

# **FACTORS LIKELY TO AFFECT THE SUCCESSFUL COMPLETION OF AN ACTUARIAL QUALIFICATION IN SOUTH AFRICA**

**Nalen Naidoo**

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## **ABSTRACT**

The actuarial profession in South Africa is currently a relatively small body of professionals with the race and gender profile heavily skewed towards White male. In a country as diverse as South Africa, the profession needs to investigate ways to make it more representative of society if it is to continue to prosper. This paper aims to review available literature to identify the factors likely to be critical to student success in undergraduate actuarial studies, post-graduate actuarial studies and eventual qualification as an actuary. By identifying these factors, a greater understanding will be gleaned about what may drive the membership profile of the profession and how these drivers can be leveraged to ensure that the membership profile of the profession adequately reflects the demographic profile of the country. While transformation is likely to be a long process, this study will hopefully compliment the existing hard work in this sphere, and help in reducing the time taken.

## **KEYWORDS**

Successful completion, actuarial qualification, South Africa

## **CONTACT DETAILS**

Nalen Naidoo, 50 St Claire, 147 First Avenue, Kenilworth, 7708. Tel: 082 296 9249.

E-mail: [nalennaaidoo@yahoo.co.uk](mailto:nalennaaidoo@yahoo.co.uk)

## 1. INTRODUCTION AND BACKGROUND

1.1 The actuarial profession in South Africa is currently a relatively small body of professionals (about 800 qualified Fellows and 1300 working student members) (Actuarial Society Database, 2007) that belong to the Actuarial Society of South Africa (Actuarial Society). The race and gender profile is heavily skewed, with 85% of the 2007 Fellow membership base being White male – and, in a country as diverse as South Africa, the actuarial profession needs to investigate ways to make it more representative of society if it is to continue to prosper.

1.2 This need led to the posting of a topic on the Actuarial Society Research Watch covering the supply and demand of actuarial resources in South Africa. Actuarial demand is being dealt with separately in another paper (by Wilma Terblanche) that is still unpublished. For actuarial supply, it is necessary to divide the research into various sub-objectives:

- Determining the factors likely to affect qualification as an actuary
- Building these into a survey for dissemination amongst the membership and performing statistical tests to determine each factor's relative strength
- Constructing a demographic projection model to enable the actuarial profession and other stakeholders to have some view of the future population of actuaries and students, both in terms of numbers, as well as other demographic characteristics
- Linking this supply model to the demand side
- Drawing conclusions around the levers for success that need to be pulled to ensure that the membership profile of the profession adequately reflects the demographic profile of the country
- Using the tool in future for the Actuarial Society and other stakeholders to measure progress clearly and objectively

1.3 This paper aims to achieve the first objective listed above by identifying the factors likely to be critical to the successful completion of undergraduate actuarial studies and post-graduate actuarial studies and eventual qualification as an actuary. While it is likely to take some time before the demographic profiles at undergraduate level are reflected in post-graduate programmes (this is supported by Breier (2006) in

her study of medical doctors), this study will hopefully be a step towards realising why this is. As a result, this paper will attempt to stimulate thinking around the possible levers for success that need to be pulled to ensure that the membership profile of the profession adequately reflects the demographic profile of the country and may serve as a base for further research aimed at achieving the fifth objective above. It will take the form of a review of available literature, with the eventual creation of a survey that can be disseminated amongst the membership. By identifying the factors critical to the success of actuarial students (and possibly, in future, incorporating these into regression models of the probability of qualification), a greater understanding will be gleaned about what drives the membership profile of the profession.

1.4 In looking to improve success and persistency of students, Lotkowski, Robbins and Noeth (2004) suggest a structured approach to ensure that the problem is understood, an appropriate solution is developed and the solution is implemented effectively:

- Determine student characteristics and needs, as well as what resources are available
- Take an integrated approach in retention efforts
- Implement an early alert, assessment and monitoring system
- Determine the cost-benefit analysis of intervention strategies compared to persistence or success

1.5 Applying this to an actuarial context, the first point in paragraph 1.4 would involve (as already mentioned in the second sub-objective in paragraph 1.2) an appropriately designed questionnaire being sent to the membership (given the absence of existing data). The second point in 1.4 would involve considering the different aspects of retention and ensuring that programmes deal with them holistically. The third point would depend on the results of the survey and any further modelling of the actuarial population, as these would indicate the critical factors that need to be monitored and levered as circumstances warrant it. The levels of success and persistency from the fourth point (particularly in the context of setting transformational goals) can be monitored over time, relative to goals, but benefits will

only be fully recognised after at least a decade, when consistent application of the strategies start to yield results.

1.6 While actuarial supply and demand are being covered in different papers, the inter-relationship between the two concepts cannot be over-looked. As Breier (2006, p25) pointed out:

*“Professions and their professional education programmes are seen in relation to national and international professional labour markets and the multiple socio-economic, political and discursive conditions that constitute professional milieu”.*

This professional labour market (both local and international) and other conditions are likely to play a role in informing actual and perceived demand, which often has an effect on the decision to start actuarial studies in the first place. As will be seen in the following sections, the factors influencing a decision to begin studies play an important role in motivation at later stages and, hence, eventual success.

1.7 It is hoped that universities and the actuarial profession can benefit from an analysis of these actuarial critical success factors. From a university perspective, the identification of individual and socio-cultural factors that influence how individual students perform, can help educators modify the learning environment to better suit the circumstances of future students and help them with their transition to university (Burton and Dowling, 2005). It may also help educators identify students who are more at risk of failing or withdrawing and provide career counselling or mentoring, as well as programs that are targeted specifically at enhancing skills. Dickson, Fleet and Watt (2000) also supported the need to understand how and why some students find university success easy, but others struggle, as did Sadler and Erasmus (2005), who felt that understanding what exactly success and failure mean in an academic environment could help improve tuition philosophy and approach amongst educators.

1.8 From a professional perspective, generating a profile of successful students will ensure that students who are ill-equipped to handle the academic pressures are identified early enough for support structures to be mobilised (Bishop and Mane, 2001). This approach may ensure that more students have the necessary skills and knowledge to complete their qualifications, improving pass rates and persistency

amongst the population. Also, the understanding of a the profile of a successful candidate can form the basis for marketing initiatives to counter the trend of the best candidates increasingly foregoing actuarial exams in favour of other academic streams. (Brown and Ciccotello (2004) found evidence of this in the United States of America and, to the extent that this is either currently happening or a precursor to happening in South Africa, it is something that needs to be guarded against).

1.9 The following section will look at the factors likely to affect the successful completion of an actuarial qualification. The focus will be on the qualification process itself, followed by a review of available literature on various success factors. Section 3 will review the literature on persistency (this is a critical element of any actuarial education system, given the immense difficulties and stresses, as well as various alternatives, which are constantly presented to aspiring Fellow actuaries). The penultimate section will summarise the likely implications for transformation of the profession in South Africa, and the final section will summarise the paper and highlight the salient conclusions. Throughout the paper, ‘minority’ students, ‘first generation’ students and ‘non-traditional’ students will encompass students that are largely Black African when applied to the South African context.

## **2. FACTORS LIKELY TO AFFECT THE SUCCESSFUL COMPLETION OF AN ACTUARIAL QUALIFICATION**

### **2.1 THE ACTUARIAL QUALIFICATION PROCESS IN SOUTH AFRICA**

2.1.1 This section aims to give a brief overview of the actuarial qualification process. For a more comprehensive discussion of the process in South Africa and other countries around the world, the reader is referred to Slattery (2004) and Slattery and Kemp (2007). The majority of South African students who have aspirations to achieve a Fellowship actuarial qualification begin their studies at a South African university. During this undergraduate phase, they read for commerce, business science or science degrees, completing courses that offer them exemptions from specific professional examinations. These subjects cover the core set of skills required to be an actuary, as well as some application of these skills to a business

environment. The number of exemptions a student can obtain depends on what the university has been accredited for by the professional body.

2.1.2 Historically, the Faculty and Institute of Actuaries in the UK have been accrediting South African universities and recognising exemptions attained through them, but this situation will be changing by the end of 2008, with the Actuarial Society of South Africa performing this role.

2.1.3 On graduation, students generally start working in an actuarial environment (traditionally the large life insurers and pension consultancies), where they continue to write professional examinations on a semi-annual basis. Depending on where students are located, they also have the option of obtaining exemptions for the more detailed, later technical subjects by attending post-graduate university courses. The final Fellowship examination, for recognition as a Fellow, is set and marked by the professional body concerned.

2.1.4 This process is long and arduous, involving almost 16 professional examinations and courses. McMahon and Boland (undated) found that students take a median time of 4 years after joining the Faculty and Institute of Actuaries (which, in South Africa, happens after graduating from university) to attain Fellowship status. As a result of this process, students are potentially subjected to numerous factors that may enhance or inhibit their chance of attaining this goal, and the difficult nature of the studies, coupled with a high pressure work environment, creates a unique situation where actuarial students are potentially subjected to large amounts of stress. This often filters into students' examination performances, where pass rates are very low (often lower than 30% for the Fellowship subjects), and just as in Dickson, Fleet and Watt (2000), the need for insight into success patterns and concerns about this consistently high failure rate, make it essential to investigate this further.

## 2.2 SUCCESS FACTORS

2.2.1 At the outset, it is essential to define "success" before one can consider the factors that contribute to it. Success, according to Häkkinen (2004), could refer to:

- Completion of an education programme (i.e. successfully maintaining persistency and staying in the programme to completion)
- Completion of an education programme with the highest quality of pass (i.e. time to completion is less important than the quality of the passes attained)
- Completion of an education programme in the shortest time possible (i.e. pass quality is not a motivator, or may even be unknown, so there is a focus on quickly achieving the minimum level to pass)
- Labour market success (i.e. efficiently moving through an education system needs to be translated into fruitful and sustainable employment)

2.2.2 In the actuarial system, completion of the education process and being awarded the resultant qualification is very likely to lead to labour market success. Also, students outside the university system will not know the quality of passes achieved. Persistency is difficult to measure and is subject to multiple definitions of its own (which will be explored in the following section). This is reinforced by Lotkowski, Robbins and Noeth (2004) who believe that performance and retention are two very different concepts.

2.2.3 As a result, success in an actuarial programme will be viewed as completion of the programme and achieving the qualification in the shortest time possible. This study will postulate factors that are likely to enable actuarial students to achieve the minimum pass standard required of them.

2.2.4 According to Häkkinen's (2004) review of available literature, up to 25% of an individual's future educational success can be explained by considering factors that are relatively easily available at the time of admission into an education system. However, there is little literature dealing specifically with actuarial education and theories around actuarial critical success factors are non-existent. Also, much of the available literature deals with performance at a university level, rather than professional examinations post-university. As a result, the challenge in this paper would be to draw on the literature on university investigations, consider what these factors are, in general, and then apply this understanding to actuarial education.

2.2.5 Throughout this process, transformation within the actuarial profession needs to be borne in mind, with a focus on how the effects of various factors are likely to differ for people with previously disadvantaged backgrounds. The Actuarial Society's Transformation Charter (Actuarial Society of South Africa, 2008) states that:

*“Transformation is about effecting change that improves the demographics of the Actuarial Society membership and promoting awareness of societal needs and pressures that are uniquely South African, in accordance with the principles enshrined in the Constitution of South Africa. For the purposes of this Charter, the point of departure is the military view that transformation is less about emerging technologies, hardware and software, and more about the change in the mindset of professionals, the vision and commitment they carry within their professions and the advice those professionals render to the communities they serve, as stakeholders in the recipients of the services of these professionals.”*

It is against this backdrop that transformational issues are given an elevated status.

