FINANCIAL VIABILITY – COSTING TEACHING MODULES AT A SOUTH AFRICAN UNIVERSITY

by

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Declaration

I declare that the dissertation hereby handed in for the qualification Magister in Accounting at the University of the Free State is my own independent work and that I have not previously submitted the same work for a qualification at/in another university/faculty.

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TO WHOM IT MAY CONCERN

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Abstract

Universities are facing a rapidly changing environment. The Fourth Industrial Revolution (4IR) is not only changing the skills needed to ensure employability, but also the mode of delivery, which threatens the very survival of traditional universities. Online education is becoming increasingly popular with the real potential of undermining the business model of traditional universities focusing on on-campus and face-to-face delivery of tuition.

Universities in developing countries often face additional problems. On the local front, universities are confronted with several challenges such as declining subsidies from government and large numbers of previously disadvantaged youth who are poor, with substandard secondary education, but in desperate need of affordable tertiary education that will ensure employability. In contrast, over the last ten years, South African universities have responded with tuition fees increasing well above the inflation rate of the country to combat their relatively declining subsidies from government. Universities in South Africa have seen the climax of the impact of these challenges during the #FeesMustFall protests that shook universities countrywide. These student protests in South Africa reached a peak after the 2015 announcement by Blade Nzimande, the then South African Minister of Higher Education, of a proposed hike in tuition fees of between 10% and 12%. The counter-reaction of the protesting students was a call for free higher education.

These protests reiterated the financing challenges universities are facing. The current trajectory of tuition fee increases implies that university education is becoming progressively more unaffordable for the majority of South African students. Add the increasing pressure on an already financially constraint government to finance poor students' tertiary education (NSFAS), and you are confronted with a very concerning dilemma to ensure the sustainability of South African universities. Traditional universities will have to make urgent and serious decisions regarding their existing business model for them to remain financially sustainable and relevant in the future.

The affordability crisis previously explained necessitates university administrators to make certain decisions. The main focus of management accounting is to provide relevant and accurate financial information for better decision-making. Informed decisions about future activities of any organisation, especially in the modern business environment, cannot be made without the required data and accurate information. The provision of cost information

to assist in the decision-making function of an organisation is an important requirement of management accounting in the digital age. Modules (a module is typically one of the courses that is presented to complete a degree) are the teaching building blocks of degrees and student enrolments, as well as the cost drivers of departments and faculties. The primary objective of this study is to determine the financial viability of teaching modules presented at a South African university using management accounting and cost allocation techniques that could assist the administrators of the university in offering affordable tertiary education to students.

The study comprised both a literature review and empirical research. The purpose of the literature review was a) to describe the changing environment of and the challenges faced by universities; b) to explore the application of management and cost accounting principles for decision making in service organisations with specific reference to universities; and c) to explain why different cost information is required to achieve different outcomes.

The main aim of the empirical research was to determine the financial viability of teaching modules presented at a South African university using management accounting and cost allocation techniques. The results of this study were utilised to discuss the different ways in which the calculation of the cost per teaching module could benefit a university, such as using the breakeven analysis as a benchmark to indicate viability. The empirical study was conducted following a quantitative design with an exploratory case purpose (one traditional South African university), using a sample of 3 497 modules presented to 276 627 students (enrolments).

The direct cost of the teaching modules of the related university was determined using the methodology as set out in chapter 4. It is rather easier to cost a product than it is to cost a service and teaching modules are regarded as a service. One of the challenges faced in calculating the cost of a teaching module was that teaching income at a university depends predominantly on the number of students enrolled for a module or degree and is thus a variable income, while the cost of teaching the module is predominantly a fixed or a period cost, since it consists mainly of salaries. This creates the classic management accounting problem of costing services in an organisation without a clear input/output relationship, which complicates the costing of a service severely. What made it even more difficult to cost modules at a university was the diverse nature of modules in terms of number of enrolments, different NQF levels, different funding weights and a varying number of credits,

as well as no relationship between income and the number of modules presented. In addition, the skewness of the data with many modules having few enrolments, with only a few modules having a large number of enrolments added to the complexity.

After taking all these complexities into account, the calculated cost, as well as the actual tuition and subsidy income of these modules, was used to determine the number of enrolments required per module to ensure that each module covers at least its direct costs (breakeven). It was established that the breakeven enrolments for undergraduate modules were 30 enrolments, with 21 modules at NQF level 8 and almost 14 at NQF level 9. This leads to the observation that 52,5% of the modules with the least number of enrolments presented at the responding university do not even cover their direct costs amounting to a direct loss of R174,9 million, while only 6,3% of the modules make a direct profit of R386,5 million. Another observation was that postgraduate modules, regardless of their higher income per enrolment, were less profitable than undergraduate modules. The results of the described calculations were applied to perform various statistical analyses to finally determine the main drivers of the direct profit of a teaching module.

The statistical analyses performed clearly indicated that the number of students enrolled in a module is the strongest driver of the direct profit of that module. This finding reiterates the value of determining the breakeven number of enrolments and forming the strategic direction of the related university around the number of students enrolled in a module.

From both a human and financial perspective, any process of strategically deciding what to do must also include what not to do any longer. The findings and conclusions from this study can assist decision-makers at universities in aligning their strategy to optimise the direct profit of teaching modules. Adjusting the strategy of a university could further lead to possible decreases in tuition fees as well as the teaching load of academics, which could ultimately lead to more research outputs. The empirical results have already been presented to top management, the deans and the management committees of all the faculties, confirming the relevance and the contribution of the study.

Key words: cost and management accounting, direct costs, indirect costs, overhead allocation, cost objective, decision-making, traditional university, service organisation, module, enrolment, Fourth Industrial Revolution, financial sustainability.

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List of abbreviations used

4IR	–	Fourth Industrial Revolution
ABB	–	Activity-based Budgeting
ABC	–	Activity-based costing
ABCM	–	Activity-based Cost Management
ABM	–	Activity-based Management
ABM	–	Activity-based Management
ACC	–	Accounting
AHRD	–	Academy of Human Resource Development
ANOVA	–	One-way Analysis of Variance
B ACC	–	Bachelor of Accounting
BBC[1]	–	British Broadcasting Company
BBC[2]	–	Behaviour Based Costing
BPR	–	Business Process Re-Engineering
CA(SA)	–	Chartered Accountant South Africa
CANOA	–	Analytical Accounting for Autonomous Public Bodies
CAS	–	Cost Accounting Standards
CESM	-	Classification of Educational Subject Matter
CMA	–	Certified Management Accountant
CNL	–	Costs of Networked Learning
CPI	–	Consumer Price Index
CPS	–	Cyber-Physical Systems
Df	–	Degrees of Freedom
DHET	–	Department of Higher Education, Science and Technology[1]
EMS	–	Economic and Management Sciences
eNCA	–	eNews Channel Africa
FAC	–	Faculty
FTE	–	Full-Time Equivalent
GDP	–	Gross Domestic Product
HBS	–	Harvard Business School
HEMIS	–	Higher Education Management Information Services
HR	–	Human Resource
IAS	–	International Accounting Standards
IASB	–	International Accounting Standards Board
IFRS	–	International Financial Reporting Standards
IPA	–	Institute of Public Affairs
LGBTQ	–	Lesbian, Gay, Bisexual, Transgender and Queer
MBA	–	Master of Business Administration
MIT	–	Massachusetts Institute of Technology
MOOCs	–	Massive Open Online Courses
MST	–	Mean square treatment
NBER	–	National Bureau of Economic Research

[1] Previously known as the Department of Higher Education and Training. The full study will, however, refer to the new name as included in this list of abbreviations.

NCCHE	–	National Commission on the Cost of Higher Education
NCHE	–	National Council on Higher Education
NPV	–	Net Present Value
NQF	–	National Qualifications Framework
NSFAS	–	National Student Financial Aid Scheme
OECD	–	Organisation for Economic Co-Operation and Development
PMG	–	Parliamentary Monitoring Group
RBC	–	Royal Bank of Canada
RCM	–	Resource Cost Model
ROAPE	–	Review of African Political Economy
RSA	–	Republic of South Africa
SAICA	–	South African Institute of Chartered Accountants
SAQA	–	South African Qualifications Authority
SCAU	–	System of Cost Accounting for the Universities
SEA	–	Share Empower Awareness Practical Application of Science
SGEM	–	International Multidisciplinary Scientific Geoconference
Sig	–	Significance
SLE	–	Senior Lecturer Equivalent
SPSS	–	Statistical Package of Sciences
SRC	–	Student Representative Councils
STATSSA	–	Statistics South Africa
Std Dev	–	Standard Deviation
STEAM/STEM	–	Science Technology Engineering Arts Mathematics
SUC	–	Cost Accounting at Catalan Universities
TCM	–	Technology Costing Methodology
TIU	–	Teaching Input Unit
TOU	–	Teaching Output subsidy
TVET	–	Technical Vocational College
UCGH	–	University of the Cape of Good Hope
UCT	–	University of Cape Town
UFS	–	University of the Free State
UK	–	United Kingdom
UK	–	United Kingdom
UNISA	–	University of South Africa
US	–	United States
USA	–	United States of America
USAF	–	Universities South Africa
WCET	–	Western Cooperative for Educational Telecommunication
WEF	–	World Economic Forum
WITS	–	University of the Witwatersrand
WRAB	–	West Rand Administrative Buildings
ZBB	–	Zero-based Budgeting

Chapter 1: Introduction and background

1.1. Introduction and background to the study

The 21st century brought about 'daunting' challenges to societies and economies (Organisation for Economic Cooperation and Development [OECD], 2012: 2), and education is a critical aspect of responding to any challenge. However, education systems must improve performance in the provision of fair educational opportunities. Part of the change required in educational systems is the provision of knowledge, tools and skills to people to remain relevant and competitive (Organisation for Economic Cooperation and Development [OECD], 2012: 2).

Remaining competitive and relevant is proving to be a challenge to universities since university education is in a time of swift change (Bawa, 2017: para. 2). Some of the changes mentioned by Bawa was already noted in 2000 and 2004 by Levine and Evans, respectively as a shift in demographics, innovative technology, commercialisation of universities, and the transformation of the universities' relationship with government, as well as the shift from an industrial society to an information-centred society (Levine, 2000: 1–3; Evans, 2004: 1). Further changes impacting the university landscape is increased competition, a decrease in government funding, but greater government involvement, increased rights of consumers (students) and the demand for value for money by students (Hagendijk, 2014: 1). Bawa (2017: paras. 4-5) adds the increased demand for higher education with a supply that is not increasing at the same speed (this increase is termed massification) to the list of changes universities are faced with. Universities are also under increased pressure to be re-established as social institutions that are "simultaneously responsive to local and global issues, with social justice at its centre" (Bawa, 2017: para. 4). The pressure on universities to adapt to the changes mentioned is ever increasing and failing to change could be a threat to the financial well-being of universities (Levine, 2000: 1–3; Evans, 2004: 1; Hagendijk, 2014: 4).

The prediction of a Fourth Industrial Revolution (4IR) puts further pressure on the financial well-being of universities. The workplace will look significantly different in 2020 and beyond from the present day. Reasons for this change stem from disruptive technologies such as artificial intelligence, advanced robotics, the Internet of things, energy storage, drones,

cloud technology, to mention a few examples (Hattingh, 2016: 1–3). Universities are not equipping students with the skills required by the organisations that will employ them, since these skills differ from what was traditionally required, and are therefore becoming less relevant (Hattingh, 2016: 1–3).

Internationally, the relevance of universities has recently been in the limelight, with various students as well as academics protesting in several countries (Ratcliffe, 2015: 1). These protests were largely aimed against the commercialisation of higher education that, according to students and staff of these institutions, leads to the university management prioritising financial goals over the needs of their student and staff bodies (Editorial, 2015c: 1). In addition to the commercialisation of higher education, the worldwide protests include matters such as the working conditions for graduate students and a lack of transparency in the management of these institutions (Editorial, 2015c: 1).

South Africa has seen its share of student protests, which reached new proportions with the widely reported #FeesMustFall protests in 2015. A wide array of issues caused the upset of the students joining protests all over the country. These issues range from the slow transformation process of South African Universities to a demand for increased funding from the National Student Financial Aid Scheme (NSFAS). Quality accommodation and transport were also included in the grievances of the students, while the main focus for the protests was the demand for lower accommodation and tuition fees. These student protests in South Africa reached a climax after the 2015 announcement by Blade Nzimande, the then South African Minister of Higher Education, of a proposed hike between 10% and 12% in tuition fees and eventually escalated to a call for free higher education (Editorial, 2015a: para. 3; BBC[1], 2016: para. 2; South African History Online, 2016: para. 3). The crisis faced by universities expands beyond the borders of South Africa.

In May 2017, Harvard Business School Professor Clayton Christensen predicted that 50% of the over 4 000 colleges and universities in the United States were bound for bankruptcy in the next few decades (Nazeeri, 2017: para. 1; Hess, 2018: para. 1). The main reason behind Christensen's prediction was the disruption caused by online education, which undermines the business model of universities, focusing on on-campus and face-to-face delivery of tuition. Online education is running universities out of business (Nazeeri, 2017: para. 1; Hess, 2018: para. 3). Universities will have to make urgent decisions regarding

their existing business models for them to remain financially sustainable (Mackeogh & Fox, 2009: 147; Long, 2012: 60; Editorial, 2014: 1).

1.1.1. Management accounting and decision-making

Decisions about future activities of any organisation, especially in the modern business environment, cannot be made without the required data and information (Lale & Andelokovic, 2014: 167). The provision of cost information to assist in the decision-making function of an organisation is an important need for management accounting in the digital age (Lawson & White, 2018: para. 27). As business decisions affect any organisation, regardless of the sector within which it operates, decisions must be made at the "beginning, during and at the end of the business process" (Lale & Andelokovic, 2014: 167). These management decisions include, but is not limited to, resource allocation in the organisation and reporting on the profitability of the integral parts of the organisation, its products, customers, and all other required areas (Lale & Andelokovic, 2014: 170–171). The management accounting system in an organisation is the key source of delivering the required information to managers to serve their decision-making needs (Lale & Andelokovic, 2014: 167; Odar, Kavcic & Jerman, 2015: 84, 86; Ciuhureanu, 2018: 41; Tenhunen & Danielescu, 2018: 41). Contrary to management accounting, decision-making based on financial accounting information, with a primary external focus, could lead to what Lawson and White (2018: 28) call "disastrous results such as bankruptcy".

Management accounting has its roots in the industrial revolution, together with the development of a "competitive market economy" and has focused on cost analysis since its origins (Bufan, 2014: 74; Tenhunen & Danielescu, 2018: 41). The outcome of the decisions made on accurate cost information may be a necessity to reduce the size of an organisation and to shift its focus to its core competency as the only option for survival (Lale & Andelokovic, 2014: 169). It is important for an organisation to have sound costing principles to avoid making incorrect decisions (Terzioglu & Chan, 2013; Patil & Kshatriya, 2016). Cost and management accounting systems can assist an organisation in estimating the cost of services better than only a budget or basic accounting could (Mohr, 2017: 94).

Organisations today must be proactive and not just reactive. Proactive decision-making focuses on strategic analysis by using various models applying an estimate to advance the decision, not a strict set of criteria (Lale & Andelokovic, 2014: 167). Management's

decision-making must further pay attention to profitability analyses centred on “effects, consumers and the market, thus not only performance” (Lale & Andelokovic, 2014: 167).

As mentioned before, the decisions universities face centre around the rethinking of their business model. For any organisation to rethink their business model, they have to perform a detailed cost analysis of their cost objective (Lepadatu, 2011: 52). A cost object or cost objective “is any activity for which a separate measurement of cost is desired” (Drury, 2018: 22). The changes in the modern business environment highlight the need for accurate decision-making by organisations.

1.1.2. The modern business environment

The modern business environment organisations operate in today is complex, interdependent and characterised by the “globalisation of economic goods and services”, consequently resulting in a highly competitive global environment (Chand & Ambardar, 2013; Lale & Andelokovic, 2014; Odar, Kavcic & Jerman, 2015; Rudawska & Belyaeva, 2018). Globalisation has forced organisations to have a large level of flexibility, stronger horizontal instead of vertical structures, decentralisation of sprofit, and multifunctional teams (Lale & Andelokovic, 2014: 169). In this global economy, aligning resources with demand creates value for owners as well as a competitive advantage. The alignment of resources with demand requires the calculation of the cost of the applicable resources (Lale & Andelokovic, 2014: 168; Tain, 2019: 2).

The advancement in technology is another key factor describing the modern business environment (Chand & Ambardar, 2013). Over the previous approximately 40 years, automation and international trade have caused a constant decrease in the number of jobs in the manufacturing industry (Oesch & Baumann, 2013: 3). The Fourth Industrial Revolution further influences the vast changes to the business environment caused by automation, which affects the global population. The Fourth Industrial Revolution involves a disruption in the way the global population “live and work” due to machine learning caused by the ability developed by humankind to store massive amounts of data. The world economy, due to the Fourth Industrial Revolution, is influenced by “cyber-physical systems (CPS) and modern technology including 3D-printing, the Internet of Things, block chain and Artificial Intelligence” (Yang et al., 2018: 4).

The new business environment, trademarked by the changes described in the previous paragraphs, demands a new role for management accountants. Traditional costing systems require an upgrade in order to provide useful information to assist management in decision-making (Moore, 1998: 6–7; Lale & Andelokovic, 2014: 169). The main feature of a traditional costing system is the focus of such a system on the production phase of the cost objective. In a bookkeeping context, traditional costing systems determine a cost for a cost objective comprising either total actual variable or planned (standard) production costs. The problem with the traditional approach to costing is that cost monitoring "starts too late and ends too early" (Lale & Andelokovic, 2014: 169). No cost monitoring occurs in the preproduction and sales phases of the cost objective (Lale & Andelokovic, 2014: 169). Modern reactions to traditional costing methods, when it comes to longer-term decision-making, include costing according to activities (Lale & Andelokovic, 2014: 169). Similarly, universities are also affected by changes in the modern business environment.

Looking from the perspective of an ever-changing higher education sector and increased pressure to extract maximum advantage from limited resources, management accounting's role in universities is the development of new approaches when providing financial information. Management accountants need to do this in order to provide continued assurance of the financial health at these institutions while they strive to meet the challenges of a changing environment (Moore, 1998: 100). Universities will be more efficient if they succeed in extracting maximum advantage from limited resources.

University programs comprise various modules, each with a different number of students enrolled, with a different amount of credits assigned to the modules, presented from different faculties. Universities will have to make decisions regarding their current business model in order for them to be more efficient. Improved efficiency at universities relies on cost and income information for the university modules and departments, Activity-based cost and income analysis as well as efficiency indicators of the variety of activities run by the university (Saladrigues & Tena, 2017: 118). Apart from the pressure to be efficient as institutions, universities must also remain relevant.

The relevance of universities is threatened by the changes that will be brought about by the Fourth Industrial Revolution. Even though the exact impact of the Fourth industrial Revolution is still unknown, it demands that universities respond both to prepare students for the workplace as well as to remain relevant as educational institutions (Yang et al.,

2018: 224–225). Remaining relevant and meeting student demands require aligning resources to affordable prices. To achieve affordability, decision-makers require a cost associated with the delivery of modules in order to take informed decisions.

The calculation of the cost of a module at a university requires management accounting principles. The purpose of financial accounting is to present financial statements that comply with a fixed set of rules (IFRS). In contrast, management accounting is not bound by a fixed set of rules, but rather by a set of guidelines (Tenhunen & Danielescu, 2018: 41). The possibility that an organisation's management team might be strongly general accounting orientated and lack an understanding of the importance of management accounting, and the tools it provides for managing an organisation could prove a further challenge to the application of management accounting in an organisation. In addition to the previously mentioned challenges, the management accounting team in an organisation could be faced with a situation where management possibly did not clearly define its information needs and have not communicated it to the accounting personnel (Tenhunen & Danielescu, 2018: 41–42).

An aspect complicating cost analysis at universities is the lack of readily available costing information on the cost objective (Cook, 2003: 1). Simply put: "The most significant problem faced by most universities is that that they do not know much about their costs." (Moore, 1998: 7) Management accounting plays a significant role in the decision-making process that universities are facing, and management accounting principles will, therefore, be applied to assist in determining the cost of a module at a South African university (Odar et al., 2015: 86).

The four characteristics of a service (see section 1.1.3. below) applied to the tuition received at a university indicate that a traditional university delivers a service. Since a university delivers a service rather than a physical product, the cost analysis required, as indicated above, is even more complicated (Kamal Basha, Sweeney & Soutar, 2015: 173).

1.1.3. Management accounting challenges in a service organisation

A "sharp increase" in the contribution of service organisations to the world Gross Domestic Product (GDP) can be seen in almost all countries (Buckley & Majumdar, 2018: para. 1) . In 1995 76% of all jobs in the United States of America (USA) were in the service industry (Gripper, 1995: 5). According to data collected from The World Bank, services in 2016

contributed to 65.04% of the worldwide GDP, with the manufacturing sector only contributing 15.67% to the worldwide GDP (The World Bank, 2019b: para. 1; The World Bank, 2019a: para. 1). Similarly, in 2018, the service sector in South Africa contributed to two-thirds of South Africa's Gross Domestic Product (GDP) (Moses et al., 2018: para. 1). Service organisations, therefore, play an important role in the economy of any country. Services rendered by services organisations are characterised by intangibility, heterogeneity, perishability and the inseparability of production and consumption. These characteristics of services can also be applied to universities as follows (Kamal Basha et al., 2015: 173–174):

a. **Intangibility:** Education received from a university is a series of services performed from the admission date of a student, lecturing and finally the assessment of the student. None of these services can be touched or seen, although certain components in the delivering of the service such as a campus facilities or textbooks are tangible.
b. **Heterogeneity:** It is complex to standardise a service. Services delivered by a university are even more complex to standardise, since humans deliver the service.
c. **Perishability:** There exists no way to store a service if there is an oversupply. Similarly, a simple marginal increase cannot correct an undersupply. If a hall does not provide enough space for the number of students, lectures will have to be repeated; therefore, duplicating the service.
d. **The inseparability of production and consumption:** Entities sell services; these entities simultaneously produce the service while the customer uses it. Inseparability also means that students participate actively in the delivery of the service, i.e. obtaining a degree. Even though inseparability is no longer a universal characteristic of service delivery; it is one of the distinguishing factors of a university where the mode of delivery is face-to-face (Keh & Pang, 2010: 55).

The four characteristics mentioned above confirm that the universities are service organisations. Service organisation managers are doubtful of the accuracy of the cost data provided to them in aid of their decision-making, which poses a problem to the decisions made at the organisations (Terzioglu & Chan, 2013: 30). Services tend to portray characteristics that are distinctly different from goods. It is therefore understandable that costing systems, originally developed for costing goods, are not necessarily appropriate

for application to the cost calculation of services (Lowry, 1990: 159, 176; Terzioglu & Chan, 2013: 30). The degree to which these systems remain appropriate in the service industry remains a point of argument in documented literature (Terzioglu & Chan, 2013: 30). It should, however, be noted that many of the rules that apply to a manufacturing environment also apply in non-manufacturing (service) environments (Gripper, 1995: 2).

Service entities have not invested sufficient time and capital in the development of their cost accounting systems (Gripper, 1995: 22). Cost accounting systems employed for services are often inappropriate, since cost accounting in most textbooks is geared more towards manufacturing organisations. It is the opinion of the authors Gripper, Terzioglu and Chan that the reason for the exclusion of service organisations in traditional cost accounting methods is that this industry does not fit in with traditional costing systems. Traditional accounting systems are not sufficient to meet the costing needs of service organisations, since they ignore investments in expenses related to an organisation's service functions. The outcome of applying traditional accounting methods in the costing of services leads to overall inaccurate cost information (Gripper, 1995: 22; Terzioglu & Chan, 2013: 32).

Service organisations may experience difficulties in the allocation of costs to the activities involved in the delivery of their services due to the lack of an applicable costing system. This is further intensified by a difficulty in defining output diversity in these organisations versus the ease of identifying outputs in manufacturing organisations (Gripper, 1995: 26; Terzioglu & Chan, 2013: 35). The intangibility of services is the main separating characteristic between the output from service delivery entities and the output from manufacturing entities (Terzioglu & Chan, 2013: 30). Intangibility is also the main cause of complexity in the calculation of the cost of service delivery, since intangibility causes difficulty in identifying a unit of service rendered (Terzioglu & Chan, 2013: 30). Cost per unit of output provides an idea to the management team of an organisation of the resources consumed (Moore, 1998: 76).

Service organisations face a challenge when it comes to defining a clear input-output relationship. A manufacturing organisation can specify its parts (input) clearly, and one product (output) can use many parts and another product a few parts. A service organisation, on the other hand, delivers cost objectives, which are services (output) that

rely in differing ways on support activities (input). The differing application of support activities to deliver the service can be difficult to pin down (Gripper, 1995: 27).

A large portion of the cost of services is costs that are not specifically related to providing a service. These costs are reported as an expense during the same period as when the entity incurred it, i.e. a period cost and is therefore not allocated to the service delivered, i.e. a product cost (Terzioglu & Chan, 2013: 32; Drury, 2018: 26–27). The cost accounting applied to service organisations differs from that applied to manufacturing organisations, since in a service environment "(a) almost all costs are period costs; (b) the output is difficult to measure; and (c) service industries are typically labour intensive with most of the labour fixed, at least in the short term" (Terzioglu & Chan, 2013: 32). A study conducted on 250 of Germany's biggest companies (in terms of revenue) included 55 (22%) service organisations. This study revealed that service organisations have an average of 847 types of costs, with fixed costs making up a "relatively high" proportion of total costs and variable costs making up a "relatively low" proportion of total costs (Terzioglu & Chan, 2013: 33). Similarly, research has shown that the majority of costs at universities are fixed and therefore the cost per unit will decline with more enrolments (representing the clients of the university) (Moore, 1998: 76).

