

Undergraduate engineering training through institutional collaboration in the Southern African region

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Abstract

The University of the Witwatersrand (Wits) and The University of Namibia (UNAM) signed an Agreement of Co operation (AOC) in 2000. This agreement, which formalised an existing informal collaboration, was primarily targeted at facilitating the transfer of potential Unam undergraduate engineering students to pursue engineering studies at the WITS Faculty of Engineering as well as improving staff collaboration in research and teaching. Students from UNAM's pre engineering programme and science departments have been beneficiaries of this agreement. Four years later, an evaluation of the collaboration reveals critical issues *vis à vis* decreasing student enrolments, unimpressive student graduation rates, and financial and operational complexities affecting student mobility all of which have institutional as well as regional implications. This paper presents highlights and pertinent lessons of the collaboration, and recommendations for similar collaboration in the Southern African region both at an institutional and regional level. As a whole, the paper uses the Wits experience to extrapolate principles and strategic issues facing institutions involved in academic collaboration and cross border movement of students within the Southern Africa region.

INTRODUCTION

The Southern African Development Community (SADC) has expressed its vision for the regionalisation of education in its Protocol on Education and Training (hereafter referred to as The Protocol) (SADC 1999). The preamble of the protocol states that

- the development of human resources is the *sine qua non* for tackling socio-economic problems facing the region
- socio-economic and technological research is crucial for sustainable development
- no SADC member state can alone offer the full range of world quality education and training programmes at affordable costs and on a sustainable basis
- in education and training, a concerted effort by member states is necessary to adequately equip the region for the twenty-first century and beyond
- a concerted effort can only be effected through the implementation of

coordinated, comprehensive and integrated programmes of education and training that address the needs of the region.

To achieve the above, member states agree, *inter alia*, to:

- maximise the effective utilisation of existing regional expertise, institutions and other resources for education and training in the region, in order to ensure long term sustainability of the co-operative effort
- reduce and eventually eliminate unnecessary and costly duplication of effort in the provision of education and training
- facilitate the movement of students and staff within the region.

Bowles and Funk (1996) describe academic mobility in the international context in terms of a movement metaphor. They refer to the physical movement of students and staff across borders; the electronic transfer of information and expertise; personal and cultural changes as students expand their vision; growing awareness of bigger contexts; the transfer of expertise from one campus or society to another; international interaction and support; and the effects of rendering development assistance to needy countries. Regional higher education, as reflected in the protocol, is embedded in a broader context of economic development in a region where the optimal sharing of resources is a *sine qua non* for personal, institutional, national and regional progress. The very essence of education being the upliftment and improvement of quality of life through the most appropriate levels and measures of provision (Kamper 2002). The current realities of our ever-shrinking global village and the complexity of phenomena that demand a multidimensional research approach, underpin the need for African academic partnerships, team research and the exchange of expertise (Malan 2001). As such, the protocol highly 'favours student and staff exchange programmes negotiated on a bilateral and multilateral basis . . . for educational purposes' (SADC 1999). The ultimate aim of the potocol is to progressively achieve, over a period not exceeding 20 years from 1999, the equivalence, harmonisation and standardisation of the education and training systems in the region. In response to this instrument, the University of Namibia (UNAM) and Wits signed an Agreement of Cooperation in 2000. Specifically, the agreement required Wits to assist UNAM in training its potential engineering students and in establishing a Faculty of Engineering. UNAM was at the time, ill-equipped to run a suite of engineering programmes and Wits was to gain from this collaboration through increased international student numbers and income, and better utilisation of its teaching and research capacities. Highlights of the collaboration since inception include decreasing student enrolments, unimpressive student graduation rates, and financial and operational complexities affecting student mobility. This paper employs the Wits experience to extrapolate some principles and strategic issues facing institutions involved in similar collaboration within the Southern Africa region.

In the sections that follow, the paper addresses the following: it provides a background for the need of the UNAM–Wits collaboration and presents the problem statement; it documents and discusses highlights of the collaboration pre- and post-the agreement and uses some of the issues highlighted to mirror regional paradigms in academic mobility. In the same breadth, it proffers recommendations for future progress in institutional collaboration within the region.