2.2.6 Factors affecting success include both those within and outside an individual's sphere of control. According to Pitkethly and Prosser (2001) in Burton and Dowling (2005), research shows that more students leave university because of struggling to adjust to the environment, as opposed to intellectual difficulties. Lewin (1936) in Milem and Burger (1997) also supported this, and proposed a model of behaviour that was based on the interaction between the environment and the person.

2.2.7 Also, much of the theory suggests that one needs to look broader than just factors affecting academic ability - as determined by Lotkowski, Robbins and Noeth (2004), focussing on mastering course content will address immediate rather than longer-term deficiencies. Also, Cilliers and de Klerk (2001, p90) felt that:

*“Conventional assessments of intelligence are not relevant in a multicultural context and fail to include other integral parts of intelligence in order to represent the whole of intelligence”.*

They felt that these other parts refer to creative or practical skills that students from “alternative” backgrounds develop in response to their often-difficult living environment when growing up. They also noted that school results of students from



historically disadvantaged schools correlate poorly with their academic achievement at university. As a result, there is an important transformation issue that supports the need to look at non-academic factors as well. In contrast, though, is the finding from Sandiford and Jackson (2003) that the non-academic variables they tested (financial difficulty, achievement tendency and need for achievement) did not have a significant relationship with course outcomes.

2.2.8 This section will be structured into two broad categories looking at exogenous factors and endogenous factors. Under the former, socio-economic factors, support structures and admission rules will be explored; and under the latter, academic, psychological, motivational, social and demographic factors, will be discussed. Throughout the discussion, the extent to which some factors will more likely affect transformation will be highlighted.

### 2.2.9 EXOGENOUS FACTORS

2.2.9.1 Socio-economic factors are discussed below.

#### Family socio-economic status

2.2.9.2 According to Letseka (2007), the socio-economic status of families of students who do not complete their university qualifications played a significant role in the students' inability to persevere. In the analysis he conducted, a lack of finance was a major obstacle to completion, as was being a first-generation university student (i.e. not having parents or even siblings with university experience). Burton and Dowling (2005) also found that having a low socio-economic background (and many siblings) placed students at increased risk of not succeeding, and Thomas (undated) found a similar set of consequences when looking at "mature" students (which she considered as generally older than 23 years of age).

2.2.9.3 The main implication of financial difficulties was that students had to take up full-time, part-time or odd jobs, at the expense of studies. Specifically in the context of transformation, Ryan (2002) in Sadler and Erasmus (2005) commented that Black trainee accountants experience different social pressures than their White colleagues and counterparts. In particular, full-time study after completing an

undergraduate degree is almost always not possible. This is because most Black candidates come from disadvantaged backgrounds, so after undergraduate study, there is an expectation amongst family and the general community for them to earn an income and repay their investment in the candidate's education. As a result, later studying needs to happen in conjunction with working, which makes the process more challenging. Sandiford and Jackson (2003) also noted that non-traditional students had complex lives with family responsibilities, work concerns and complexities in commuting to campus. Similar comments are valid for the actuarial profession, where an increased community pressure to earn an income can result in Black students tackling the challenging actuarial subjects without being able to focus on them the full attention required to succeed.

2.2.9.4 Bishop and Mane (2001) also found that family size, parental marital status and socio-economic status of the students' family influenced the chance of graduating (with the risk of non-graduation increased by having divorced parents, many siblings and having to work for pay at a young age). Häkkinen (2004), too, found personal background (such as family income) to be linked to college performance.

2.2.9.5 Another key reason for financial background affecting actuarial studies is due the high costs involved - at undergraduate level, this can involve studying at universities away from home and registering for high-cost degrees, whilst after graduation, there are the high costs of examination fees and subscriptions. Often the former can be alleviated via bursaries (the most common being those offered by life insurance companies), scholarships (the most widely awarded is that offered by the South African Actuarial Development Programme) and study loans from universities and commercial banks. However, in the case of bursaries, students are still left with large liabilities in the event that they are not successful, as many have non-performance payback clauses. Employers often carry the fees and costs associated with post-graduate studies, as students usually enter employment after university. However, even this arrangement is performance-based, as many employers often require students to pay for themselves on the second and later attempts of examinations, which can result in prohibitive amounts of costs.

### Area of living

2.2.9.6 According to Sadler and Erasmus (2005), the environment in which one grows up (e.g. rural or urban) plays an important role, as people in more rural areas are less exposed to business transactions and financial experiences (like using credit cards and cheques). This is, thus, an important factor for students who wish to pursue studies in commerce, as general business exposure can be useful to improve understanding and knowledge development. Bishop and Mane (2001) also found a rural location to be related to significantly lower wage rates in the labour market.

2.2.9.7 Burton and Dowling (2005) highlighted students from isolated regions as being at greater risk of poor university performance and Dickson, Fleet and Watt (2000) identified the effect of geographic location as an important factor contributing to student academic success at the degree and program level in tertiary study. The main reason for this is probably the need for these students to be distance students (if they cannot secure funding for university residences), and Burton and Dowling (2005) further found that being a distance student increased the risk of poor performance.

2.2.9.8 This concept is particularly relevant for many post-graduate actuarial students as they study via the UK professional body via distance learning structures. It is also relevant for undergraduate students who have to travel to one of the four main actuarial universities (in Cape Town, Johannesburg, Stellenbosch and Pretoria), requiring much resettling and readjusting.

2.2.9.9 The area in which one lives can be considered at different points in one's life (birth, completion of high school, completion of university, and completion of qualification) as the importance of this variable will change over time and affect one's development in different ways. In this context, it may be possible to associate geographic location with family socio-economic status, by looking at unemployment rates or average incomes in the area of living (or growing up) and how this affected one's family. Bishop and Mane (2001), however, investigated the effect of the characteristics of one's home state (unemployment rate and mean weekly wage in retailing) on the risk of graduating but could find no significant relationship.

### Quality of school attended

2.2.9.10 Bishop and Mane (2001) also explored the extent to which characteristics of the school attended (such as number of students enrolled, average teacher salary, student-teacher ratio, a measure of the proportion of students from low-income families, ethnic breakdown of the student body, and whether it was private or public) affected later academic success. They found that the risk of not graduating increased where students attended a large high school, and reduced where students were surrounded by a lower proportion of low-income classmates and the academic performance of peers was low. Given the historically poor state of many schools traditionally reserved for Black Africans, this has an important implication for transformation in South Africa.

2.2.9.11 In addition, Häkkinen (2004) and Rothstien (2003) in Häkkinen (2004) found that the socio-economic environment of the school is significantly linked to college performance.

2.2.9.12 The effect of support structures is discussed below.

### Existence of role model or mentor

2.2.9.13 There is much in the way of literature that supports the critical role that having a mentor or role model has in university success and this literature could be justifiably and easily extended to students who have completed university. The concept of a role model includes the possibility of someone in the community or general area that can be inspirational without actually having physical contact with his or her subject. The role of a mentor will include academic counselling and advice, but one should not overlook that orientation programmes and counselling services offered by institutions would also play a role here.

2.2.9.14 Lotkowski, Robbins and Noeth (2004) highlighted the importance of university mentors in their role of providing students with formal and informal social excursions such as institutional gatherings, lectures or shows. Additionally, the mentors work together with the students on academic- and resource-

based competencies, such as use of campus information systems like the library. They also believed mentoring and support groups improve levels of student involvement, motivation and academic self-confidence, and, in turn, increased levels of institutional commitment and engagement. Lotkowski, Robbins and Noeth (2004, p13) also mentioned that:

*“To help build academic self-confidence and motivation, students may receive academic counselling and advising. To increase levels of social support and involvement, they may be encouraged to participate in social support groups, such as campus big brothers or big sisters and student organisations.”*

Fortunately for the actuarial profession, the Association for South African Black Actuaries have, since inception, attempted to run a mentorship programme for students at universities.

2.2.9.15 Sadler and Erasmus (2005), in the context of the accounting profession, felt that role models are essential to create interest in the profession and by sending Chartered Accountants out into communities, they could act as role models for the youth when they see the rewards of pursuing an accounting career. An increase in racial representivity on leadership structures was also highlighted as an important way to create role models. Similar reasoning would apply to the actuarial profession, and the possibility of one person filling the roles of both role model and mentor cannot be dismissed. Role models extend beyond the professional realm, though, into the university context, where, as mentioned by Letseka (2007), having siblings with general university experience can be invaluable in making students more comfortable with their studies.

#### Institutional support

2.2.9.16 According to Burton and Dowling (2005), there are three ways in which students react to entering university:

1. Tackle the challenges thrown up by new learning and social experiences
2. Find the experience far less enjoyable and even traumatic
3. Leave the university because they come to the realisation that it is not for them at that point in time

Often, a student's reaction is influenced by the level of support that he or she perceives the institution to provide.

2.2.9.17 Lotkowski, Robbins and Noeth (2004) felt that contextual influences (such as the extent to which a university student receives financial aid, institution size and selection processes) are important and will inform the level of institutional commitment experienced (i.e. the level of confidence in, and satisfaction with, the institutional choice). Holmes, Ebbers, Robinson and Mugenda (2000) in Lotkowski, Robbins and Noeth (2004, p14) believe that the orientation programme is a key way for the university to encourage institutional commitment:

*“Orientation programs can help reinforce to students that they matter to the institution and will be supported as they proceed to completion of their degrees. This validation connects the student to the institution and helps build institutional and goal commitment as well as social support networks.”*

They also suggest the introduction of students to faculty, staff, other students, extracurricular opportunities, library services, career-planning services and academic support services are key to this student buy-in.

2.2.9.18 Such is the importance of this social integration, Kennedy, *et al.* (2000) in Lotkowski, Robbins and Noeth (2004) believe that, despite below-par academic performance, many students will choose to continue due to their successful social integration into the institution. Mangold *et al.* (2003) in Lotkowski, Robbins and Noeth (2004, p15) also stress the importance of programs that bring students together, as they help develop social and learning communities and “foster a shared consensus regarding institutional goals and promote persistence”

2.2.9.19 In addition, Sadler and Erasmus (2005) felt that student success is affected by the support structures offered by the higher education institution concerned. The then-President of the South African Institute of Chartered Accountants (SAICA) called on distance learning universities to review the processes of preparation of future professionals and Schoole (2004) in Sadler and Erasmus (2005) also felt that distance-learning institutions should play more of a role in aiding transformation by increasing the number and quality of support programmes offered

to assist Black African students and identifying the problems students experience in their studies.

2.2.9.20 As far as professional bodies are concerned, Mabena (1997) in Sadler and Erasmus (2005) identified Black communities' ignorance of the accounting profession and careers related to the profession as a key factor affecting lack of Black African entrance into the profession. He also highlighted a lack of career guidance in schools and felt that the accounting profession should reach out to schools regarded as traditionally Black African and market the profession to learners as being both challenging and interesting.

2.2.9.21 Sadler and Erasmus (2005) highlighted some of the work that SAICA and the Public Accountants' and Auditors' Board (PAAB) have done to increase their level of support provided, in an attempt to increase the success rates of Black African and Coloured students. These are wide-ranging and include advancement programmes for trainee accountants; sponsorships for selected students to study full-time; firms focussing their corporate social responsibility programmes on upgrading tuition in mathematics and accounting; and SAICA and University of Johannesburg collaborating to upgrade accounting faculties at Fort Hare and University of Limpopo, so those degrees can be accredited by SAICA. This last initiative allows students to study nearer to home, which makes studies cheaper and allows them to be close to family support structures.