Service organisations also face difficulty in separating costs into their fixed and variable components, which influences how the cost per unit is calculated (see chapter 3 for a further discussion on cost behaviour). In addition to the challenge faced by service organisations to split costs into a variable and fixed component, the large portion of total costs for services comprising joint costs adds to the complication of costing service unit output (Terzioglu & Chan, 2013: 33–34).

Service organisations are further challenged by the choice of the cost calculation system to apply (see section 1.4.1.2. for a detailed explanation of the difference between an absorption [full] cost calculation system and a variable cost calculation system). Literature regarding the use of full versus variable costing in service organisations provides mixed opinions and is outdated (Terzioglu & Chan, 2013: 34). The problem with the application of full costing in service organisations revolves around the allocation of joint costs to the service delivered (Terzioglu & Chan, 2013: 34). The allocation of joint costs is "at best arbitrary", which means that service organisations with a high amount of joint costs will find the determination of individual service costs more difficult. The high presence of joint costs

in service organisations reiterates the difficulty in the identification of the input related to the output of the organisation (Terzioglu & Chan, 2013: 34).

Another particularly difficult task service organisations face is how to allocate overhead costs to the cost object (service), in particular the fixed portion of the overhead costs (Terzioglu & Chan, 2013: 35). Overheads are growing in proportion to the total cost of the cost objective (Terzioglu & Chan, 2013: 35). In service organisations specifically, overheads usually make up a significant portion of total cost. Overheads allocated on a traditional costing method is arbitrary and could lead to inaccurate cost calculations (Moore, 1998: 14; Terzioglu & Chan, 2013: 35). Costing of services has a further complexity embedded in the form of delivery of non-standardised services, where the cost calculation often happens only after the delivery of the service (unless the client requests a quotation) (Terzioglu & Chan, 2013: 32).

The allocation of costs to educate students have been researched since before 1998. Studies done in 1998, 2000 and 2004 all highlighted the complications in determining the cost of education as a service. Alejandro (2000: 36) found that administrators at universities are sometimes oblivious to the cost of educating a student, which is the cost per unit. The study by Alejandro further indicates that higher education administrators often implement simplistic calculations for calculating the cost per unit, which proves not to be a useful tool for them to assist in their tasks (Alejandro, 2000: 36). The traditional calculations performed by universities entail combining all costs incurred by the institution and simply dividing the total cost by the number of actual students (Alejandro, 2000: 36). The traditional cost calculation methods for calculating the cost of educating a student worked well when universities primarily focused on educating full-time undergraduate students residing at the institutions, which implied that each student unit was regarded as uniform. Universities now offer multiple services such as research, public service, and other supporting services in addition to teaching. The range of services offered by universities makes the cost calculation of the cost objective at these institutions even more complex (Bowen, 1980: 115; Alejandro, 2000: 36).

Even though the cost calculation of the cost objectives at universities is highly complex, universities cannot afford to ignore the cost of their service any longer, since higher education is just as much affected by competition as any other industry. Class fees and other costs are rising due to inefficient use of resources and a lack of accurate cost

information could further lead to “ill-advised” cutting of academic programs and support activities (Moore, 1998: 16). The National Commission on the Cost of Higher Education (NCCHE), a public advisory commission under the United States Department of Education, commented that administrators, faculty and students, and how they choose to spend their time, either directly in the classroom or spending time on “other teaching and research activities” contribute the most to the rise in the cost of higher education (Evans, 2004: 24).

There exists limited research on costing in service organisations compared to costing in manufacturing organisations, even though the service sector is increasing in its contribution to the worldwide economy. However, research in the costing at universities has increased (refer to chapter 3). The difference in research quantity regarding costing services as opposed to the costing of goods is understandable, since costing practices were originally developed for manufacturing organisations (Terzioglu & Chan, 2013: 29; Mohr, 2017: 91).

In a typical manufacturing or retail environment, variable or product costs dominate, with a direct causal relationship to outputs, which make variable costing and budgeting much more relevant and accurate. The absence of a direct or causal relationship of costs to outputs, such as in most service organisations and universities, means that conventional cost and management accounting methods are severely constrained. The lack of appropriate costing systems to cost a service is also the case when acquiring cost information for modules to assist with decision-making at universities.

1.2. Problem statement and research objectives

The global challenges, such as the 4IR, and local challenges, such as poor students looking for affordable education faced by South African universities necessitate administrators at these institutions to make significant decisions regarding their business model to ensure the future existence of their organisations (Lapovsky, 2018: para. 1). University administrators require cost data to assist in this decision-making process (Lepadatu, 2011: 52).

Furthermore, a university is also a service entity, and service entities have challenges when it comes to obtaining relevant cost data. Universities deliver more than one type of service, i.e. teaching as well as research, which complicates cost allocation even further (Perkins, 1973: 3–12; Etzkowitz et al., 2000: 313; Walton & Martin, 2004: 11; Bikse et al.,

2016: 76). Internationally the business environment is changing. Many of these changes revolve around the Fourth Industrial Revolution dealing with technological advancement such as Artificial Intelligence that is forcing universities to adapt in order to respond to automation in the form of knowledge as well as in production (Yang et al., 2018: 2). A further threat to universities is the continual rise in the popularity of online education as opposed to face-to-face and on-campus modes of delivery that characterise these institutions (Cabrera & Fernández-Ferrer, 2017: 48; Hess, 2018: para. 3).

Universities currently allocate costs on traditional methods (see section 1.4.3. below) using allocation bases that are arbitrary and not necessarily directly linked to the cause of the cost. An example of arbitrary allocation is using the number of students enrolled at an institution, and not necessarily using a uniform measurement like a full-time equivalent (FTE) student, for example. Traditional methods do not take the complexity of modern higher education into consideration (Alejandro, 2000: 36). Universities deliver different degrees comprising various modules. Different faculties present these degrees, each with varying costs associated with it. These modules have different credits awarded to it by the relevant universities based on the duration of the modules. Universities further deliver these modules at different National Qualifications Framework (NQF) levels. As pointed out earlier, universities are being forced to rethink their current business model (Saladrigues & Tena, 2017: 118).

The South African government predominantly finances South African universities; thus a profit motive has never been a primary objective for most of these institutions (Crous, 2017: 240). The average tuition fees per module at South African universities have also increased more than inflation over the past 10 years, contributing to the #FeesMustFall protests in 2015 (University of Stellenbosch, 2017: 3–4). South Africa faces serious economic problems such as unemployment, poverty, distribution of wealth and low levels of economic growth. The country is further plagued by high levels of government debt, with NSFAS adding to the financial burden of government. The question to be asked is whether it is not time for universities to rethink their academic relevance and financial survival in these turbulent times by changing how they use cost principles in the costing of teaching modules? The following objectives have been identified to address the mentioned challenges.

1.2.1. Primary objective

Teaching income at a university depends predominantly on the number of students enrolled for a module or degree and is thus a variable income, while the cost of teaching the module is predominantly a fixed or a period cost, since it consists mainly of salaries as stated in the previous section. This creates the classic management accounting problem of costing services in an organisation without a clear input/output relationship. The primary objective of this study is to determine the financial viability of teaching modules presented at a South African university using management accounting and cost allocation techniques that could assist the administrators of the university in offering affordable modules to students.

1.2.2. Secondary objectives

The following secondary objectives will support the achievement of the primary objective of this study.

- Describe the changing environment of, and the challenges faced by universities.
- Explore the application of management and cost accounting principles for decision making in service organisations with specific reference to universities.
- Explain why different cost information is required to achieve different outcomes.
- Explain the methodology applied in determining the cost of a teaching module at a South African university.
- Apply the stated methodology to calculate the cost per teaching module at a South African university.
- Discuss the different ways in which the calculation of the cost per teaching module could benefit a university, such as using the breakeven analysis as a benchmark to indicate viability.

1.3. Clarifications of concepts

The study focuses on South African universities. When reference is made to modules, it relates to teaching modules only. Literature referring to higher education institutions uses the terms higher education, universities and traditional universities interchangeably. For this study, the term *universities* will be used as a reference to traditional universities. The

term *traditional universities* refers to universities that focus mainly on face-to-face and on-campus delivery of tuition. The study uses the following concepts:

Management accounting	"The preparation of financial and non-financial information for the use of management of the company." (Cost Perform, 2017: para. 4)
Cost accounting	"A method of collecting, recording, classifying and analysing the information related to cost." (Cost Perform, 2017: para. 2).
Cost	"A resource sacrificed or foregone to achieve a specific objective." (Jegers et al., 2002: 681).
Cost objective	"The unit of analysis of which cost is measured." (Jegers et al., 2002: 681).
Manufacturing cost	All product costs that are related to producing the cost objective of an organisation (Reider, 2008: 3).
Non-manufacturing cost	Costs that relate to activities apart from producing the cost objective (Reider, 2008: 4).
Direct cost	Costs that establish different products from the very moment they are incurred, costs that an organisation can trace directly to the cost objective (Dowless, 2007: 53; Reider, 2008: 4; Dima, 2013: 17)
Indirect cost (overhead cost)	Those costs that an organisation cannot trace directly to a cost objective also called overheads, and that has to be allocated to the cost objective. Manufacturing indirect costs include all manufacturing costs apart from direct materials and direct labour (Dowless, 2007: 53; Reider, 2008: 4; Dima, 2013: 17).
Fixed costs	The total value of a fixed cost remains unchanged, or changes in insignificant proportions, when the level of output changes (Dowless, 2007: 53; Reider, 2008: 4; Dima, 2013: 17).

Variable costs	Total variable costs change proportionately, with a change in the level of output or related activity (Dowless, 2007: 53; Reider, 2008: 4; Dima, 2013: 17).
Semi-fixed or Step-fixed costs	These costs change with a change in output volume or activity in “steps” or when a range is exceeded (Dowless, 2007: 53).
Semi-variable costs	These costs vary, but not in proportion to a change in output volume. A cost classified as semi-variable consists of a variable as well as a fixed component. Costs that contain both a fixed and a variable component is also known as mixed costs (Reider, 2008: 4).
Joint costs	Costs incurred to simultaneously produce more than one output unit utilising the same input units (Terzioglu & Chan, 2013).
Product cost	“Those costs that are identified with goods purchased or produced for resale.” (Drury, 2018: 26)
Period costs	Costs incurred in producing the cost objective excluding direct materials, direct labour and variable overheads. Costs expensed during the period in which they were incurred (Chatfield & Neilson, 1983: 66; Smit, 1989: 57–62; Drury, 2018: 149).
Cost allocation	“The process of assigning costs when a direct measure does not exist for the quantity of resources consumed by a particular cost object.” (Drury, 2018: 25)
Activity	Any task or unit of work or event working towards a specified purpose (Moore, 1998; Bufan, 2014: 74).
Cost driver	“The basis used to allocate costs to cost objects in an ABC system.” (Drury, 2018: 73)
Cyber-physical systems	“Physical and engineered systems whose operations are monitored, coordinated, controlled and integrated by a computing and communication core.” (Yang et al., 2018: 2)

Full-time equivalent enrolment	"A measurement equal to one student enrolled full time for one academic year." (Staff writer, 2003: 1)
Teaching input unit	A full-time equivalent enrolment that is weighed according to the funding grid as determined by the South African Department of Higher Education, Science and Technology (Ministry of Education South Africa, 2004: 6).
Teaching output unit	A grant dependant on the actual total of non-research graduates as well as the normative total of non-research graduates as generated by a head count passed through the relevant weighting grid as determined by the South African Department of Higher Education, Science and Technology (Ministry of Education South Africa, 2004: 8).

1.4. Abbreviated literature review

The background to this study indicated that management accounting principles originally developed in the manufacturing environment. The background further stated that there is a lack of research on the application of management accounting in service organisations. The abbreviated literature to follow will explain certain terms and concepts from the field of management accounting mainly from a manufacturing perspective, even though a university delivers a service. The full literature review of this study will adopt the terms and concepts to fit the service industry, where applicable. This section will outline various cost models for South African Universities, costing structures of universities, allocation of direct and indirect costs and Activity-based costing used at universities.

1.4.1. Investigation of various available cost models for South African universities

Section 1.1 of this study highlighted the various challenges faced by universities that threaten their financial sustainability. A university remains an organisation that has to manage its costs. Managing costs is one of the most critical aspects of running any organisation successfully (Gordon & Loeb, 2001: 13; Novák et al., 2017: 75). In order for an organisation to manage its costs, they require a knowledge of the cost of their product, which is their cost objective. To calculate the cost of the cost objective of an organisation,

the type of cost calculation system the most fitting to the organisation must first be determined. Once the organisation has made its choice of cost calculation system, the organisation must decide on the best cost model for their decision-making needs within the chosen cost calculation system. Figure 1.1: Basic cost models available to organisations illustrate this process.

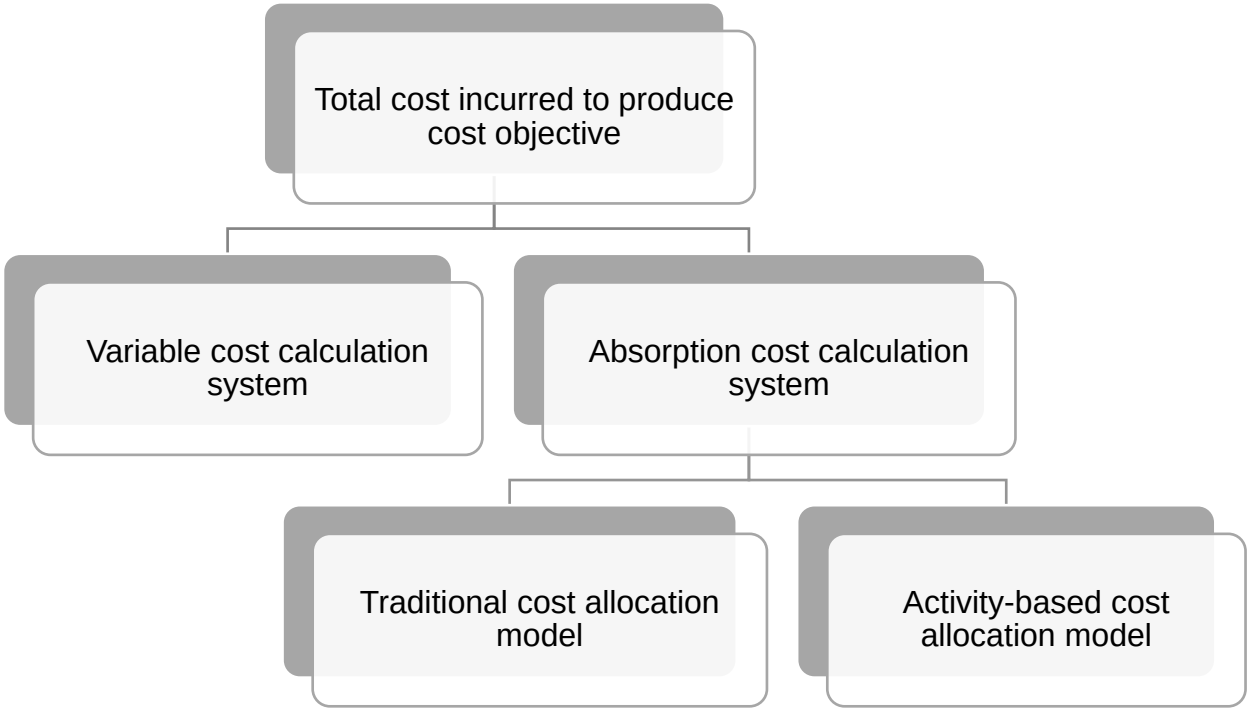


Figure 1.1: Basic cost models available to organisations

The various cost models as illustrated in Figure 1.1 will be discussed in detail in the sections to follow.

1.4.1.1. Cost calculation systems

The calculation of the cost of a cost objective takes place in two steps. Step one accumulates costs by different classifications, depending on the need and chosen cost model of the organisation. Step two allocates the accumulated costs to the cost objective (Chatfield & Neilson, 1983: 63; Smit, 1989: 46; Drury, 2018: 23). An organisation can select one of two cost calculation systems to perform the cost allocation in the second step of the cost calculation process, namely an absorption (full) costing system (referred to as absorption costing) or a variable (direct) costing system (referred to as variable costing) (Chatfield & Neilson, 1983: 66; Hojna, 2013: 64). The section below will briefly discuss each cost calculation system.

1.4.1.2. Variable versus absorption cost calculation systems

Absorption costing allocates all direct as well as indirect costs incurred in producing the cost objective to the related cost objective. This means that absorption costing allocates fixed and variable costs together, regardless of the difference in the nature of these costs (Hojna, 2013: 65; Dima, 2013: 16; Hojna, 2015: 107; Lutilsky, Žmuk & Dragija, 2016: 38). Variable costing indicates fixed and variable costs separately (Hojna, 2013: 65; Dima, 2013: 16). This costing model includes only variable costs in the cost of the cost objective and expenses fixed costs as a whole in the time period in which the organisation incurred the cost (Chatfield & Neilson, 1983: 66; Smit, 1989: 57–62; Dima, 2013: 16; Hojna, 2015: 107–108; Drury, 2018: 149).

External reporting requires the application of absorption costing. In the International Financial Reporting Standards (IFRS), IAS 2.10 states that product cost consists of the cost of purchase, which includes direct materials, as well as conversion costs, which comprise direct labour as well as a "systematic allocation of fixed and variable production overheads" (International Accounting Standards Board [IASB], 2015b: A883; Geiszler, Baker & Lippitt, 2017: 45–46).

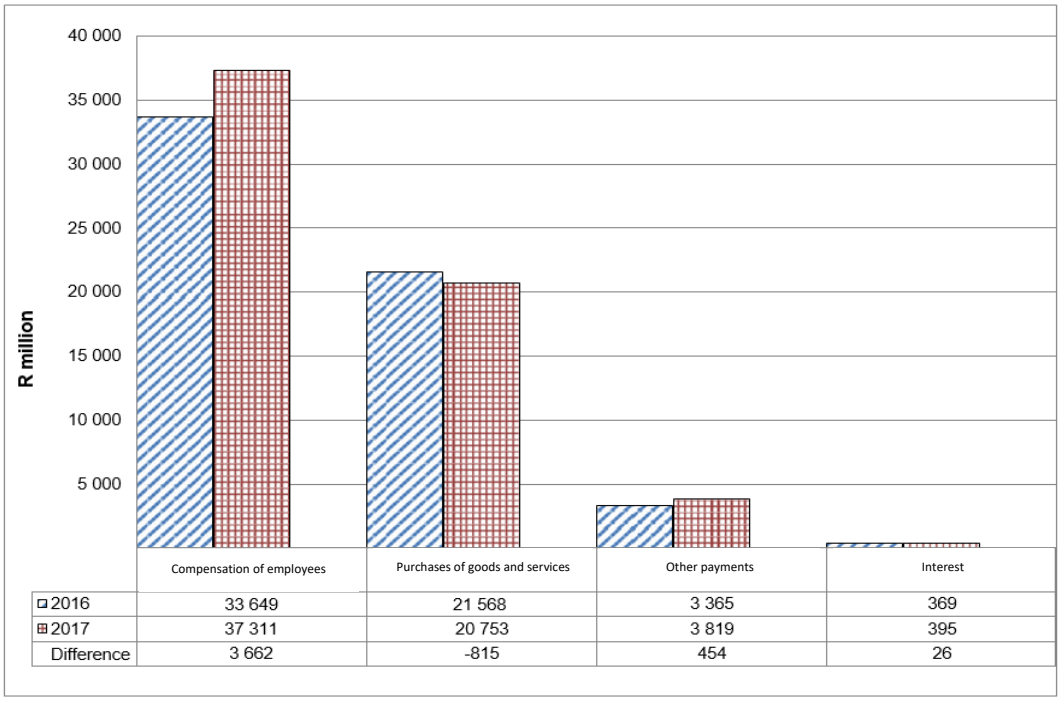
An organisation can choose to implement variable costing for internal reporting purposes, since it provides information that could assist in decision-making. Decision-making requires a separation of costs into fixed and variable components, which makes absorption costing inappropriate due to the mix of variable and fixed costs in costing the cost objective (Hojna, 2015: 112; Geiszler et al., 2017: 45–46). Treating fixed costs as a total deduction as is the case when applying a variable costing system only allows for making short-term decisions. For longer-term decisions, gradual coverage of fixed costs must be taken into account, since all fixed costs become variable in the long-term (Dima, 2013: 20).

When an organisation must determine the price of a cost objective from a long-term perspective it must, at a minimum, cover all costs incurred in producing the cost objective. This means that absorption costing is the best approach when the price of a cost objective must be determined (Hojna, 2015: 107). An organisation still has to take the different types of costs incurred to provide the cost objective into account before its management team chooses between a variable and an absorption cost calculation system. The next section looks more closely at which types of costs are incurred by a university.

1.4.2. The costing structure of universities

The type of organisation will influence the choice between a variable and an absorption cost calculation system. As stated in section 1.1.3. of this study, a university delivers a service. The costing structure of a service organisation differs greatly from the costing structure of a manufacturing organisation. A manufacturing organisation has a large portion of variable costs, since these costs can easily be traced to a unit of production. The distinction between variable and fixed cost in a service organisation is not as straightforward, since the product in a service organisation is not tangible and often delivered by human capital. Human capital costs in the form of salaries normally behave like a fixed cost (Evans & Bellamy, 1995: 36; Terzioglu & Chan, 2013: 32–33).

Service organisations' operating expenses are almost completely committed fixed costs (Szychta, 2010: 49). A university that delivers a service also has its main component of expenditure related to salaries (Statistics South Africa, 2017: 6). Figure 1.2: Economic classification of cash payments for operating activities for the 2016 and 2017 financial years at South African higher education institutions shows the proportions of payments of South African higher education institutions relating to compensation for workers.



	Compensation of employees	Purchases of goods and services	Other payments	Interest
2016	33 649	21 568	3 365	369
2017	37 311	20 753	3 819	395
Difference	3 662	-815	454	26

Figure 1.2: Economic classification of cash payments for operating activities for the 2016 and 2017 financial years at South African Higher Education Institutions

(Source: Statistics South Africa, 2017: 6)

Since the biggest portion of costs incurred by universities is fixed costs, as illustrated in Figure 1.2, absorption costing will be most applicable at universities. Absorption costing will include this large portion of costs in the cost objective cost, where variable costing will not.

The study, *Financial Sustainable Universities – Towards Full Costing in European Universities* conducted by the European University Association found that some countries such as the United Kingdom (UK) and the Netherlands have implemented absorption costing at their universities. Other countries like Estonia, Croatia and Slovenia have not implemented any methods to trace and allocate their costs to cost objectives (Dragija & Lutilsky, 2012: 39). Europe sees absorption costing as a method to enhance accountability (Dragija & Lutilsky, 2012: 39). Dragija and Lutilsky conclude their study on the application of absorption costing at European universities that this method of cost calculation provides the ability to universities to "identify, calculate and allocate" all costs incurred at universities (Dragija & Lutilsky, 2012: 54). Absorption costing will provide the most benefits to a university in the calculation of the cost of a module.[2]

1.4.3. Allocation of direct versus indirect costs

Section 1.4.2. concluded that a university could benefit the most from applying an absorption cost calculation system to calculate the cost of a module. Absorption costing, as stated above, requires all costs incurred in producing the cost objective to be allocated to the cost objective. As Hojna (2013: 67) puts it, "In absorption costing indirect (fixed) costs are allocated to a unit of output (action) on the basis of the expected volume of production, despite these costs having actually nothing to do with the unit of output." Absorption costing, therefore, means that the cost of the cost objective must include fixed as well as variable costs. Hojna states above that indirect costs must also be allocated when absorption costing is applied. An organisation can apply the classification of direct or indirect to costs incurred, depending on how easily it can trace the costs to the cost objective (Reider, 2008: 4).

Constant changing conditions characterise the modern market environment. These changes challenge organisations to adapt in order to remain competitive (see section

[2] A module is one of the separate parts of a course taught at a college or university (Collins Dictionary, n.d.: para. 1). Some institutions refer to a course instead of a module. A selected group of modules make up a degree or program.

1.1.2.). One significant change in our modern environment is the increased application of automation (Tolsma, 1996: 8). Increased automation leads to increased indirect costs incurred by organisations (Tolsma, 1996: 9; Hojna, 2013: 64). The allocation of this ever-increasing indirect portion of total costs is a requirement in the application of absorption costing (Hojna, 2015: 66). The allocation of indirect cost (overheads) to the cost objective is not an easy task (Narong, 2009: 17). Various techniques are available to allocate indirect costs to the cost objective, but each method contains a level of inaccuracy (Hojna, 2013: 66). In the past, indirect costs were assigned to cost objectives (products, services or processes) as a percentage of direct labour or direct materials (Narong, 2009: 17).

A cost allocation model that assigns general costs using a cost allocation base that is in proportion to the number of output units produced, such as the amount of materials used or labour hours incurred, is called a traditional cost allocation model (Narong, 2009: 17; Bazrafshan, 2017: 164; Sisa, Siklosi & Szijarto, 2018: 283). Mechanisation of production, increased competition in the global market and a change in the structure of product prices meant an increase in the amount of overheads incurred by organisations in proportion to direct labour and direct materials (Cooper & Kaplan, 1988; Smit, 1989; Tolsma, 1996: 8–9; Bazrafshan, 2017: 164). While indirect costs were increasing as a proportion of total production costs, direct labour decreased to as low as five to nine per cent of total production costs (Cooper & Kaplan, 1988; Smit, 1989; Tolsma, 1996). The traditional method of allocating costs has accordingly become ineffective, and manufacturers were forced to implement fundamental changes to traditional methods of cost allocation (Tolsma, 1996: 9; Bazrafshan, 2017: 164; Sorros, Karagiorgos & Mpelesis, 2017: 311).