BACKGROUND

After many decades of colonisation, the Republic of Namibia gained political independence from South Africa in 1990. Namibia is a vast country with land area of about 825 418 km², a population of 1.8 million (2000 est.) and a gross domestic product (GDP) per capita of US\$4 300 (1999 est.). Racial proportions are 86 per cent African, 7.4 per cent coloured and 6.6 per cent white. The country is endowed with rich mineral resources and has a thriving mining, livestock, grain and fishing industry (MAPQUEST 2005). For historical reasons, Namibia inherited a weak base in science and technology: colonial governments minimised the education of the local, largely African population, especially in subjects related to physical sciences and mathematics. A spin-off from this deprivation is the vicious cycle of the non-availability of suitably qualified teachers of mathematics, the natural sciences and commerce and therefore, students, who would in turn teach others (Mji 2002). As a result, Namibia faces an acute shortage of professional and technical manpower in almost all fields of engineering (Bisanda 2000). This shortage is significant in light of the vast resources that remain undeveloped and/or underdeveloped.

To meet growing human resource requirements, the University of Namibia Act 18 was passed on August 31, 1992 (UNAM 2004). This Act enabled the university section of the then National Academy to become a university. The programmes inherited from the Academy were mainly related to arts and social sciences. Although the Faculty of Science existed at that time, it was poorly equipped in terms of staff, teaching and research facilities. A five-year development plan drawn up in 1994 facilitated the expansion of the Faculty of Science that currently runs amongst other things, a two year pre-engineering programme (Bisanda 2000). Establishing a Faculty of Engineering has been difficult for several reasons including the low student uptake of high level science and mathematics, insufficient seed money and difficulties in recruiting qualified academic staff (Bisanda 2000). Added to the above, is the low population numbers in Namibia making it difficult to justify investment in a Faculty of Engineering. The current decision to go ahead with an incremental approach to establishing the Faculty of Engineering is driven by a combination of growing population, development need and future expectations of growth.

The 1st year of the pre-engineering programme, which is a general science programme with emphasis on physical sciences and mathematics, is targeted at

upgrading the knowledge and skills of students who completed secondary education with an International General Certificate for Secondary Education (IGCSE) to the level of the Higher International General Certificate for Secondary Education (HIGCSE). IGCSE examinations (a lower grade than HIGCSE) are set and marked in Namibia but moderated by the University of Cambridge while HIGCSE examinations are set, marked and moderated by the University of Cambridge. The second year of the pre-engineering programme is considered by UNAM to be equivalent to the 1st of 4 years towards a Bachelor of Science in Engineering degree (B.Sc. (Eng.)). This component has a strong emphasis on basic engineering sciences such as engineering mechanics, drawing and engineering mathematics. Students with a complete suite of required HIGCSE subjects may be directly admitted into the second year of pre-engineering programme.

By an Act of Parliament in 1994, parallel developments were realised at the Technikon section of the then National Academy, transforming it into the Polytechnic of Namibia (PON) (PON 2005). PON offers Certificates, Diplomas and Bachelor of Technology (B.Tech.) degrees in a number of engineering fields. The current Diploma and B.Tech engineering programmes do not meet national requirements for registration as Professional Engineer as the Namibian Engineering Council will only consider B.Sc. (Eng.) degree graduates for registration. The gap created by a lack of resources to train indigenous engineers has encouraged the influx of expatriates into the Namibian engineering profession. A study in 1996 revealed that about 45 per cent of all engineers in Namibia were expatriates, 40 per cent of established engineering posts in the public service were not filled and 60 per cent of the occupied posts were filled by non-Namibians (Thomas 2000). To bridge this gap, UNAM has looked to better-equipped institutions in the SADC region to assist in training its potential engineering students: Wits was considered as one of such institutions.

This article highlights issues related to the financial and operational complexities influencing student mobility and training in the Southern African region as mirrored through the UNAM–Wits collaboration. The specific question addressed with regard to this collaboration is, how can the Wits Faculty of Engineering (hereafter referred to as Wits Engineering) maintain and grow its UNAM student enrolments? At Wits, the experience has been declining UNAM student enrolments and unimpressive throughput (graduation and retention) rates (see Table 1). This paper will contribute to the question by analysing what went wrong at Wits. In the paper, the distinction of the two streams from UNAM (i.e. students from UNAM's science departments and pre-engineering programme) is aimed at facilitating effective faculty admission and retention interventions for these students. The interventions recommended would likely be useful for other Southern African students and institutions faced with similar challenges.