2.2.9.22 The Actuarial Society Transformation Charter (Actuarial Society of South Africa, 2008) is also a useful reference, which refers to the support the profession can offer by:

- Exploring active bridging programmes to transcend the gap from university to the workplace
- Ensuring the education curriculum reflects the demands of the transforming human resource development without compromising on the education standards, which must be at the level of international best practice guidelines as set by the International Actuarial Association

2.2.9.23 The implications of the second point can have far-reaching effects on the supply of actuarial students, to the extent that there are fears around the compromising of standards when this imperative is being implemented as part of the current localisation of education process. Given the important role that the profession plays as an institutional body, it is up to the leadership of the profession to provide the necessary support and reassurances to all students and qualified members that the value of their qualification will under no circumstances be eroded. However, actuarial studies are already cognitively challenging with high examination standards (as evidenced by the high failure rates), so, in providing this reassurance, the profession should beware of raising the barriers to entry to unjustifiably high levels.

2.2.9.24 What stands out from all the ideas mentioned above (in particular, the initiatives in the accounting profession) is the collaborative nature of the initiatives, where the professional body (both at university-level and working-student-level), universities and employers co-operate. This type of cooperation should be considered as an important factor for the actuarial profession.

#### Teaching quality

2.2.9.25 This exogenous academic factor has the potential to be one of the most influential in an actuarial student's development during university. Sadler and Erasmus (2005, p48) concluded that the view that academic success rests entirely on students "is inconsistent with the principles of outcomes-based education, which require both 'high expectations' and 'expanded learning opportunities'" – both of which need to be provided by the educator.

2.2.9.26 Taafe and Cunningham (2005) found that the extent to which students received enough help with their work, the level to which teachers were prepared for their lessons, and the quantity and quality of feedback that students received on assignments, were all essential to success. This feedback issue is particularly relevant to actuarial studies post-university, where much of the studying is done in a distance-learning fashion, and timely and useful feedback on assignments submitted is essential.



2.2.9.27 In a university context, lectures are viewed with mixed feelings by many students and Hunter and Tetley (1999) explored the reasons for people attending lectures in an Australian university. Baldwin (1993) in Hunter and Tetley (1999, p3) felt that a good lecture can offer students:

*“A synthesis of a great deal of material that would be beyond the students’ range if left to themselves; an explanation of that material which is responsive to a particular audience; an analysis and critique of the material; a discussion of the processes involved in synthesizing and analysing (‘metacognitive reflections’); a personal stance, involving an exploration of the lecturer’s values and assumptions; a model of intellectual discourse, demonstrating the procedures and assumptions of a particular discipline, in a more accessible form than textbooks; a model of commitment to that discipline and excitement about intellectual discovery in general; a potent stimulus, through the presentation of challenging and provocative ideas, arguments and counter-arguments, debates, problems, paradoxes and dilemmas.”*

2.2.9.28 While this may be an idealistic view of lectures, it does place a lot of pressure on educators to achieve all these goals. This may be very relevant to actuarial studies, which are cognitively challenging, and require an educator showing a student how to think and what approach to take. Interestingly, staff at the university Hunter and Tetley studied thought lectures were where students gain knowledge, whereas tutorials were where they learn to analyse problems, learn new thinking skills, change their attitudes and learn to discuss and correct their misconceptions. Despite this somewhat contradictory understanding, to the extent that tutorials do serve this purpose, then it would seem that the overall education experience is favourable.

2.2.9.29 From a transformation perspective, Venter (2003) in Burton and Dowling (2005) suggests that educators must adapt to student-body diversity in order to foster self-confidence and assist the learners to become independent. A learning environment that is open to diversity may very well ensure academic success amongst the new diverse groups. The challenge, then, would be how to achieve this when different education deliveries are being utilised and where students entering a program often have different levels of educational standing. Once again, there is a lot

of pressure placed on educators to simultaneously deliver the tuition material in the most effective way possible, while still bearing in mind how the different backgrounds of students affect their absorption of their delivery. Sadler and Erasmus (2005) also felt that quality of teaching is important and that lecturers' approach to teaching is affected by their perceptions of factors that will contribute to students' success.

2.2.9.30 While most of the discussion above focussed on the university experience, much of it is also relevant post-university, to the way material should be developed and disseminated. This would apply to tutorial groups, small-group study sessions facilitated by a professional body and distance learning components.

2.2.9.31 A discussion of the effect of admission rules follows below.

2.2.9.32 Rules governing the admission of students into both a university and a professional body can play a role in determining success, as they define the population of students from which qualifiers will be drawn. To the extent that the admission rules are too relaxed or too stringent, a lesser or greater proportion (respectively) of the student population should be expected to qualify each year (assuming standards remain unchanged and students who enter persist to completion).

2.2.9.33 Häkkinen (2004) explored the influence of admission rules in the form of entrance exams and found that, in engineering, entrance exams were a better prediction of graduation than past academic performance (this is in contradiction, though, to Gillerg (1987) in Häkkinen (2004), who found that, for students in business, entrance exams have no connection with time-to-degree). Häkkinen (2004) felt that admission rules should be designed to help in achieving education policy goals and they should be comprehensible, stable, fair, cost-effective and legitimate. He felt that a subject-related entrance exam may measure motivation and an applicant's interest in the field of study and might predict academic success better than a general aptitude test or matriculation examination grades. He based this on the belief that the entrance exam should give a realistic picture of what the actual studying is like. Naumann, Bandalos and Gutkin (2003) had a further suggestion for admission tests, saying that incorporating some measure of 'self-regulation' (e.g. the

type of study skills employed by the student) would further assist with predicting performance (this is covered below).

2.2.9.34 Interestingly, Häkkinen (2004) picked up a ‘learning effect’ i.e. if entrance exams are used instead of past school performance, mainly older students will be selected since older applicants might be applying to the varsity for the second or third time and have more information on how one should prepare for the entrance exams). An important implication is that if only entrance exams are relied upon, only a small fraction of new high school students would be accepted. In addition, in designing these admission tests, Garam and Ahola (2001) in Häkkinen (2004) found applicants who had higher school results preferred admission based directly on these results, as opposed to those who did not perform well in school and who, consequently, preferred general tests of aptitude.

2.2.9.35 Universities have only recently started using entrance examinations, but their success in predicting graduation success is not known in general. One of Häkkinen’s (2004) main findings, though, is that the factors which can be used as admission criteria and which are observable to the admission committee at the time of the admission decision, explain about 15% of the variation in student achievement.

2.2.9.36 As far as professional entrance requirements for the Actuarial Society of South Africa are concerned, there is currently a heavy reliance placed on achieving a suitable standard of achievement in university subjects. Having some form of entrance standard is essential, though, as “models built by Akerlof (1970) and Leland (1979) portray professional entrance exams as a necessary barrier to entry and a signal of quality” (Brown and Ciccotello, 2004, p6). According to Brown and Ciccotello (2004, p2), in the face of the growing competition between actuarial and other financial services credentials (which is reinforced by Breier’s (2006) model incorporating general labour market considerations), as well as the competition from those with no actuarial credentials, “the profession must both design its entry sequence efficiently and understand how the skills of its members can create the most value.”

2.2.9.37 Bishop and Mane (2001) considered the effect of higher graduation standards (based on the belief shared by many that high standards will postpone the graduation of some and prevent the graduation of others). According to them, economic theory would predict that the average income per student would decline as a result (since the time to enter the labour market is now longer, with more years of non-generation of income). However, they also pointed out that, if the increase in standards improves the signal that attaining such a degree gives the labour market, then the economic payoffs to those who get a degree or diploma would increase, so the returns to the student for the greater required effort would also increase. It is also possible that higher graduation standards can overcome an environment where employers prefer experienced workers, rather than those straight out of university (and the application to an actuarial context is apparent, where many employees start as graduates, with the institution that they graduated from being a strong indicator of quality).

2.2.9.38 Lyn, Palandra and Daykin (2002) and Häkkinen (2004) refer to the self-selective nature of some education programmes and highlight that, in such programmes, changes to entrance criteria will change the population under study, and hence the conclusions drawn. As a result of this, an important question for bodies that rely on these rules is whether different admission rules lead to altered student populations (in terms of academic ability, demographics and psychological factors) and hence a change in average student achievement.

## 2.2.10 ENDOGENOUS FACTORS

2.2.10.1 It is important to attempt to measure the effect of factors internal to an individual as these intrinsic factors have subtle and indirect influences on success, which are not immediately obvious to the individual concerned. However, it should be acknowledged that the measurement of these factors is affected by the fact that “people tend to attribute bad outcomes to external factors, bad luck and other temporary circumstances...rather than to their innate ability” (Bishop and Mane, 2001, p5).

2.2.10.2 Academic factors are covered below.

2.2.10.3 Endogenous academic factors are probably the most traditional of the critical success factors. Academic ability (as measured by past performance), one's approach to studying and how the work environment can aid ability all play a role. Discussion around how valid it is to measure academic ability by past performance will be delved into by looking at the theories of intelligence.

2.2.10.4 Lotkowski, Robbins and Noeth (2004) found that academic factors make a significant contribution to improvements in college retention and performance. Programmes that are focussed on measuring academic skills assume that motivation to succeed is linked to academic performance and the results from these assessments, monitoring student performance, and observing student patterns can help institutions identify those students who may need intervention strategies to help them operate at the appropriate level.

2.2.10.5 A concept mainly concerned with retention, but which is relevant, nonetheless, to academic performance, is 'academic integration'. Nora (1993) in Lotkowski, Robbins and Noeth (2004) describes this as the attachment to and affiliation with the college and the resultant academic environment, whether in or out of the classroom. Braxton and McClendon (2005) in Lotkowski, Robbins and Noeth (2004) said that this could be developed through formal learning experiences with staff members or peers or through informal social contact with academic staff and involvement in student societies and organisations. Clearly, having students who have a strong affiliation with an institution can help the chances of academic success (as discussed under the institutional support section above).

2.2.10.6 An important concept informing past and future academic ability is the extent to which students understand what is expected of them to pass and whether there is a party that is committed to communicating these expectations to them. McInnis, James and Hartley (2000) in Burton and Dowling (2005), found that a large proportion of first-year on-campus students in Australia were ill-prepared for tertiary studies, were unsure of what was expected of them and were not motivated to perform academically. Sadler and Erasmus (2005) also stated that expectations should be explicit and lecturers should explain why the expectation exists. This is particularly relevant for actuarial studies in South Africa, where independence of the

examiners (for professional exams) relative to the people facilitating tuition, can create the potential for a disconnect between the two parties. Any disconnect that arises may then be compounded when messages are passed to students.

2.2.10.7 Despite that fact that pre-existing academic factors are important, it is important to consider the development of students going forward, as well. Tinto (1987) in Burton and Dowling (2005) stated that it is essential that students either enter with, or have the ability to acquire, the necessary skills for scholastic success and that students identified as 'at-risk' should be provided career-counselling services.

#### Past academic performance

2.2.10.8 Past performance can be considered separately for high school and for university, where relevant, as the different environments, objectives and motivations can sometimes lead to differing levels of performance across the two institutions. There is much in the way of literature that finds overall high school performance an essential predictor of tertiary (and later) education success (Cilliers and de Klerk, 2001; Lotkowski, Robbins and Noeth, 2004; Bishop and Mane, 2001; Dickson, Fleet and Watt, 2000; and Häkkinen, 2004). Other literature looks more at general past academic achievement as being relevant (Burton and Dowling, 2005).