The allocation of indirect costs based on direct costs, as the traditional method suggests, is misleading, since each cost object requires indirect costs in different measures and accordingly causes decision-makers to make decisions on the profitability of certain products over others based on misguided information (Narong, 2009: 17). The lack of accuracy in cost objective information as a result of traditional cost allocation methods is an even bigger problem in organisations delivering multiple products. Almost all organisations delivering multiple products or services face cost distortion (Cooper & Kaplan, 1988: 97).

The allocation of direct costs to products or services by direct allocation is reasonably straightforward. The distortion of costs arises due to the traditional allocation of indirect

costs, which takes place in two steps. The first step is to group costs in relevant cost pools. These cost pools can be departments or smaller sections within departments. The second step is to assign the costs accumulated in the cost pools from step one to the cost objective. Organisations perform the first step very accurately, but start slipping with the second step. The allocation of the costs in the cost pools to the cost objective on the traditional method of cost allocation is executed simplistically, with many organisations still allocating these costs based on direct labour, even though direct labour is a cost generally declining in its occurrence due to technological advancement as stated above (Kaplan, 1986: 195; Cooper & Kaplan, 1988: 96). The illustrated traditional cost allocation method leads to the cost distortion referred to in the previous paragraph. This cost distortion means that the profit of high-volume products (services) is often understated, as opposed to speciality items (services), which will have lower volumes, the profit of which is understated (Cooper & Kaplan, 1988: 98; Geiszler et al., 2017: 45). Cost distortions could lead to cross-subsidising of low-volume, customised products by high-volume, standard products (Cooper & Kaplan, 1988: 97–98; Innes & Mitchell, 1997: 192; Alejandro, 2000: 28–29).

A solution to the distortion experienced by applying a traditional cost allocation model is an Activity-based cost (ABC) allocation model. ABC has been stated as “the most significant costing innovation” applied at universities (Lutilsky et al., 2016: 36).

1.4.4. Activity-based costing and universities

ABC allocation follows a similar two-stage process as a traditional cost allocation model, as explained in section 1.4.1.1. ABC, however, differs from traditional methods of cost allocation in step 1, where ABC uses activity cost pools as opposed to departments as is usually the case in traditional models. These activity cost pools will differ from organisation to organisation and are determined based on an observation of the process to produce the cost objective. The cost from each cost pool is allocated in the second step to the cost objective using unique cost drivers associated with the activity of the cost pool (Goddard & Ooi, 1998: 31; Bazrafshan, 2017: 164). Different types of modules presented at universities require different combinations of activities, and therefore the cost of each module will differ (Cook, 2003: 5).

Universities could apply ABC to improve their processes, budgeting, and the analysis of costs versus benefit as well as for planning purposes (Evans, 2004: 4). ABC can further

assist universities in identifying whether their costs are for teaching, application processing or student advising purposes by allocating costs to products or services based on how they absorb resources (Evans, 2004: 4). An ABC system can teach university administrators to control how the institution incurs activities and therefore control costs (Evans, 2004: 4). The tool of ABC can provide universities with more accurate information to make strategic decisions, control resource consuming activities and improve their competitive advantage by improved management of tuition hikes through focusing on operational inefficiencies (Evans, 2004: 5).

Even though the implementation of ABC provides more accurate cost objective costs, it becomes complex and costly, since the organisation must establish various cost pools with their respective cost drivers (Bazrafshan, 2017: 165; Sorros et al., 2017: 311). ABC can also be very time consuming, especially in the implementation phase, due to the vast amount of data the organisation must collect, which organisations' current accounting systems do not support (Bazrafshan, 2017: 165; Sorros et al., 2017: 311). The high cost and time related to an ABC cost allocation system sometimes exceed the benefit obtained from more accurate cost objective costs obtained from this system, especially in smaller organisations (Bazrafshan, 2017: 166). The full literature review of this study will include the history, implementation and further detail related to ABC.

1.4.5. Conclusion on the abbreviated literature review

Universities deliver a service. In producing this service, universities incur a large amount of indirect and fixed costs. The cost calculation system most applicable to costing in organisations with a large amount of indirect and fixed costs is an absorption costing system.

Traditional cost allocation systems apply absorption costing in a simplified way. A traditional cost allocation model could cause inaccurate cost information and accordingly incorrect decisions by university administrators. A solution to the inaccurate costs supplied by traditional cost allocation models is Activity-based costing, but Activity-based costing has several limitations related to it (refer to section 3.4.1.2). This study will, therefore, aim to apply a cost model based on Activity-based costing principles to determine the cost of a module at a South African university.

1.5. Research methodology

The discussion of the methodology followed in this study requires an understanding of certain concepts. Defining research is the starting point for understanding research methodology. Research can be defined as: “An original investigation aimed at the discovery and interpretation of facts, the revision of accepted theories or laws in light of new facts or the practical application of such new or revised theories or laws through the gaining of knowledge” (Goodchild, 2016: 29); “The systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions” (lexico.com, n.d.: para. 1); and “A systematic, carefully planned and performed investigation in a scientific manner, into the study of material, sources and established facts in order to search for new facts and reach new conclusions” (Crous, 2012: 25). The cited definitions of research clearly state that the research process starts with an investigation after which new facts can emerge or the existing theories can be applied in order for the researcher to arrive at new conclusions.

1.5.1. Literature review

The investigative portion of research requires a review of existing literature. After existing literature is reviewed, the empirical part of the research can take place (Crous, 2012: 26; Goodchild, 2016: 30). The literature review in this study encompassed a review of the literature surrounding the origin and definition of traditional universities and the challenges faced by universities, both globally and locally, as well as the literature regarding costing principles and its application in the service industry. A literature review is more accurately stated as a review of the existing body of scholarship (Mouton, 2001: 87; Crous, 2012: 26; Bryman et al., 2014: 93; Goodchild, 2016: 31; Van Zyl et al., 2017: 54). A literature review assists a researcher in (Bryman et al., 2014: 93; Van Zyl et al., 2017: 53–54):

- identifying what the research already performed in the chosen field of study;
- determining the relevant concepts and theories to the study;
- identifying an appropriate theoretical framework on which the research can be based;
- identifying methods to address the research question; and
- aiding in the justification of the relevance of the research.

Mouton (2001:87) adds that a proper review of the available literature in the chosen field of study could save time, since it prevents the researcher from repeating results of studies already performed and aids in avoiding mistakes researchers have already made. A good literature review could provide a roadmap to follow in the applicable study (Mouton, 2001: 87). A good literature review is characterised by the following criteria (Mouton, 2001: 90–91; Goodchild, 2016: 31):

- The review must be extensive in covering the main aspects of the chosen field of study;
- Treat authors fairly and consider the stated arguments before criticizing it;
- The review must be relevant and up to date;
- Multiple sources must be included; not just internet searches; and
- It must be structured and sensible.

The quality of a literature review is enhanced by a well-organised structure. The next section explores different ways in which a researcher can structure the literature review in a study.

Six possible ways to structure a literature review are briefly discussed in this section. They include, but are not limited to, chronologically, by theory, by definition or school, theme-based, by hypothesis, by case study or by method (Mouton, 2001: 91; Crous, 2012: 28; Editorial, n.d.: para. 1). Each of these methods performs a certain function in a literature review.

Although the chronological method is the simplest of the methods mentioned above, it is sometimes the only way a researcher can make sense of the available literature. A chronological structure presents the oldest research first and proceeds until the most recent research is presented. This method can be utilised together with other structures to make it more organised (Crous, 2012: 29; Editorial, n.d.).

Certain studies require a review of the most recent and relevant “theories, models or definitions of a particular phenomenon” highlighting those most relevant to the research (Mouton, 2001: 92; Crous, 2012: 30). From these stated theories, definitions or models a hypothesis can be derived, which forms the framework for the empirical study. A literature structured around theories, definitions or schools of thought is usually performed in one of

two ways (Mouton, 2001: 93); firstly, by organising the theories chronologically, starting with the oldest first. This method makes the discussion of the arguments around the development of the most recent theories easier; secondly, by organising the theories in such a way that the discussion ends off with the position adopted in the study (Editorial, n.d.: para. 2).

The formulation of the research problem usually highlights the main themes of a study. The theme-based method of the literature review is mostly seen in exploratory studies (see section 2.2). Studies utilising this structure usually do not aim to test a theory, but have an objective to determine clear definitions of the key concepts in a study (Crous, 2012: 29).

In studies with an already established body of empirical results, there often exists a debate over which hypothesis best explains a certain result. The debate usually surrounds the issue of which of the conflicting hypotheses are more correct. The researcher then organises the literature review around the evidence in favour of each of the applicable hypotheses (Mouton, 2001: 94; Crous, 2012: 30; Editorial, n.d.: para. 5). The hypothesis of a study is a statement of what the researcher wants to prove by performing the research (Crous, 2012: 30). Some studies refer to the research problem and the research question as the hypothesis (Crous, 2012: 30).

The case study method is a literature review based on the large groups forming the units of analysis for the study. A literature review structured around the cases studied is more common in exploratory studies. In the mentioned studies, the literature review often aims to make a certain point by utilisation of examples over a wide range (Mouton, 2001: 94; Crous, 2012: 30).

The aim of the method approach is to structure the literature review around the different methods available to investigate a certain occurrence as applicable to the study. This method is most often used in research following a quantitative approach (Mouton, 2001: 95; Crous, 2012: 31–32).

The selection of the best structure to use in the literature review depends on the research problem. A combination of methods is usually applied based on each method’s merits and applicability to solving the research problem (Mouton, 2001: 95; Crous, 2012: 32).

The literature review forms an important base for any research. A literature review provides information on the scholarly activities performed in the related field of study and provides the researcher with information to identify gaps or problems within the selected field of study. The structure that the researcher selects when presenting the literature review must be done while keeping the guidelines of a good literature review in mind to gain the maximum benefit from this part of the research process (Crous, 2012: 32).

1.5.2. Empirical investigation

The empirical part of research follows the literature review. The purpose and design of an empirical investigation are important to give direction to a study. This section will discuss the research design and purpose of the empirical portion of this study.

1.5.2.1. Research design

Empirical research can follow two distinctive approaches, namely quantitative or qualitative (Bryman et al., 2014: 30; Goodchild, 2016: 35). The choice between a qualitative or quantitative research approach is reliant on the understanding of the research problem and the best method of solving the stated problem (Goodchild, 2016: 35). The term *research approach* refers to the general orientation in the manner in which the research is conducted (Bryman et al., 2014: 30).

Quantitative research refers to the collection of data in the form of numbers, and the statistical analysis of data gathered (Bryman et al., 2014: 41; Goodchild, 2016: 35). Qualitative research refers to an approach that emphasises words over the quantification of the analysis of collected data (Bryman et al., 2014: 31; Goodchild, 2016: 35). Additionally, qualitative research emphasises the generation of theories rather than proving theories (Bryman et al., 2014: 31). Moreover, qualitative research has an interpretive nature with the objective of gaining detailed knowledge in a specified field (Goodchild, 2016: 36).

This study will revolve around data collected from the finance and human resources departments of a South African university. The data will contain information on the income received from different modules in the form of class fees and government subsidies, costs allocated to faculties by the university administrators, as well as information on the number of students enrolled in academic modules. Further information obtained is on the number

of credits awarded to each module. The final portion of data that the researcher will collect is information on the teaching input units as submitted by the specific university to the Department of Higher Education, Science and Technology (DoHET) in South Africa for their amount of teaching input subsidy from the South African government. The study will gather the data mentioned for the 2017 financial year. The researcher will then analyse the gathered data, and a cost model will be developed to determine the financial viability of the modules at this specific South African university.

Research in the area surrounding cost models applied at universities is limited. Most of the current studies follow a very complex approach such as ABC (refer to chapter 3 for a detailed analysis of universities applying ABC). The most significant critique against an ABC system is that it is very time consuming and costly, and that the cost to implement such a system far outweighs the benefit derived from the accuracy of the cost allocation. The studies attempting to apply an ABC system to a university also only focused on one department or program and employed a limited number of activity cost centres, which reiterates that such a system is too complex to benefit university administrators in their decision-making process (Alejandro, 2000: 8–9). Information supplied by existing traditional accounting systems is also insufficient in the decision-making process required by university administrators (Cook, 2003: 48). A different, effective method of cost allocation is therefore required, and this study explores a different method incorporating cost and management accounting principles.

The purpose of this study is to analyse the collected data, as described earlier in order to develop a theory (cost model) that will be applied to the selected sample of modules at a South African university. A research purpose of “build and test theory” describes a quantitative research approach (Cooper & Schindler, 2006: 199). This study will therefore be built upon a quantitative approach to research. The large sample size of this study is typical of quantitative research (Cooper & Schindler, 2006: 199). The population of the study will be the total number of modules presented at the specific South African university which amounts to 4 088. Out of the 4 088 modules, a sample of 3 497 modules, based on criteria specified in detail in chapter 4 of this study, is selected.

From the above description, it is clear that the research design of this study is quantitative. The purpose of research can, however, be either exploratory, explanatory or descriptive (Van Zyl et al., 2017: 86). Each of these purposes is briefly discussed in the next section.

1.5.2.2. Research purpose

1.5.2.2.1. Exploratory research

An exploration phase is a part of every research project. Exploratory research, however, becomes very useful in fields of study where the existing body of knowledge is limited or where ambiguity or uncertainty exists (Van Zyl et al., 2017: 87). Where the aforementioned conditions exist, exploratory research aids in the development of “theoretical frameworks, hypotheses or research propositions”, which can be further tested by different research designs (Van Zyl et al., 2017: 87). Cooper and Schindler (2011:143) add that exploration assists researchers to “develop concepts more clearly, establish priorities, develop operational definitions, and improve the final research design”. Exploratory research has six main types, namely historical research, phenomenology, ethnography, grounded theory, case research and action research (Van Zyl et al., 2017: 87–88), each of which will be discussed briefly.

Historical research assists in uncovering lessons from the past. Historical research requires much more than just providing a chronological order of events, but rather interpreting these events, understanding why the events occurred and trying to identify related patterns in the gathered data. Historical research is not a type of exploratory study that is often followed in the economic and management science field (Van Zyl et al., 2017: 87).

The purpose of phenomenological research is to understand the way in which interactions with other people and the physical environment shape the behaviour of people. Even though phenomenology has its origins in the fields of philosophy and psychology, it is becoming an increasingly important tool in management research. The technique of phenomenology lies in hermeneutics. Hermeneutics is where text passages from interviews (“hermeneutic units”) are identified, which “links key themes in the researcher’s interpretation” (Van Zyl et al., 2017: 87).

With its roots in anthropology, ethnography’s main aim is for a researcher to immerse him- or herself so completely in a situation to become part of it. The aim is for the research subjects to become so used to the researcher over time that they act in a more natural way and maybe reveal more about their practices than what would have occurred in a normal research setting. Ethnography is a suitable research type in economic and management

sciences to study, for example, various cultures within an organisation (Van Zyl et al., 2017: 88; Malhotra, Nuna & Birks, 2017: 162).

Grounded theory is suitable in fields with limited prior research. This type of exploratory research seeks out the development of theories from the research on an inductive basis. Grounded theory starts with data collection and finds its place in the studying of processes. Grounded theory refers to a research design where data are collected and analysed simultaneously in a systematic process (Malhotra et al., 2017: 168). This is, however, not a type of research that is used very often in the economic and management sciences field of study (Van Zyl et al., 2017: 88).

Case research is particularly popular in the economic and management sciences subject field. Case research follows a case study design where a unit of analysis, which can be a selected individual, organisation or even an event is studied in detail for a determined time period. Case research's main purpose is to obtain more detail about a poorly understood aspect. Case-based theories relying on strategic sampling of cases are developed and generalisations are drawn from these theories (Bryman et al., 2014: 113). A study can include one or multiple cases (Van Zyl et al., 2017: 88).

"Action research is an interactive form of knowledge development." (Van Zyl et al., 2017: 88). This type of exploratory research utilises strategic enquiry to solve the inherent problems in a specific setting. This type of research relies on teamwork, led by a professional researcher linking stakeholders and decision-makers in order to improve a specified situation (Malhotra et al., 2017: 171). Participants in action research become co-researchers and this research develops in a participatory manner, since each step's results become part of the next step as it is implemented (Van Zyl et al., 2017: 88).

1.5.2.2.2. Explanatory research

Explanatory research, also referred to as causal research, has the main purpose of establishing whether a causal relationship exists between dependent and independent variables (Cooper & Schindler, 2011: 151; Van Zyl et al., 2017: 90; Malhotra et al., 2017: 79) and is also referred to as experimental research. Experimental research can be pre-experimental, true experimental or quasi-experimental (Van Zyl et al., 2017: 90; Malhotra et al., 2017: 315). Pre-experimental research forms part of exploratory research as described in the previous section. True experimental research relies on the achievement

of four conditions: using a control group as a comparison for the treatment group; ensuring that the allocation of subjects between the control group and treatment group is random; the establishment of baseline measurement through pre-testing; and controlling of possible confounding variables by the researcher (Van Zyl et al., 2017: 91; Malhotra et al., 2017: 317). Variables are confounding when their effect on the dependent variable is not the same as what was anticipated (Cooper & Schindler, 2011: 716; Malhotra et al., 2017: 910).

With this type of research, the treatment group receives the “treatments, programme or intervention” and the results of this group are measured against the control group (Malhotra et al., 2017: 317; Van Zyl et al., 2017: 91). This is difficult research to apply to economic and management sciences, since it is almost impossible to control the confounding variables, since research in this field is exposed to a variety of factors completely out of the control of the researcher (Van Zyl et al., 2017: 91). Quasi-experimental research is therefore much more practical in economic and management sciences research. In quasi-experimental research, the random allocation of subjects to the control or treatment group is not a pre-condition. The researcher also does not have to control all confounding variables (Van Zyl et al., 2017: 92; Malhotra et al., 2017: 318).

Although causal research is used in quantitative research designs, quantitative research can also be non-experimental. Ex post facto studies also compare groups, but there exists no manipulation of the independent variable by the researcher, since group allocations take place in a random fashion (Van Zyl et al., 2017: 93). Correlation research is also a non-experimental form of quantitative research forming part of causal studies. Correlation research measures the linear relationship between variables without determining the causality between the variables (Van Zyl et al., 2017: 93). Correlation research is a method often employed in the field of economic and management sciences (Van Zyl et al., 2017: 93).

1.5.2.2.3. Descriptive research design

Descriptive research applies in studies with an objective to describe a certain phenomenon. This form of research is quantitative in nature and applies quantitative survey methodology. Descriptive research can be performed via observation studies, developmental design or descriptive surveys, described briefly below (Van Zyl et al., 2017: 89; Malhotra et al., 2017: 73).

Observation studies entail a structured and focused attempt to form objectivity. This research design requires the researcher to observe a chosen occurrence, within a specified time frame and meticulously recording the results. The recorded results should yield data that could be quantified and, therefore, generalised to the population. This method could be useful in many economic and management sciences research (Van Zyl et al., 2017: 89; Malhotra et al., 2017: 289).

Developmental research aims to establish by what means the characteristics and behaviour of people change over a period of time. Developmental designs can either be cross-sectional or longitudinal (Van Zyl et al., 2017: 89; Malhotra et al., 2017: 74). Cross-sectional studies gather a sample from different cases to enable a comparison between the measurements of the different groups (Bryman et al., 2014: 106; Van Zyl et al., 2017: 89). Longitudinal studies survey the same sample over a specified period (Bryman et al., 2014: 109; Van Zyl et al., 2017: 89).

With descriptive surveys, information about groups of people is obtained by asking and tabularizing the answers provided. The goal with descriptive surveys is to learn something from the participating groups to be able to generalise the answers (Van Zyl et al., 2017: 89; Malhotra et al., 2017: 269).

1.5.2.2.4. Selected research purpose

The aim of the quantitative approach to this study lies in the definition of the term “exploration.” Exploration is “the process of collecting information to formulate or refine management, research, investigative, or measurement questions” (Cooper & Schindler, 2006: 709). Exploratory research studies are loosely structured and include the development of concepts and operational definitions. The exploration phase of a study aids in understanding the problem faced and searches for ways to solve the problem (Cooper & Schindler, 2006: 709–710).

Data (as explained above) from only one university will be collected, and the cost model will be applied to only this university as an aid to the university’s administrators to assist with their decision-making process during this period of rapid change in the university environment, as explained in section 1.1 of this study. This study is, therefore, an exploratory case study. By analysing the collected data, the researcher aims to respond to the problem statement stated in section 1.2.

1.5.3. Summary

This section indicated that this study will provide an overview of the available literature in the field of management and cost accounting with specific reference to the university environment as part of the service industry. The literature review will be followed by an empirical investigation. The various research designs and purposes that can be applied were discussed and it was concluded that the nature of the data as well as the research objectives for this study will require a quantitative design with an exploratory case purpose. The quantitative research in this study will be supported by non-experimental correlation research based on the assumptions stated in chapter 4, derived from the literature review in chapter 3.

1.6. The significance of this study

> *Education is the great engine of personal development. It is through education that the daughter of a peasant can become a doctor, that the son of a mineworker can become the head of the mine, that a child of farm workers can become the president of a great nation. It is what we make out of what we have, not what we are given, that separates one person from another.*
>
> Nelson Mandela

Universities face certain challenges forcing them to rethink their current business model (Lapovsky, 2018: 1). A funding crisis due to the decrease in government subsidies of universities created a significant shortfall that universities are struggling to resolve. This funding crisis, coupled with a decrease in the relevance of universities due to new competition in the form of massive open online courses (MOOCs), as well as the possibility of the Fourth Industrial Revolution characterised by automation and artificial intelligence has left universities in a struggle to survive (Editorial, 2014: 1).

Universities are reacting to the challenges they are facing by making decisions about their current business model (Lapovsky, 2018: 1). Knowing the costs related to a decision is a key factor in decision-making or for future planning (Lepadatu, 2011: 52).

This study aimed to determine the cost of academic modules at a South African university. The application of the outcomes of this study could assist the administrators of the South

African university in making the necessary decisions that could be pivotal to their financial survival.

The costing methodology followed in this study could assist various universities in obtaining accurate and reliable data to make the decisions they are faced with. Angel Gurria, the founder secretary-general of the Organisation for Economic Cooperation and Development stated, “Education is an investment in the future.” He continued to say that “Our work on education aims to make that investment strong, effective and fair.” (Organisation for Economic Co-Operation and Development [OECD], 2012: 2). The work done in this study will contribute towards a fair, effective and strong university environment. The costing methodology could further prove a valuable analytical tool for any South African university that may aid university administrators in making decisions that could affect the future success of universities in South Africa.

1.7. Ethical considerations

Ethical principles are cardinal to all researchers (Diener & Crandall, 1978: 1). Ethical principles are important, since they assist in the prevention of abuse and aid to define responsibilities (Diener & Crandall, 1978: 1).

Diener and Crandall (1978: 3) describe ethics in research as “guidelines and principles that help us uphold our values”. Ethics in the conduct of research are principles that help the researcher decide which research goals are the most important. It assists in the reconciliation of conflicting goals and values (Diener & Crandall, 1978: 3). There are four classifications of ethical considerations in business research:

- Whether it could pose harm to the participants of the research;
- Whether informed consent is lacking;
- Whether there was any privacy invaded; and
- Whether the research involves deception

(Diener & Crandall, 1978: 7; Bryman et al., 2014: 120).

The data this study used are institutional data from a South African university. The data are already in existence, and the researcher does not need to gather additional data. To

ensure that this study adhered to all four ethical considerations, the researcher obtained the data personally from the vice-rector of the specific university. This process ensured that there was no lack of informed consent. The study would not mention any individual names of modules, staff members or departments from the collected data and will publish only anonymous results, where required. This step would further ensure that the study did not invade any person's privacy and that no harm could come to the participants of the research. The last ethical step the researcher undertook was to send the report on the findings of this study back to the relevant university upon completion so that the research would not involve open deception.

Further insurance of the application of ethical principles of this study was to apply for ethical clearance from the General Human Research Ethics Committee at the University of the Free State. The researcher of this study is registered as a Chartered Accountant in South Africa (CA [SA]) with the South African Institute of Chartered Accountants (SAICA). SAICA holds all its members to a strict code of conduct which requires a high level of ethical behaviour in all their actions.

Since the data applied in this study is very sensitive, all files will be password protected and encrypted. The data will be kept until all possible, ethical publications from this study has been submitted and accepted.

1.8. Chapter layout

The layout of this study is as follows:

Chapter One: **Introduction and background**

The study commenced with a background into the various challenges faced globally as well as locally by universities. As a result of these challenges, the problem statement of the study followed. The chapter continued with an explanation of the objectives of the study in response to the problem statement. The chapter included a brief review of the available literature on various cost models applicable to traditional universities in support of the objectives stated. A description of the research approach applied by the researcher followed the abbreviated literature review. The conclusion to the chapter included a statement on the significance of the study as well as the ethical considerations for the success of the research conducted.

Chapter Two: Literature review on the university environment

Chapter two will contain a literature review on the definition of a traditional university. This chapter will also include the history of traditional universities in South Africa. The literature review in this chapter will continue with research on the current relevance, both globally and locally, of traditional universities. This chapter will include how the funding structure of South African universities work and provide a breakdown of the cost structure of a typical South African university.