On the regional scale, it was envisaged that the following factors may provide answers to the specific question addressed in the UNAM–Wits collaboration:

Table 1: UNAM's SD and PEP student statistics at Wits Engineering

Year of first registration	SD (No.)				PEP (No.)			
	Enrolments	Total graduated	Graduated in the minimum time	Dropped out	Enrolments	Total graduated	Graduated in the minimum time	Dropped out
1997	6	5	1	1				
1998	1	0	0	1				
1999	4	3	3	1				
2000	0	0	0	0				
2001	0	0	0	0	5		2	1
2002	0	0	0	0	1			0
2003	0	0	0	0	5			2

- The quality of administrative service students receive when they apply or make contact with the receiving institution
- The reputation or public image of the receiving institution
- The career prospects associated with the programmes of study offered at the receiving institution
- Financial aid available to the sending institution's students
- The receiving institution's marketing initiatives at the sending institution
- Proximity of the receiving institution to the student's homes
- Social conditions such as crime and 'foreigner-friendliness' in the receiving city
- Settling down experiences of students at the receiving institution
- Students' qualifications and academic experience prior to enrolling at the receiving institution and
- The students' performances in course assessments over each academic session at the receiving institution.

RESEARCH METHOD

A descriptive survey study involving UNAM students at the Wits Engineering and the UNAM pre-engineering programme was conducted in addition to a longitudinal study on UNAM (science department and pre-engineering programme) students' academic performances at the WITS Engineering. Data for the former study were collected using a questionnaire designed and administered by the researchers. Data for the latter study was generated from the WITS academic database. The characteristics of the participants, their responses and detailed discussions are presented below.

RESULTS AND DISCUSSION

In addressing the question above, this section has been divided into two parts. In the first part, biographical and background information of the respondents is presented. This is then followed by respondents' responses to the different statements given and discussions surrounding the issues raised. The second part presents information about respondents' performances in course assessments over each academic session while distinguishing UNAM's science department and pre-engineering programme students. A general overview at the end of each part, mirrors on a regional scale, some highlighted institutional issues.

PART I

BACKGROUND AND BIOGRAPHICAL INFORMATION OF RESPONDENTS

16 (out of 18) UNAM students enrolled at the Wits Engineering (Group A) and 19 (out of 23) pre-engineering programme students enrolled at UNAM (Group B) completed and returned the questionnaires during the third quarter of 2004. Of the 16 students comprising Group A: 1 is from UNAM's SD, 12 are from the UNAM pre-engineering programme and 3 are from other institutions; 12 are male and 4 are female; 1 is white and 15 are black. Of the 19 students comprising Group B: 17 were in their final (2nd) year of PEP study and at the stage in their lives were continuation of their studies was high priority. They therefore bring a fresh perspective to the statements posed in the questionnaire; 17 are male and 2 are female; 1 is coloured and 18 are black.

Table 2 presents a response profile to some of the statements in the instrument (the abbreviation NAns represents No answer proposed by the respondent).

FINANCIAL CONSIDERATIONS

Statements 1 to 5 sought to determine the extent to which financial considerations determine respondents' choice and enrolment at an SADC tertiary institution.

On respondents' tuition and living expenses in South Africa, the majority of the respondents (15 of Group A and 16 of Group B) are sponsored by public or private institutions. These include national government departments, international non-profit organisations (e.g. the Swedish International Development Co-operation Agency (SIDA) and multinational corporations (e.g. Namdeb Diamond Corporation (Pty) Limited). Over the years, Namibian government bursaries have proven insufficient to cover expenses for tertiary education in South Africa (Thomas 2000). Hence, the majority of Group A (14 No.) were sponsored by Namibian-based multinational corporations. In 2004, only 1 respondent in Group A was enrolled at Wits Engineering with a Namibian government bursary. Prior to 2004, SIDA sponsored a large number of bursaries to study especially Civil and Environmental Engineering at Wits Engineering.

Table 2: Questionnaire response profile

Serial No.	Statement	Group A (No.)			Group B (No.)		
		Yes	NAns	No	Yes	NAns	No
1	I have a bursary to study at Wits	15	0	1	16	0	3
2	My bursary specifies that I must study at Wits	2	0	14	3	1	15
3	WITS charges lower fees compared to other comparable institutions in Southern Africa	9	0	7	12	1	6
4	Payment of fees upfront discouraged my interest in Wits	8	1	7	7	2	10
5	The distance of Wits from my home is acceptable	10	0	6	8	0	11
6	At the time of application, Wits was my first choice university	4	1	11	16	0	3
7	Wits offers qualifications of a very high standard	16	0	0	19	0	0
8	A qualification from Wits guarantees one employment	13	0	3	18	1	0
9	I am confident of graduating at Wits at the minimum time	12	1	3	18	1	0
10	The admissions process was quick, very clear, straight-forward and smooth	9	0	7	6	2	11
11	Administrative staff were/are very friendly	12	0	4	15	0	4
12	I first heard about Wits from Wits marketing initiatives	8	0	8	13	0	6
13	I was attracted by the institutions physical appearance	12	0	4	19	0	0
14	High crime rates in Johannesburg negatively impacted my interest in studying at Wits	12	0	4	14	0	5
15	My settling-down to study at Wits was smooth	10	0	6			
16	I like the main language of communication at Wits i.e. English	13	0	3	17	0	2
17	My friends at Wits had a major influence in my interest in Wits	6	0	10	5	0	14