2.2.10.9 In particular, specific school subjects have been found to have different effects. Cilliers and de Klerk (2001), in studying the relationship between abilities and performance, found that students with different abilities (practical, analytical or creative) performed differently in various subjects - practical abilities correlated negatively with mathematics performance, but were good predictors of performance in Economic and Management Sciences, while analytical abilities were strongly related to all subjects, and creative abilities featured nowhere. To the extent that tertiary subjects require abilities different to the corresponding school ones, performance is likely to differ between school and tertiary level. Dickson, Fleet and Watt (2000), when reviewing available literature, found that past school academic performance was more strongly correlated for science-related than arts-related tertiary courses.

2.2.10.10 Dickson, Fleet and Watt (2000, p69) in their own study, found that there was a relationship between high school performance and tertiary academic achievement (as mentioned above), but this was not very strong. Interestingly, they concluded that this suggested that these are not equivalent performance measures and that the possibility of changes in teaching and learning methods over time and the possible disconnect with assessment methods is an important factor to consider when trying to determine the effect of high school performance.

2.2.10.11 From a transformation perspective, Gist, Goedde and Ward (1994) in Sadler and Erasmus (2005) found that minority students have a lower level of academic achievement due to poor mathematics performance in school. Leading from this, Cilliers and de Klerk (2001) and Sadler and Erasmus (2005) take a different view when dealing with students from historically disadvantaged schools and backgrounds. Both sets of researchers feel that incorporating matriculation results into selection methods is not appropriate as they only give an approximate indication of the likelihood of success, and have limited empirical support. Cilliers and de Klerk (2001, p91) found that school results of these students correlate poorly with their academic achievement at university, so the current selection methods used “lead to probably thousands of students entering university (who should not) and likewise, probably thousands who are denied entrance (and who have the potential).” This important proviso when dealing with past school performance is related to how the different types of intelligence flourish differently in different environments. This will be covered in greater detail below.

2.2.10.12 From a professional perspective, Breier (2006) feels that, despite the fact that professions are, technically, open to all, there are still many obstacles, ascribed mainly to the South African schooling system which, unfortunately, does not produce enough matriculants who meet the entrance requirements for tertiary institutions or professional programmes. As a result, the extent to which high school performance can affect tertiary success is further influenced by the disconnect between the preparation provided at high schools and the expectations placed on students by tertiary institutions. Dickson, Fleet and Watt (2000, p60) also pointed out a similar major weakness when trying to analyse past

school performance, in that it is “impossible to observe the grades of people who do not enter the university because of low scores on end-of-school assessments, a fact which results in a truncated distribution for high school results.” This could make these data ineffective on incorporation into prediction models due to the lack of sufficient variation.

2.2.10.13 In terms of university performance in early years affecting eventual graduation and eventual completion of professional examinations, Gore (2006) found significant correlations between first semester college performance and commitment, academic discipline, general determination, and academic self-confidence. It is very likely that this correlation would persist into later years if these traits remain. Dickson, Fleet and Watt (2000) also found that having a previous tertiary qualification (i.e. demonstrating the ability to succeed at this level) was an important contributor to academic success in subsequent degrees.

2.2.10.14 In their study, though, they also found that the type of previous tertiary qualification held was important, as studying at a particular type of Technical and Further Education Institute in Australia actually increased the chance of failure at university. This is important when considering the movement of actuarial students between universities or between other tertiary institutions and universities, as these students are often placed into later years of a degree and given credits for courses done, meaning that they miss out on first-year introductory material and gradual acclimatisation to the new university's expectations.

2.2.10.15 Brown and Ciccotello (2004), in the context of actuarial studies, found good exam performance was associated with the possession of an advanced degree and having a high collegiate grade point average. Specifically looking at subjects, they found mathematical aptitude was strongly linked to exam success, whereas the marginal effects of other courses was modest, with the impact of non-accounting education slightly stronger than that of accounting education. McMahon and Boland (undated), in studying actuarial science graduates from an Irish university, found that good performance in the last year of one's degree, a high class of degree awarded and a high number of exemptions obtained, reduces the time to qualification, but that this effect wears off over time.



### Communication skills

2.2.10.16 While home language is a demographic factor, the skill in communicating in a generally-accepted business language (like English) is an essential academic factor that can be affected by the home language spoken. Importantly, this covers both the receipt and delivery of information, and is discussed in greater detail in sections below.

2.2.10.17 This is reinforced by Sandiford and Jackson (2003), who found good language skills to be important when material is abstract and difficult. This is very relevant to the studying of actuarial material and the eventual communication of technical concepts once an individual enters the workplace. Comprehension and communication skills need to be developed within students and need to form a critical part of any system of assessment (but, before this, any system of teaching).

### Study skills

2.2.10.18 These refer to the normal study habits and strategies that students have (also referred to as 'learning-related' variables and including the choice of distance-learning over face-to-face tuition) and whether they are effective in achieving their academic aims.

2.2.10.19 Lotkowski, Robbins and Noeth (2004) looked at academic-related skills like time management skills, study skills and study habits (taking notes, meeting deadlines, using information resources) and tried to measure academic self-confidence (the level of confidence one feels in being able to succeed in an academic environment). They found a strong link between the skills and confidence felt (i.e. preparedness in the approach to studies should increase the belief that one will succeed). However, they only found academic self-confidence to be a strong predictor of performance. Indeed, Pintrich (1995) in Naumann, Bandalos and Gutkin (2003, p3) felt that "students who believed they were capable of doing academic work were more likely to engage in learning strategies that led to better academic performance". (The three main strategies here were: finishing homework

assignments by deadlines, concentrating on school subjects and studying despite distractions). It should be noted, though, that Gore (2006) found a negative relationship between confidence and academic performance (probably because over-confidence led students to cut down on useful learning strategies).

2.2.10.20 Lotkowski, Robbins and Noeth (2004) were of the impression that a student's characteristics when entering an institution will play a major role in persisting through to graduation, but showed that programs to assist first-year students would increase the potential for success. Such programs would involve tutoring, social activities and personal counselling, as well as interventions that expose students to, and coach them on, techniques and concepts that are vital for college success: time management, test-taking, note-taking and management of stress. As is evident, these programs mainly focus on the skills required when studying.

2.2.10.21 In addition, Sadler and Erasmus (2005) found that self-discipline and effort, time management and a student's approach to study affected student success, and Gore (2006) also found a positive relationship between academic discipline and performance. Importantly, none of these elements can be easily and directly predicted from matriculation results. Sadler and Erasmus (2005) highlighted the important role of perceptions of what will enhance chances of success or failure at varsity – these perceptions, whether misguided or not, inform many students' strategies to tackling various subjects, and there is an inherent risk that students and the lecturers assessing them have different views in respect of these.

2.2.10.22 Hunter and Tetley (1999) explored the role of attending lectures at a university, as part of a student's approach to studying a particular subject. Interestingly, they found that non-attendance doesn't affect students' success in a course, but that the majority of students were unwilling to dispense with lectures altogether. They felt that this was because of a misunderstanding, in students' eyes, of what they perceived the most important part of lectures to be: the lecture notes. This is a limited view in the light of the goals of a good lecture (mentioned above) and they found that good students realised that what they were hearing in a lecture was more than just content. Students that attended, though, because material was perceived to be too complex to make up on their own, seemed to realise that there was

some material that is not readily available outside lectures and saw some value in attending. Overall, though, attendance at lectures could be an important factor for success, as long as students understand what they should be taking away from it and lecturers realise what they should be imparting.

2.2.10.23 Naumann, Bandalos and Gutkin (2003) found that including learning-related variables along with variables for college admission tests, improves the ability to predict college performance. The learning-related variables that they studied were study strategies, goal setting, seeking assistance from others, and time management. Their main finding was that variables like these (called 'self-regulation' variables, since they are within the student's control) should be used to make college admission decisions, as they provide a more holistic view of a student and makes such decisions more valid.

2.2.10.24 They also felt that first generation students will benefit from any services (of an academic nature) that enhance skills in self-regulation and it is also likely that this will have a positive impact on retention and success. Ramirez (1997) in Lotkowski, Robbins and Noeth (2004), suggested a slightly different approach by highlighting how academically focussed programs (e.g. the widely-applied Supplemental Instruction) aimed at historically difficult college courses can help students master content and develop learning and study strategies for that course. This approach is different in that it targets high-risk courses directly rather than high-risk students.

2.2.10.25 Another factor that is relevant is whether a student studies on-campus, or via a distance-learning mechanism. Dickson, Fleet and Watt (2000) studied how these two modes of study affected academic performance and determined that distance-learning is more difficult than on-campus study, as distance-students are disadvantaged by limited student/student and student/staff interaction, as well as limited access to resources (like the library). These findings are in accordance with other literature they reviewed that suggested that distance education has an adverse effect on success. Apart from these practical difficulties, Burton and Dowling (2005) found distinct differences in educational background between on-campus and

distance-learning students, which may further contribute to differences in success between the two.

2.2.10.26 The effect of mode of study is very relevant to actuarial studies, where many working students in South Africa are distance-students (despite the availability of on-campus or face-to-face tuition options, in some instances). Brown and Ciccotello (2004, p1) found that “candidates who are currently students in academic institutions pass actuarial exams in courses one through four at a higher rate than candidates in the workforce”. They found that formal academic education (i.e. being tutored) is a value-adding step in getting exam credits (but they didn’t control for other candidate attributes, such as experience and aptitude).

#### Work experience

2.2.10.27 Brown and Ciccotello (2004) considered the Certified Financial Planner examination and found that both academic education and experience in the profession were positive inputs to success. In an actuarial context, one could argue that more experienced candidates have a greater chance of success in examinations, as they are able to enrich their responses with a practical angle, gleaned from their years at work. However, one could also argue that students who have a deep knowledge of their particular work area slant examination responses to allow them to draw on their experience, and that this actually detracts from their responses and lowers their chances of success. Either way, Lyn, Palandra and Daykin (2002) support the notion that the actuarial profession should require employers to implement a structured approach to gaining work experience (currently operationalised as the Work Based Skills program under the UK examination system). This structured approach may allow students to develop practical skills in relevant areas in a way that complements the later actuarial examinations, making students’ examination responses more appropriate.

2.2.10.28 In doing their analyses on actuarial students, Brown and Ciccotello (2004) did not have access to data on years of experience working for an actuarial firm, time taken to pass previous exams or whether the candidate took an ‘actuarial program’. Regardless, they did find that candidates who were full-time

students outperformed candidates who were employed, making additional work experience a negative influence on success. However, more recent research (by Grant *et al.*, 2002; Colbert and Murray, 1998; and Ciccotello *et al.*, 2002 in Brown and Ciccotello, 2004) shows that being in full-time study is less important for success than candidate aptitude and dedicated exam preparation (once again highlighting the importance of study skills and academic ability). As a result, to the extent that working students have sufficient study leave from their work environment, they can improve their preparedness to the stage where they are on par with full-time students, in terms of likelihood of examination success.

### Intelligence

2.2.10.29 Intelligence can play a potentially critical role in examination success. This factor should influence academic ability, the ability to learn new facts and apply judgement around them, and the ability to interact with others in work and social settings. However, as Sternberg (1999) pointed out, intelligence can mean different things to different cultural groups and conventional narrow measures of intelligence may not encompass the breadth required to be relevant in a multi-cultural context. He also pointed out that one could not assume that conventional intelligence tests are equally valued everywhere. Sahin *et al.* (2007) supported this comment and felt that evaluation made through value judgements does not truly reflect the underlying state and different societies have different psychosocial, economic, environmental and cultural positions.