Chapter Three: Management and cost accounting applications at universities

Chapter three will explore the available literature surrounding costing principles. This will include a broad overview of applicable cost terms and concepts as well as a detailed explanation of the different cost calculation systems and cost allocation models available to cost a module at a South African university. This chapter will also contain a detailed investigation of Activity-based costing as a basis for a cost allocation model at a university. This investigation will include the history of Activity-based costing, and the advantages and disadvantages of such a costing system, including the implementation of an Activity-based costing system. The chapter will conclude with additional applications that can follow from the implementation of an Activity-based costing system.

Chapter Four: Research methodology

Chapter four of this study will contain a detailed description of the research design and methodology the researcher followed. This chapter will include the data collection and analysis methods. This chapter will explain the research purpose and approach of this study and will detail the quantitative design of the study.

Chapter Five: Empirical analysis and results

This chapter will contain the results of the data analysis according to absorption cost calculation principles. The chapter will include the calculated income, costs and direct profit of all modules at a South African university. These calculations will further be applied to calculate the breakeven number of enrolments per module at various NQF levels amongst the different faculties at the university. This chapter will also contain the results of the statistical analyses applied in this study.

Chapter Six: Conclusions and recommendations

Chapter six will conclude the study. The conclusion will summarise the findings from reviewing literature as well as the empirical work of the study and make recommendations where applicable. This chapter will also include the limitations relevant to the research conducted and refer to possible future research opportunities from the study.

1.9. Limitations of this study

The research conducted in this study could face certain limitations. The results of this study cannot be generalised to other universities as only one university's data were used. It will also not contribute to the academic excellence of the institution. Data of only one academic year were used, which limits the number of comparisons that could be performed.

1.10. Summary

Section 1.1 of this study pointed out the various challenges universities are facing. These challenges range from student protests regarding the quality and cost of higher education and decreased government funding to threats regarding the relevance of universities. Regardless of the type of threat universities are facing, it is clear that university administrators have to make some significant decisions if they are to ensure the survival of these institutions.

Section 1.1 of this study further pointed out that the starting point of any sound business decision is accurate cost information. Section 1.1 also indicated that universities, due to their complex business models and their cost objective being a service, face various challenges in obtaining accurate cost information to assist with the decision-making process.

This study aims to determine the cost of a module at a South African university by applying a cost model based on ABC principles that could assist in the provision of accurate cost information to the administrators of universities. Accurate cost information is an important factor to assist universities in their navigation of the crises they currently face.

Chapter 2: Literature review on the university environment

2.1. Introduction

Chapter 1 started with a discussion of the challenges faced by universities, both globally and locally. The objectives stated in chapter 1 aimed to address these challenges. However, a better understanding of the university environment is required before a solution to these challenges can be considered.

The literature in chapter 2 provides a description of traditional universities in South Africa and the university landscape on a global level, including a discussion on the student protests in different countries. This is followed by a brief discussion on the funding structures of South African universities and the decreased relevance of traditional universities before a conclusion is reached.

2.2. Decreasing relevance of traditional universities

The challenges faced by universities on a local as well as global front described in chapter 1 apply specifically to traditional universities. The characteristics of a traditional university are the inherent cause of some of the challenges these institutions face. An understanding of these characteristics could provide guidance on understanding the costs incurred in delivering teaching modules. A traditional university is characterised by the focus of the institution, which is primarily on teaching and research, with public service as an additional task (Perkins, 1973: 3–12; Etzkowitz et al., 2000: 313; Walton & Martin, 2004: 11; Bikse et al., 2016: 76). The mode of delivery of tuition, which is mainly face-to-face and on-campus, separates traditional universities from other higher education institutions with a primary mode of delivery of online or distance learning to passive recipients (Mackeogh & Fox, 2009: 147; Long, 2012: 60). According to Walton and Martin (2000: 8; 2004: 11), other criteria associated with traditional universities include sponsorship of research, openness of access, focus on education, evidence of scholarly activity and independence.

Traditional universities have, furthermore, struggled with critique relating to employability of their graduates, the change in mode of delivery of higher education training and the creation of entrepreneurial universities. Each of these are briefly discussed below.

2.2.1. Employability

It is not possible to discuss the objectives of a university without referring to the employability of graduates as one of the main issues to be considered by a higher education institution (Holmes, 2013: 539; González-Romá, Gamboa, & Peiró, 2018: 132). Employability is defined as “those basic skills necessary for getting, keeping, and doing well on a job” with which it “enables students to acquire knowledge, personal and professional skills and encourage the attitudes that will support their future development and employment” (Robinson, 2000: 1; Warraich, 2008: 3). A further definition of employability is “a set of achievements – skills, understandings and personal attributes – that makes graduates more likely to gain employment and be successful in the chosen occupations, which benefit themselves, the workforce, the community and the economy” (Yorke, 2004: 410; Yorke, 2005: 8; Warraich, 2008: 4).

Employability has become what society sees as an educational outcome in economic terms due to an expectation of lifetime earnings (Holmes, 2013: 539; Martini & Fabbris, 2017: 352–353). The current reality is that governments seek to expand higher education, but have been reducing public expenditure in this regard. The reduced spending by government has led to students themselves, or their families having to bear the increasing cost of higher education on an expectation of a lifetime of earnings (Holmes, 2013: 539).

Higher education institutions cannot guarantee employment, but it can be reasonably expected of a higher education institution to take all the necessary steps to increase the likelihood that graduates will obtain appropriate employment (Holmes, 2013: 540–541). Evidence, however, suggests that obtaining a higher education degree is no longer a guarantee of employment (Mok, Wen & Dale, 2016: 266). Some graduates are overqualified for their current jobs, and others are unemployed because they do not possess the skills required for the available jobs (RBC, 2018: 2). Moreover, there are concerns about a rising crisis of students trained for jobs that soon might not exist, instead of obtaining skills that will make them employable (Editorial, 2014: 1; Frey & Osborne, 2017: 269–278; RBC, 2018: 2).

Employability as a result of the skills obtained at any university is diminishing due to computerisation and a shift in skills required in the labour market, since moderate skills increasingly become automated, specifically concerning white-collar jobs (Bresnahan,

1999: F413; Frey & Osborne, 2017: 254). The estimated rate of automation of total United States (US) employment is 47% (Editorial, 2014: 1; Frey & Osborne, 2017: 265). This estimated rate of automation means that there is potential for automation in occupations related to 47% of the total US employment over the next few decades (Frey & Osborne, 2017: 265). Jobs with the highest probability to be automatized are routine intensive occupations that follow well-defined procedures for which an algorithm can be established (Autor & Dorn, 2013: 1559; Frey & Osborne, 2017: 255).

Routine intensive activities are methodical and repetitive and are accomplished by following a specific set of directions. A non-routine task will require adaptability, human interaction and problem-solving (Autor, Levy & Murnane, 2003: 1283; Jaimovich & Siu, 2012: 7). Tasks such as managing, technical and professional work are classified as non-routine, cognitive tasks. Non-routine, cognitive tasks include occupations such as economists, physicians, analysts and public relations officers. Routine cognitive tasks will include occupations in sales, mail clerks, data entry and administrative or office support. Routine manual occupations include so-called blue-collar occupations and will entail dressmakers, machine operators and mechanics as examples. Non-routine manual occupations will include janitors, manicurists, bartenders and health aids, for example. Routine occupations comprise middle-class occupations (Acemoglu & Autor, 2010: 20; Jaimovich & Siu, 2012: 78; Cortes, 2016: 78).

Table 2.1 contains the 31 top-most occupations (out of 702 occupations) that Frey and Osborne identified as having the highest probability to be automated due to their routine intensive nature (2017:278):

Table 2.1: Automated occupations

Percentage	Occupation
98%	Bookkeeping, accounting, and auditing clerks
98%	Legal secretaries
98%	Radio operators
98%	Driver/sales workers
98%	Claims adjusters, examiners, and investigators
98%	Parts salespersons

Percentage	Occupation
98%	Credit analysts
98%	Milling and planning machine setters, operators, and tenders, metal and plastic
98%	Shipping, receiving, and traffic clerks
98%	Procurement clerks
98%	Packaging and filling machine operators and tenders
98%	Etchers and engravers
98%	Tellers
98%	Umpires, referees, and other sports officials
98%	Insurance appraisers, auto damage
98%	Loan officers
98%	Order clerks
98%	Brokerage clerks
98%	Insurance claims and policy processing clerks
98%	Timing device assemblers and adjusters
99%	Employees responsible for keying data into systems
99%	Library technicians
99%	New accounts clerks
99%	Photographic process workers and processing machine operators
99%	Tax preparers
99%	Cargo and freight agents
99%	Watch repairers
99%	Insurance underwriters
99%	Mathematical technicians
99%	Sewers, hand
99%	Title examiners, abstractors, and searchers
99%	Telemarketers

(Source: Frey & Osborne, 2017: 278)

What is evident from the study by Frey and Osborne (2017) is the polarisation of the labour market. The polarisation includes the significant growth in both low-income service delivery as well as high-income cognitive tasks due to the difficulty of setting an algorithm to repeat the skills. The repetitive skills that would most probably be automated are found in the middle of the different skills and income classes. The labour market in Britain is currently portraying a clear hollowing out at the middle of the skills and wage distribution (Jaimovich & Siu, 2012: 2; Autor & Dorn, 2013: 1559; Frey & Osborne, 2017: 255). Any higher

education programs that aim at employability within the middle-skills level will become less relevant as the available occupations at this level decrease.

2.2.2. Mode of delivery

As stated at the beginning of this chapter, traditional universities are characterised by face-to-face and on-campus modes of delivery. However, there is an international trend towards online education of students (Cabrera & Fernández-Ferrer, 2017: 48; Hess, 2018: para. 3). This trend towards online education includes the establishment of Massive Open Online Courses (MOOCs), which provide education at a significantly lower cost delivered at a time and place that fit the students (Editorial, 2014: 1).

In 2018, 101 million learners made use of MOOCs (Shah, 2018: para. 1). The top MOOCs providers in 2018 in descending order (based on registered users) were Coursera (37 million), EdX (18 million), XuetangX (14 million), Udacity (10 million) and Furturelearn (8.7 million) (Shah, 2018: para. 3). The courses offered by MOOCs range from a Master's in various fields, including Accounting and Information Technology Management, as well as a Global Master of Business Administration (MBA) degree and many more, to shorter courses in fields including statistics, information technology, health and wellness and many others (Editorial, 2016b: para. 2; Shah, 2018: para. 12). Some traditional universities such as Harvard, Stanford and the Massachusetts Institute of Technology (MIT) have responded to the change in the higher education environment by offering students some digital exposure in conjunction with traditional methods of delivering higher education. There is, however, a risk that some universities that have not yet reacted to the change in the higher education environment will be too late to survive the digital revolution (Davies, 2012: 65; Ostashewski et al., 2017: 185). Universities reacting too late to the digital revolution in the higher education environment might find that they will have to change their business model dramatically to keep their customer base (enrolled students) from declining (Davies, 2012: 65).

Pressure from online education providers as well as a bigger domestic tertiary presence overseas through online education has already caused student numbers at traditional universities to decline (Davies, 2012: 66). The current state of MOOCs might not be a threat to traditional universities, since universities still have a monopoly when it comes to awarding credits and decrees and MOOCs have already seen a decline in enrolments in

2018 but, with digital developments occurring, different industries backing online education, willing students and links with employers, universities will soon feel the pressure from declining enrolments due to students preferring MOOCs over a traditional university education (Davies, 2012: 66; Ostashewski, Howell & Dron, 2017: 184; Shah, 2018: para. 1).

2.2.3. Entrepreneurial universities

The world is consistently moving from products and services to a knowledge-based economy (Smit, 2002: 6). The pursuit of innovation and realisation of economic development depends on a quality education received by the workforce (Keser, 2015: 59). Higher education is, therefore, one of the most important cornerstones of this knowledge-based world (Smit, 2002: 6; Cargill, 2007: 373). The decrease in government funding of universities, also in South Africa (refer to section 2.4), and the government's expectation that universities will address funding inequalities, increase access and capacity as well as success rates and standards (Smit, 2002: 7; Filippakou & Williams, 2014: 79) is forcing universities to do more with less. This results in universities not being able to avoid management based on solid financial business principles (Smit, 2002: 7; Cargill, 2007: 373).

The conflicting expectations of government mentioned in the previous paragraph require a response from universities, since "national systems are blunt instruments for reform" (Smit, 2002: 7; Filippakou & Williams, 2014: 77). An entrepreneurial response is required from universities if they want to remain competitive in the new world of knowledge and at the same time remain financially viable (Smit, 2002: 7).

Non-traditional providers of higher education are growing at a frightening rate (Smit, 2002: 8). These providers are termed "corporate universities" and are broadly categorised into five groups (Smit, 2002: 8):

- For-profit corporate higher education providers;
- Sophisticated, multi-dimensional education and training facilities within international organisations;
- Not-for-profit, in-house education and training organisations;

- Nominally non-for-profit universities and colleges that seek to market services at a profit. These institutions offer their services directly to businesses or fee-paying students; and
- Prestigious public universities internationally expanding their markets via distance learning, oftentimes on a commercial basis.

The growth in the number of these non-traditional universities seems to indicate that the days of traditional universities and their traditional format, institutions that try to be everything to everybody, are numbered (Smit, 2002: 11). This effectively means that higher education's proverbial ivory tower has been shattered (Cargill, 2007: 373). The term "entrepreneurial universities" has become the buzzword to describe institutions that navigate the changing needs of the market the most successfully (Smit, 2002: 12). In many instances, governments are urging universities to become more entrepreneurial, leading to universities raising more and more of their own funds (Cargill, 2007: 374).

Entrepreneurial universities do not have a one-size-fits-all definition (Musau, 2017: para. 3). There are, however, various terms to describe the phenomenon of entrepreneurial universities such as inventive, creative, practical, entire university becoming enterprising, innovation, taking risk and a shift in organisational character (Smit, 2002: 12; Musau, 2017: para. 3). Despite the wide descriptions of what an entrepreneurial university entails, there is a broad understanding that entrepreneurial universities seek to obtain an increasing percentage of their funding from third-stream income (Cargill, 2007: 378; Taylor, 2012: 289; Filippakou & Williams, 2014: 72). This can occur by engaging in activities that do not necessarily form a direct part of their core activities but is financially sensible (Filippakou & Williams, 2014: 78). It is clear that stimulating entrepreneurial activities at universities should be part of the central strategy of any government, but it remains to be seen whether or not "academic excellence is enhanced or inhibited by entrepreneurial success" (Filippakou & Williams, 2014: 79).

Not all universities, however, see the opportunity in entrepreneurship, but rather see it as a threat (Oleksiyenko, 2002: 5). Faculty members of traditional universities focus on getting more income; not on generating wealth. These members are more focused on the required procedures and red tape than performance and results (Oleksiyenko, 2002: 6). A major concern for universities seeking to become more entrepreneurial is that inexperienced managers tend to grasp at every commercial opportunity. Oftentimes, these opportunities

are taken without accurate cost analysis, business models or the analysis of strategic advantages, only based on the short-term benefits obtained (Cargill, 2007: 375). The possible negative impact of these actions by managers and the hold of the idea of a traditional university on these institutions may last for an undetermined period. However, innovation and entrepreneurship in public universities have to be implemented and cannot be avoided, just as the change required by the challenges in the university environment described in this chapter cannot be avoided (Oleksiyenko, 2002: 6)

2.3. University landscape

As mentioned earlier, the inherent characteristics of universities have caused unique challenges for these institutions. This section aims to shed some light on the university environment, with specific reference to student protests, to expand on the challenges faced by these institutions as mentioned in chapter 1.

2.3.1. European, American and Canadian student protests

The global protests by students as well as academics experienced by universities since 2015 have placed an increased emphasis on the relevance of universities (Ratcliffe, 2015: 1). Protests by students and academics at universities have a long history and include protests in France, Chile, Czechoslovakia, Prague, China, Canada, the United Kingdom (UK) and the Netherlands.

The year 1968 was one of the significant dates in the history of student protests. In May and June 1968, France was shaken by student protests for two months. The term “Bloody Monday” referring to these protests expresses the violence associated with the France protests. These protests saw 422 students arrested and the injury of 345 policemen (Fomunyam, 2017: 39). The protests started at the Nanterre Campus of the University of Paris, but had an impact all across Europe, North America and even further. These protests mobilised students, academics, workers, Communist and Socialist party members and even trade unions to rebel against the strict power exercised by the government run by Prime Minister George Pompidou and President Charles de Gaulle (Becker & Seddon, 2018: 1). Formally, these protests’ aims ranged from higher national wages to a complete overthrow of the government and, informally, a more free, fun and expressive society (Hargreaves, 2018: 35).

In 1988, the Gallaudet University experienced the “Deaf President Now” protest, which resulted in the resignation of the then newly appointed, current, hearing president, Elisabeth Zinser, and the appointment of a deaf president, I. King Jordan (Greenwald, 2014: 6). In 1989, amongst others, Czechoslovakia and Prague experienced student protests for various reasons, but resulting in the same consequences with tens, even hundreds of students injured (Fomunyam, 2017: 39). Chile had a seven-month-long protest in 2011 where students’ demands centred around free, quality and public education without universities profiting from higher education (Fomunyam, 2017: 39; Cummings, 2019: 50).

Student protests continue into the 21st century. More recent examples include Canada, the UK and the Netherlands in 2015. Graduate students at the University of Toronto and the University of York in Canada went on strike due to the minimum remuneration packages offered to graduate and teaching assistants as well as research assistants, and improved rights of employment for members of the lesbian, gay, bisexual and transgender and queer (or questioning) (LGBTQ) community. They required that graduate students be guaranteed a remuneration package above the poverty line, to be increased with inflation as well as the rise in living costs (Ratcliffe, 2015: 1).

In the UK, students at the London School of Economics and Political Sciences occupied a central administration room for more than a week in March 2015 under the social media tag of #OccupyLSE. The students were protesting the marketisation of education. OccupyLSE had an end goal where students, lecturers and workers run the University, a project called Free University of London (Ratcliffe, 2015: 1).

Students further occupied Maagdenhuis, the main administration building at the University of Amsterdam in the Netherlands, demanding that the institution change to a more democratic regime. Protesters aimed to improve the transparency of the decision-making process at the university. The protesters at the University of Amsterdam took a stand against the University making a profit as well as the forced focus on efficient service delivery and a harmonious community. The protesters felt that higher education’s main priority should instead be critical thinking, creativity and education (Ratcliffe, 2015: 1).

2.3.2. African student protests

Africa has seen its own share of student protests over the years. These protests can also be traced back to 1968, which was branded as a year of political turmoil. In Tunisia, the protests were influenced by the events that occurred in France in 1968 (see section 2.3.1), with the protesters identifying with international activists on anti-colonial causes such as the liberation of Palestine and ending the Vietnam War. In February 1968, steelworkers in Helwan, Egypt protested against a lenient ruling of the military court in a case of negligence by military aviation officers during the June war. The June war refers to Israel defeating Egypt in June 1967, which lead to a political and military crisis ending in Gemal Abdel Nasser's resignation as president of Egypt. On 21 February (Egyptian Student Day), up to 100 000 students from large role-playing universities in Cairo and Alexandria joined the steelworkers in their protests. The protest in Cairo alone caused the death of two workers, injuring 77 citizens and 146 police officers, which lead to the arrest of 635 people and the destruction of vehicles and buildings in the Egyptian capital, Cairo (Becker & Seddon, 2018: 1).

In November 1968, Egypt was struck by further student protests after the announcement of a new education law. The resulting uprising started with high school students in Mansoura. These high school students were later joined by university students and labourers, among others. On the second day of the Mansoura uprising, the demonstrations caused the death of three students and a farmer, wounding 32 protesters, nine police officers and 14 soldiers. The protest in Mansoura incited protests from the leaders of the student movement of the engineering faculty at Alexandria University who launched additional protests. During these protests, clashes with police forces injured 53 law enforcement officers and 30 students. The situation in Alexandria became dire, and on 25 November 1968, these protests and large-scale demonstrations resulted in 16 deaths. In 1972, Egyptian universities saw more uprisings to protest against Muhammed Anwar el-Sadat's attempts at the liberalisation of Egypt's economy and the reversal of his predecessor, Gemal Abdel Nasser's Arab-socialism and his empty promises of reckoning with Israel (Becker & Seddon, 2018: 1).

In 1968, students in the Congo protested against the Congo ruler's fake anti-imperialism. These protests turned violent with 60 students from the University of Kinshasa killed in 1969 (Becker & Seddon, 2018: 1). In Ethiopia, students protested against new school fees

(among other demands) from as early as 1969. Students in Tanzania used their voice against imperialism, voicing specifically anti-Americanism during 1968 in opposition to the signing of an agreement in government to receive American Aid. Kenya, in turn, saw students protesting against the Soviet invasion of Czechoslovakia in March 1969, marching in protest to the hanging of African Nationalists in Rhodesia (Becker & Seddon, 2018: 1).

Between 1990 and 1998, 110 cases of student protests in Africa were reported (Fomunyam, 2017: 40). Protesting students in Egypt and Morocco formed a central part of the 2011 Arab uprisings (also knowns as the Arab Spring) due to the scarcity of resources required at their universities, increases in tuition fees, hunger and deteriorating living conditions (Fomunyam, 2017: 45). The Arab uprisings refer to anti-government protests that started in Tunisia in 2010, and by the Spring of 2011, have spread across Arab-speaking countries throughout North Africa as well as the Middle East (Blakemore, 2019: para. 1). More than 40% of protesters during the Arab Spring in North Africa consisted of students (Fomunyam, 2017: 45).

In February 2011 in Morocco, thousands of Moroccans, mostly students, protested against Morocco's governance and demanded political change. 2014 saw the arrest of 10 Moroccan students outside the Ibn Tofail University as a result of the violent nature of a protest against the increased cost of transportation from student dormitories to school. Students at the University of Lagos caused a campus-wide shut down on 6 and 7 April 2016 in protest of a lack of basic amenities (Fomunyam, 2017: 49). Student protests in Africa in 2016 further saw students at the University of Liberia petition lawmakers through a protest at the entrance of the Liberia Capitol Building. The purpose of this protest was to increase the university's funding by US$29 million to keep up with the university's growth and development plan after the university had increased tuition fees from US$2 to US$4 (Fomunyam, 2017: 49). Damages to property, destruction of university structures and violent attacks from all sides of the protests characterised student protests that have occurred over the past few decades (Fomunyam, 2017: 38). This study does not provide for a detailed description of all student protests in the world or in Africa, but provide only a brief overview of the frequency of student protests and the concerns that led to the protests.

2.3.3. Student protests in South Africa

Although student protests in South Africa generally bring to mind the Soweto 1976 protests, student protests in South Africa can also be dated back to 1968. In 1968, students at the University of Cape Town (UCT) led a sit-in known as the “Mafeje Affair” to protest against the government’s intervention in the University’s hiring process (Becker & Seddon, 2018: 1). The peaceful sit-in of 1968 at UCT was followed a few years later by the notorious 1976 student protests. On 16 June 1976, the first students gathered at Naledi High in Soweto, South Africa, at the start of what should have been a peaceful protest against the Bantu education system and Afrikaans as the medium of instruction. These protests ended in violence, with reports of the death of at least 23 students, as well as the destruction of nearly all the West Rand Administrative Buildings (WRAB) in Soweto. The damages included the burning of 21 offices and three schools, the plundering of 10 offices, and the destruction of an unknown number of beer halls, bottle stores and municipal halls (Editorial, 2013: 1). Hastings Ndlovu, aged 15, was the first student shot by the police during the Soweto uprisings on 16 June 1976. The second fatality, Hector Peterson aged 12, became the icon for the student struggle as a result of the publication of his photo surrounding the events of this day. Around 300 predominantly white students from the University of the Witwatersrand (WITS) took to the streets in protest against the killing of school children, joined by many black workers (South African History Online, 2012: para. 1; Editorial, 2013: 1).

More recently, protests at South African universities reached new heights, starting on 9 March 2015. On this date, a University of Cape Town student defaced the statue of Cecil Rhodes by throwing a bucket of sewage over it (Nzimande, 2015: para. 1; Ray, 2016: 10). What followed was a lengthy timeline of South African student protests. The upset of the students joining protests all over the country was caused by a wide array of issues, from the slow transformation process at South African universities to a demand for increased funding from the National Student Financial Aid Scheme (NSFAS), quality accommodation and transport and, at the height of the protests, the demand for lower accommodation and tuition fees. The South African student protests reached a climax after the 2015 announcement by Blade Nzimande, the South African Minister of Higher Education at the time, of a proposed hike of between 10% and 12% in tuition fees and this eventually escalated to a call for free higher education (Editorial, 2015b: para. 3; BBC[1], 2016: para.

2; South African History Online, 2016: para. 3). The protests invoked vast social media attention, with a timeline starting with the #TransformWits campaign in January 2015, #RhodesMustFall in March 2015, #OpenStellenbosch in April 2015 and the start of the widely known social media campaign of #FeesMustFall with #WitsFeesMustFall in October 2015 (Rand Daily Mail Newswire, 2015; Heher, 2017: 9; Ndenze, 2018).