A closer look at the respondents' bursaries reveals a bias for certain engineering disciplines. The multinationals, because of their directed business thrusts, favour Mining Engineering and its related disciplines. In this case, of the 14 respondents in Group A sponsored by multinational corporations in 2004, 10 were enrolled in the School of Mining Engineering, 3 in the School of Process and Materials Engineering and 1 in the School of Electrical and Information Engineering. There were no enrolments in the School of Civil and Environmental Engineering. It may seem that because of the bias above, students desirous of pursuing engineering studies at other SADC institutions and in need of bursaries, may be obliged to choose Mining Engineering and its immediately related disciplines.

Statement 2 required respondents to indicate the extent to which sponsors influenced the choice of tertiary institution in which they were intending to or presently studying at. The responses indicate that the choice of tertiary institution was primarily made by non-sponsors (14 of Group A and 15 of Group B). Non-sponsors refer most probably to respondents and/or their families. In effect, this response profile suggests that level of enrolments may be influenced by marketing initiatives (e.g. exhibitions, promotional visits and media adverts) of cross-border institutions specifically targeted at prospective students and their families. In principle, sponsors do not force their bursary students to attend a specific institution except where, *inter alia*, precedence indicates the perceived superiority of graduates from one institution above others, an institution's *alumni* are able to influence bursary awards to favour their *almamater*, or cultural compatibility (such as race or language) is used. The first reason applies to many of the respondents who were obliged to study at Wits.

A larger proportion of Group A (9 No.) and Group B (12 No.) expressed a perception that Wits charges lower fees in comparison with other institutions in South Africa. This means that Wits should be a more attractive study option for especially aspiring self- and government-funded students as hardships due to insufficient funds may likely be minimised at Wits in comparison with other South African institutions. A useful addition to the response profile above would have been the responses of applicants who were offered a place at Wits but due primarily to financial reasons, enrolled elsewhere. Contrasting the response above is the upfront payment of fees as a Wits requirement for the enrolment of international students. 8 respondents in Group A and a slightly lower, yet significant number of Group B (7) indicated that the requirement of upfront fees payment discouraged their interest in Wits. This applies especially to self-funded students and bursary students, who may, for one reason or another, be required to pay all or some of their fees in advance before enrolment.

In respect of the distance of Wits from respondents' homes, 11 respondents in Group B indicated that they consider the distance to be unacceptable. This concurs with the view by Bowen (1977) and Imenda et al. (2002) that due to the need to be close to home, most students and/or parents would preferably choose from several universities in the vicinity of their home locations. This is understandable considering that many of the students are recently out of high school and desirous to be close to home. Nonetheless, acculturation is seen in the response of Group A (10) who, after settling down to studies at WITS, do not consider the distance unacceptable. The implication of the above is that distance from home is likely to take lower priority in the decision-making process for mature/experienced (in respect of age and travel) students. In many instances, larger proportions of international students have enrolled at historically White universities because of the better-developed infrastructural and research capacity and a broader curriculum on offer than historically Black universities (Rouhani and Paterson 1996) situated closer to their home locations.

From the above, it can be concluded that financial considerations play a significant role as regards student mobility in the Southern Africa region. Critical amongst the parameters considered above and reflected on a regional scale is the high dependence on non-governmental sources for funding student bursaries outside national borders. In agreement, Kamper (2002) emphasises the regional mobility of students as a market phenomenon that has an elitist (in a financial sense) dimension. As a result, the relatively small number of students who can afford it or have been successful in acquiring bursaries, move to reputable providers of quality education. In consequence, students unable to secure bursaries, are government sponsored or desirous of pursuing 'remotely relevant' disciplines are likely to be marginalised. Non-governmental support in this regard may therefore be considered a strength and weakness. As the latter, if it encourages the development of skills primarily for the use of the donor to the detriment of public organs and if it perpetuates the so-called foreign training disease whereby promising students are lured away, in many cases never to return to their home countries. As the former, it can be constructive in building skills and institutional capacity locally and in the region (Kamper 2002). Non-governmental institutions are therefore critical to socio-economic development and we would argue that they must be prepared to cooperate far more openly with governments to achieve economies of operation in skills development that are not achievable at a local level.

