not meet the SABS specifications. Accordingly, the task of the TSC is to train the SMME entrepreneurs in the procedures of manufacturing in order to improve the quality of their products and to meet the SABS specifications. The TSC sometimes collect the samples of the products from the clients and take them to the TSC laboratory where they are tested and further work undertaken to improve the product and the technology. The TSC then produces improved samples which are then sent to SABS for approval.

The clients normally pay 10 percent of the project costs and the remaining amount is paid by financiers such as Small Enterprise Development Agency (SEDA) or Provincial Development Corporations. As a result, when the product has been improved and approved by SABS, the results are presented to the client and the financier of the product. That is to say, the TSC produces two sets of reports. One for the SMME that was assisted and the other for the financier that paid for the 90 percent of the project costs.

TSC has identified a need to assist SMMEs with the technique and method of measuring and quantifying their products and raw materials. The lack of precision and knowledge in metrology results in increased expenses owing to reject products, over-dosage, product instability and ultimately customer dissatisfaction and poor quality products. Consequently, the technology station has introduced metrology as a new offering to improve the measuring techniques of the SMME entrepreneurs. The service addresses calibration of measuring instruments such as scales, ph meters; quantity calibration of storage and blending tanks; raw materials pre-weigh techniques; and, batch up scaling and down scaling.

In accordance with the social objectives of government, the TSC is reaching out to the underdeveloped regions and poverty nodes in the country, particularly in the Provinces of North West and Limpopo. The initiative is aimed at enabling the businesses and poor communities to access the technologies offered by the TSC. The specific training of the TSC relates to product formulation, measurement techniques, and health and safety regulation.

3.1.3 Participation of the faculty members

The Departments of Chemistry and chemical engineering assist the TSC with the provision of human capital in the form of students and lecturers. The faculty members including students have been active in the transfer of knowledge and technology relating to product development and testing. The chemical engineering students have assisted the TSC with knowledge of plant design and specification. The station has also been able to draw students from the Departments of Marketing and Accounting into the workings of the station. For example, the marketing management students assisted the station in designing and printing marketing materials including business cards for staff at the station and updated the service catalogue. At the same time, the accounting students prepared monthly financial statements, audited financial documents and facilitated payments of service providers and suppliers.

3.1.4 Successes of the TSC

Through the technical support of the TSC some clients have been able to participate in the formal economy as shown in Box 3.1

Box 1: Selected success stories of the TSC

After the assistance of TSC a client was able to win a tender at the Department of Health to supply the Department with hand soap and other detergents. Further, she was able to supply a Spar supermarket in Pretoria with her cleaning products. The TSC has assigned a student intern to continue to assist the client with the process of manufacturing and to monitor the quality of her products. Another client who manufactures a wide range of herbal creams was able to expand her client base due to the fact that clients were more comfortable to use her natural herbal extracts to loose weight after receiving training from TSC. The client was also trained in the development of new products, and packaging. In another instance, a client was able to increase the manufacturing capacity, move from smaller premises to bigger premises, had the products certified by SABS, and able to supply the Spar Supermarket in the town of Germiston, secured a contract with Johannesburg Water to supply the cleaning products, offered an

opportunity to use “Proudly South Africa” logo since the products were SABS certified, and employed two workers to market the products of the company. An important intervention relates to the assistance the TSC offered to a company called KIARAH Chemicals. The TSC assisted the company to obtain ISO 9001:2000 accreditation through the SABS. The TSC is now in the process of assisting the company to set up a mini laboratory for quality control and testing.

TSC provides internships to few students due to limited capacity at TSC and thus contributes to employability of the students. For example, the accounting student that assisted TSC with accounting services later secured permanent employment with the Department of Correctional Services. Overall, TSC interns have managed to secure employment in different private sector companies including the mining sector and pharmaceutical laboratories. This success can be attributed to the technology station’s efforts that ensure that students acquire technical skills that make them readily employable in the private sector. The TSC training addressed the key concern of the employers that of making students industry ready. While this was not the original intention of the TSC, the result is however, praiseworthy. This marks the end of the discussion of technology stations as disclosed by official documents. The following section explores the relationship between the university on the one hand and society and the productive sector on the other hand as revealed during the interviews.

4. RELATIONSHIP OF THE UNIVERSITY WITH SOCIETY

In exploring the relationship between the university and society, some observations were made. It was argued that universities used to be viewed as ivory towers although that perception is slowly changing¹. It was also pointed out that sometimes universities did not understand societal realities². That is to

¹ Interview, 26/11/2007

² Interview, 26/11/2007

say, the society still does not fully understand what is done at university that can benefit the society³. Accordingly, it was emphasized that the university needs to understand the problems of society, such as, employment and employability of students, and begin to address them⁴.