2.2.10.30 Sternberg (1999, p146) strongly believes that intelligence is largely culturally defined and that “many psychologists who have studied intelligence believe that it is in ‘the eye of the beholder’”. In particular, he found that:

*“Different groups placed differing emphases on cognitive- versus social-competence aspects of intelligence. Teachers, however, emphasised cognitive over social aspects of intelligence. The research showed that the more the modal conception of intelligence of members of an ethnic group matched the modal conception of teachers in the school, the better the children of that ethnic group did in school.”*

He further found that different groups place different emphasis on verbal compared to non-verbal communication, and, once again, a match with the values of the school resulted in higher performance at that school.

2.2.10.31 The importance of social-competence skills cannot be underplayed, and, while some skills are essential at school, they can often take a lower priority in the work environment. This is in stark comparison to other studies which drew linkages between school performance and later academic performance and supports comments made by Cilliers and de Klerk (2001) and Sadler and Erasmus (2005) around previously disadvantaged students, mentioned earlier. Essentially, to the extent that the assessments in school settings are inappropriate for the ethnic group concerned, there is no way to say that poor performance at school would be replicated at later stages.

2.2.10.32 Sternberg (1999) proposed, in his Triarchic Theory of Intelligence, that intelligence can only be understood in relation to three aspects in interaction i.e. the individual's internal world, individual's experience and individual's external world. Under this theory, the interaction of the internal and external world is mediated by experience. As a result, he attempted to develop measures of practical intellectual skills and creative abilities and to discover ways of encouraging the most socially appropriate uses for these skills. These skills are particularly relevant to the recent international shift to problem-based learning (involving substituting lectures with group-work that involved case studies) in the education of professionals (Breier, 2006).

2.2.10.33 In the tests Sternberg (1999) ran, he found that the student group that appeared more highly analytical looked like a typical 'bright group' – mostly white, upper-middle-class, from well-regarded high schools. The more highly creative and practical groups were mainly minority students with diverse socio-economic-class backgrounds and less well-regarded high schools. His explanation for this is that privileged children were probably shielded from adverse, challenging or dangerous societal circumstances, allowing them to focus on developing abstracted memory and analytical skills that schools typically reward. Children from adverse environments had to develop practical and creative skills to survive their

circumstances and the practical, verbal or mathematical skills they developed that assisted them in these environments did not transfer to the school environment.

2.2.10.34 Some of his key findings were that tests of creative intelligence and practical intelligence have a very low correlation with conventional intelligence tests, despite the fact that these creative and practical tests are probably more predictive of important criteria affecting school performance and post-school performance. Importantly, he felt that “if children are taught in a way that reflects their patterns of culture and abilities, their achievements can improve” (Sternberg, 1999, p157).

2.2.10.35 The link to transformation here is self-evident. The way in which students are assessed should be related not only to the way they are taught, but also to the way they have been socialised. This is essential to ensure a truly accurate measure of ability is achieved. The type of intelligence that a student displays at school, university or at work, and the match to the current set of assessment methods, is essential to determine if he or she is likely to succeed academically.

2.2.10.36 Psychological factors and their effects are covered below.

2.2.10.37 An individual is affected by numerous psychological factors that influence academic success. These factors are interrelated and pervasive, and can be vastly different from person to person, making individuals susceptible to different situations in different ways, via having their own unique stress points. Whilst the immense heterogeneity between people can complicate measuring different psyches in a standard way, there may be some characteristics that most successful students exhibit that warrant further analysis. As is the case with most psychological factors, though, extreme versions of one particular trait (even if positive) are not necessarily desirable and can often lead to counter-intuitive effects. This will need to be borne in mind as each trait or style is discussed.

### Personality traits

2.2.10.38 Burton and Dowling (2005) developed several psychological tests to create a 'learning profile' for each student by identifying students' learning preferences, cognitive abilities (e.g. general reasoning, verbal and spatial abilities), and major personality traits. These personality traits follow the OCEAN tests of a self-report survey and looked at (Burton and Dowling, 2005, p73):

- Openness to Experience – “a preference for familiar versus novel experience”
- Conscientiousness – “self control and need for achievement”
- Extroversion – “a person’s interest in interactions with others and levels of sociability”
- Agreeableness – “cooperation versus competition”
- Neuroticism – “emotional stability”

2.2.10.39 The main finding here was that agreeable and extroverted students are more likely to be successful. Extroversion was probably important because these students were confident and comfortable consulting and collaborating with others, socialising and working in teams (so were more likely to be good at assessments that measure these traits). Interestingly, in contrast, McKenzie, Gow and Schweitzer (2004) in Burton and Dowling (2005) found agreeableness and introversion to be important.

2.2.10.40 Burton and Dowling (2005, p73) further measured three additional traits using published surveys based on Likert scales:

- Self-efficacy - “reflects a student’s optimistic belief in their ability to cope with stress in a variety of challenging situations” (scale found in Schwarzer and Jerusalem (2000))
- Proactive attitude - “reflects a student’s belief in the various facets such as resourcefulness, responsibility, values and vision” (scale found in Schwarzer (undated))
- Proactive coping - “reflects a student’s ability to commit to, and engage in, an autonomous and self-directed setting” (scale found in Greenglass (undated))

2.2.10.41 They found self-efficacy and proactive attitude were both related to academic success, but neither directly predicted performance. Being self-confident, as these two measures suggest, seems to help empower students to manage



their learning environment. Indeed, these ideas are applicable outside the academic environment, as Bishop and Mane (2001) concluded, after measuring a similar concept (self-esteem). They found that wage rates were positively related to higher levels of self-esteem. As can be expected, self-confidence and self-esteem can also feed into high levels of motivation, which can keep students positive and focussed on completing their academic courses (this is covered further, below). However, Crocker *et al.* (2003) point to the dangers of student linking their self-esteem too strongly to academic competence, as students who do this are more adversely affected by bad grades than they are positively affected by good ones. This creates a situation where symptoms of depression increased, and where students focussed on avoiding failure rather than obtaining high levels of success.

2.2.10.42 Anxiety and depression were two important factors that Sahin *et al.* (2007) found to be important in determining school success. As a result, one could propose that psychological counselling centres or school counsellors should be used more frequently to aid success. Counter-intuitively, anxiety and depression problems actually increase performance since students force themselves, biologically and psychologically, to succeed. This may lead to a situation where biological and psychological distress increases, and points to the fact that anxiety needs to be managed, without dismissing the positive impact that this energy release can have.

2.2.10.43 Finally, from a transformation perspective, Tracey and Sedlacek (1984) in Naumann, Bandalos and Gutkin (2003) developed the Non-cognitive Questionnaire to determine the factors affecting college performance for minority students. Ting (1998) in Naumann, Bandalos and Gutkin (2003) used this questionnaire and found that psychosocial variables such as successful leadership experience and community service played a major explanatory role amongst first generation students.

### Thinking styles

2.2.10.44 Allport (1937) in Grigorenko and Sternberg (1997) first introduced the idea that thinking style reflects a person's typical or habitual mode of problem solving, thinking, perceiving and remembering. Cilliers and de Klerk (2001)

applied this to the academic environment by stating that thinking styles were better predictors of academic performance than academic assessment. Grigorenko and Sternberg (1997) also felt that different styles of thinking were an important factor when predicting academic performance. Important for them, was that equally able people with different thinking styles tend to do better in different assessment settings. In a situational-style-type of framework, Grigorenko and Sternberg (1997) felt that the aim should be to find or develop an 'optimal' style dependent on a specific situation, rather than try and classify styles as 'bad' or 'good'. Sternberg (1988 and 1994) in Grigorenko and Sternberg (1997) also said that, under the Theory of Mental Self-Government, a thinking style is neither an ability nor a personality trait, but rather sits at the interface between the two, where it is a way of expressing abilities.

2.2.10.45 Applying this to actuarial education, it is apparent that different thinking styles are required for different levels of the examination process, depending on the skills set being tested. The 'core technical' subjects are of a more technical nature, where it can be argued that they require well-structured and process-centred thinking. The later 'specialist application' subjects require higher-order thinking skills to allow for the appropriate synthesis of information and the application of judgement. Often, critical to the successful completion of examinations, is the realisation that two very different thinking styles are required at different stages of the process.

2.2.10.46 Grigorenko and Sternberg (1997) found, in past studies, that thinking styles predicted school success, as teachers considered students as being higher achievers when they appeared to exhibit the same thinking styles that the teachers did. As mentioned earlier, this is also the same for intelligence, where students' academic performance increases, if they have the same conceptions of intelligence as their teachers. Grigorenko and Sternberg (1997) found that thinking styles did not differ across sex, grade, or ability patterns, and that types of assessment, while not affecting students with different ability patterns, did have differing effects on students of different thinking styles.

2.2.10.47 This has an important application to transformation initiatives – students are more likely to achieve when their profiles match those of teachers, but

not many South African university lecturers teaching Black African actuarial students have similar frames of reference to these students. It is acknowledged, though, that this will have less of an effect in professional examinations, where studying is often at a distance and anonymity is guaranteed.

2.2.10.48 Regarding the application to the work environment, Holland (1973) in Grigorenko and Sternberg (1997) developed a theory that distinguished amongst realistic, investigative, artistic, social and enterprising styles on the job. In the context of Bishop and Mane's (2001) comments that the 1980's saw employers placing more emphasis on cognitive skills when hiring staff, it is clear that different jobs required different types of these thinking skills, and that has been increasingly appreciated. Also, one could argue that academic success for working actuarial students involves the successful balancing of the thinking styles required for success in the work environment, with the thinking styles required for the type of examination they are attempting.

2.2.10.49 Motivational factors are discussed below.

2.2.10.50 Given the cognitively challenging nature of actuarial studies and the frequently long routes to qualification, high levels of motivation are essential to give students the energy to succeed. Students can derive their motivation from various sources, including, *inter alia*:

- An intrinsic drive to succeed and high self-esteem
- Focussing on the end-goal of qualification and the benefits associated with this (based, in part, on the perception of total and practice-area specific demand for actuarial skills)
- Pressure from family members, role-models or mentors
- Sharing the challenges with their peers and hence encouraging collegial bonding

2.2.10.51 Taafe and Cunningham (2005) found motivation (in terms of the perseverance required to complete a course of study) and being committed to the goal of completing a qualification, to be essential predictors of success. In contrast, Lotkowski, Robbins and Noeth (2004) looked at the concepts of academic goals (the

level of commitment to obtain a college degree), achievement motivation (the level of motivation to achieve success) and general self-concept (the level of self-confidence and self-esteem), but none of these factors were significant in predicting academic success. Gore (2006) also didn't find any relationship between the concepts of motivation and goal-setting, and the outcomes of performance and persistence.

2.2.10.52 Bishop and Mane (2001) studied the extent to which parents were involved in their children's lives, as well as the extent to which a student's locus of control played a role (via a parent involvement index and locus of control index, respectively). They found a positive relationship between wage rates and parents who set tighter limits on behaviour. In addition, having an internal locus of control lead to higher wage rates. Supporting the importance of this latter finding, Sahin *et al.* (2007) found 'can't concentrate or can't pay attention for long' had the greatest negative effect on students' success, whereas the item with the greatest positive effect on success was 'feels he or she has to be perfect'.