Another parameter implicitly reflected on a regional scale is the 'creaming' or poaching from other nations, high academically achieving students (those most likely to have acquired bursaries). Most higher education institutions in South Africa aim to have about 10 per cent of admission places available for international students (Smallwood and Maliyamkono 1996). Several reasons including the need to promote diversity as a core value – not only in terms of race, gender, religion, orientation and culture, but also of opinion – are used (Rouhani and Paterson 1996). To be truly relevant, institutional diversity must be embraced and strived after (Rouhani 2002) and without doubt, the presence of international students facilitates the realisation of this core value (Smallwood and Maliyamkono 1996). The inflow of high achieving students is also beneficial to the receiving institution/country in the long term if these students complete their studies successfully and obtain gainful employment (the issue of displacing locals in the job market arises, but it is not pursued further here) (Malan 2001). While attempting to meet these critical regional and institutional needs for institutional diversity and a qualified work force, care must be strongly exercised not to be seen to be poaching students from neighbouring countries where local institutions that can perform similar training functions exist – thereby perpetuating the 'foreign training disease'. This does not mean that international students should be turned away if their home institutions offer the qualification they seek to register for at the South African receiving institution rather than active recruitment programmes by South African institutions should be avoided in such a neighbouring country.

INSTITUTIONAL REPUTATION

Another factor postulated as responsible for respondents' choice and enrolment at an SADC tertiary institution is the image, reputation and quality of graduates of the receiving institution. Items 6 to 9 addressed this factor.

Of Groups A and B 100 per cent perceive the qualifications attained at Wits to be of a very high standard. A similar indication is shown in response to statement 8 majority of both respondents agree that a qualification from Wits guarantees employment. The positive assessment of Wits degrees is further reflected in the response by 16 respondents in Group B concerning their first choice university (statement 6). Mji (2002) concurs with the explicit premise of these responses – that obtaining a qualification would enable graduates get a good job and that qualifications of a high standard attracts applicants and will further increase the quality and reach of jobs available to graduates. However, poor student graduation rates (see Part II) may help dampen these suppositions by observing the responses of Group A to statement 9: 3 respondents in Group A indicate that they are not confident of graduating at the minimum time while 1 presented no answer to the statement. Similarly, a majority of Group A (11 No.) did not choose Wits as their first choice university at the time of application (statement 6). It may be that in retrospect, after some unpleasant experiences reflected in responses to statements 10, 14 and 15, Wits has become unattractive in comparison with other institutions.

Since students gravitate naturally towards centres of excellence (Smallwood and Maliyamkono 1996), it is becoming increasingly obvious that developing certain critical skills within the SADC region may only be possible through the recognition and advocacy for regional centres of excellence. This in no way implies the need to develop these institutions from scratch, but simply to recognise and upgrade certain reputable national institutions and programmes to regional centres of excellence (especially in capacity building of research and tuition). Resources in different locations within the region may be grouped in terms of already established performances (Kamper 2002) as tertiary-level institutions operate in a field and at a level where internationalisation is already highly developed, and where traditions of cross-border cooperation are already well established. The creation of such centres is always a sensitive issue because they symbolize an important stage in the process of regional integration and cooperation, and can pose a significant threat to even well-established national centres. Hence, the need to also recognise that a regional approach to human resource development will only succeed if the political will to pursue a regional solution is sufficiently well-developed to be accepted by all the key actors involved (Smallwood and Maliyamkono 1996).

ADMINISTRATION AND GENERAL IMPRESSIONS

Administrative efficiencies are aspects of an institution that are critical to the first impressions created in the mind of aspiring applicants. Statements 10 to 15 sought to determine respondents' opinions.

On the admission process being quick, very clear, straightforward and smooth, 7 of Group A and 11 of Group B thought otherwise. Nonetheless, a high proportion of Group A (12 No.) and Group B (15 No.) thought administrative staff were very friendly. That a high proportion of Group B thought the admissions process was fraught with difficulty poses a challenge to institutional enrolment processes. From follow-up discussions, many of the respondents received admission responses very late and past the application deadlines for bursaries which they desired to apply for. Also, admission responses arrived at a time when it was too late to pursue study permit applications. In fact, the institutions that responded quicker and positively to admission applications attracted the largest enrolments from Group B.

Statement 13 strongly indicates that the institution's physical appearance is relevant to the decision-making process regarding applicants' choice of university. Rouhani and Paterson (1996) indicate that the geographic location of the historic White universities in the cities is attractive to international students. Despite this, the high crime rate in Johannesburg plays a significant role in negatively influencing students' interests in studying at WITS. 12 respondents in Group A and 14 respondents in Group B confirm this. This is of concern as most universities facing this problem are limited in their ability to provide direct solutions to this response. Nonetheless, they can strengthen their on- and off-campus security systems. Marketing these security initiatives will facilitate applicant's confidence in their security before, during and after enrolment.