Students achieved their first victory following the start of the protests in 2015 with the announcement of the removal of the Rhodes statue from the grounds of the University of Cape Town on 8 April 2015 (Editorial, 2015d: para. 1; Chaudhuri, 2016: para. 1). The outcome of the 2015 protests was a 0% increase in students' class fees for the 2016 education year (Bond, 2015; Editorial, 2016a: paras. 1–6; Heher, 2017: 13–17). A further outcome of the protests that started in 2015 was an announcement by Minister Blade Nzimande that university councils would have discretion in the tuition fee increases for the 2017 academic year, but that these increases would be capped at 8%, with a 0% increase for students from families earning less than a combined annual household income of R600 000 (Bond, 2015: para. 5; Editorial, 2016a; Heher, 2017: 13–17). As a result of the 0% increase in fees for the 2016 academic year, South African universities experienced a shortfall of R2.3 billion (Editorial, 2015a: para. 1; Crous, 2017: 4). Damages to infrastructure at all the universities in South Africa amounted to over R800 million (Staff writer, 2016b: 1; Staff writer, 2016a: 1). Protests in South Africa from 2015 to 2017 caused the University of Johannesburg damages of more than R100 million (Fomunyam, 2017: 54).

The most recent outcome from the protests started in 2015 can be seen at the University of the Free State. One of the concerns of students that formed part of protests at the University of the Free State was the rate of decolonisation. This concern amounted to a request for the removal of the statue of President Marthinus Steyn situated in front of the Main Building at the Bloemfontein Campus (Editorial, 2018: para. 6). The request for the removal of the statue resulted in success for the students on 23 November 2018, with an announcement by the Free State University council of the removal of the President Marthinus Steyn Statue in front of the Main Building on campus to a site off campus (Seleka, 2018: 1).

The 2015 South African protests and the resulting government decisions resulted in a R2.5 billion shortfall. In 2016, the South African National Treasury (National Treasury), together

with the Department of Higher Education, Science and Technology and other departments, stated that they were working to fund this shortfall (Editorial, 2015a: 1; Crous, 2017: 4). However, the South African government did state that universities would be required to contribute towards the shortfall from their own reserves (Editorial, 2015a: 1; Smit, 2016: 889; Crous, 2017: 4).

In response to the student-led protests that started in 2015, the President of the Republic of South Africa established a commission to determine the feasibility of free higher education for all South Africans. The Commission of Inquiry into Higher Education and Training released their report on the feasibility of free higher education for all in South Africa in November 2017. The report concluded that the government did not have sufficient financial capacity to provide entirely free higher education to all students (Commission of Enquiry into Higher Education and Training, 2017: para. 6; Chabalala, 2017: para. 2). In spite of the findings of this report, the President of South Africa announced in December 2017 that the government "would subsidise free higher education for poor and working-class students" (Tandwa, 2018: para. 6). The National Treasury of South Africa indicated that the cost of meeting the announcement of the president would mean an increase of between R17.7 billion and R40.7 billion in government subsidy for the 2018-2019 financial year. In response to the shortfall of the 2015 #FeesMustFall protests, the post-school education budget increased from R76.7 billion in the 2017-2018 financial year to R88.8 billion in the 2019-2020 financial year. Over R4.5 billion was "reprioritised" in 2016 towards the National Student Aid Scheme (NSFAS) and the National Skills Fund allocated around R1.4 billion to higher education for 2016. However, in spite of all the additional funds and increases, there remains a shortfall (Mompei, 2016: paras. 2–3; Mhlanga, 2017: paras. 1, 4).

The protests and resulting action from the South African government described in this section may threaten the survival of South African universities if action is not taken. This section further highlighted that the responsibility of responding to this threat cannot solely rest on the shoulders of the government. Universities must respond to this threat to their future financial sustainability by considering streamlining their funding structures, which include how they determine the costs related to providing the tuition the funding is required for. The current funding structure of universities must, therefore, be analysed to gain a better understanding of the cause of this threat.

2.4. Traditional universities in South Africa in context

2.4.1. NSFAS funding problems experienced by South African students

Youth unemployment in South Africa confirms the importance and relevance of traditional universities. In the first quarter of 2019, more than half of 15- to 24-year-olds in South Africa were not employed (55.2%) (Statistics South Africa, 2019: 23). This figure reveals a mismatch between the skills obtained by the relevant labour force and the skills required by the job-creating sectors in South Africa (Donnelly, 2017: para. 3). The fact that South Africa needs to rethink its approach to education is that 56% of unemployed South Africans have less than a matric; 34.5% had matric; 2.1% were graduates; and 6.9% had another form of tertiary education. These statistics indicate that uneducated people are side-lined and marginalised and that jobs are absorbed by the trickle of people able to afford a decent education (Donnelly, 2017: para. 17).

In an effort to make higher education accessible to more students, the statutory body NSFAS was established to provide financial aid for poor students (Ministry of Education South Africa, 2004: 6). NSFAS aims to support students in accessing and successfully completing higher education and training studies (National Student Financial Aid Scheme, 2019: para. 1). At the start of the 2019 academic year, students encountered various issues in regard to NSFAS. The South African Union of Students raised 12 issues with the Minister of Higher Education, which include certain issues related to NSFAS. The 12 issues are summarised as follows (Pandor, 2019a: 1–7):

1. Students with outstanding fees who met all the qualifying criteria to continue their studies were prevented from registering;
2. Crises with student accommodation, transport services and a breakdown of campus health services;
3. A lack of available funding for postgraduate studies;
4. The processing of NSFAS appeals and conflicting information available on allowances;
5. An amount of R154 million still had to be distributed to Sbux[3]-receiving students;

[3] A payment system for students receiving NSFAS aid utilising a student's cell phone to generate a voucher code to be used at registered merchants.

6. Students were kept from registering due to delays in the payment of funds from other sponsors and bursary funders;
7. Refusal of access to academic records and certificates of certain NSFAS students due to outstanding funds;
8. Academic exclusion and poor conditions of learning;
9. Students with disabilities and international students' concerns regarding funding available for them;
10. The unfair way in which cleaners and security personnel were treated as well as the ongoing issues related to the in-sourcing of general workers;
11. Student safety was compromised, coupled with the suspension of student leaders and the related security and police brutality; and
12. Challenges regarding transformation affecting workers and students.

Further challenges related to NSFAS funding evident from a meeting convened by the Higher Education and Training Parliamentary committee on 16 August 2018 include delayed finalisation of funding, which had a negative impact on students and universities. This is due to students and universities struggling with the allocation of funds to student accounts as a result of delayed remittance advice and disbursement reports from NSFAS to the institutions (Higher Education and Training Parliamentary Committee, 2018: para. 8).

Universities' funding is also put under further pressure since the late confirmation of students on the NSFAS side resulted in universities carrying students' allowances from their own funds, with the risk remaining that institutions will have to carry the debt if the related students remain unconfirmed as NFAS-funded students. There were also a number of administrative issues regarding NSFAS, ranging from insufficient quality control, lack of approval causing struggles for students' food and accommodation, to incomplete and inaccurate loan approval forms. Further concerns related to 2017 funding only received by students in 2018, which caused problems with the inclusion of these students into the 2018 funding cycles and universities and students being adversely affected (Higher Education and Training Parliamentary Committee, 2018: para. 8).

2.4.2. A brief history of the development of South African traditional universities

South Africa has 26 universities registered as public universities, as listed in List 1: Public Universities in South Africa (the explanation of the term “public university” follows later in this section) (Universities South Africa, 2018: 1–2). Out of the 26 listed universities, 25 can be classified as traditional universities. The exception is the University of South Africa (UNISA), which offers distance learning as its main mode of delivery of tuition. The 26 universities are:

1 Cape Peninsula University of Technology
2 Central University of Technology
3 Durban University of Technology
4 Mangosuthu University of Technology
5 Nelson Mandela Metropolitan University
6 North-West University
7 Rhodes University
8 Sefako Makgatho Health Science University
9 Sol Plaatje University
10 Tshwane University of Technology
11 University of Cape Town
12 University of Fort Hare
13 University of Johannesburg
14 University of KwaZulu-Natal
15 University of Limpopo
16 University of Mpumalanga
17 University of Pretoria
18 University of South Africa (UNISA)
19 University of Stellenbosch
20 University of the Free State
21 University of the Witwatersrand
22 University of Venda
23 University of Western Cape
24 University of Zululand
25 Vaal University of Technology
26 Walter Sisulu University

(Source: Universities South Africa, 2018: 1–2)

The universities listed above has a rich history, which qualifies them as traditional universities. The South African College, established in 1829, was the first higher education institution in South Africa (Metrowich, 1928: 6; Mabizela, 2002: 42; Kruss & Kruss, 2005: 262). Although this college had initially been privately funded to provide a secondary education for the elite, it became partially government funded by 1834 when the government in power made a grant-in-aid of £200, which later on became an annual contribution (Metrowich, 1928: 6; Behr & Macmillan, 1971: 229; Kruss & Kruss, 2005: 262). The South African College was incorporated as a college in 1837 and became a public institution in 1878 (Metrowich, 1928: 6; Kruss & Kruss, 2005: 262; Bitzer & Wilkinson, 2012: 385). In 1918, this college was incorporated as the University of Cape Town in 1918 (Metrowich, 1928: 6; Kruss & Kruss, 2005: 262). In 1973, The *University Incorporation Act* led to the establishment of the University of the Cape of Good Hope (UCGH) (Metrowich, 1928: 3; Mabizela, 2002: 42; Bitzer & Wilkinson, 2012: 385).

Since 1858, higher education in the Cape Colony was under the control of a Board of Examiners. This board was not a degree-granting body and students were evaluated according to the University of London's external exams (Metrowich, 1928: 1; Bitzer & Wilkinson, 2012: 385). In 1877, Queen Victoria, by Royal Charter[4], gave the degrees of the UCGH the same meaning as a degree at any university in the United Kingdom. UCGH was now enabled to set its own examinations (Behr & Macmillan, 1971: 230; Mabizela, 2002: 42). In 1916, UCGH was renamed the University of South Africa (UNISA), modelled on the University of London (Mabizela, 2002: 42; Kruss & Kruss, 2005: 262; Manson, 2016: 2). As the Cape Colony grew, an institution like the South African College was not sufficient as a higher education institution and the time arose for the establishment of a university. The need for a university resulted in the *University Incorporation Act of 1973* (Metrowich, 1928: 2). Since the creation of the *University Incorporation Act of 1973*, South Africa has seen the establishment of various other public universities.

Table 2.2: The origins and fate of the pioneering higher education institutions in South Africa portray the background of public universities in South Africa. These universities followed a similar path of development to the UCGH and eventually UNISA, in that they were established as private institutions by churches or individuals, and then became semi-

[4] A Royal Charter incorporates a body of persons into a legal entity with the powers of a natural person. A Royal Charter was the only means of incorporating a body before companies could be registered as the practice is in the current day (The Privy Council Office, 2015).

private and semi-autonomous over time since their board of directors consisted of private as well as public representatives. These institutions were finally recognised as the public institutions we know today (Metrowich, 1928: 6–14; Behr & Macmillan, 1971: 229–235; Mabizela, 2002: 42).

Table 2.2: Origins and fate of the pioneering higher education institutions in South Africa

College	Founders	Year founded	Year incorporated	Year granted university status	Current status
South African College	Private initiative	1829	1837	1918	University of Cape Town
Diocesan College	Church of England	1848	--	Subsumed by the University of Cape Town in 1911	
St. Andrew's College (which became Rhodes University College)	Church of England	1856	1916	1951	Rhodes University
Pietermaritzburg High School (which became University College and later Natal University College)	Natal government	1863	1916	1949	University of Natal
Theological School of Burgersdorp	Dutch Reformed Church	1869	1921	1951	The University of Potchefstroom for Christian Higher Education
Huguenot Seminary at Wellington	Dutch Reformed Church	1874	1916	Became part of the Theology Faculty at the University of Stellenbosch	
Transvaal Technical Institute* (which became the Transvaal University College)	Witwatersrand Council of Education (an Independent body)	1904	1916	1921	University of The Witwatersrand
				1930	University of Pretoria
South African Native College (which became the University College of Fort Hare)	Missionaries and other individuals	1916	1923	1970	University of Fort Hare
The Grey University College	Sir George Grey, Governor of the Cape Colony	1855	1910	1950	University of the Free State

(Source: Metrowich, 1928: 10; Mabizela, 2002: 43; Fourie, 2006: 27,95; University of the Free State, 2018a)

The universities mentioned in Table 2.2 above were all founded and incorporated before 1948. The period between 1948 and 1990 was a period in South African history remembered for white domination and discrimination against other ethnicities (Mabizela, 2002: 45; Kruss & Kruss, 2005: 264). This political period influenced the funding of universities. The establishment of the Commission of Inquiry into Native Education (Eiselen Commission) had to bring the education system in line with apartheid legislation. The Eiselen commission's 1951 report caused the establishment of the *Extension of University Education Act of 1959*. The Act subsequently led to certain higher education institutions set up for specified ethnic groups (Behr & Macmillan, 1971: 240–242; Mabizela, 2002: 45).

Table 2.3: Universities established during the apartheid period specifies current universities, established during the apartheid period, by the ethnic group it was initially established for. Certain universities were designated for whites. These universities were government-aided and therefore semi-autonomous. Universities that are fully private or fully government-subsidised universities are not part of the South African university culture. The universities designated for blacks were government-controlled colleges. The difference in funding between black and white universities skewed the higher education landscape, since government funding was reserved for white universities. By following the evolution of universities in South Africa, the requirement of government support and intervention cannot be ignored. It suggests that there exists a need for government to take control of higher education as a public service (Behr & Macmillan, 1971: 241; Mabizela, 2002: 43; Kruss & Kruss, 2005: 264).

Table 2.3: Universities established during the apartheid period

Institution	Designated population group	Year founded	Year granted university status	Status as at 2002
University College for Coloured People	Coloured	1959	1970	University of the Western Cape
University College for Indians (later the University College of Durban- Westville)	Indian	1961	1970	University of Durban-Westville
University College of the North	Sotho	1959	1970	University of the North
University of Port Elizabeth	Afrikaner (though bilingual)	1965	1965	University of Port Elizabeth
Rand Afrikaans University	Afrikaner	1966	1966	Rand Afrikaans University
University College of Zululand	Zulu	1959	1970	University of Zululand
South African Native College[5]	Xhosa	1916	1970	University of Fort Hare
University of the Transkei	Xhosa	1976	1977	University of the Transkei
University of Bophuthatswana	Tswana	1980	1980	North-West University
University of Venda	Venda	1982	1982	University of Venda
Vista University[6]	Blacks in general	1982	1982	Vista University

Since 1990, the South African political landscape has become more democratic. The first democratic government in South Africa established the National Council on Higher Education (NCHE). The function of the NCHE was to develop a system of transformation in the higher education sector in South Africa. This process lead to the *Higher Education*

[5] Although the South African Native College was meant for all blacks at its foundation, it was designated specifically for Xhosa-speaking people during the implementation of the apartheid policy.

[6] Vista was the country's second distance education provider, targeting 'urban' blacks (as opposed to homeland 'nationals').

Act 101 of 1997 (Mabizela, 2002: 48; Council on Higher Education, 2007: 1). The *Higher Education Act 101 of 1997* defines a higher education institution as:

> "any institution that provides higher education on a full-time, part-time or distance basis and which -
>
> (a) merged, established or deemed to be established as a public higher education institution under this Act;
> (b) declared as a public higher education institution under this Act; or
> (c) registered or provisionally registered as a private higher education institution under this Act."
>
> (RSA, 1997: chap. 1; Mabizela, 2002: 48)

This broad definition of a higher education institution has ensured that public as well as private institutions have been recognised as higher education institutions and have been registered by the Department of Higher Education, Science and Technology (Mabizela, 2002: 49; Kruss & Kruss, 2005: 273). The transformation process described in the previous paragraphs has brought South Africa to the current-day stance where it has 100 registered private higher education institutions, 27 provisionally registered private higher education institutions, 26 registered public higher education institutions as well as 50 Public Technical Vocational Colleges (TVET), and 291 Private TVET Colleges (Department of Higher Education Science and Technology, 2015: 2–154; Department of Higher Education Science and Technology, 2017: 10–115; Universities South Africa, 2018: 1–2; Department of Higher Education Science and Technology South Africa, 2018: paras. 1–2). A private higher education institution is not government funded but registered by the Department of Higher Education in accordance with the *Higher Education Act of 1997* (RSA, 1997: para. 53).

This study will focus on traditional public universities with reference to a specific South African university. All literature going forward in this study will refer to any public traditional higher education institution of any kind as a university.

2.5. The funding structure of South African universities

A comprehension of the sources of funding of universities in South Africa will enhance an understanding of the full impact of the student protests of 2015 as well as the resulting decisions regarding the low increase in tuition fees. A three-stream model funds

universities in South Africa. The first stream represents a block and earmarked grant allocated from the South African government (PwC South Africa, 2016: 1; Heher, 2017: 257). These grants are determined based on various factors as set out in the Funding Framework (refer to section 2.5.1.) by the Department of Higher Education in South Africa (Ministry of Education South Africa, 2004: 2). The second stream is income derived from tuition and class fees received from students by the universities (PwC South Africa, 2016: 1; Heher, 2017: 257). The last stream of the three-stream model consists of funding raised by the traditional universities themselves from sources such as donations or research income, commonly referred to as third-stream income (Universities South Africa, 2016; Heher, 2017; Moolman, 2018). The determination of block and earmark grants as well as class and tuition fees is briefly discussed below.

2.5.1. Determination of block and earmarked grants by the South African Department of Higher Education, Science and Technology

2.5.1.1. Determination of the National Higher Education budget amount

The previous section indicated that the sources of public funding of higher education institutions in South Africa consist of three sources, i.e. government grants, student tuition and other fees, and lastly third-stream income (Ministry of Education South Africa, 2004: 2). Figure 2.1: Sources of funds of public higher education institutions illustrates the three sources from which funds flow towards public-funded universities as well as TVET colleges in South Africa.

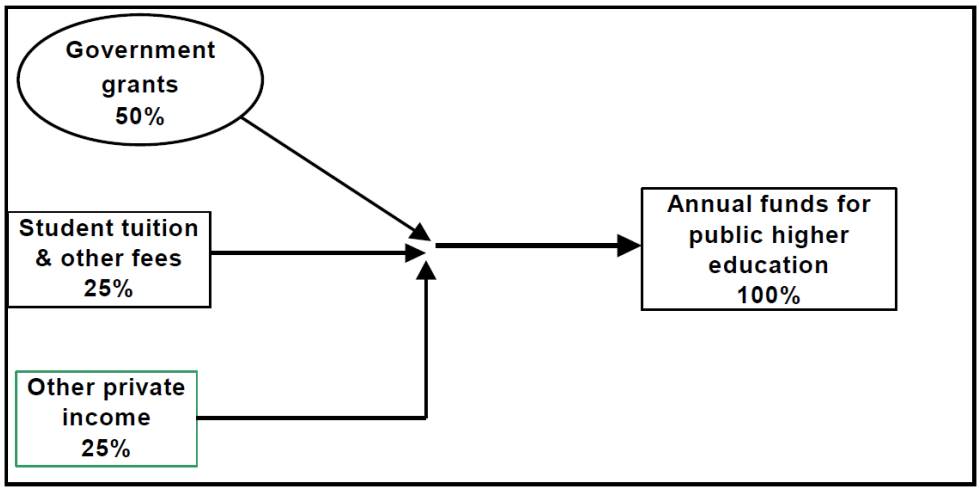


Figure 2.3: Sources of funds for public higher education institutions
(Source: Ministry of Education South Africa, 2004: 2)

Figure 2.1 includes an approximation of the proportion of funds received by the higher education system in totality. The proportion of funds will vary depending on the strength of the institution to generate private funds (Ministry of Education South Africa, 2004: 2). All public higher education institutions must submit annual financial statements to the Department of Higher Education, Science and Technology in South Africa. The annual financial statements of public higher education institutions must include all expenditures as well as income from all its public and private sources (Ministry of Education South Africa, 2004: 2). Even though the Department of Higher Education, Science and Technology is aware of all the income received by higher education institutions from student fees and other private income, it does not take any of these sources of income into account when government grants are distributed to the individual institutions (Ministry of Education South Africa, 2004: 2).

The Department of Higher Education, Science and Technology in South Africa distributes grants from the government to qualifying institutions based on the funding framework approved in the *Government Gazette* of 9 December 2003 (Vol 462, number 25824) since the 2004/05 funding year (Ministry of Education South Africa, 2004: 2).

Figure 2.2: Integration of planning and funding in the higher education funding framework illustrates how the new funding framework interacts (a) with national planning and policy priorities; (b) with the quantum of funds made available in the national higher education budget; and (c) the approved plans of individual institutions (Ministry of Education South Africa, 2004: 2).

The steps illustrated in Figure 2.2 are as follows (Ministry of Education South Africa, 2004: 4):

- The Department of Higher Education, Science and Technology in South Africa, after insight into and in consultation with the applicable higher education institutions, submits its Medium-Term Expenditure Framework along with proposals for their final budget for the following year to National Treasury;
- National Treasury approves an interim higher education three-year rolling budget. National Treasury further finalises the following year's budget for higher education; and
- Taking into account the total amount approved by National Treasury for higher education as well as the approved enrolment plans from the applicable higher

education institutions, the Minister of Education approves the grants allocated to the individual institutions for the relevant year of funding.

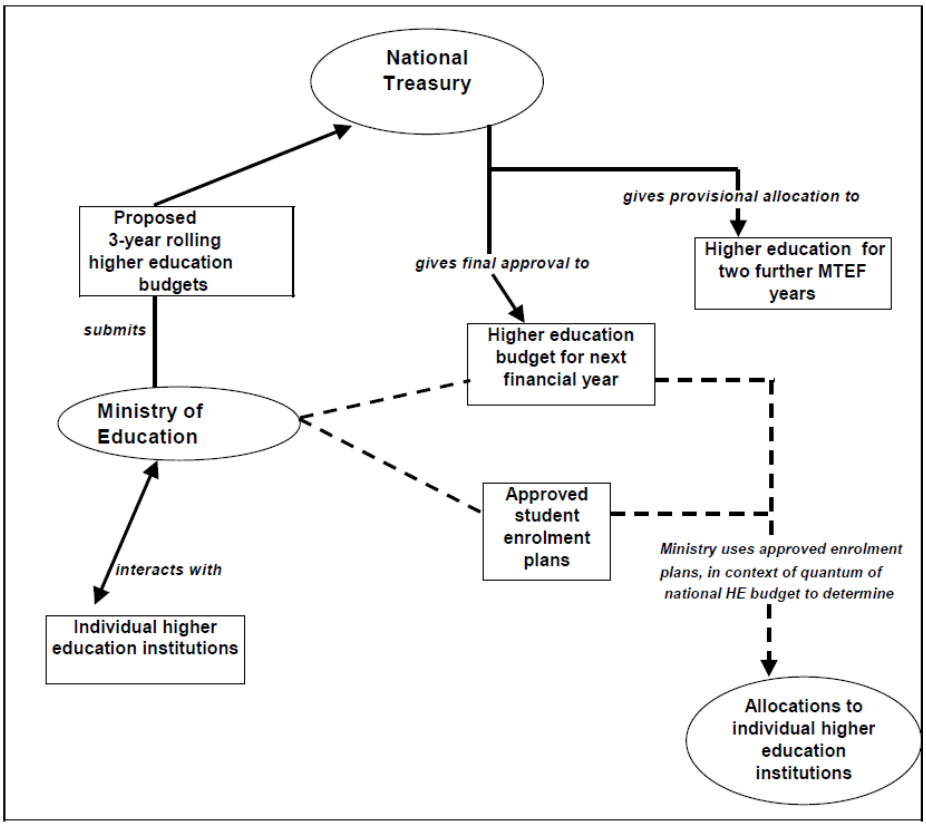


Figure 2.4: Integration of planning and funding in the higher education framework
(Source: Ministry of Education South Africa , 2004: 4)

Table 2.4: Government budgets for the university sector set out the division of government grants per university sector. The table shows the different categories of grants approved by the National Treasury for the university sector from the 2015/16 to 2018/19.

The biggest portion of the amount of grants approved by the South African Government consists of block grants and earmarked grants (Ministry of Education South Africa, 2004: 5). From Table 2.4 it is clear that the total budgeted grant for the 2018/19 allocation year is R46 514 940, of which R26 915 052 comprise block grants and R9 193 017 the total budgeted earmarked grants. This demonstrates that R36 108 069 (77.63%) is the portion of the total grants to the university sector that are specified as block and earmarked grants.

2.5.1.2. Earmarked grants

The majority of earmarked grants consist of funds allocated from the National Treasury through the Department of Higher Education, Science and Technology to the National Student Aid Scheme (NSFAS). NSFAS further raises money from local as well as international donors. A small portion of earmarked grants is allocated towards other specific purposes like the payment of interest or redemptions on government loans (Ministry of Education South Africa, 2004: 5).

2.5.1.3. Block grants

As illustrated in Table 2.4, block grants make up the largest share of grants (57.86%). Block grants are made up of four building blocks, i.e. teaching input grants, teaching output grants, research output grants and institutional factor grants (Ministry of Education South Africa, 2004: 5). The starting point for Block grant calculations and Earmarked grants progress reports is data obtained from audited Higher Education Management Information Services (HEMIS). The HEMIS data are submitted annually by universities to the Department of Higher Education, Science and Technology (DOHET) (Department of Higher Education Science and Technology, 2017: 6). This data are then applied to calculate the different building blocks of Block grants.

