

## Failure Modes and Effects Analysis of Repeating Accounting Students

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**ABSTRACT** Over the years, the failure patterns of repeating students of Bachelor of Accounting among South African universities have become more noticeable and a concern to both academics and administrators alike. The paper identifies and determines the potential failure pattern that leads to the occurrence of failure of this group of students and suggests changes on curriculum design or teaching, learning and assessment methods so as to achieve best performance. Accordingly, using a deductive analysis approach that utilises the Failure Mode and Effects Analysis (FMEA) tool to analyse the results of an in-depth interview conducted among accounting academic staffs and students at a historically disadvantaged university in South Africa. Analysis showed that the failure patterns were significantly similar, significantly more reliable, and significantly more discernible on the risk of the repeated failures.

### INTRODUCTION

Many universities accounting students in South Africa have been more involved in repeat courses during the last ten years. These groups of students have been involved in repeating same courses a number of times. The affected students are mostly second and third year accounting students papering for the general Bachelor of Commerce Accounting. Moreover, many of these students are forced to enrol at another university to pass the failed courses after two attempts. However, it will take the concerted effort of all stakeholders for this trend to be reversed. Sayer et al. (2002) identify causes of academic failure to range from deficient paper skills to financial, domestic and emotional problems, especially among medical students. In contrast, Gomes-Neto and Hanushek (1994) believe that the general concern about academic repetition in developing countries derives from budgetary and social implications of having large number of students in a crowded classroom. Other reasons for academic failures among university students include poor academic progress, lack of clear goals and motivation (Morisano et al. 2010; Lozano et al. 2014). While researchers based their papers on medical, psychology and high school students in Brasil and the United States of America (Gaultney 2010; Souza e Silva and Rocha Filho 2011), this paper

focuses on undergraduate accounting students at a university in South Africa where by the majority of its students are from rural high schools. Using a deductive analysis approach that utilises the Failure Mode and Effects Analysis (FMEA) tool, an analysis of the results of a paper questionnaire was conducted, plus in-depth interviews with both academics and students at a disadvantaged university in South Africa. This paper sought to identify and determine potential failure pattern among this group of students and to propose changes to curriculum design or teaching, learning and assessment methods so as to achieve best performance. This paper provides answers to the following research questions: what are the reasons for the failure pattern among repeating accounting students at this university?; what effects does the failure patterns have on the teaching and learning approach being used?; and how can these failure patterns and effects be mitigated, especially since the university is traditionally a rural university?

The rest of the paper is structured as follows: the next section provides a brief conceptual framework. This is followed by an exploration of causes of failure among university students. Following this, the next section discusses the case of the failure pattern of the Bachelor of Commerce Accounting students in a historically disadvantaged university and the effects

on teaching and learning approach. The final section draws conclusions.

### **Related Literature**

This section presents an overview of the concepts of academic failure and repeating students in the context of a university setting.

#### ***Academic Failure***

Academic failures result in both financial and emotional stress for students and impact negatively on resource, performance and throughput ratio for the higher institution concerned (Gracia and Jenkins 2002). Over the years, it has become apparent that students with non-specialist background in accounting perform poorly in core accounting modules (Lane and Porch 2002). In previous studies, some determinants of performance in undergraduate accounting modules have been identified to include gender, prior accounting knowledge, academic aptitude, mathematics background, previous working experience and age (Koh and Koh 1999). More importantly, as suggested by Byrne and Flood (2005), is the impact on learning of students' motives for entering higher education; their rationale for selecting an accounting programme; their preparedness for further paper; and their expectations. Research has shown that beginner accounting students have many stereotypical negative perceptions of accounting because negative perceptions are often created in introductory accounting courses (Mladenovic 2000). As such, since stereotypes influence career choice, courses supporting unrealistic perceptions may result in the wrong candidates choosing accounting careers, while the right candidates choose non-accounting careers (Friedlan 1995).