LANGUAGE

Language is an important aspect of the political education discourse in Southern Africa presently one which may remain so for sometime to come (Malan 2001, Imenda et al. 2002). Overall, the response profile on this issue is as follows: 13 of Group A and 17 of Group B indicated that the medium of communication at Wits (i.e. English) was acceptable. 3 of Group A and 2 of Group B were unsatisfied probably because the medium of communication amongst these respondents is Afrikaans. In the past, although a greater proportion of international students were enrolled at English-medium universities than at Afrikaans-medium universities in South Africa, most Namibian students attended Afrikaans-medium universities as Afrikaans was an official language in Namibia prior to independence. That is why in 1992, 72 per cent of 763 Namibian students in South Africa were at Afrikaans-medium universities. At the time, the Namibian contingent contained significant

proportions of White nationals. The cultural and historical links between these White Namibians and historically Afrikaans-medium universities can be traced back to the colonial era (Rouhani and Paterson 1996).

This language legacy of postcolonial Africa has its advantages and disadvantages. In respect of the former, it greatly simplifies the process of cooperation and student mobility between already affiliated races and institutions and facilitates a smoother and quicker settling down experience for students. In respect of the latter, it greatly inhibits cooperation and mobility across the language divide even when all geographical and historical logic favours collaboration (Smallwood and Maliyamkono 1996). It therefore contradicts the current recognition of diversity as a core institutional value (as discussed above) and perpetuates separate development along language and therefore racial lines. To enhance student mobility within the region, language and cultural barriers should be almost non-existent (Kamper 2002) in tertiary institutions.

OVERALL IMPRESSION

One way to determine an individual's overall impression about an institution is to enquire if the individual would recommend friends and family to study at the same institution (Imenda et al. 2002). Sadly, in response to the statement 'my friends at Wits had a major influence in my interest in Wits', only 6 of Group A and 5 of Group B answered in the affirmative. Patrons and *alumni* have been proven to be effective in marketing their *almamater* (Imenda et al. 2002), and the responses to this statement indicates that institutions need to recognise the negative parameters militating against its patronage and rigorously re-orientate itself to addressing these parameters.

On the regional scale, South African universities are a major attraction to international students. In 1992, 4603 international students were registered in South African universities putting South Africa in the top 40 of the world's host countries for international students. In Africa, only Egypt (5752) hosted more international students in that year (Rouhani and Paterson 1996). In 1998, 67 per cent of international students at South African universities originated from the African continent, with the majority (62%) from SADC and the largest groups from Zimbabwe and Namibia (Rouhani 2002). Reasons for this attraction includes the fact that African currencies are generally weak compared with those of first world countries and the cost of African students studying in these countries can be prohibitive, and SADC students pay South African fees. It makes economic sense therefore to consider studying in a first-class African university (such as exists in South Africa) (Malan 2001). Also, first class African universities have better chances of providing learning experiences that are relevant to the problems of the continent in comparison to first world universities. Therefore, in order to grow centres of excellence in the SADC region, universities need to improve the living and learning experiences of their patronage. South African universities, by

enrolling increasing international student numbers, are also likely to attract greater donor support from international agencies, especially for universities serving critical needs of the region. In addition, South African students will benefit from academic and social interactions with international students and in time, South Africa could derive financial and political benefits through ties and loyalties developed with former students (Rouhani and Paterson 1996).

PART II

LONGITUDINAL STUDY OF UNAM STUDENTS' ACADEMIC PERFORMANCE

Internationally, students' probability for success in further study is largely influenced by their home and school backgrounds (Zaaiman et al. 1998). This section therefore investigates UNAM (SD and PEP) students' academic performance at Wits Engineering (using a longitudinal study of academic records from 1997 to 2004 inclusive) in relation to their pre-Wits qualifications. The study was conducted to aid the analysis of the unimpressive throughout (graduation and retention) rates since the UNAM–Wits collaboration began. In all, 12 SD students enrolled at Wits Engineering between 1997 and 2004 inclusive and 15 PEP students enrolled between 2001 and 2004 inclusive. The points below are based on a summary of the findings presented in Table 3.