Table 2.4: Government budgets for the university sector

Budget category	Budget totals for the university sector				Increase in budget from previous financial year			
	2015/16 (R'000)	2016/17 (R'000)	2017/18 (R'000)	2018/19 (R'000)	2015/16	2016/17	2017/18	2018/19
1 Block grants for universities	**20 538 361**	**21 678 098**	**25 322 874**	**26 915 052**	**5.0%**	**5.5%**	**16.8%**	**6.3%**
1.1 Teaching inputs	13 141 519	13 753 540	16 220 201	17 252 089	3.4%	4.7%	17.9%	6.4%
1.2 Institutional factors	1 170 372	1 225 710	1 445 538	1 537 499	6.1%	4.7%	17.9%	6.4%
1.3 Actual teaching outputs	3 213 301	3 512 017	4 310 654	4 584 887	8.0%	9.3%	22.7%	6.4%
1.4 Actual research outputs	3 013 169	3 186 831	3 346 481	3 540 577	8.8%	5.8%	5.0%	5.8%
2 Earmarked grants for universities	**5 666 037**	**6 246 374**	**8 701 418**	**9 193 017**	**21.0%**	**10.2%**	**39.3%**	**5.6%**
2.1 Infrastructure & output efficiencies	2 301 200	2 422 013	2 541 903	2 688 063	4.6%	5.3%	5.0%	5.8%
2.2 Two new universities								
Capital funds	1 000 000	974 736	978 482	1 000 542	100.0%	-2.5%	0.4%	2.3%
Operational funds	201 014	290 429	360 736	416 489	26.4%	44.5%	24.2%	15.5%
NIHE Northern Cape Pipeline Students	12 000	10 000	6 500	0		-16.7%	-35.0%	100.0%
2.3 Foundation provision	304 470	319 956	335 794	355 270	28.7%	5.1%	5.0%	5.8%
2.4 Teaching Development	616 900	649 596	510 000	0	1.2%	5.3%	-21.5%	100.0%

Budget category	Budget totals for the university sector				Increase in budget from previous financial year			
	2015/16 (R'000)	2016/17 (R'000)	2017/18 (R'000)	2018/19 (R'000)	2015/16	2016/17	2017/18	2018/19
2.5 Research Development	199 000	209 547	165 000	0	6.2%	5.3%	-21.3%	-100.0%
2.6 University Capacity Development			225 000	945 000				320.0%
2.7 Clinical Training of Health Professionals	429 635	452 406	475 026	502 578	4.6%	5.3%	5.0%	5.8%
2.8 HDI Development Grant (8 universities)	410 743	433 532	454 992	481 382		5.5%	5.0%	5.8%
2.9 Veterinary Sciences	141 764	149 250	156 638	165 723	4.1%	5.3%	5.0%	5.8%
2.10 MBChB students		30 700	27 900	16 700			-9.1%	-40.1%
2.11 Interest & redemption on historic loans	4 447	4 209	3 647	3 282	-34.2%	-5.4%	-13.4%	10.0%
2.12 Zero percent student fee increase		300 000	0	0				
2.13 Merger multi-campuses	44 864	0	0	0	-52.6%	-100.0%		
2.14 Gap funding grant for poor & missing middle student fees [1]		0	2 459 800	2 617 988				6.4%
3 Grants to Institutions	**4 123 807**	**8 924 157**	**9 921 058**	**10 395 762**	**5.2%**	**116.4%**	**11.2%**	**4.8%**
3.1 NSFAS - Cape Town[2]	4 094 978	6 350 811	9 889 209	10 362 081	4.6%	55.1%	55.7%	4.8%

Budget category	Budget totals for the university sector				Increase in budget from previous financial year			
	2015/16 (R'000)	2016/17 (R'000)	2017/18 (R'000)	2018/19 (R'000)	2015/16	2016/17	2017/18	2018/19
NSFAS - Cape Town Historic Debt Relief		2 543 000						
3.2 Institute for Human and Social Sciences	23 829	25 081	26 323	27 837		5.3%	5.0%	5.8%
3.3 African Institute for Mathematical Studies	5 000	5 265	5 526	5 844	4.2%	5.3%	5.0%	5.8%
4 Sector oversight	**10 000**	**10 000**	**10 500**	**11 109**		0.0%	5.0%	5.8%
4.1 Sector Planning, Monitoring, Evaluation & Support	10 000	10 000	10 500	11 109		0.0%	5.0%	5.8%
TOTAL	**30 338 205**	**36 858 629**	**43 955 850**	**46 514 940**	**8.1%**	**21.5%**	**19.3%**	**5.8%**
Note 1: The amount of R2 459,800 million in 2017/18 for the gap funding grant for poor and missing middle student fees will be funded through reprioritisation with the PSET system								
Note 2: The amount of R2 369,924 million in 2017/18 for unfunded university students from 2016 academic year will be funded through reprioritisation with the PSET system.								

(Source: Department of Higher Education Science and Technology, 2017: 3)

2.5.1.3.1. Teaching input grants

The first portion of Block grants consists of allocated Teaching input grants. There are three key steps involved in the determination of the Teaching input grant allocated to an individual institution:

Step 1:

The applicable institutions' total full-time equivalent (FTE[7]) students for the year of the grant (year *n*) minus two (*n-2*) is taken as the starting point. This figure is then adjusted to firstly correct possible data errors and then to make provision for either student rolling plans based on the Minister of Education's approval (Ministry of Education South Africa, 2004: 7).

Step 2:

The figure calculated in Step 1 is now passed through a grid. The grid in question is approved by the Minister of Education on a rolling three-year foundation. The grid works by placing FTE enrolments into categories weighted, also referred to as funding weights, in respect of course material, course level and lastly the mode of instruction delivery (Ministry of Education South Africa, 2004: 7). Table 2.5: Funding weightings for teaching inputs 2017/18 and 2018/19 illustrates the Teaching input grant grid applicable for the 2017/18 and 2018/19 allocation periods.

Table 2.5: Funding weightings for teaching inputs 2017/18 and 2018/19

Funding group	Undergraduate & equivalent		Honours & equivalent		Master's & equivalent		Doctoral & equivalent	
	Contact	**Distance**	**Contact**	**Distance**	**Contact**	**Distance**	**Contact**	**Distance**
1	1.0	0.5	2.0	1.0	3.0	3.0	4.0	4.0
2	1.5	0.75	3.0	1.5	4.5	4.5	6.0	6.0
3	2.5	1.25	5.0	2.5	7.5	7.5	10.0	10.0
4	3.5	1.75	7.0	3.5	10.5	10.5	14.0	14.0

(Source: Department of Higher Education Science and Technology, 2017: 7)

[7] An FTE student enrolment represents a student taking the full workload required for a specific program, e.g. if a program requires 120 credits, one FTE will represent a student enrolled for all 120 credits. A student enrolled for only 40 credits will represent 40/120 = 0.33 of an FTE (Sheppard, 2015: 1).

The funding groups in Table 2.5 are HEMIS FTE student groupings. The HEMIS FTE groupings are based on Classification of Educational Subject Matter (CESM) as set out in Table 2.6: Funding groups for 2017/18 and 2018/19 (Department of Higher Education Science and Technology, 2017: 7).

Table 2.6: Funding groups for 2017/18 and 2018/19

Funding group	CESM categories included in funding group
1	07 education, 12 law, 18 psychology, 19 public administration and services
2	04 business, economics & management studies, 05 communication & journalism, 06 computer & information sciences, 11 languages, linguistics & literature, 17 philosophy, religion and theology, 20 social sciences
3	02 architecture & the built environment, 08 engineering, 10 family ecology & consumer sciences, 15 mathematics & statistics
4	01 agriculture & agricultural operations, 03 visual and performing arts, 09 health professions & related clinical sciences, 13 life sciences, 14 physical sciences

(Source: Department of Higher Education Science and Technology, 2017: 7).

The result of the passing of FTEs through the grid illustrated in Table 2.5 is teaching input units (TIU). TIU should be based on planned and approved FTE student enrolments. These enrolments are determined by the Ministry in consultation with individual institutions. These enrolments become a contract between the DOHET and university councils (Department of Higher Education Science and Technology, 2017: 8).

Table 2.7: Ministerial approved teaching input units

UNIVERSITY	MINISTERIAL APPROVED FUNDED TEACHING INPUT UNITS		
YEAR	2014	2015	2016
CAPE PENINSULA UT	57 851	60 097	61 821
CAPE TOWN	63 171	64 516	65 597
CENTRAL UT	21 496	22 265	23 433
DURBAN UT	43 509	45 709	48 238
FORT HARE	22 147	23 397	24 801
FREE STATE	56 779	57 764	58 882
JOHANNESBURG	80 610	81 500	82 412
KWAZULU-NATAL	86 908	89 691	91 922
LIMPOPO	33 177	39 074	40 599
MANGOSUTHU UT	15 167	16 126	17 340

UNIVERSITY	MINISTERIAL APPROVED FUNDED TEACHING INPUT UNITS		
YEAR	2014	2015	2016
NELSON MANDELA	46 588	47 719	49 730
NORTH WEST	77 709	81 412	86 108
PRETORIA	108 005	110 582	112 487
RHODES	16 602	17 033	17 600
SEFAKO MAKGATHO	14 219	16 480	18 475
SOUTH AFRICA	150 297	155 188	156 130
STELLENBOSCH	70 378	73 207	74 577
TSHWANE UT	83 281	86 425	91 015
VAAL UT	33 078	34 052	35 524
VENDA	23 161	25 306	26 520
WALTER SISULU	38 299	38 770	39 266
WESTERN CAPE	39 537	41 350	43 180
WITWATERSRAND	71 062	72 550	74 038
ZULULAND	24 610	23 502	22 445
TOTAL	**1 277 641**	**1 323 719**	**1 362 140**

(Source: Department of Higher Education Science and Technology, 2017: 9)

Table 2.7: Ministerial-approved teaching input units indicates the approved teaching input grants by per university for 2016/2017 to 2018/19 as per June 2014 planned student enrolment figures (Ministry of Education South Africa, 2004: 8). Step 3 uses the approved teaching input units to calculate the grant amount.

Step 3:

The following equation illustrates the calculation of an individual institution's teaching inputs grant value (*i*) (Ministry of Education South Africa, 2004: 7–8):

Equation 2.1: Calculation of Teaching Input Grant

$$i = \left\lfloor \frac{a}{A} \right\rfloor \times I$$

i = Teaching inputs grant value.

a = Teaching inputs for the individual institution.

A = Teaching inputs for all the institutions ($\sum a = A$).

I = Total allocated amount in the national budget for teaching inputs.

From the information contained in Table 2.7, each individual university will receive their proportion of TIUs (a) of the total teaching input units (A = 1 362 140 for the 2018/2019 funding period) multiplied by the total allocated amount in the national budget for teaching inputs (*I*) (Ministry of Education South Africa, 2004: 7–8).

2.5.1.3.2. Teaching output grants

The Teaching output grant allocated to Higher Education institutions depends on the actual number of non-research graduates and diplomats for the funding year (*n*) minus two (*n-2*), as well as the amount of non-research graduates and diplomats an institution should have produced according to national benchmarks (Ministry of Education South Africa, 2004: 8). Both outputs mentioned are required since different grants for each individual institution are produced (Ministry of Education South Africa, 2004: 8). This study will focus only on the teaching input grants received by traditional universities, since the teaching output grant depends on factors not within the control of the related university.

2.5.1.3.3. Research output grants

Determining an individual institution's research output grant for a specific year (*n*) depends firstly on the number of actual research graduates as well as publication units for two years before the specific year (*n-2*). Secondly, an individual institution's research output grant is calculated by taking the norm set by national benchmarks into account (Ministry of Education South Africa, 2004: 12). This study will not take any research output grants into account, since it is aimed only at teaching modules.

2.5.1.3.4. Institutional factor grants

Institutional factor grants are allocated to universities that have a large proportion of disadvantaged South African students forming part of their student body. The grant is determined based on the proportion of disadvantaged students for year *n* (the current year) to the total "unweighted FTE contact student enrolment in year *n-2"* (Ministry of Education South Africa, 2004: 16). This grant amount is added to the teaching input grants of universities (Ministry of Education South Africa, 2004: 16).

The second stream of income universities receive is income from tuition and class fees of students. The determination of tuition and class fees is up to the discretion of each

institution but is becoming an increasingly larger portion of total income at universities (see section 2.5.3).

2.5.2. Determination of class and tuition fees by universities

South African universities determine the tuition and class fees charged to students by applying various elements of the differentiated tuition fee model, the free market tuition fee model, and the modified redistributive tuition fee model (Higher Education South Africa Task Team, 2008: 22). The differentiated tuition fee model is identified by fees that differ from program to program related to the cost of presenting the program. In a differentiated tuition fee model, each university sets its fees independently, sometimes causing significant variations between institutions (Higher Education South Africa Task Team, 2008: 21). A free-market tuition fee model applies class fee rates based on the market demand for the related program as well as the potential earnings capacity of the program graduates (Higher Education South Africa Task Team, 2008: 22). The modified redistributive tuition fee model means students pay tuition based on their families' disposable income. Since this model is difficult to apply, the onus was placed on the students to present themselves for means-testing. The element where students take the responsibility to present themselves for a lower tuition fee is the modified aspect of the redistributive tuition fee model (Higher Education South Africa Task Team, 2008: 22). The process of setting tuition fees in South African universities has the following characteristics (Higher Education South Africa Task Team, 2008: 22–23):

- There is no universal guide to administer the process of setting tuition fees;
- Vast differences exist between the processes of determining tuition fee increases at different institutions. Some institutions negotiate increases in cooperation with the Student Representative Councils (SRC), whereas other institutions do not engage the cooperation from the SRC at all;
- Various institutions use the general consumer inflation rate to determine their fee increases;
- Most higher education institutions set their tuition fees taking the fees at competing institutions into account; and
- Only a few institutions determine the cost of tuition based on the total direct and indirect cost related to the program.

Given the described process of setting tuition fees, it is evident that an investigation into the setting of these fees is necessary to avoid similar student protests as a result of the unaffordability of higher education. The fact that fee increases for South African students might not be in line with the increase in cost to present students with the related education as mentioned in the previous paragraph, is of great concern. A further concern is an imbalance between the increase in government funding and tuitions fees illustrated in the next section.

2.5.3. Impact of the South African funding structure

The current funding structure of universities creates an opportunity for financial instability since not all of the income is controllable by the universities. The steady decrease in government funding for higher education in South Africa since 2001 further increases the pressure universities face (Higher Education South Africa Task Team, 2008: 10).

A distortion in the funding structure is occurring due to decreasing government funding, while universities face continued pressure to admit an increasing number of students, together with the expected transformation in various areas, as highlighted by student protests (refer to section 2.3.3.). This distortion was emphasised by the grievances of protestors as referred to in section 2.1 (Cloete & Wangenge-Ouma, 2008: 907; Smit, 2016: 889; Universities South Africa, 2016: 5; Crous, 2017: 239). The results of this distortion are seen in Figure 2.3: Government subsidies, fee income and student numbers, which illustrates the relationship between the increase in student numbers and funding of these students via class fees and government subsidy in the years 2011 to 2015 in South African universities (Crous, 2017: 242).

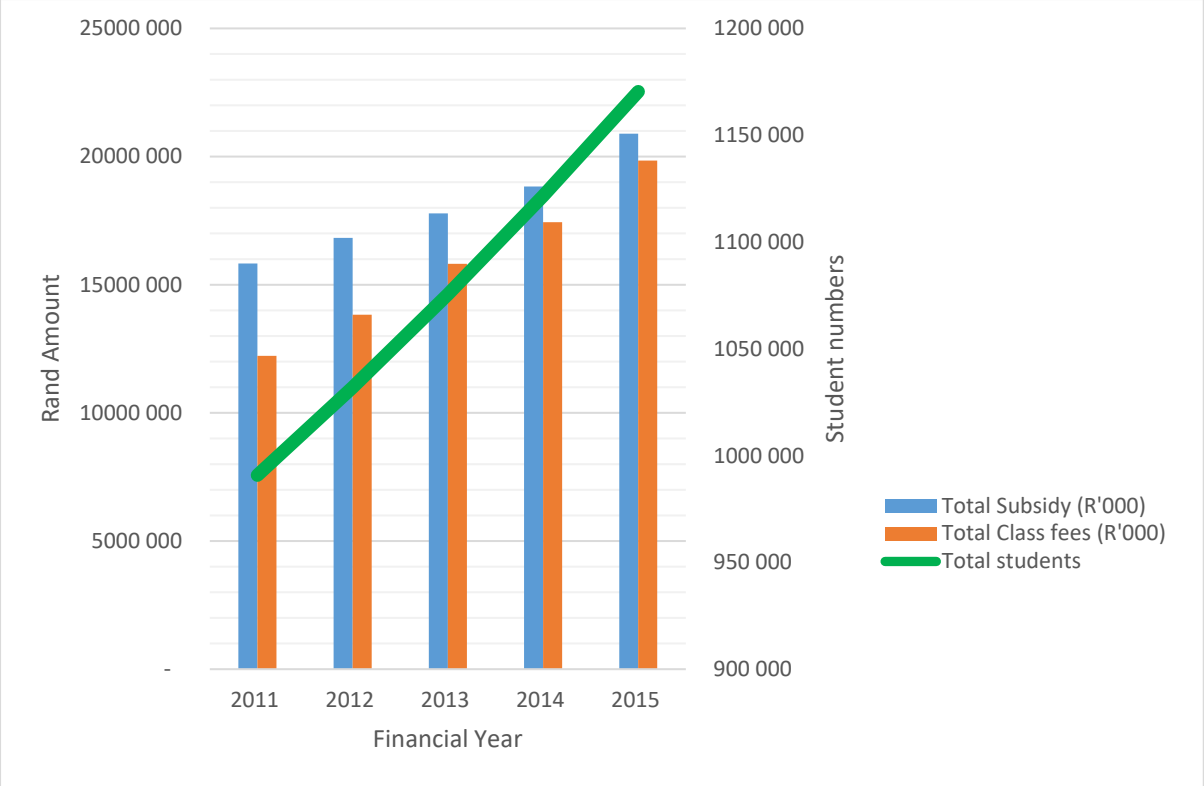


Figure 2.5: Government subsidies, fee income and student number
(Source**:** Crous, 2017: 242)

Figure 2.3 illustrates that university funding cannot keep up with the increase in student numbers. Universities have seen a steady decline in the marginal increase in government funding in proportion to the increase in tuition fees charged by institutions, as illustrated in Figure 2.4: Income from class fees and government subsidies of South African Universities (Crous, 2017: 240). Government grants made up 49% of universities' budgets in 2000, but only 40% of universities' budgets in 2015 (Cloete & Wangenge-Ouma, 2008: 907; Heher, 2017: 257; Crous, 2017: 4).

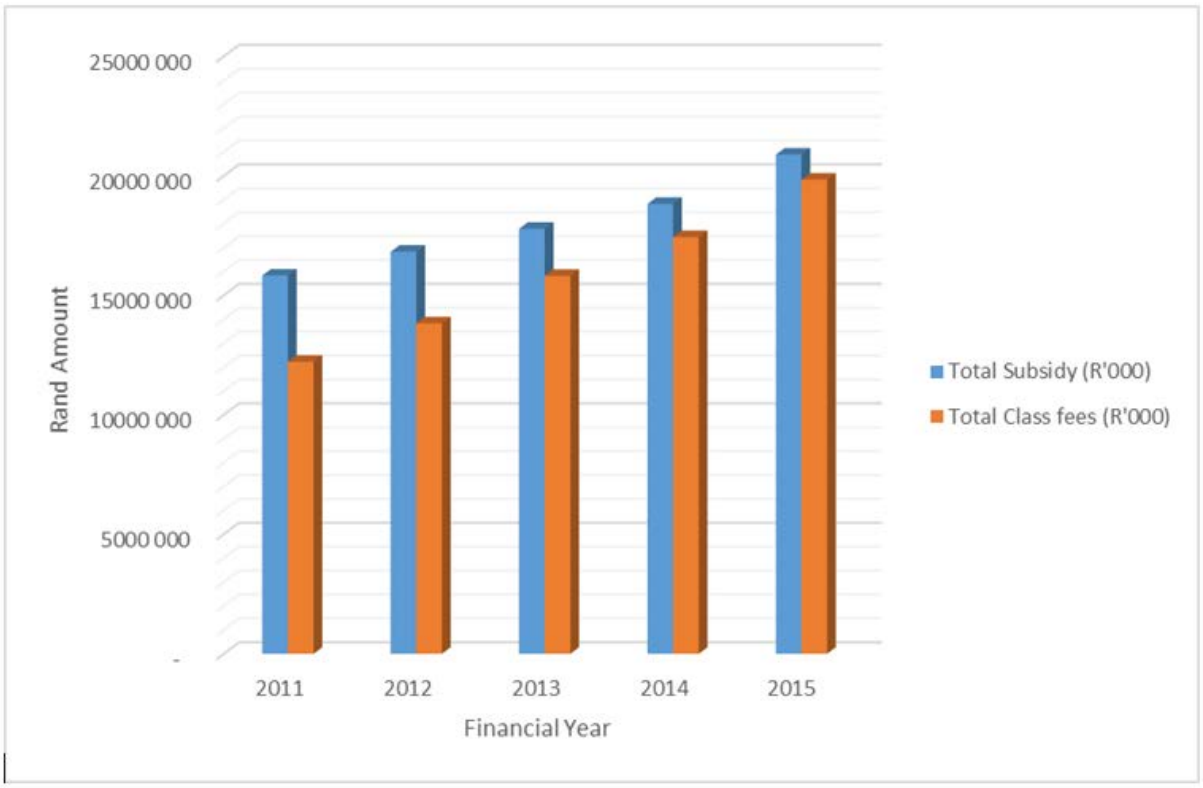


Figure 2.4: Income from class fees and government subsidies of South African universities

The increase in government funding of higher education has also recently fallen below the Consumer Price Index (CPI), as illustrated in Table 2.6: Nominal annual increases in block grants for the higher education sector (University of Stellenbosch, 2017: 3–4).

Table 2.8: Nominal annual increases in the block grants for the higher education sector

	2012	**2013**	**2014**	**2015**	**2016**	**2017***
Consumer Price Index (CPI)	5.63%	5.75%	6.07%	4.58%	6.80%	6.42%
	2012/13	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**2017/18**
Nominal Annual Higher Education Block Grant Increase	6.40%	5.80%	6.10%	5.00%	5.50%	5.00%

* Forecast

Figures 2.3 and 2.4 as well as Table 2.8 confirm that government funding of higher education in South Africa is on the decrease, which causes universities to increase their class fees to be able to continue their operations (Higher Education South Africa Task Team, 2008: 9–10). The continual increase in tuition fees means that higher education is increasing its financial burden on families of students, while many employers doubt the institutions' ability to provide graduates with the skills required to further their careers

(Harris, 2013; Calonge & Shah, 2016). An additional challenge faced by universities is the continuous decline in the relevance of these institutions in the modern world.

2.6. Summary

This chapter focused on various aspects of the traditional university landscape. The chapter started with a discussion on the relevance of universities under threat, which adds to the uncertainty regarding these institutions' future financial sustainability. The definition of a traditional university was discussed and the traditional universities in South Africa were highlighted, together with a discussion of the global as well as local protests that disrupted activities at universities in the past. The chapter ended with a discussion of the fee structure of traditional universities and the threats to future financial sustainability arising from this structure.

Global protests, automation of occupations, the shift in the skills required by employers due to the projection of a Fourth Industrial Revolution and an overthrow of the traditional way of teaching as described in the background to this study, have placed a tremendous amount of pressure on traditional universities to rethink the product they are offering as well as the management of their current affairs. Failure to effectively manage all the changes in the global university environment could threaten the financial sustainability of these organisations. It is clear that university administrators are forced to make certain dynamic decisions that could be life-saving for universities.

The next chapter will look at management and cost accounting as a valuable tool in the provision of accurate information that could aid university decision-makers to make the required decisions. Chapter 3 will also explain the application of management and cost accounting in service organisations, specifically the university environment. Chapter 3 will further provide an explanation of the important cost terms and concepts that are used in determining the financial viability of teaching modules at the selected university, as explained in chapter 4.

Chapter 3: Management and cost accounting applications at universities

3.1. Introduction

Chapter 2 of this study drew attention to the changes in the local and global university environment. These changes are forcing decision-makers at universities to make important decisions to ensure the future financial viability of these institutions. Chapter 1 of this study highlighted that the provision of accurate cost information to aid management in their decision-making process is the main function of a cost and management accounting system (refer to section 1.1.1.). This chapter expands on the decision-making function of management and cost accounting and provides information on the implementation of a management and cost accounting system in service organisations with specific focus on universities.

3.2. The application of management and cost accounting principles in decision-making at universities

In general, organisations are forced to obtain more accurate product costs due to the increase in the global market competition (Mohr, 2013: 25; Gunarathne & Samudrage, 2018: 240). One of the founding fathers of most of the modern cost and management principles as we know it, Robert Kaplan, already in 1988, expressed his concern surrounding managers of organisations that base their decisions on financial accounting figures, primarily used for external reporting (Moore, 1998: 42). This system is not sufficient for decision-making and Kaplan, therefore, further mentioned the need for a "separate, simplified management accounting system" to enable chief executive officers in their decision-making role (Moore, 1998: 43).

The implementation of a management and cost accounting system at a university requires thoughtful consideration. Cropper and Drury (1996: para. 35) emphasise that there is a case to be made that no conflict exists between good accounting practice and the provision of good education (Moore, 1998: 100). Universities are facing a higher degree of global competition, whether it is to capture teaching as well as research talent, or better ranking positions. Universities are also subject to a high degree of transparency and accountability but are facing decreasing resources (Saladrigues & Tena, 2017: 118; Sorros et al., 2017:

309). These challenges mean universities must have improved efficiency as one of their main aims (Saladrigues & Tena, 2017: 118).