It emerged that the objectives of the interactions between university on the one hand and society on the other hand tends to be motivated by perceived benefits that the participants can derive from each other. In order to improve the relationship between society and university, it was observed that dialogue was important and that the government could play a facilitative role in that regard. First, there is a need to create space to test the thinking that occurs at university. Second, there is a need to define priorities that are of common concern between society and university⁵. Third, the university needs to market its services⁶. A logical belief is that the university can improve its relationship with society through its third mission particularly if it is relevant to society and the productive sector.

5. MISSIONS OF THE UNIVERSITY

The university views its mission in terms of four broad areas, *viz*, to serve and empower society; to extend the parameters of technological innovation; to establish and maintain strategic partnership networks locally and internationally; and, to create, apply and transfer knowledge of an international standard (Tyobeka, 2007). The field interviews, however, emphasized two missions of the university, *ie*, teaching and research⁷. A senior university manager also agreed that the main missions of the university are, teaching and research but went on

³ Interview, 17/10/2007

⁴ Interview, 24/10/2007

⁵ Interview, 26/11/2007

⁶ Interview, 24/10/2007

⁷ Interviews, 22/10/2007; 19/11/2007; 26/11/2007

to add innovation, and community engagement⁸. While there is no common view of the missions of the university, there is an implicit understanding that the university is expected to generate new knowledge, produce high-end human capital that can participate in advancing global stock of knowledge and research⁹. The emphasis was placed on producing employable graduates¹⁰.

The third mission of the university is also worth exploring. More specifically, the interviews revealed an emphasis on community involvement and making the university accessible to the community. There was an expectation that the university should have both social and economic impact in society¹¹. Logically, it is through the third mission that the university can be expected to strongly remain relevant to society. Innovation and technology transfer were seen as two areas through which the university could implement its third mission. Emphasis was placed on making the university relevant to the needs of the industry. An important response was identified in the area of customizing the university's training to the relevant needs of society and industry'¹². Even academics at TUT stressed the need to utilize the existing infrastructure and human resources to deliver services to the industry¹³. The senior personnel at TUT also disclosed the need to develop strong relationships with venture capitalists¹⁴.

What emerged from the interviews is a third mission that should be closely linked to the industry. However, it also emerged that the relationship between the university and the productive sector is neither a mature one nor a very successful one. The university tends to depend on the Department of Education

⁸ Interview, 23/11/2007

⁹ Interview, 30/10/2007; 21/11/2007; 26/11/2007

¹⁰ Interview, 19/11/2007

¹¹ Interview, 22/10/2007

¹² Interview, 26/11/2007

¹³ Interview, 24/10/2007

¹⁴ Interview, 23/11/2007

from where its funding is mainly sourced. Consequently, the university fails to nurture other relationships with the industry¹⁵.

A promising observation was that of an emerging relationship with the productive sector where the university was evolving from being a training provider to problem solver¹⁶. The industry was, however, still concerned with issues of confidentiality and product quality. That is to say, the industry did not trust that university could produce quality products¹⁷. However, the linkages with various industry players were slowly diminishing these concerns. In particular, the specific linkages with design, manufacturing, and maintenance sectors of the industry were improving the perceptions about the university¹⁸. For example, some industry players in the chemicals sector were beginning to approach the TSC for ideas and requests to develop new technologies¹⁹. Overall, it has been observed that the technology stations are contributing to the implementation of the university's third mission. However, their focus is still on micro and small enterprises rather than medium and big industries where more jobs can be created (CHE, 2008). Finally, while the third mission is increasingly becoming important at the university, its organization has not yet achieved its place in the structure of teaching and research.

6. CONCLUSION

It has been observed that as the country becomes more knowledge base, industry and commerce tend to demand a higher level of education, knowledge and skills from their human resources. Similarly, as the university strives to become more relevant to society and the productive sector, its third mission

¹⁵ Interview, 26/11/2007

¹⁶ Interview, 30/10/2007

¹⁷ Interview, 24/10/2007

¹⁸ Interview, 24/10/2007

¹⁹ Interview, 17/10/2007

becomes more critical. More importantly, the challenges of technology transfer and development of technology-intensive industries place the university at the heart of human capital development and science-led innovation which is central in the development of knowledge-intensive industries.

The review has shown that the two technology stations located at Tshwane University of Technology represents an intervention by the national Department of Science and Technology to fulfil the policy objectives of the White Paper on Science and Technology. Whilst these are largely being fulfilled in so much as they contribute to improving the performance of the National System of Innovation; more work needs to be done to further embed the learning generated from this programme in the workings of the Faculties of the University itself. The alignment of Technology Stations with the formal teaching and research agenda of the University will assist in defining the third mission in an unambiguous manner. Such a redefinition offers much towards generating better performance management metrics which will enhance the sustainability, impact and outcomes of the Technology Stations programme.

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