Whereas Tan and Laswad (2006) observe that personal, referents and control factors are determinants of students' intention to major in accounting, Auyeung and Sands (1997) contend that parental influence; peer influence; teacher influence; association with others in the field; aptitude for the subject matter; availability of employment; prestige and social status; earning potential; cost of education; and year of paper have greater impact on career choices. Gracia and Jenkins (2002) recognised that, while

there are complexity and subjectivity issues in the academic performance of undergraduate students, such issues are influenced by the negative focus of reasoning underlying the choice of paper. This means that the underlying reasoning of a student's choice of accounting will greatly impact his or her academic performance. Other factors such as the impact of affect; the importance of the role of the tutor; the tutor expectation gap; levels of control and personal responsibility for learning; and patterns of participation, are possible significant and important factors in understanding students' academic performance (Gracia and Jenkins 2002).

The negative perceptions that are created in introductory accounting courses derive from the institution's teaching and learning methods. Acknowledging the existence of such negative perceptions will afford tutors the opportunity to have a greater sensitivity to, and a better understanding of their students, so as to enable better informed-curriculum, teaching and assessment within the accounting discipline, thereby aiding students' transition to higher education, and leading to higher quality learning (Byrne and Flood 2005). Studies have shown that while non-traditional teaching methods such as Co-operative Learning and Case-Based Learning are more effective in changing negative learning than the more traditional Lecture-based methods, these methods have produced limited success (Mladenovic 2000). Gracia and Jenkins (2002) discovered that students who undertake supervised work-experience do better. The usefulness of active or participatory learning have been emphasised, though the success of this methodology does not depend on methodology alone, but on the constantly evolving, dialectical relationship between methodology and learners, that is mediated by the tutor to promote lifelong learning (Kane 2004). The substantial increase in the enrolment figures of accounting students in developing countries in the last decade posed a critical challenge for the use of the active learning method. A major fallout of these increases is the maintenance of class sizes in universities, especially at undergraduate level (Mulryan-Kyne 2010). It is clear from research literature that large classes at higher institutions create particular problems for tutor and student alike, many that contribute to less effective teaching and learning (Mulryan-Kyne 2010).

### ***Repeating Students: Why Student Fail***

Research have demonstrated that a student approach to learning is a critical factor in determining the quality of the learning outcome (Byrne et al. 2002). A number of reasons have been advocated for poor academic performance of accounting students in higher institutions. Gracia and Jenkins (2002) explain that much of the work on accounting students' performance is quantitative, which restricts understanding of the deeper feelings and perceptions of students towards their studies. Non-attendance of class is one of the major factors responsible for poor performance and increased repeats, especially among students engaged in part-time employment (Paisey and Paisey 2004). Paisey and Paisey (2004) argue that some aspects of students' academic work may affect attendance, such as the timing of classes and coursework assignments, and subsequently have a positive relationship to academic performance. The low level of students' orientation to learning and inadequate structure of students' learning outcomes have also been identified as reasons for academic failure among undergraduates (Ramburutha and Mladenovic 2004). In contrast, Booth et al. (1999) found that higher surface approach to learning is associated to less successful academic performance. In South Africa, a paper by Zulu (2008) revealed that academic failure among Black accounting students is attributable to late submission of assignments, inability to ask questions, and poor communication skills.

### **METHODOLOGY**

The case study method was adopted for this paper on the general Bachelor of Commerce Accounting repeating students in four courses (viz., Financial Accounting, Auditing, Management Accounting and Taxation) in a disadvantaged university in South Africa. This was intended to identify and determine any potential failure pattern that led to the occurrence of the failure of this group of students and to make suggestions to achieve best performance. Data for this paper are based on the responses from a questionnaire and in-depth interviews of both academic staff and students within the School of Accountancy of a disadvantaged university in South

Africa. The Failure Mode and Effects Analysis (FMEA) tool was used to analyse these results by calculating the Risk Priority Number (RPN) to determine what further action needs to be taken. The FMEA is a systematic, proactive method for evaluating a process to identify where and how it might fail and to assess the relative impact of these failures, in order to identify the parts of the process that are most in need of change (Chin et al. 2009).