Saladrigues and Tena (2017: 118) state that improving efficiency requires, among other things:

- "information on the costs and income of university units and centres;
- a cost and income analysis based on activities, not just according to units and cost centres, and;
- indicators that gauge the efficiency of the various activities run by the universities (teaching, research, technology transfer, third mission, and university extension*)."*

Management and cost accounting's main purpose is to provide management with information on the costs of their products or services utilised or produced by an organisation to settle its place in the relevant market (Hojna, 2015: 105). Cost accounting provides process and cost information, which aids organisations in their decision-making (Mohr, 2013: 6). Whether the accounting information provided to management improves their decision-making determines the success of management and cost accounting (Moore, 1998: 38).

Cost accounting provides essential information for the following purposes that aids in the decision-making process (Hojna, 2015: 105–106):

- Intra-company price setting for products, works or services;
- Compiling cost budgets of operating divisions and monitoring of production efficiency;
- Determining the value of work-in-progress and finished goods;
- Evaluating and comparing products, services and work cost developments over several periods.

Information provided by an organisation's cost accounting system enhances decision-making, since it provides an understanding of what drives the costs incurred by organisations. Furthermore, accurate cost information from these systems can aid cost comparisons within and between companies (Mohr, 2013: 8). Another benefit from management and cost accounting that forms part of the decision-making process in organisations is the ability to implement strategic cost cuts by applying advanced cost accounting principles such as ABC, since the costs of services can be compared. Accurate

cost data can also assist in performance management. More accurate cost data thus put performance outcomes into perspective (Mohr, 2013: 9).

There are many benefits in the implementation of a management and cost accounting system, as explained above. Unfortunately, most research in the field of management accounting has been focused on the manufacturing sector and only a small portion on the service industry. Research on the application of management accounting at universities has been limited (refer to section 1.1.3.) (Cropper & Drury, 1996: para. 2; Mohr, 2013; Chand & Ambardar, 2013: 1). Universities are positioned as suppliers of a range of products in the form of modules, which must be sold in a highly competitive market. Like any commercial organisation, if universities set their prices too high, there is a risk that they will lose enrolments to other universities. Just so, if they set their prices too low, they will incur losses (Cropper & Drury, 1996: para. 33; Mohr, 2013: 25). Universities should, at a minimum, be aware of the costs involved in the decisions they are making to exercise informed decision-making (Cropper & Drury, 1996: para. 10; Moore, 1998: 37–38).

Cropper and Drury state (1996: para. 34):

> "Against a backdrop of a rapidly changing higher education sector, and ever-increasing pressure to extract maximum benefits from scarce resources, the management accountant is having to develop new approaches in the provision of financial information."

The management accountant is responsible for continually ensuring the financial health of universities while addressing the challenges caused by the rapidly changing university environment. Failure to do so could result in a lack of financial sustainability as was evidenced by the financial failure of the University of Wales, Cardiff in 1985 (Cropper & Drury, 1996: para. 38). The concept of management and cost accounting is relatively new to universities, with very few traces found before the middle 1980s (Saladrigues & Tena, 2017: 121). Until 1995, when certain high-earning universities in the United States of America (USA) had to start implementing some of the Cost Accounting Standards (CAS) as set out by the Budget and Management Office of the USA government. These universities in the USA had cost systems that kept direct and indirect costs separate. Since 1995, these USA universities had to implement a cost system that allocates all costs to the related cost objective and these universities' cost systems began to consider all their activities (Saladrigues & Tena, 2017: 121–122).

An important factor to note in considering the implementation of a management and cost accounting system is that accounting and reporting standards applicable to non-profit and governmental organisations, i.e. universities, developed separately from the standards applicable to other organisations (Moore, 1998: 32). In a survey undertaken in 1996, Cropper and Drury researched the application of management accounting practices in the areas of profitability analysis, budgeting as a control mechanism, capital investment appraisal as well as reporting on performances (Cropper & Drury, 1996: paras. 7–8; Moore, 1998: 100). The survey revealed that most universities are interested in some form of profit analysis. The study further revealed that a majority of universities preferred to cost their "commercial activities, such as short courses and consultancy" applying a "direct-cost plus fixed percentage overhead" method. Universities preferred a full-cost approach to determine the cost of degree courses (modules). A significant finding from this 1996 survey is the indication that universities desire a more accurate method for costing their core activities (Cropper & Drury, 1996: paras. 10–13).

In the same Cropper and Drury study in 1996, 100% of universities indicated that they employed a system of budgetary control (Cropper & Drury, 1996: para. 17). The most popular method of budgetary control evident from the survey was an inflation increase on the previous year as well as incremental budgeting. The major flaw in both these methods is that it perpetuates inefficiencies from previous years to the following year (Cropper & Drury, 1996: para. 20).

The survey results further indicated that universities use financial and non-financial measures of performance and measure performance internally according to budgetary controls as well as externally between universities. The measure of capital investment appraisals preferred the most according to the survey results was the calculation of Net Present Value (NPV) (Cropper & Drury, 1996: paras. 21–26).

However, the implementation of a management and cost accounting system at a university is a difficult task due to the challenges related to the identification of the input as a measurement of output. This difficulty is due to the unusual nature of the production process of a university (Saladrigues & Tena, 2017: 120). The production process of a university requires the simultaneous performance of different activities, which lead to the sharing of resources between the activities. To illustrate, labour cost for teaching and

research staff, for example, is incurred to produce all the products of the university (teaching, research and other activities) (Saladrigues & Tena, 2017: 120).

Mohr (2013: 19) recognises two primary considerations for a cost accounting system in any organisation, i.e. usefulness and affordability, but adds credibility as a consideration specific to public organisations. The credibility associated with cost accounting information in public organisations (including universities) occurs through a process of evolution and not just through the implementation of a generic costing system such as ABC (Mohr, 2013: 19).

The review of literature captured in the preceding paragraphs in this section indicates that there exists a growing desire to understand the nature of costs as well as the drivers of universities' cost behaviour better (Sorros et al., 2017: 310). The need for efficiency and a better understanding of the nature of university costs mean that cost accounting is an essential tool for universities (Saladrigues & Tena, 2017: 118; Sorros et al., 2017: 310). Recent years have seen an acceleration in the implementation rate of cost analysis at universities (Saladrigues & Tena, 2017: 118). The implementation of management and cost accounting systems requires the setting up of a cost model as the first step (Saladrigues & Tena, 2017: 119). Universities ordinarily choose their cost drivers and activities as well as their cost accounting methods (Sorros et al., 2017: 312). The next section will explore the concepts related to cost classification and cost allocation applicable to costing teaching modules.

3.3. Cost classification

To be effective, a cost model must balance accuracy and detail (Spence & Seargeant, 2015: 85). Positive accountancy theory can be applied to determine the best possible cost model to apply at an organisation. Positive accountancy theory states that a cost model that "minimises the combined costs of cost system errors and the cost of measurement" is the optimal cost model for an organisation (Mohr, 2013: 23). Cost system errors occur when decisions made using inaccurate cost data cause the inefficient application of resources (Mohr, 2017: 24). The cost of measurement can include the cost of labour incurred in the setup of the system, the technology cost in support of the setup system, and the cost for maintenance of the applicable system (Mohr, 2017: 24). According to Mohr, experts suggest that the optimal system is a system where the cost of errors of the

system as well as the cost of measurement of the system balances (Mohr, 2013: 24). Organisations often face situations where the implemented cost model is either too simplistic and is therefore not effective, or too complex, or contains too much detail to ensure efficient maintenance of the model (Spence & Seargeant, 2015: 85).

An awareness of the relationship between costs and the factors influencing or determining the costs can improve managements' control over the related costs (Shillinglaw, 1982: 23; Smit, 1989: 33). An essential aspect of managing costs is the allocation of costs to a cost objective (Smit, 1989: 34; Gordon & Loeb, 2001: 13). A cost objective is the reason for the required measurement of costs. This cost objective is any activity that requires a separate measurement of costs (Smit, 1989: 34; Gordon & Loeb, 2001: 13–14; Drury, 2018: 25). For this study, the term "product cost" will include the cost of delivering a service, as is the case at traditional universities. To determine the product cost at a university, an understanding of the different ways in which costs can be classified is required. The next section investigates the various ways in which a cost can be classified in terms of the cost objective.

3.3.1. Cost classification – different costs for different purposes

Specified objectives set by the management team of an organisation can assist in classifying costs. The objective set by management refers to the question asked that requires an answer and will affect the cost information required. Hence, different costs for different purposes (Oliver, 2000: 13; Datar & Rajan, 2018: 13; Drury, 2018: 47). This means that the cost information prepared for one purpose might prove completely inappropriate for another purpose (Oliver, 2000: 13). Figure 3.1: Cost classification bases illustrates the various bases for classifying costs, based on the objectives set by management under the headings: *element* or *nature; function; behaviour; decision-making* and *controllability*.

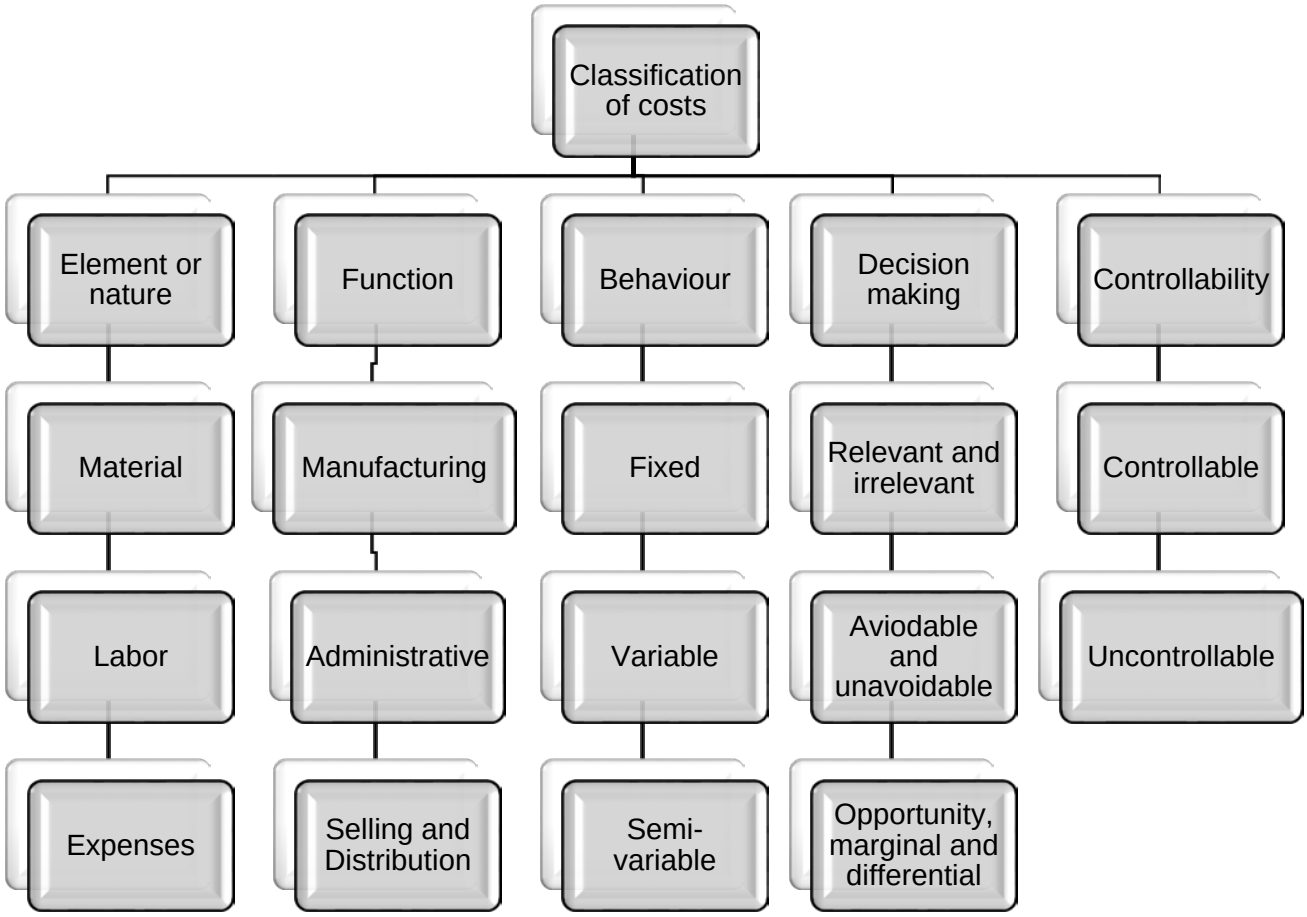


Figure 3.1: Cost classification bases

(Source: Fadhil Consultancy and training, 2017: 1)

One cost can be classified on various bases. From Figure 3.1, direct labour, for example, is a labour cost based on element or nature, manufacturing based on function, variable based on behaviour and relevant or irrelevant depending on the decision taken as well as controllable. The understanding of the different bases on which costs are classified is a fundamental building block in the interpretation and analysis of financial information (Oliver, 2000: 16). The phrase “different costs for different purposes” also highlights the complexity of cost classification (Chatfield & Neilson, 1983: 26; Smit, 1989: 35). An administrative cost, for example, will not be included in the calculation of the cost of a product for external reporting purposes, but might be included in determining the cost of a product for decision-making purposes based on relevant costing principles.

The classification of costs is important to determine operating leverage[8] and the breakeven point (see section 4.6.2.2.1.). Cost classification is also vital for profit planning, control and decision-making (Gunarathne & Samudrage, 2018: 245). It is therefore necessary to understand cost classification as part of the cost assignment and classification process. This study will look at three ways to classify costs in further detail, i.e. classification by function, behaviour and decision-making. The combination of these methods was termed a three-way cost classification model by Gean and Gean (2016: 37). Understanding the related cost terms and concepts under these elements is considered sufficient for the costing of teaching modules as performed in this study.

3.3.2. Cost classification by function

According to the first International Accounting Standard (IAS 1), the classification of cost by function groups costs that assist the organisation in performing the same activity together. IAS 1 further identifies the function of expenses as cost of sales, distribution costs, administrative expenses or any other expenditure (International Accounting Standards Board [IASB], 2015a: A861).

After the establishment of the function of a cost, classification of the cost assigned to a cost objective between direct and indirect costs occurs (Smit, 1989: 41; Drury, 2018: 23). Direct cost is the cost of material used, labour cost incurred and all other expenses that occur directly as a result of the production of output (Edwards, 1958: 562; Gordon & Loeb, 2001: 13; Novák et al., 2017: 76). Direct costs can thus easily be traced to a cost object and are also straightforward assigned to the cost object. Indirect costs require an allocation scheme specifying selected allocation bases since it is difficult to trace indirect costs to a cost object. Typically, costs such as materials and labour not directly traceable to a cost object or depreciation of machinery and utilities are all classified as indirect costs or overheads (Gordon & Loeb, 2001: 13; Novák et al., 2017: 76; Drury, 2018: 24). The second manner in which cost is classified is by behaviour.

3.3.3. Cost classification by behaviour

Part of cost classification is the knowledge of how costs behave. Cost behaviour refers to how costs change with a corresponding change in output activity and is a crucial part of

[8] The extent to which fixed costs are used in business operations to generate more than proportionate increases in operating profit.

the cost management planning, controlling and decision-making process (Hansen, Mowen & Guan, 2009: 50; Novák et al., 2017: 76). Physical input may be hours worked, while physical output will amount to the customers served in a service organisation (Linna et al., 2010: 74). Within a university setting, an example of input in the delivering of a teaching module (output) is the teaching hours spent by the lecturer. Traditionally, the classification of costs according to behaviour includes whether a cost is fixed or variable (Anderson & Lanen, 2009: 1–2; Novák et al., 2017: 76).

Fixed costs are costs that remain constant in total for a specified time period even as the activity driving the cost (cost driver) varies (Smit, 1989: 37; Alwin, 1995: 7; Hansen et al., 2009: 52; Anderson & Lanen, 2009: 7; Drury, 2018: 29). The fixed cost per unit of the cost driver will vary since the total fixed cost will remain unchanged with a change in the level of the cost driver (Drury, 2018: 30). Figure 3.2: Fixed costs: (a) total; (b) unit illustrates the behaviour of a fixed cost in total as well as per unit.

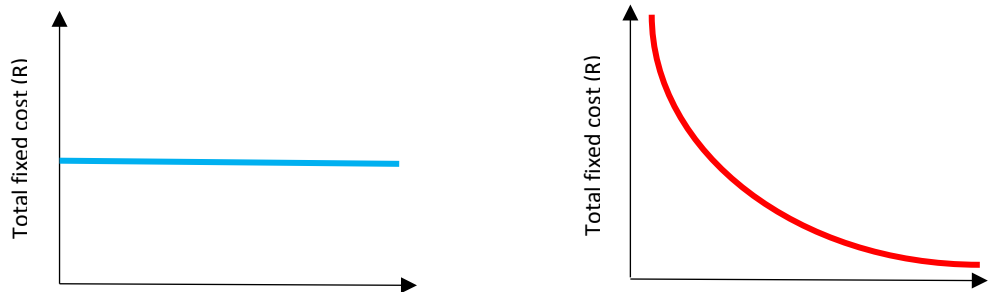


Figure 3.6: Fixed costs: (a) total; (b) unit

(Source: Drury, 2018: 29)

Contrary to fixed costs, total variable cost varies in relation to the change in the level of the activity driver, but remains constant per unit of the cost driver (Smit, 1989: 37; Alwin, 1995: 7; Hansen et al., 2009: 52; Anderson & Lanen, 2009: 7). Figure 3.3: Variable costs: (a) total; (b) unit illustrates the behaviour of costs classified as variable.

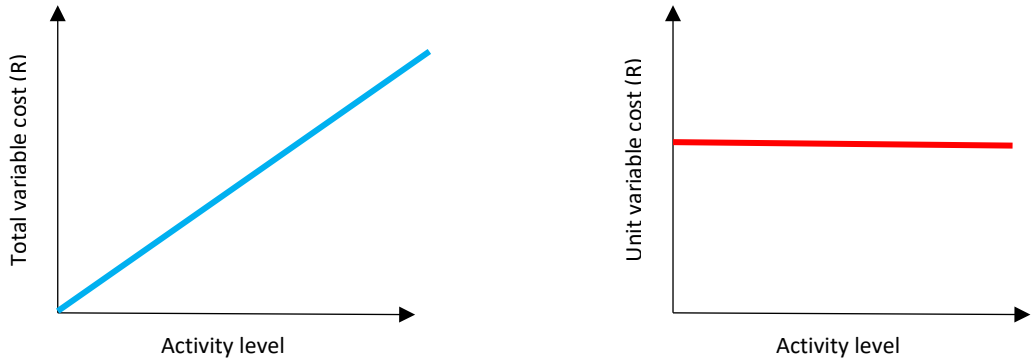


Figure 3.7: Variable costs: (a) total, (b) unit

(Source: Drury, 2018: 29)

This method of classification becomes complex, since few costs are completely fixed or completely variable (Anderson & Lanen, 2009: 1–2; Novák et al., 2017: 76). If an organisation cannot readily classify a cost as either fixed or variable, it can be semi-variable (mixed) or step-fixed (semi-fixed) (Novák et al., 2017: 76; Drury, 2018: 30).

A semi-variable or mixed cost is a cost that has a variable and a fixed component. A cost that has a variable, as well as a fixed component, will vary in total, but not in proportion to a change in the cost driver activity (Smit, 1989: 38; Alwin, 1995: 7; Drury, 2018: 30). Figure 3.4: Mixed cost uses the example of the behaviour of selling costs in a computer company in accordance with a change in the number of computers sold to illustrate the behaviour of a cost classified as a mixed cost.

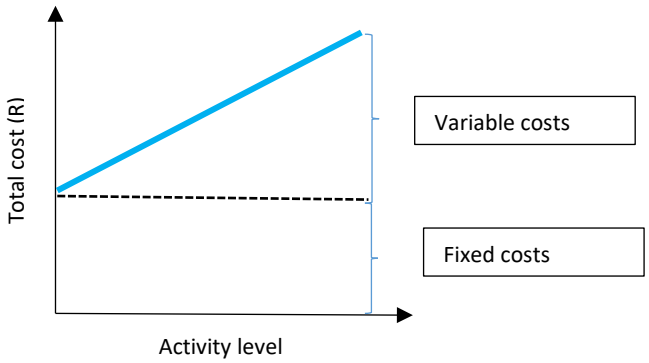


Figure 3.8: Mixed Cost

(Source: Hansen et al., 2009: 53)

Step-fixed or semi-fixed costs are costs that have the characteristics of a fixed cost, but only within a specified range. As soon as the number of the activity driver increases above this range, the cost increases once-off and will then be constant until the next increase

above the specified range (Smit, 1989: 38; Alwin, 1995: 7; Drury, 2018: 30). Figure 3.5: Step-fixed costs illustrates how a cost classified as a step-fixed cost increases at a specific activity level, and then stabilises until the activity reaches the next step's level.

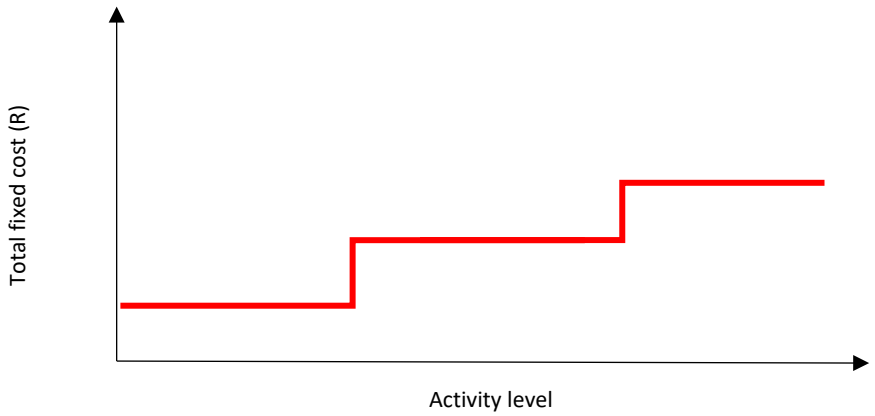


Figure 3.9: Step-fixed costs

(Source: Drury, 2018: 30)

The classification of costs according to behaviour will only be valid if the conditions within the specific environment aimed at producing the product (or service) remain unchanged (Chatfield & Neilson, 1983: 35; Smit, 1989: 38). Over a longer term (usually longer than a year), all costs become variable, since the manufacturing conditions cannot be expected to remain stable over a more extended period (Chatfield & Neilson, 1983: 35; Hansen et al., 2009: 54). The last classification discussed for this study is the classification of costs by its relevance to decision-making,

3.3.4. Cost classification by relevance to decision-making

The third classification required for this study is the classification of costs by their relevance to decision-making. A cost is relevant to decision-making if the cost will be incurred in the future and differs between the options under consideration (Hansen et al., 2009: 636; Gean & Gean, 2016: 42). Relevant costs consist of incremental costs (avoidable costs) and opportunity costs (Chatfield & Neilson, 1983: 387; Smit, 1989: 44). Incremental or avoidable costs will be incurred in the future, but can be avoided as a result of the decisions made by management (Chatfield & Neilson, 1983: 387; Smit, 1989: 45). Opportunity costs are the best alternative foregone by choosing one option over another (Chatfield & Neilson, 1983: 387; Drury, 2018: 33). Irrelevant costs will not be affected by the decision taken and

consist of committed or unavoidable costs and sunk costs (Chatfield & Neilson, 1983: 386–387; Drury, 2018: 32–33). The cost incurred regardless of the decision taken is committed cost. These costs cannot be avoided by choosing one option over another (Chatfield & Neilson, 1983: 387; Drury, 2018: 32). A decision taken in the past incurs sunk cost. A sunk cost will not be affected by any decision taken at present or in the future (Chatfield & Neilson, 1983: 386; Drury, 2018: 32)

3.4. Investigating cost accounting models

Section 1.4.2. of this study concluded that a university would benefit most from applying an absorption cost accounting system. Section 1.4.3 investigated the challenges faced by organisations in the application of an absorption cost accounting system and suggested the application of an ABC cost allocation model as a solution to these challenges. However, section 1.4.4 highlighted the various arguments against the implementation of an ABC cost allocation model. This section will explore the development and application of ABC costing further to indicate the many advantages of the implementation of such a system, specifically applied to universities. The final part of this section will deliver an account of some of the cost accounting models applied at universities as discovered through a review of the available literature.

3.4.1. Activity-based costing

A review of the literature surrounding cost accounting applications in universities all over the world indicated a focus on an ABC allocation model. These studies investigated the application of such a system as a more accurate way of assigning costs in an organisation dominated by indirect costs and provided insight into the benefits of the implementation of this model at universities (refer to section 1.4.2.) (Evans, 2004; Dragija & Lutilsky, 2012; Sobańska & Kalinowski, 2013; Sorros et al., 2017; Sisa, Siklosi & Szijarto, 2018). In a study performed by Moore in 1998, the accuracy of implementing an ABC allocation model versus a traditional cost allocation model at a university concluded that an ABC model provides superior information to information provided by a traditional cost allocation model (Moore, 1998: 153). Additionally, in 1998, Goddard and Ooi pointed out that although the practical implementation of an ABC model has its difficulties, it improves the efficiency of overhead allocations compared to traditional cost allocation systems (Goddard & Ooi, 1998: 38).

Alejandro (2000: 88) tested the feasibility of the implementation of an ABC model as a method of cost estimation in college and university programs and concluded that, irrespective of various obstacles, ABC provides valuable cost estimation information. A further conclusion from a case study on the application of ABC at a university by Cook in 2003 is that “the benefits far outweigh the time to set up an ABC model” (Cook, 2003: 47). The findings from the above-mentioned studies about the implementation of an ABC cost allocation model at universities warrant a further investigation into the origin and application of such a model.