Between 2001 and 2004 inclusive, 4 of the pre-engineering programme students dropped-out/were excluded while between 1997 and 2004 inclusive, 4 of the science department students dropped-out/were excluded. In a detailed analysis not presented in Table 3, the science department students, on average, accrued a higher number of Student Years (2.75) per drop-out/excluded student than the PEP students (1.0). 2 of the 4 science department drop-out/excluded students averaged 4.5 Student Years before exclusion.

Science department graduates accrued a total of 6 repeat years (5 of which were in the third and fourth years of study) between 1997 and 2004 while pre-engineering programme graduates accrued a total of 4 Repeat Years between 2001 and 2004 (all of which were in the first and second years of study).

Reasons for the trends above could be that (1) In general, science department students at enrolment, may be more mature in age and experience than the pre-engineering programme students and hence more resistant to abandoning their studies as a result of one or more failures (points a and b). In comparison, all the drop-out/excluded pre-engineering programme students abandoned their studies during the earlier years of study (point b) and in many cases, did not appeal for readmission. (2) the current Wits Engineering rules readmitting excluded students have become more strict, making it difficult for failed students to be readmitted (point b) (3) today, it may appear that many more students are enrolling into

Table 3: UNAM science department and pre-engineering programme students' academic performance at WITS Engineering

Year of first registration	Stream*	Registered	Registered into second year	No. who dropped-out/were excluded after one or more years of registration	Graduated in registered year (No.)			Of these graduates and those still regd. (No.)					Still registered	Average				Graduated %		
					4	5	6	was excl. & re-admitted	rpt 1st yr	rpt 2nd yr	rpt 3rd yr	rpt 4th yr			No. of years to graduate		No. of student years per graduate			
															Now	Poss.	Now	Poss.	Now	Max Poss.
1997	SD	6	1	1	1	3	1	3	1	0	3	2	0	5.0	5.0	5.8	5.8	83	83	
1998	SD	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1999	SD	4	0	1	3	0	0	0	0	0	0	0	0	4.0	4.0	4.3	4.3	75	75	
2000	SD**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
2001	SD**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
2002	PEP	5	0	1	2	0	0	0	1	1	0	0	2	4.0	4.5	9.0	5.0	40	80	
	SD**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
2003	PEP	1	0	0	0	0	0	0	0	0	0	0	1	0.0	4.0	0.0	4.0	0	100	
	SD**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
2004	PEP	5	2	2	0	0	0	0	0	1	0	0	3	0.0	4.0	0.0	5.0	0	60	
	SD	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOT	PEP	4	2	1	0	0	0	0	0	1	0	0	3	0.0	3.7	0.0	4.0	0	75	
	SD	12	2	4	4	3	1	3	1	0	3	2	0	4.5	4.5	5.1	5.1	67	67	
	PEP	15	4	4	2	0	0	0	1	3	0	0	9	4.0	4.0	9.0	4.5	13	73	

*Scienc department and pre-engineering programme represents students enrolled at Wits Engineering from UNAM's science departments and pre-engineering programme respectively

** – represents no enrolments in that year for that stream

tertiary institutions without much conviction about their preferred course of study. Hence, a failure in the first few years of study (point b) could easily deter a student from pursuing that career path.

In comparison with the SD students (2 No.), a higher number of pre-engineering programme students (4 No.) were first enrolled into the second year of study. This is primarily because the pre-engineering programme is considered to cover a significant proportion of a first year B.Sc. (Eng.) degree programme. Although the Wits Engineering admissions staff recognise this fact when evaluating the admissions applications for pre-engineering programme students, a blanket cover admission into second year of study is not applied. Rather, the second year pre-engineering programme students who are directly admitted into the second year of study at the Wits Engineering are those students who have not failed a course during the pre-engineering programme and have done exceptionally well academically. It must be noted however, that this admission process is sometimes encumbered by the ambiguities associated with evaluating academic transcripts for curricula that is not well understood.

The pre-engineering programme students that are first enrolled into the second year of study are expected to spend 3 Student Years per Graduate. Of the 4 pre-engineering programme students first enrolled into the second year of study, 1 dropped-out/was excluded and 2 have repeated one year of study. Currently, the Average Possible Number of Student Years per Graduate that can be achieved from the pre-engineering programme student stream is 4.7. Of the 2 science department students that were first enrolled into the second year of study, 1 dropped-out/was excluded and the other took 5.0 Student Years to Graduate. By implication, although a higher number of PEP students are admitted into the second year of study, their academic performances are not significantly better than their science department counterparts.

The Average Possible Number of Years to Graduate that could be achieved in both streams for each academic year reveals that the pre-engineering programme students spend slightly less time to graduate (4.0 years) than the science department students (4.5 years). The same holds true for the Average Possible Number of Student Years per Graduate (4.5 years for pre-engineering programme students and 5.1 years for science department students).