### **Failure Modes and Effects Analysis (FMEA)**

Failure Modes and Effects Analysis (FMEA) is an engineering technique used to define, identify and eliminate known and potential failures, problems and errors from system, design, process or service before they reach the client (Chin et al. 2009). For the purpose of this paper, students represent the product. The FMEA technique has gained wide acceptance and applications in a wide range of industries such as aerospace, nuclear, chemical, manufacturing, nursing and medicine (Guimaraes and Franklin Lapa 2004; Duwe et al. 2005; Paparella 2007; Yang et al. 2011). The objective of adapting the FMEA technique in this paper is to allow tutors and administrators to identify and prevent known and potential problems encountered by repeat accounting students. At any rate, Paparella (2007) contends that the use of a complex engineering technique such as FMEA in an education-related research is adaptable because the technique is straight forward, proactive in risk identification and quality improvement that is simple to learn and applicable in all settings. As such, FMEA can help to identify known and potential failure modes and their causes and effects among students; help prioritise identified failure modes; and can also help them work out corrective actions for the failure modes (Chin et al. 2009). In essence, the risk of each identified failure mode needs to be evaluated and prioritised so that appropriate corrective actions can be taken for different failure modes (Guimaraes and Franklin Lapa 2004). The priority of a failure mode is determined through the Risk Priority Number (RPN), which equals the product of the Occurrence (O), Severity (S), and Detection (D) of the failure (Chin et al. 2009), that is:

$$RPN = O \times S \times D$$

The three factors, namely, O, S and D, are all evaluated using the ratings from 1 to 10 as de-

scribed in the appendix. Consequently, the failures with higher RPNs are considered to be more critical and need to be given higher priority (Chin et al. 2009).

While the FMEA technique has been proven to be one of the most important early preventative initiatives at the design stage of a system, process or service, it has, however, been extensively criticised for various reasons. Such criticisms include the following:

- ♦ the generation of exactly same value of RPN by different sets of O, S, and D with their totally different hidden risk implications;
- ♦ the assumption that all three factors, viz., O, S, and D, have the same importance;
- ♦ that the mathematical formula for calculating RPN is questionable and debatable;
- ♦ the conversion scores is different for the three factors;
- ♦ small variations in one rating may lead to vastly different effects on RPN; and
- ♦ the three factors are difficult to precisely determine (Chang et al. 2001; Sankar Prabhu 2001; Pillay and Wang 2003; Bowles 2004).

Based on the above reasons, Chin et al. (2009) proposed that a modified FMEA can model the diversity and uncertainty of the assessment information in FMEA, as well as incorporate the relative importance of risk factors into the determination of risk priority of failure modes in a strict way.

## RESULTS AND DISCUSSION

A sample of 25 academic staffs and 220 students at a School of Accountancy in a disadvantaged university in South Africa participated in this paper. However, only 16 of the 25 academic staff, representing 64%, and 153 of the 220 students, representing 70%, responded to the questionnaire (see Appendix). As stated earlier, the FMEA model was adapted to analyse the responses from this questionnaire. The reason is that the model can be adapted by the analyst to analyse particular failure modes and effect of the situation under investigation (Guimaraes and Franklin Lapa 2004; Duwe et al. 2005; Paparella 2007; Yang et al. 2011). Based on the underlying assumptions of the FMEA model, the average individual mode scores of the three different factors were taken. Nevertheless, the result of the analysis is presented below:

Formula:  $RPN = O \times S \times D$

Average scores from the questionnaire are:

O = 11; S = 8.44; and D = 13.44

$RPN = O \times S \times D = 11 \times 8.44 \times 13.44 = 1247.78$

The implication of the analysis is that the repeat students are at high risk of failure when repeating a course they have failed before due to the factors identified to have caused their failure at first attempt. Based on the responses of the respondents (academic staff and students alike) which utilised the FMEA, the RPN of 1 247 as computed above is considered too high (Chin et al. 2009). Analysis showed that the failure patterns were significantly similar, significantly more reliable, and significantly more discernible on the risk of the repeat failures. Therefore, this set of students requires special attention as they are considered to be at risk.

Incidentally, responses from the in-depth interview attribute reasons for failure to lack of internet access, especially for repeating students who stay off-campus given that it is more dangerous when going back to residences after papering late into the night at the University Library. They pointed out that preparing off-campus is not conducive because of heavy noise coming from loud music by residents. Among other reasons given for students' failure is, namely, the apparent lack of preparation before tests and examinations are written as time slots for some of the repeated courses clash with those of other courses that they were meant to take (Morisano et al. 2010; Lozano et al. 2014). In addition, repeating students are often times not funded for repeating a course. Heavy drinking during weekends among the male students, as well as broken relationships as a result of cheating and physical abuse from partners, were some of the reasons why this set of students fail. Likewise, the lack of self-paper and absenteeism from lectures: for reasons connected with being ashamed of attending lectures with students regarded as their junior, are considered as contributing to failure rate among repeating students. The lack of confidence and composure that leads to pre-emptive conclusion among this set of students that certain courses, like Financial Management, are difficult to understand, have led some of them to become psychologically prepared for failure. A significant factor for failure among these sets of repeating students is their continued absence or lack of participation during tutorials, which is normally held in the eve-

nings after lectures. In like manner, some of the respondents were of the opinion that a repeating student whose parents are going through divorce could become traumatised and that may result in failure.