2.2.10.53 Sadler and Erasmus (2005) also found that an interest in the course of study, self-confidence and motivation were important factors (that couldn't be easily observed from matriculation results) for student success. They asked a question specifically about the reasons for joining the accounting profession as well, linking motivation to the concept of ambition. However, in an actuarial context, it should be noted that, arguably, not many first-year students fully appreciate the scope of the profession that they have joined, nor do they fully conceptualise the effort required to complete their studies. In fact, Lyn, Palandra and Daykin (2002, p6) felt that "many students are not exposed to, and therefore cannot appreciate, the entire scope of the profession until they have entered the workforce". As a result, when this realisation finally happens, it is possible that student motivation levels decline as they may feel disillusioned with their choice or they realise that this will require more effort they were willing to expend, both of which can impact academic success.

2.2.10.54 From a transformation perspective, Naumann, Bandalos and Gutkin (2003) felt that first generation university students do not have the same sources of support as later generation students, so they rely heavily on motivational factors to achieve academically. So, linked to the earlier comments on self-regulated

learning being a study skill, these students' successes are probably most closely related to their efforts in self-regulation. Pintrich (1995) in Naumann, Bandalos and Gutkin (2003, p1) felt that "self-regulated students view academic tasks as useful and interesting and see themselves capable of successfully fulfilling academic responsibilities". Associated with this, Naumann, Bandalos and Gutkin (2003) found that locus of control and expectancy for success influenced study decisions for first generation students.

2.2.10.55      However, this is in contrast to Carpenter, Friar and Lipe (1993) in Sadler and Erasmus (2005), who found that minority students have a lower level of academic achievement due to lower performance expectations (from people around them). Nevertheless, there does seem to be a strong overall reliance on motivation for these students, and strategies to increase levels of motivation (based on the various sources mentioned above) would very likely assist transformation.

2.2.10.56      Social factors and their effects are covered below.

2.2.10.57      A student's social integration is a critical factor for academic success. Whereas many people may believe that social activity is often in tension with academic activities (with the two competing for limited available time at university or while not at work), both are important in creating an environment where optimal performance can occur. This is particularly relevant where social activities happen with peers in the same academic group, allowing cross-pollination of study skills techniques and improved academic integration.

2.2.10.58      Lotkowski, Robbins and Noeth (2004) looked at social support (the level of social support a student feels that the institution provides) and social involvement (the extent to which a student feels connected to a college environment, peers, faculty and others in college, and is involved in campus activities). Both were important factors in predicting academic success (as well as retention). Through institutional interventions like block registrations, students are able to enrol in the same courses and attend classes as a single cohort. This makes them more likely to form peer networks, which can assist with developing academic-related skills,

increase social involvement, and perhaps even improve their general self-confidence and self-esteem.

2.2.10.59 According to Lotkowski, Robbins and Noeth (2004), there is a greater likelihood that students will withdraw if they find it difficult to establish friendships and students who pursue their studies to completion often say that they felt welcomed and supported by other students and even staff members. Bean and Metzner (1985) in Taafe and Cunningham (2005, p4) indicated that measures of social integration needed to encapsulate the “nature of relationships with teachers outside of class time, student friendships on campus and the extent of involvement in extra-curricular activities”.

2.2.10.60 Programs that aim to retain students by focussing on improving academic performance are based on models such as Tinto’s Theory of Student Departure (1975, 1993) and Bean’s Student Attrition Model (1980, 1985), both in Lotkowski, Robbins and Noeth (2004). Tinto believes a student’s integration into the social and academic life of the institution is affected by how his or her high school education interacts with his or her initial level of institutional commitment (in terms of its academic goals) i.e. how well you did at school can determine how well you think you will do after school and how committed you are to succeeding at this institution.

He then feels that social interaction can have a positive effect on academic performance when students forge friendships with other students who have strong academic orientations.

2.2.10.61 From a transformation angle, though, first generation college students struggle to fit in socially, largely due to issues around language, socio-economic status and cultural background (Lotkowski, Robbins and Noeth, 2004). According to Tatum (1997, 2004) in Lotkowski, Robbins and Noeth (2004, p17), “students need to see themselves reflected in the academic environment around them – in the faculty, staff, and faces of their peers, to avoid feelings of marginality that can undermine success”. Feelings of being marginalised can be significant in terms of overall academic integration and academic success, and these feelings should be measured by exploring issues of respect and acknowledgment.

2.2.10.62 Factors of a demographic nature are discussed below.

2.2.10.63 Demographic factors include variables like race, gender, age, marital status, religion and home language, amongst others, and many studies have found strong relationships between various demographic factors and academic performance. Bishop and Mane (2001) also pointed out that, on a practical level, since academic success is influenced by an array of other characteristics of the community and the student, it is advisable to control for as many of them as possible to reduce the possibility of biases introduced by omitted variable.

#### Age

2.2.10.64 In particular, age was found to be important by Burton and Dowling (2005), Dickson, Fleet and Watt (2000) and literature reviewed by Häkkinen (2004). The impact of age, though, was uncertain, as Öckert (2001) in Häkkinen (2004) found age at entry to be negatively related to student performance, but Dickson, Fleet and Watt (2000) (while acknowledging that the results from the literature were mixed) found that older students generally performed better than younger students. Thomas (undated) supported the fact that 'mature students' doing tertiary studies (who were generally older than 23 years of age in her studied populations) were less likely to succeed as they were at the stage of life where they struggled with financial independence, family responsibility and demanding work lives that are in conflict with studying.

#### Race and gender

2.2.10.65 Betts and Morrell (1999) in Häkkinen (2004) found that ethnic group is significantly linked to college performance. Ethnicity and culture were also important factors for Burton and Dowling (2005) who found distinct differences between on-campus and distance learning students, while Bishop and Mane (2001) found that ethnicity affected market wage rates (these were lower for African American people).

2.2.10.66 Öckert (2001) in Häkkinen (2004) found that females are most likely to graduate from university, but Bishop and Mane (2001) found females had significantly lower wage rates when they started working. Crocker *et al.* (2003) pointed out the effect of gender stereotypes on the advancement of women in scientific disciplines. This is primarily around how women experience a greater negative effect on their self-esteem when they perform poorly academically in traditionally male-dominated professions (such as engineering and actuarial science). Often, being a small proportion of a profession can make females question their ability at precisely the times when their abilities are being most challenged. It is also very likely that these subtle effects are applicable to race groups as well (specifically to Black Africans in the South African actuarial context, who make up a very small proportion of the profession).

2.2.10.67 Steele (1997, p614) defined the concept of a ‘stereotype threat’:  
*“The social-psychological threat that arises in a situation or doing something for which a negative stereotype about one’s group applies. This predicament threatens one with being negatively stereotyped, with being judged or treated stereotypically, or with the prospect of conforming to the stereotype.”*

In investigating this threat, he found that women in mathematical fields and African Americans doing standardised tests experienced this, where they attempted to overcome the threat by disproving the stereotype. As a result, they put much pressure on themselves to succeed, as failure was viewed merely as confirming the stereotype, and this pressure invariably lead to poor performance.

2.2.10.68 Specifically in the context of a woman’s attraction to and success in mathematics, he pointed out that this could be hindered by emotional reactions arising when the threat is experienced, or the chronic presence of the threat wearing down motivation. This idea of male dominance in mathematics being psychosocial, however, is counterbalanced by Benbow and Stanley (1983) who found that differences in mathematical reasoning ability at the highest ranges may have some grounding in biological differences. However, despite some indications of differential performance in the field of mathematics, McMahon and Boland (undated),



found no significant differences between males and females when looking at the time to qualification as an actuary.

### Home language

2.2.10.69 Home language was already mentioned as important when dealing with general communication skills. It is also essential to consider the possible language barrier that exists in South Africa, where eleven official languages are recognised, but most actuarial courses and study materials are delivered in English. However, merely being a first language English speaker does not guarantee good communication skills, though it can greatly assist.

2.2.10.70 For students who regard themselves as non-English first language, Kapp (2004) suggests that it is easy enough to pick up a second language for everyday conversation via regular practice. However, to succeed academically in a second language environment, students need a strong conceptual understanding in their first language, which then allows them to build a link between the second language and their first language. This highlights that it is probably more important to initially have excellent language skills (regardless of language spoken) – the appropriate development of another language will then follow.

2.2.10.71 This has a particular transformational implication as many Black African students (who are not first-language English speakers) are negatively affected by university admission rules that require good English marks at high school – if it can be shown that a student has good language skills, then, with an appropriate settling in period to acclimatise to the new English-language environment, these students may subsequently flourish in their studies. It should be acknowledged, though, that the new Outcomes Based Education school system and concomitant changes to university entrance requirements may place less of an emphasis on school English language marks and help to reduce the effect of this variable in future.

2.2.10.72 While it may not be possible to draw clear causal relationships between certain demographic characteristics and academic success (apart from, perhaps, gender), it is possible that various other factors (academic, psychological,

motivational or social) are more prevalent in people with certain demographic characteristics. For example, it may be that Black African unmarried females below the age of 25 have high levels of academic ability and an appropriate command of various thinking styles, but struggle with low levels of motivation from negative family pressures and poor social integration as they are not reflected in the environments around them, making it less likely that they will succeed on an actuarial path. If this were indeed the case, it would be most illuminating to determine if and how certain demographic characteristics are associated with other important success factors.

### **3. PERSISTENCY**

3.1 While retention on education programmes is difficult to measure and analyse, largely due to the practical difficulties of having to track down students who are no longer in the programme, it remains a critical component of any system.

Understanding the reasons for students leaving a programme is the second leg of understanding what factors help students succeed in a system. While in many cases the factors are similar, there are factors and models specific to persistency that need to be considered.

3.2 A profession can only thrive when the strongest candidates are attracted into the profession - as Lyn, Palandra and Daykin (2002, p11) stated, “the challenge is to attract individuals who will excel and fulfil the vision and values of the profession. The future leaders, with expertise, imagination and personality, will emerge from this body”. However, after attracting these candidates, leakage from the system must be minimised through monitoring persistency, and the throughput of students to qualification must be such that qualifiers are professionals of the highest standard who are representative of our diverse South African society.

3.3 There are many studies that cover persistence at university level and a few at the professional level, as well. Sandiford and Jackson (2003) developed a model showing how academic, socio-economic and motivational variables were related to students’ persistency in a community college nursing program. The theoretical frameworks used included: Tinto’s Student Integration Model, Bean’s Student

Attrition Model, Bean and Metzner's Nontraditional Graduate and Stahl and Pavel's Community College Retention Model. As mentioned earlier, Lotkowski, Robbins and Noeth (2004) also highlighted the importance of these theories by showing that most retention programs that focus on improving academic performance are based on models such as Tinto's Theory of Student Departure (1975, 1993) and Bean's Student Attrition Model (1980, 1985).

3.4 Gore (2006) found institutional commitment, academic-related skills, social support and social involvement to be predictive of college persistence. He especially highlighted the need to incorporate results into institutional and classroom-based interventions. Lotkowski, Robbins and Noeth (2004) also favoured institutional interventions, saying that academically focussed retention programmes that aim to increase students' academic competence (thereby increasing the likelihood of retention) are key. Taafe and Cunningham (2005, p3) further reinforced the important role played by the teaching staff at an institution, as well as the support provided by the institution, by finding that withdrawing students differed from persisters largely due to their lower opinions of the college, in general, and of the educators, in particular.