The last column depicting the Maximum Possible Graduated Percentage reveals overall, a higher percentage of graduates from the pre-engineering programme stream (73%) assuming no failures, drop-outs/exclusions and repeats occur during the remaining years of study.

Tables 4 and 5 present data on Clear Passes from each stream enrolled in the first year of study and for each academic year respectively. A Clear Pass occurs when a student obtains 50% or more in all courses taken over a year of study. Although the pre-engineering programme students perform better than the science department students in terms of Percentage Clear Passes in both tables, both streams display an overall declining performance in Percentage Clear Passes. The

better results for pre-engineering programme students (in comparison to science department students), indicates that the pre-engineering programme definitely contributes to upgrading the skills and scientific knowledge of its entry level IGCSE students. This improvement in the pre-engineering programme students is however, not commensurate with their HIGCSE counterparts (Tables 4 and 5). Therefore, the PEP, which aims to upgrade IGCSE level students to HIGCSE level, is achieving some degree of success in this regard but not as significant as initially intended.

DISCUSSION

The equivalence, harmonisation and standardisation of secondary qualifications within the SADC region would eliminate the ambiguities in qualification evaluation and the regional transferability of qualifications as is evidenced in the

Table 4: Clear passes in the first year of engineering study

Academic session	SD			PEP			HIGCSE		
	Enrolled	Clear passes	% Clear Passes	Enrolled	Clear passes	% Clear Passes	Enrolled	Clear passes	% Clear Passes
1997	6	5	83	–	–	–	2	1	50
1998	1	0	0	–	–	–	2	2	100
1999	4	3	75	–	–	–	2	2	100
2000	–	–	–	–	–	–	–	–	–
2001	–	–	–	5	5	100	2	2	100
2002	–	–	–	1	1	100	2	2	100
2003	–	–	–	5	2	40	–	–	–
2004	1	0	0	4	2	50	–	–	–
TOTAL	12	8	67	15	10	67	10	9	0

Table 5: Clear passes over each academic year of engineering study

Academic session	SD			PEP			HIGCSE		
	Enrolled	Clear passes	% clear passes	Enrolled	Clear passes	% clear passes	Enrolled	Clear passes	% clear passes
1997	6	5	83	–	–	–	2	1	50
1998	7	5	71	–	–	–	4	4	100
1999	11	8	73	–	–	–	6	6	100
2000	10	5	50	–	–	–	6	4	67
2001	8	8	100	5	5	100	7	7	100
2002	5	4	80	6	4	67	8	8	100
2003	–	–	–	10	7	70	4	4	100
2004	1	0	0	12	10	83	4	4	100
TOTAL	48	35	73	33	26	79	41	38	93

UNAM–Wits collaboration during the evaluation of admission applications into the second year of study. This can be achieved through regional cooperation in examination systems through the establishment of regional examination boards. Much of SADC has, as part of its historical legacy, a long familiarity with examination systems adapted from mainly European models. In a limited manner, these models have provided an essential point of reference for secondary systems that were not only credible nationally, but also regionally and internationally. Whether these systems are totally adaptable to regional requirements are legitimate concerns that should be answered. Regional examination boards will not only confer greater credibility on the examination system itself but also enormously facilitate mobility and the international recognition of secondary qualifications. Regional examination systems have the further advantage of lending itself to international development cooperation between the first world and SADC (Smallwood and Maliyamkono 1996).

CONCLUSION

In this article, collaboration between tertiary education institutions within the Southern African region is mirrored through the UNAM–Wits collaboration. Based on the analysis presented in Parts I and II of this article, the following statements infer:

- Student bursaries are critical if student mobility beyond national borders is to occur
- Non-governmental institutions (especially multinational corporations) must be prepared to cooperate far more openly with governments in order to achieve economies of operation in skills development that are not achievable at a local level
- To grow centres of excellence in the SADC region, universities need to improve the living and learning experiences of their patronage
- Care must be exercised by South African universities not to be seen to be poaching students from neighbouring countries where local institutions that can perform similar training functions exist – thereby perpetuating the “foreign training disease”
- Regional resources should be grouped and located in terms of already established performance i.e. in focus areas and centres of excellence (Kamper 2002)
- There should be pertinent common interests, circumstances and needs, demonstrable mutual benefits of, and a common loyalty and political will towards regionalism (Kamper 2002)
- The equivalence, harmonisation and standardisation of secondary qualifications will enhance student mobility within the region and can be facilitated using regional examination boards
- Language and cultural barriers should be almost non-existent (Kamper 2002).

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