While extra lectures and tutorials have been suggested to reduce deficient paper skills among this set of students, respondents noted that, if this action is not taken urgently, many of the repeating students may not be able to complete their studies. It is proposed that repeating students should be allowed to access funding to enable them to complete their qualification; just as relocation and counselling have been suggested for repeating students who have domestic problems such as divorce of parents. For those students experiencing poor academic progression due to lack of clear goals and motivation, it is believed career counselling will be a good recommendation. Respondents contend that internship in accounting firms during semester breaks will help resolve the problem of lack of prior accounting knowledge and issues with previous working experience. For repeating students experiencing academic failures due to relationships, they have been advised to seek gender and academic counselling. However, on the issue of smaller lecture venues and over-crowdedness, respondents suggested an improvement of the university's infrastructure so as to reduce the number of students in a lecture hall. They argue that this will necessitate sourcing for additional lecturers.

### CONCLUSION

The failure patterns and effects of repeating accounting students at a South African university have been examined, with some of the reasons and justifications considered unique to historically disadvantage Black South African University. The results were then analysed to determine if a significant pattern of failure occurred among the group of repeating accounting students over the years to understand the failure mechanism so as to eliminate the root causes. However, conclusions and generalizations can be drawn with regards to similar university settings, especially among developing African countries. Consequently, the failure patterns and effects analysis of the set of repeating general Bachelor of Commerce Accounting students in

this paper provide information to scholars and administrators alike so that they could understand the capabilities and limitations of their teaching, learning and assessment methods to achieve best performance.

### RECOMMENDATIONS

Based on the analysis of the respondents' responses to the paper questionnaire, the paper recommends that at-risk students be identified mid-way through the semester to institute correct measures. The paper suggests that scholars and administrators need to concentrate on the failure patterns found in this paper, which would have significant effects on their teaching, learning and assessment methods, and then grade them into categories, such as catastrophic, critical or mild, in order to scale it down to a miniscule value. More importantly, effective and efficient teaching and learning approach will go a long way towards ending these circles of failures.

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## APPENDIX

Dear Respondent (s),

I request your cooperation by responding to the questions below regarding the above topic which is of great concern in our school. Kindly choose between the numbers 1-10 on the three themes below by ticking (") in the appropriate box. (1 represents the least oc-

currence, detection, and severity respectively; while 10 represents the highest level of occurrence, detection, and severity). This questionnaire is strictly for research purpose; hence, your identity is protected.

Thank you for responding.  
Researcher

**Table 1: Failure mode and effects analysis of second-third year bachelor of commerce accounting students at the University of Limpopo**

| <i>Steps in the process</i> | <i>Failure mode</i>                  | <i>Failure causes</i> | <i>Failure effects</i> | <i>Likelihood of occurrence (1-10)</i> | <i>Likelihood of detection (1-10)</i> | <i>Severity (1-10)</i> | <i>Risk priority number (rpn)</i> | <i>Actions to reduce occurrence of failure risk</i> |
|-----------------------------|--------------------------------------|-----------------------|------------------------|----------------------------------------|---------------------------------------|------------------------|-----------------------------------|-----------------------------------------------------|
|                             | Deficient paper skills               |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Financial problems                   |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Domestic problems                    |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Emotional problems                   |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Crowded classroom                    |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Poor academic progress               |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Lack of clear goals and motivation   |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Gender                               |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Prior accounting knowledge           |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Academic aptitude                    |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Mathematics background               |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Previous working experience          |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Age                                  |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | The impact of affect                 |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | The role of the tutor                |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | The tutor expectation gap            |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Levels of control                    |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Personal responsibility for learning |                       |                        |                                        |                                       |                        |                                   |                                                     |
|                             | Patterns of participation            |                       |                        |                                        |                                       |                        |                                   |                                                     |