### 3.5 THEORIES OF PERSISTENCY

3.5.1 Many of the theories of persistency focus on the level of commitment a student feels towards an institution and the level of support that the student perceives the institution to provide. The idea of institutional support is critical (and probably a precursor to true institutional commitment), and is related to ideas introduced on institutional support in the discussion in a section above.

3.5.2 According to Milem and Berger (1997, p1), "Tinto's interactionist model of student departure (1975, 1993) and Astin's theory of involvement (1984) both deal with the issue of persistence in college and are among the most widely cited approaches in the higher education literature". This is reinforced by McCubbin (2003). Astin (1975), in Milem and Berger (1997), concluded that students more likely to depart from college environments were those who were not involved with college life. Tinto (1993, p71), in Milem and Berger (1997, p2), also supported the

critical role that student involvement played, in both academic performance and retention, and stated:

*“There appears to be an important link between learning and persistence that arises from the interplay of involvement and the quality of student effort. Involvement with one’s peers and with the faculty, both inside and outside the classroom, is positively related to the quality of student effort and in turn, both learning and persistence.”*

### 3.5.3 THE STUDENT INTEGRATION MODEL

3.5.3.1 McCubbin (2003) looked at the problems associated with student attrition and examined how the Student Integration Model (SIM) (Tinto, 1975) models the factors that influence this behaviour. In what was a revolutionary way of thinking, Tinto differentiated between different types of leaving behaviour (as opposed to the traditional definition of dropping out): academic failure, voluntary withdrawal, permanent dropout, temporary dropout and transfer. He asserted that attrition occurs because the individual is insufficiently integrated into different aspects of college and university life and at the heart of this SIM is the degree to which the individual is integrated into the social and academic aspects of the university. Tinto felt that the two most important systems at college were academic and social, and believed an extreme integration in one would cause problems in the other. He also assessed the degree to which individual characteristics (personality traits) would make a person more likely to drop out, and focussed on the extent to which a student is committed to the goal of attaining a degree and the extent to which he or is committed to the university.

3.5.3.2 Under this model, goal- and institutional commitment are affected by individual attributes (age, sex, academic ability), academic and social experiences in high school, family background (social status, values and expectations) and educational expectations (how long the student intended to attend the institution, and how important the student viewed the institution). Clearly, demographic, socio-economic and motivational factors are all important here. The eventual dropout decision is influenced by the way a student’s commitment to the goal of college completion interacts with his or her commitment to the specific educational

institution. According to Tinto, academic integration affects goal commitment directly, while social integration affects institutional commitment.

3.5.3.3 Tinto found that academic dismissals were usually amongst students with a lower socio-economic status, lower aptitude and lower levels of intellectual development than those who persisted. However, students who voluntarily withdraw generally had a higher socio-economic status and higher intellectual levels than persisters. The implications for professions are far-reaching, in that the students who choose to leave may actually be the strongest ones, capable of excelling in any field they choose, and the skills and talents being 'bled' elsewhere constitute a great loss.

3.5.3.4 Integrating students academically involves the development of a strong affiliation with the academic environment, both within and outside formal class-time. Braxton and McClendon (2002) in Lotkowski, Robbins and Noeth (2004, p15), felt "academic integration could be developed through learning centred interaction with faculty, academic peers and staff, and through informal social contact with faculty and involvement in student organisations". This is linked to comments made by Tinto (1975) on social integration, where a lack of this would lead to voluntary withdrawals. Importantly, very high levels of social integration may lead to deficits in academic performance, but not directly to withdrawal, as long as the interaction in question was with a support group with 'strong academic orientations'. Social interaction within the academic environment has a double positive effect, as it increases both the levels of social and academic integration.

3.5.3.5 According to Tinto, from a student's point of view, academic integration is a combination of academic performance (extrinsic reward) and intellectual development (intrinsic reward). Students who persist view the education process as providing more intrinsic rewards (vocational development associated with gaining knowledge and appreciating ideas).

3.5.3.6 Under his theory, Tinto viewed the process of integration as consisting of three steps that needed to be completed in order:

- Separation – students dissociating themselves from the norms of past communities, including families, high school friends, and other local ties

- Transition – students are separated from their past lives but have not yet adopted the norms and behaviours from their new environment
- Incorporation – students adapt to and adopt the prevailing norms and behaviour patterns of their college or university community

It is after this final step that students become integrated, but an important point highlighted is that successful integration does not necessarily imply good persistency.

3.5.3.7 Tinto highlighted that contact with staff and other students in a university had a major role to play in the incorporation stage, but he was concerned more about the influence that this contact has on the student's perception of the level of support the institution provides and the level of commitment to student welfare. It is clear that persistence, whether in a university setting or in the context of professional membership, needs to be understood in terms of what processes are in place to help students move through the stages of integration mentioned above. It would seem that the 'transition-incorporation' step requires most of the focus.

3.5.3.8 To assist with this last step-movement, Tinto felt that rituals and ceremonies are essential, as they help validate any connectedness that students feel (to each other and to the institution). In a university setting, it is easier to implement these ideas if there are large residence populations, but all institutions can offer on-campus activities, student union activities, sports events, and other activities that can run with, alongside or out of the curricula.

### 3.5.4 PERCEIVED INSTITUTIONAL SUPPORT

3.5.4.1 Drawing on Tinto's theories, Milem and Berger (1997) proposed a model in which student behaviours and perceptions interact to influence the development of academic and social integration. They believe that students have different initial levels of institutional commitment when entering an institution, which can influence the extent to which they get involved in activities organised by the institution. In their model, the transition stage (occurring within the first 8 weeks of their study) is when students begin to engage in a variety of behaviours that reflect varying levels of institutional involvement. By getting involved in this way, students develop perceptions around the extent to which the institution supports the academic and social aspects of their experiences. These perceptions then influence the

probability that students will continue to expend energy through getting involved. When getting involved, students also perceive levels of peer support, which can further interact with institutional support to determine subsequent levels of involvement.

3.5.4.2 An important point they raised is that this ‘behaviour-perception-behaviour’ process is an essential cycle that occurs as a mechanism to help students take the step from transition to incorporation. This cycle helps inform students’ institutional commitment, which influences their decisions to remain or depart from that institution. In an actuarial context, it can be questioned whether student members are fully incorporated into the profession (or whether professional bodies take this development cycle into account when interacting with their members). This is particularly relevant as most of the profession’s traditional methods of communication and contact (e-mail and post) are to members on the Actuarial Society database, which excludes the vast numbers of undergraduate students that would not have registered with the profession yet (Actuarial Society of South Africa Database, 2007). It is also unclear whether Fellow members are fully incorporated (they are unlikely to want to depart, in the sense that this model is defining the concept, but it is unclear whether they have full levels of institutional commitment).

3.5.4.3 From this discussion, it is clear that perceived institutional support is key to retention. Some of Milem and Berger’s (1997) main findings were:

- Institutional commitment was a strong positive predictor of intent to re-enroll in the following semester.
- African American students reported higher levels of activist involvement but the lowest levels of perceived institutional support. Govender (2008), who studied levels of perceived support in residence populations at a South African university, found similar outcomes amongst Black African students.
- Students who had higher levels of academic achievement or were more academically orientated were more likely to become involved in organised activities and reported higher levels of perceived institutional support, but students who were not engaged academically had strong negative perceptions of institutional support. Gillerg (1987) in Häkkinen (2004) reinforced this when by finding that (for students specifically in business courses),

performing well in an entrance exam is negatively correlated with dropout probability.

- Past school performance was directly related to academic integration.
- Initial level of institutional commitment, at the time of entry, was a weak positive predictor of institutional commitment later on.
- Involvement with faculty members in and out of the classroom, as well as peers, positively influenced various cognitive and affective outcomes for college students.
- Social integration was more influential in predicting student persistence than academic integration (in the institution they studied).

3.5.4.4 Given the importance of institutional support, it is no surprise that mode of study is relevant to persistence. Sadler and Erasmus (2005) felt that accounting distance-learning students are higher persistency risks than on-campus students as they are affected by: poorly designed study guides, lack of formative assessment and insufficient student support systems. This is also highly relevant to actuarial students, where much of the studying for professional examinations happens via distance-learning systems.

## 3.6 THE REVISED STUDENT INTEGRATION MODEL

3.6.1 McCubbin (2003) pointed out the three common criticisms of the SIM: it is not an adequate model, it does not generalise beyond traditional students, and academic integration is not an important predictor of student attrition. In dealing with them, Tinto subsequently switched the focus of his research to highlight the importance of the classroom in the education and attrition process.

3.6.2 He stated, "It is from the classrooms, and the interactions that occur therein, that the processes of academic and social integration emerge. This is because the classroom is the common factor in any students' educational experience" (Tinto, 1997 in McCubbin, 2003, p8). Tutors and educators are present at all classes and students are required to participate in coordinated learning projects (while this is in the context of universities, this is also supported by Breier (2006), who described project-group case study analyses as more relevant for professional education). This type of education fosters strong links amongst the students and between the students



and the academic structures at the institution. Tinto felt that putting students in an environment where they learn in collaborative groups aids them in developing peer-support networks. As a result, this further integrates them in to social groups, while simultaneously integrating them into the academic sphere (McCubbin, 2003).

3.6.3 From this, he suggested that it is more valid to “consider academic integration as being nested within the broader sphere of social integration” (McCubbin, 2003, p8). He also suggests that the two concepts have differential effects depending on the time in the student’s academic development. Social integration is more important during the first year of study, when it is important for students to develop social relationships and support networks. In later years of a degree, academic integration is more important, for the majority of students, than social integration.

3.6.4 As an aside, a criticism of the SIM that has not been taken into account in subsequent revisions is that the role of a mentor or role-model is ignored. From the discussion earlier, it is clear that they can play an essential role in both academic and social integration. For the actuarial profession, it is likely that these mentors or role-models could then be involved both in attracting good candidates, as well as ensuring that they stay within the profession.

#### **4. IMPLICATIONS FOR TRANSFORMATION OF THE ACTUARIAL PROFESSION IN SOUTH AFRICA**

4.1 To the extent that students from different backgrounds have different levels of social, psychological and academic development, the stresses involved in the qualification process can be compounded, making an already difficult process almost unbearable. By investigating some of the factors required for success, an understanding can be gleaned around how to create an environment that is conducive for these factors to flourish, and how this environment needs to differ depending on a student’s background. This section attempts to summarise some factors that are very likely to have a particularly acute effect on previously disadvantaged students.

4.2 Structural issues arising from the legacy of apartheid means that many Black African students have families with a low socio-economic status, resulting in pressure on students to earn an income as early as possible. This means that the challenging actuarial subjects may be tackled without the full attention required to succeed. Many Black African students also live in isolated regions and rural regions, and studies have highlighted that students from isolated regions are at a greater risk of poor university performance (Burton and Dowling, 2005 and Dickson, Fleet and Watt, 2000). In South Africa, this means many Black African actuarial undergraduate students have travel to one of the four main actuarial universities (in Cape Town, Johannesburg, Stellenbosch and Pretoria), requiring much resettling and readjusting to a new and different environment. Being in a rural region means that general exposure to business transactions and financial concepts is limited, making the transition to university even more difficult for these students. In addition, the historically poor state of many schools traditionally reserved for Black Africans, also exposes these students to the risks of poor performance associated with poor quality schools (Bishop and Mane, 2001).

4.3 Role models and mentors play a critical role in providing advice and guidance to students, but these are in short supply for Black African actuarial students (despite efforts by the Association for South African Black Actuaries to run a mentorship programme). This could be alleviated when more Black Africans eventually qualify and assume these roles, but can also be helped by ensuring sufficient representation on professional leadership structures. Also, for first generation students who may not have heard of the actuarial profession, it is important to actively market the profession in the communities (Sadler and Erasmus, 2005). Being first generation, in itself, is also a disadvantage, as Letseka (2007) found that having siblings with general university experience can be invaluable in making students more comfortable with their studies.

4.4 Linked to the above idea, students need to perceive collaborative efforts to support them from the universities, professional bodies and employers. The accounting profession has already embarked on numerous initiatives to assist transformation (Sadler and Erasmus, 2005), but one of the most relevant ones in the actuarial context would be the collaboration between the professional body and a

major university to upgrade the facilities at a smaller university to ensure it could be accredited. This would be invaluable if it could assist in reducing the number of previously disadvantaged people that need to travel long distances and relocate to study their chosen path.

4.5 Regarding teaching methods, educators must adapt to student-body diversity (Venter, 2003 in Burton and Dowling, 2005). Methods employed should be sensitive to students of different educational backgrounds and should be consistently assessed to ensure that enough is being done to reduce the differences between the race groups (e.g. many Black African students have poor computer literacy skills, but are expected to access lecture material from websites and submit online assignments early on in their degrees).

4.6 Past academic performance can play a role in predicting future performance, but Cilliers and de Klerk (2001) and Sadler and Erasmus (2005) take a different view when dealing with students from historically disadvantaged backgrounds. Both sets of researchers feel that it is not appropriate to incorporate matriculation results into selection methods for these students as they only give an approximate indication of the likelihood of success. It is likely that these selection methods probably exclude many students who would otherwise have had the potential to succeed. This important proviso when dealing with past school performance is related to how the different types of intelligence flourish differently in different environments and highlights that measures relying on past school performance are weakened by any disconnect between teaching methods and assessment methods, as well as the extent to which the assessment methods are inappropriate for the ethnic group concerned.

4.7 Regarding study skills, Naumann, Bandalos and Gutkin (2003) found that first generation students, probably due to insufficient guidance from a lack of role models within their immediate environment, will benefit from any services that help them improve their skills in self-regulation (i.e. allow them to get better control over specific variables within their control) .

4.8 Intelligence is largely culturally defined, with students generally performing better when their concept of intelligence agrees with that of their teachers. Sternberg

(1999) found that minority students are more highly creative and practical than other students and these skills (developed in adverse environments) did not transfer to the school environment. He found that the way in which students are assessed should be related not only to the way they are taught, but also to the way they have been socialised, and that one needs to consider the extent to which the type of intelligence being displayed actually matches the current set of assessment methods before conclusions about intelligence can be drawn.

4.9 There are also important personality traits for previously disadvantaged students that can be encouraged from young ages. Ting (1998) in Naumann, Bandalos and Gutkin (2003) found that psychosocial variables such as successful leadership experience and community service played a major explanatory role for success amongst first generation students.

4.10 As for intelligence, Grigorenko and Sternberg (1997) found that teachers considered students as being higher achievers when they appeared to exhibit the same thinking styles that the teachers did. Students are more likely to achieve when their profiles match those of teachers, but not many South African university lecturers teaching Black African actuarial students have similar frames of reference to these students, which can subtly act as an impediment to these student's success.

4.11 Regarding motivational factors, first generation university students do not have the same sources of support as later generation students, so they rely heavily on motivational factors to achieve academically (Naumann, Bandalos and Gutkin, 2003). However, minority students have a lower level of academic achievement due to lower performance expectations (from people around them) (Carpenter, Friar and Lipe, 1993 in Sadler and Erasmus, 2005). It is likely that the boost to self-esteem from people showing faith in you is quite helpful and can reduce motivation when it is not given.

4.12 From the social side, first generation college students struggle to fit in socially, largely due to issues around language, socio-economic status and cultural background (Lotkowski, Robbins and Noeth, 2004). There may also be feelings of marginality, which can be significant inhibitors of academic integration and success (Tatum, 1997 and 2004 in Lotkowski, Robbins and Noeth, 2004).

4.13 Gender and race stereotypes are particularly acute in the actuarial profession where there is a small proportion of females and Black Africans. This can make these students question their ability at precisely the times when their abilities are being most challenged (Crocker *et al.*, 2003). Also prevalent is the ever-present 'stereotype threat' (Steele, 1997) which causes the affected students to try to overcome the threat by disproving the stereotype and putting so much pressure on themselves to succeed, that they invariably perform poorly. The chronic presence of the threat also wears down motivation.

4.14 It is more important to have excellent language skills (regardless of language spoken) to allow another language to be learnt (Kapp, 2004). However, given the insufficient focus on language skills in schools, this can be an issue for Black African students, many of whom have a difficult situation made more complex by the fact that they are not English first-language.

## **5. CONCLUSIONS**

5.1 This review of the relevant literature has suggested many factors that are likely to affect success in an actuarial qualification in South Africa and that can be studied further. To recap, success has been defined as the completion of the qualification in the shortest time possible.

5.2 Family socio-economic status is important as actuarial studies are costly and most students rely on the resources of people close to them to complete their education. Also, a lack of finances may mean that many students are pressured to enter the workforce as soon as possible, resulting in them tackling actuarial subjects in conjunction with a career. The area in which one lives can play a role as students from rural areas are unlikely to have encountered general financial concepts that would make a transition to a business degree quite difficult. Also, students from isolated regions need to either follow distance learning options (which have their own set of disadvantages) or need to relocate closer to a major actuarial university, at great financial cost and with great disruption to their lives. The type of school one attends can also influence future success as attending a large school with a large proportion of

classmates with a low socio-economic status and who perform poorly can, in turn, lead one to perform poorly post school.

5.3 Mentors play a critical role in developing academic and resource-based competencies and can increase levels of student involvement, motivation and academic self-confidence, leading to improved institutional commitment and engagement. Role models are important in stimulating interest in the profession, particularly amongst groups of people who may have otherwise never encountered these professionals. Linked to this is the support that an institution provides a student with. This is invaluable in making students feel connected to an institution and collaborative efforts between professional body, university and employer would be most successful in achieving many goals simultaneously. The role of the teacher is critical to any education system, where expanded learning opportunities need to accompany high performance expectations. Lectures are important in cognitively challenging studies, like actuarial science, as they can show students how to think, but education needs to be delivered in a way that takes into account a diverse student population with different educational standings and backgrounds – information needs to be delivered in an inclusive way.

5.4 Admission rules are important because they define the population that will proceed through to qualification, but they can only be useful predictors of success if they measure the appropriate skills. Subject-related tests may be more relevant than general tests, as they may indicate motivation to a greater extent. Too great a reliance on entrance examinations over past school performance, though, may result in older students being accepted at the expense of younger people. Regardless, strong admission rules (like high graduation standards) are useful as a signal of quality of graduates to the labour market and can overcome a situation where experienced workers are preferred.

5.5 Some of the most important factors are academic ones. Past academic performance has varied results as a predictor of success, probably due to a potential disconnect that can arise between teaching methods and assessment methods. Having a prior tertiary qualification may also not always help, as students who move universities and are given credits for qualifications at the sending university, find that

they were not given the chance to acclimatise to the expectations of the new university or given access to first-year introductory material. Communication skills are essential, given the highly technical and complex nature of both actuarial studies (i.e. the ability to understand study material) and eventual work (i.e. the ability to convey messages to a non-technical audience). Study skills are important as they lead to academic self-confidence, which leads to the further adoption of useful strategies. Three important strategies are finishing homework assignments by deadlines, concentrating on the most important subjects and studying despite distractions. Lectures are important as part of a suite of study methods, only if students realise that lectures are where they can actually learn how to think and approach problems, rather than just get notes. Many students have a choice between on-campus or distance learning options for later actuarial subjects and being formally tutored has been found to be a value-adding step. It is unclear whether work experience is completely positive or negative (examination answers can be given a practical angle, but only if they are not slanted to allow this drawing from experience), but examination preparedness is essential and working students who are given sufficient study leave can increase their chances of success to the same level as full-time students. Intelligence is largely culturally defined and tests of practical and creative intelligence have a low correlation with conventional intelligence tests despite the fact that creative and practical skills are, arguably, more important post school. Importantly, students should be assessed not only to the way they are taught, but also to the way they were socialised.

5.6 Regarding psychological factors, people with high levels of self-confidence and a leaning towards teamwork are successful because they generally have high levels of self-esteem and motivation. However, there are dangers with linking self-esteem too closely with academic success, as these students are more prone to suffering from depression and focus on avoiding failure rather than achieving true success. Thinking styles operate in a situational-style-type framework, where there is no one style that guarantees success, but rather different styles are appropriate to different circumstances (e.g. different stages of the examination process require different styles). Just as in the research around intelligence, it has been found that teachers considered students as being higher achievers when they appeared to exhibit

the same profile (in terms of thinking style or concept of intelligence) that the teachers did.

5.7 People derive their motivation from various sources, but there are mixed results as to whether high levels of parental involvement or a strong internal locus of control lead to greater success. Regardless, having high levels of performance expectations can be useful as they increase self-worth by showing that people believe in you.

5.8 Whereas many people may believe that social activity is often in tension with academic activities (with the two competing for limited available time at university or while not at work), both are important in creating an environment where optimal performance can occur. This is particularly relevant where social activities happen with peers in the same academic group, allowing cross-pollination of study skills techniques and improved academic integration.

5.9 As far as demographic factors are concerned, the impact of age is uncertain, but it is likely that older students find themselves at a disadvantage when they are at the stage of life where they struggle with financial independence, family responsibility and demanding work lives that are in conflict with studying. Gender and race stereotypes can have a crippling effect on academic success for females and Black Africans, as being a small proportion of a profession can make these students question their ability at precisely the times when their abilities are being most challenged. In an attempt to overcome the stereotype threat they feel, they put much pressure on themselves to succeed, as failure is viewed merely as confirming the stereotype, and this pressure invariably leads to poor performance. Regarding language skills, while there is often a focus on English as it is the primary language of business and most actuarial courses, it is more important to have excellent language skills in general (regardless of language spoken) to allow the appropriate development of another language.

5.10 Persistency can be improved by focussing efforts at the transition-incorporation stage of a student's development at an institution. These efforts will allow the student to develop a strong affiliation with the academic environment and



have a positive impact on the student's perception of the level of support the institution provides and the level of commitment to student welfare. Project-based group-work is probably the most effective means of allowing students to forge strong links amongst themselves and between them and educators.

5.11 Importantly, the discussion in section 4 has highlighted particular anomalies from a transformation perspective, giving possible explanations as to why the proportion of Black African actuaries is currently so low and why it will probably take some time for this situation to improve. At a base level, Black African actuarial students have to deal with the structural issues introduced by the apartheid regime (including lower standards of high school education and lower socio-economic statuses of their families), which can filter into various issues like a lack of computer skills and other preparatory skills or a lack of understanding of general business concepts and financial transactions. In addition, these students have to deal with the issues associated with being largely first generation university students, together with the fact that academic and intelligence assessments performed are probably inappropriate for their social and cultural context. These students also struggle with integrating socially and academically into the institutions.

5.12 Given these difficulties, transformation will not happen without targeted intervention from institutions (the profession, universities and employers) to help students overcome at least some of these obstacles. Transformation initiatives should aim to implement programmes that remove any structural problems that make it less likely for Black African students to graduate or qualify, and aim to place all students on an equal footing. The challenge is in ensuring that, in achieving this aim, the programmes do not break down the actuarial profession's traditional and accepted barriers to entry.

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