A major advantage of the implementation of an ABC cost allocation model is cost control. Cost control and the determination of the profitability of a product are difficulties that, historically, was not recognised in service industries (Evans & Bellamy, 1995: 32; Alejandro, 2000: 35). These difficulties arise as a result of the highly competitive environment associated with the modern business world, together with the change in availability of resources, which places a greater emphasis on accountability and warrants more control over costs and improved product profitability (Alejandro, 2000: 35). These factors caused greater pressure on non-profit organisations to learn how to manage their cost. Non-profit organisations, which include universities as well, usually do not have set prices for the services they provide, and in the case where set prices do exist, a thorough cost analysis does not exist to support it (Alejandro, 2000: 35). The reason for the lack of cost analysis is that a lot of times non-profit organisations fail to establish a cause-and-effect relationship between a particular cost object and the costs related to the cost object (Alwin, 1995: 5; Alejandro, 2000: 35). An ABC cost allocation model can aid universities in obtaining the required detail regarding the costing of their activities, as well as to uncover the hidden costs they might have been unaware of to assist in the decision-making process (Sorros et al., 2017: 310). The promotion of the ABC method occurs due to a belief that traditional accounting information has no use for managers who want to evaluate how efficient decisions regarding their organisations’ resource allocation are (Bufan, 2014: 75).

Traditional accounting relies on traditional cost allocation models, which do not assign accurate costs to cost objects (refer to section 1.4.3) and therefore do not provide the required accurate information for decision-making. ABC models provide a solution for the cost allocation problems associated with traditional methods of cost allocation (Cooper & Kaplan, 1988: 98; Alejandro, 2000: 23; Askarany et al., 2007: 53; Narong, 2009: 11). Many

arguments exist that state that the product cost derived from an ABC system is superior to product costs calculated by applying traditional cost allocation methods, since the product cost derived from the former system is a more accurate reflection of the resources the product consumed during its production process. ABC systems, therefore, lead to better operational and strategic decision-making (Szychta, 2010: 50; Bufan, 2014: 74; Geiszler et al., 2017: 45). The development of ABC models has a short history, which is explored in the next section.

3.4.1.1. The history of Activity-based costing

Organisations are increasingly concerned with the provision of timely and detailed management accounting information to remain competitive in the global economy characterising the modern business environment (see section 1.1.2), (Askarany, Smith & Yazdifar, 2007: 53; Wnuk-pel, 2010: 8). During the 1990s, the *Journal of Accountancy* featured articles emphasising the need for more accurate cost information (Cook, 2003: 5). The accounting profession was crying out that financial reporting was not providing relevant information for decision-making, further declaring that information supplied by traditional management accounting was distorted, inadequate and dysfunctional (Cokins, 1994: 74; Cook, 2003: 5).

Since 2009, the modern business environment has also seen an increase in the proportion of indirect or overhead expenses due to advanced manufacturing technologies, which meant that conventional costing methods had lost its effectiveness for managers (Narong, 2009: 11; Gunarathne & Samudrage, 2018: 240). Information provided by traditional accounting systems was too distorted and amassed to provide relevant information for decision-making (Tolsma, 1996; Wnuk-pel, 2010). Organisations did not allocate indirect costs logically, since too many costs were grouped together, causing an excessively broad average cost per object (Cook, 2003: 5). The problems encountered from the use of traditional accounting systems in the changing business environment were as follows (Ruhl & Bailey, 1994: para. 4,6; Tolsma, 1996: 12):

- The recovery of overheads on a single performance measurement (usually direct labour hours);
- The allocation of overheads while ignoring the driver of the cost;
- A lack of understanding of activities causes unfocused cost control;

- A focus on historical information;
- A compartmentalised approach to costing causes a failure to address business processes;
- A low level of accuracy;
- Failure to point out improvement opportunities for productivity; and
- A lack of provision of accurate product costs.

One of the main problems with the traditional method of cost accounting in regard to cost allocation is the lack of association of expenses and costs with the specific activity or process that caused the expense (Cook, 2003: 5; Narong, 2009: 11). A traditional costing system uses volume-related drivers, such as units or labour hours, to allocate overhead costs to cost objects (Cooper & Kaplan, 1992; Tolsma, 1996). Volume-based drivers mean that high-volume products will support low-volume products in carrying overhead costs, which does not provide accurate information for decision-making (Tolsma, 1996: 13). The use of volume-related drivers emphasises the problem of inaccurate cost allocation even further if these drivers do not explain the growth in the cost of activities.

Activity-based costing can provide answers if an increase in volume-based drivers do not explain the growth in the cost of certain activities (Cooper & Kaplan, 1992; Tolsma, 1996). Activity-based costing was first mentioned by Professors Cooper and Kaplan in 1988 and has since been a focal point in management accounting discussions (Szychta, 2010: 49). Although ABC's initial development focused on the manufacturing industry, the service industry can implement it equally well (Innes & Mitchell, 1995: 138; Innes & Mitchell, 1997: 193). The development and implementation of an ABC cost allocation system has proven advantageous to organisations; however, these advantages have a few problems associated with them.

3.4.1.2. Arguments for and against Activity-based costing

3.4.1.2.1. Arguments against the implementation of an Activity-based cost allocation model

There are various arguments in support of the application of an ABC system but also a lot of resistance. One argument against the use of an ABC system is that this system is a full-absorption costing system (refer to section 1.4.1.2.), which fails to split between fixed and

variable costs; thus making it inappropriate for use during the decision-making process (Geiszler et al., 2017: 45).

Many organisations have discontinued the use of ABC systems, since the operation of an ABC system may be technically complex and requires skilled personnel (Szychta, 2010: 49; Wnuk-pel, 2010: 8). The cost of implementing an ABC system should, however, be compared to the benefit derived from it to ensure that the benefit exceeds the cost (Alejandro, 2000: 38). A major challenge with the implementation of an ABC system is that it can be very time consuming and expensive (Chaffman & Talbott, 1990: 17; Alejandro, 2000: 38).

In addition to the arguments against the implementation of an ABC system mentioned above, Tolsma (1996: 54-55) summarised the criticisms related to the implementation of an ABC system in his Master's thesis as follows:

- ABC systems sometimes lack a precise enough description due to a need to retain simplicity. An example where a precise description might be lacking would be the case where the cost of fulfilling an order sometimes ignores the fact that certain orders are more difficult to fulfil than others;
- The errors management accountants are currently making might be too small to justify the implementation of such a vast and expensive system as ABC;
- Due to the high cost of measurement, it is sometimes uneconomic to incur such high costs for only product costing purposes. Virtually all information required for the implementation of an ABC system is already available. Measurement cost consists of the cost to route this information to the costing system and the cost associated with the calculation of product cost;
- To identify the activities involved in the applicable business process as well as assigning a cost driver to each of the identified activities requires a measure of subjectivity as well as arbitrariness. This subjectivity and arbitrariness open a gap for the manipulation of product costs;
- The management and cost environment still considers ABC a historical costing system and its usefulness might be doubtful in a business environment where future costs are the primary focus in decision-making;

- ABC systems often ignore activities when the associated data are unreliable or not available. Examples of such activities often include marketing, customer service and distribution;
- There are currently no conclusive studies that prove that ABC systems improve the bottom line in organisations. There exists a lack of documented success of ABC that takes the problems related to the implementation of such a system as well as the possible additional applications associated with ABC into account;
- Organisations aim to reduce “cross subsidies” with the implementation of an ABC system by allocating costs to the cost objectives more accurately. The outcome of a reduction in cross-subsidising is that the cost of certain products will increase, while the cost of other products will decrease. The total cost for the organisation will, however, remain the same, assuming that the overhead cost does not change. An organisation applying a cost-plus-pricing model can, fortunately, adjust its prices by a change in the allocated costs. However, most companies cannot offset the reduction in the price of one product by increasing the price of another product;
- ABC requires the manipulation of a large amount of information for an organisation to make decisions based on thorough information; and
- An ABC system requires that even the buying department uses timesheets to keep track of the amount of time spent procuring every part of the product.
  (Cooper, 1991; Hartnett, Lowry & Luther, 1994; Tolsma, 1996)

In spite of the disadvantages associated with the implementation of an ABC model as described above, this model holds various advantages. These advantages are described in the section to follow.

3.4.1.2.2. Arguments for the implementation of an Activity-based cost allocation model

The implementation of an ABC cost allocation model in a service organisation provides information on the profitability of services, customers, markets as well as the costs of providing the services and the processes involved (Szychta, 2010: 49). The identification and use of multiple drivers for costs by implementing an ABC model mean service organisations can link the services delivered and the actual cost of that service better (Alwin, 1995: 5). The analysis of costs by activity assists in cost control and, eventually,

cost reduction, leading to enhanced efficiency and profitability of operations (Innes & Mitchell, 1997: 192; Alejandro, 2000: 40).

The information provided by an ABC system also enhances the determination of the cost implications of decisions (Alwin, 1995: 5; Innes & Mitchell, 1997: 192). One of the most important decision-making advantages of an ABC system is the indication of the cost recovery necessary in the setting of selling prices to obtain the desired profitability levels (Chaffman & Talbott, 1990: 15; Innes & Mitchell, 1997: 193).

Although an ABC cost allocation model is more complex to implement than a traditional cost allocation model, it delivers more accurate cost data of the related product or service (Tolsma, 1996: 21; Alejandro, 2000: 38). Some of the further benefits obtained by an organisation with the implementation of an ABC model include (Sharman, 1990: para. 2; Ruhl & Bailey, 1994: 34; Tolsma, 1996: 50–51):

- An overhaul of the product cost ranking in a multi-product organisation due to the correction of benefits traditionally accrued to low-volume products;
- ABC systems could increase the efficient management of marketing and distribution costs;
- Improved control over costs brought on by an improved awareness of the activities driving the related costs;
- An ABC system could improve management's understanding of profitability, since it provides management with more accurate overhead costs attributed to the cost objective;
- Planning and budgeting functionality in an organisation is enhanced, since the analysis of cost drivers, as required by ABC, provides a new view when the organisation examines cost behaviour;
- ABC assists managers when they have to answer the question regarding the strategies they want to pursue in the future;
- ABC makes it possible to compare the operation of plants and divisions within the organisation during the decision-making process due to the systems' increase in the credibility and usefulness of cost information;

- ABC provides useful cost information on all the major activities as well as business processes undertaken by an organisation, which a cost model can capture at a relatively low cost; and
- The words precision and accountability summarise the advantages as listed above.

Before taking the final decision whether or not to implement an ABC model, the organisation seeking the change must consider its inherent characteristics and how these affect the advantages and disadvantages of such a model. This model is only seen as the best model if the benefits from implementation exceed the cost (refer to section 4.3).

3.4.1.3. The implementation of Activity-based costing

An ABC cost allocation model traces a cost from the resource that is responsible for incurring the cost, to the activity or process using the resource, and finally to the cost objective, which can be a product, service, customer, etc. (Cooper & Kaplan, 1998: 110). An ABC model, like a traditional cost allocation model, applies the two stages of cost allocation (refer to section 1.4.1.1.). ABC models, however, differ from Traditional cost allocation models, since an ABC model allocates indirect costs to activity cost pools in the first step, whereas a Traditional model allocates costs into productive divisions, usually departments. The cost of the activity is then allocated based on cause and effect only to the products that utilise that activity (refer to section 1.4.4.) (Alejandro, 2000: 23; Szychta, 2010: 50; Geiszler et al., 2017: 45).

An ABC model utilises various allocation bases to assign costs from the cost pools to the cost object, whereas a traditional cost allocation model uses only a few (usually direct labours hours or machine hours). The allocation bases used in an ABC cost allocation model are cost drivers to the identified activity used to group the costs in step one, in proportion to the extent the cost driver is absorbed by the specific product (Szychta, 2010: 50; Wnuk-pel, 2010: 7; Drury, 2018: 50). Examples of cost drivers are the number of purchase orders the procurement department issued, the number of employees required to perform the related activity, or the number of machine set-ups that is required to produce a batch of items (Alejandro, 2000: 34). The main cost drivers used by universities vary between the hours worked by staff and the number of students (Sorros et al., 2017: 311). The implementation of an ABC cost allocation model, therefore, starts by identifying the causal relationship between the cost incurred in bringing forth the cost object as well as

the activity responsible for incurring the cost. Next, the organisation must identify the driver for that specific activity and group costs together in activity cost pools based on the drivers identified. The next step is calculating the cost per driver. The organisation can now determine the cost related to the cost object based on its consumption of the driver (Tolsma, 1996: 42–43).

Organisations that will benefit most from an ABC model have (Alejandro, 2000: 6):

- an extensive range of products;
- various operating activities;
- overheads making up a large proportion of total costs; and
- a price per unit greatly different from their competition.

If an organisation chooses to implement an ABC cost allocation model, it can benefit further from Activity-based management techniques and Activity-based budgeting. Both these tools for managing an organisation are briefly discussed in the sections to follow.

3.4.1.4. Activity-based management

An ABC cost allocation model integrates several activities into one analysis that identifies activities, calculates its cost and selects and measures cost drivers for each activity, which ultimately provides an information base for managing the cost of operations more effectively. The effective management of costs occurs through managing activities that assist in budgeting more effectively for organisational costs through Activity-based budgeting. The information provided by the implementation of an ABC model not only assists in Activity-based budgeting, but also provides a basis for Activity-based management (Innes & Mitchell, 1997: 192; Szychta, 2010: 50; Cokins & Capusneanu, 2011: 48). Activity-based management (ABM) is a tool that the management team of an organisation can apply to measure costs more accurately, and use as a scientific method to reduce costs as well as an advanced system of planning, monitoring and control. ABM ensures the application of Activity-based costing (ABC), Activity-based cost management (ABCM), Activity-reporting, Performance measurement and benchmarking, Continuous improvement (CI), Product-customer and sector profitability, Business process re-engineering (BPR), and Activity-based budgeting (ABB) (Tolsma, 1996: 2–3).

For this study, ABM is only mentioned as an additional management tool that benefits a firm that chooses to apply an ABC model. Further applications associated with the implementation fall outside the scope of this study.

3.4.1.5. Activity-based budgeting

ABC cost allocation models provide information for the implementation of Activity-based budgeting. Activity-based budgeting links activities to individuals to provide a strong focus on the responsibilities of these individuals to rank their priorities. Information provided by an ABC cost allocation model and ABB can also be used to prepare a budget from a zero base (Zero-based budgeting (ZBB)) (Innes & Mitchell, 1997: 192).

3.4.2. Summary

Even though the implementation of ABC was limited primarily to the manufacturing industry in the past, it could prove useful in the university environment. The increased accuracy of cost data resulting from the implementation of an ABC model could assist the administrators of universities in the decision-making process related to their academic activities (Alejandro, 2000: 40). Each type of university module requires different combinations of activities; therefore, the cost of each module will differ (Cook, 2003: 5).

Colleges and universities could apply ABC to improve their processes, budgeting, the analysis of costs versus benefit and for planning purposes (Evans, 2004: 4). ABC can further assist universities to identify whether their costs are for teaching, application processing or student advising purposes by allocating costs to products or services based on how they absorb resources (Evans, 2004: 4). An ABC model can teach university administrators to control how the institution incurs activities and therefore, controls costs (Evans, 2004: 4). Through the use of ABC, universities have a tool to understand, communicate and control the cost to educate different groups of students (Evans, 2004: 5). ABC can provide universities with more accurate information to make strategic decisions, control resource consuming activities, and improve their competitive advantage by improved management of tuition hikes and focusing on operational inefficiencies (Evans, 2004: 5).

To meet current costing needs, costing systems must include various cost models. This will ensure the validity of data (Spence & Seargeant, 2015: 87). Section 3.5 provides

examples of cost models implemented at universities, most of which are based on a combination of ABC and traditional cost allocation methods.

3.5. Existing cost accounting models for universities

Cook (2003: 8) states that the costing models applied at universities are split into two fundamental categories, i.e. cost-volume models and cost (Cook, 2003: 8). The study by Cook focused on distance education, but traditional universities can apply the principles of the models, since no elements are specifically associated with distance education. Choosing the best model to apply at a university will depend on the information required by the administrators of the institutions. The next sections discuss these two broad categories of cost.

3.5.1. Cost-volume models

When cost-volume models are applied, fixed cost and variable cost are added together to obtain the total cost (Cook, 2003: 8). The cost-volume model focuses on the relationship between income, cost and input volume, and can be applied to determine an organisation's breakeven point (Stevenson, 1996: 216; Cook, 2003: 9). The breakeven point in an organisation is the point of sale where the organisation will make neither a profit nor a loss; that is the point where the total cost for the organisation equals the total income (Drury, 2018: 172). Organisations have applied the cost-volume model for decades (Cook, 2003: 8). In the field of higher education, institutions often apply cost-volume analysis to a single module to determine whether the revenue from that module can cover the cost to deliver the module sufficiently (Cook, 2003: 9). The following section highlights some of the existing cost accounting models that universities could apply.

3.5.1.1. The Rumble model

The Rumble model is a cost-volume or breakeven model presented by the following equation (Cook, 2003: 9):

Equation 3.2: The Rumble Model

$$E = Sx + xC + OH$$

In the above equation,

E = total expenses;

S = cost per student, which is a variable cost;

x = number of students;

C = cost per course representing fixed cost; and

OH = overhead costs.

A major shortcoming of the Rumble model is that it provides no suggestion of how to determine an overhead cost per course[9] (Cook, 2003: 9). The Rumble model further provides no information useful for decision-making, such as comparisons of product costs or even information useful for decision-making at an institutional level (Cook, 2003: 9).

3.5.1.2. The Jewett Model

Frank Jewett based the costing model he developed on the following equation (Finkelstein et al., 2000: 88; Cook, 2003: 10):

Equation 3.3: The Jewett Model

$$TC = wL + OEX$$

In the equation stated above,

TC = total costs;

w = wage rate;

L = labour hours; and

OEX = all other expenses and overheads.

The Jewett model, like the Rumble model, is aimed at calculating the total cost of operation. However, this model integrates other benefit qualifications, including average learning outcomes to adjust FTE, measuring teaching outputs, the productivity of learning as well as the productivity of faculty and staff, the practical technology used in the classroom and distributed technology definitions and the resources required by the relevant faculty (Finkelstein et al., 2000: 85; Cook, 2003: 10). FTE is the abbreviation for Full-Time Equivalent and represents a unified measure for enrolments. FTE is the student equivalent of each student enrolled for 15 units of course work in the USA, while the equivalent in South Africa will be 16 units of course work (Finkelstein et al., 2000: 92). FTE enrolments

[9] A course refers to a module a student needs to complete as part of a selected number of modules to obtain a specified diploma or degree or program.

can be calculated by weighing enrolments to determine the equivalent of 16 units, or the amount of all units enrolled for by students for all modules divided by 16 (Finkelstein et al., 2000: 92).

The Jewett model calculates the total cost of operation using the equation stated above and then compares the amount to Jewett's selected output measures, the credit hours obtained by students, and the total learning outcomes. Just like the Rumble model, the Jewett Model includes overhead costs in the total cost. The Jewett model, however, expands on the Rumble model, since it was designed to determine the total cost of a program (degree), not just a single course (Cook, 2003: 10). The Jewett model has a fair number of shortcomings. Firstly, it defines the total cost of a program as the wage rate multiplied by the total labour hours and adding all other expenses. This equation is a basic assumption of all cost models, regardless of whether it is cost-volume or cost accounting. In addition to the primitive calculation of total costs, the Jewett model fails to address the issue of cost allocation and therefore defeats the purpose of cost accounting. Finally, this model fails to address departmental and interdepartmental full costing, which limits the results at different levels of an institution (Cook, 2003: 10).

3.5.2. Cost accounting models

The ABC cost allocation model, as described in section 4.1. is a model categorised as a cost accounting model used by university systems in addition to the cost-volume models mentioned above (Cook, 2003: 11). Managers have more confidence in ABC models, since the method of assignment is a logical result of activities (Cook, 2003: 11). The cost accounting models discussed in this section all provide a form of ABC cost allocation.

3.5.2.1. Flashlight costing model

The Flashlight costing model was not developed as a generalised system or a system that an organisation could use in various ways. It is a system that, like a flashlight, shines on a small part of a bigger picture. The Flashlight model can provide information only on a particular technology-based situation (Cook, 2003: 11).

The Flashlight costing model is based on the following assumptions: a) the only relevant cost is instruction costs; b) the model includes only direct costs, except for indirect space and computing cost; c) the model includes opportunity cost; and d) the cost object is a

single course (Cook, 2003: 11). The model functions by calculating the cost of an individual course and then adding all the course costs together to calculate the full cost of a degree (Cook, 2003: 11). The significance of the Flashlight model lies in the fact that it was the first model to attempt to apply ABC principles to university distance learning. The reality of the Flashlight model is that it includes very few ABC principles and even though an ABC cost allocation model is a full costing system, the Flashlight model ignores operational costs and takes only instruction cost into account (Cook, 2003: 12). The Flashlight model further excludes overhead costs (Cook, 2003: 12). The Flashlight model also does not conform to generally accepted accounting principles, since it includes opportunity cost. The inclusion of opportunity costs, however, makes the Flashlight model applicable to decision-making. The next model, Technology costing methodology, addresses the shortcomings identified in the Flashlight model, focusing on the lack of scope and lack of consistency (Cook, 2003: 13).

3.5.2.2. Technology costing methodology (TCM)

The pressure to provide a determination of the cost of applying new technologies resulted in the TCM after a meeting of the Steering Committee of Western Cooperative for Educational Telecommunication (WCET) administrators in 1997 (Cook, 2003: 12). Legislators in the USA requiring data on how effective their investment in new telecommunication equipment was, as well as faculties that want to know what the cost of the use of new technologies in the design of their courses would be necessitated the development. Instead of focusing on a small part of a whole, TCM focuses on the cost of a course (Cook, 2003: 13).

The TCM study resulted in limited comparability across institutions, therefore also limiting its usefulness by institutions (Cook, 2003: 13). Certain costs such as clerical and support staff that are seen as indirect and is not included in the TCM format, limiting the TCM study. This means that even though the TCM model scope and consistency exceed that of the Flashlight model, there exists a lack of clear understanding of ABC from the developers of TCM; the TCM tables seem disorganised, and there is little theoretical matter (Cook, 2003: 15). The TCM model was created specifically with a focus on distance learning (Cook, 2003: 11). The TCM model will, therefore, not be applicable for use at traditional universities.

3.5.2.3. Costs of networked learning study (CNL)

The team responsible for the development of the cost of networked learning study built on the identified weaknesses of the Flashlight and TCM studies. A team of researchers at Sheffield Hallam University in the United Kingdom conducted this study in 1998. The Costs of networked learning (CNL) is an ABC model (Cook, 2003: 16).

The conclusion of the CNL study was the development of a model that implements ABC with correct assumptions assisting in the provision of outstanding decision-making information for the whole institution. In addition to the valuable decision-making information provided by the CNL model, the CNL study aided in product-cost awareness and, due to its flexibility, it could also provide information on new technologies (Cook, 2003: 16).

The correct application of ABC at the Washington State University proved to yield valuable information at the instruction, department, and institution levels of the university (Cook, 2003: 19). There are various examples of other universities applying some form of Activity-based costing, which are explored below.

Apart from the Cost volume and Cost accounting models described in section 5, Spanish universities implemented what Valderrama and Sanchez (2006) referred to as an Analytical cost accounting model. This model combines traditional and ABC cost allocation models (Valderrama & Sanchez, 2006: 251). The details of the implementation of the Analytical cost accounting model at various universities in Spain are briefly described below.

3.5.3. Analytical cost accounting model

Spanish universities tend to focus on the allocation of costs to a cost objective based on an arbitrary basis. The basis on which the allocation of the costs to the cost objective takes place does not often correspond with the level of the services provided or with the nature of the activity carried out to deliver the cost objective (Valderrama & Sanchez, 2006: 251). During the early part of the 1990s, the Spanish government participated in the development of a system of cost accounting for universities (SCAU). The SCAU adapts the theoretical model suggested by the analytical accounting for autonomous public bodies (CANOA) project (Valderrama & Sanchez, 2006: 251).

An analytical accounting system has been in use by the Autonomous University of Barcelona since 1992. The analytical system uses responsibility centres such as teaching centres, departments, support services, research centres, as well as centres for central administration, and determines the cost of each of these responsibility centres (Valderrama & Sanchez, 2006: 251). The analytical system described determines the cost of individual degree courses in total and unit terms per student. After the identification of the cost per cost centre, Barcelona University assigns the cost to each macro-activity, i.e. teaching first- and second-year courses; research, together with third-year courses, as well as other studies and support services provided to the university community and to the basic activities of the university. The university then determines the cost of an individual degree course by taking the percentage of each department's resources dedicated to an individual degree course and allocating the macro-activities to the degree course. The teaching plan provides information to derive the percentages on which this allocation takes (Valderrama & Sanchez, 2006: 251–252).

The University of Cadiz developed a full costing model. The full costing model can be applied to determine the cost of one credit in a module leading to a specific degree or similar qualification as taught at the University of Cadiz (Valderrama & Sanchez, 2006: 252). The first step in the application of the full costing system is to identify the different cost centres. These cost centres are then classified from the budget's units of expenditure, and then an allocation of the cost centres to each principal and support centre occurs. The university can now distribute the cost of each service management centre to all the other centres in relationship to the support centre or, if the activity is specifically related to the relevant course, to the degree or diploma courses (Valderrama & Sanchez, 2006: 252). The previous step will accumulate all costs in the final cost centres or the specific course. The final step in this allocation process is the assignment of cost from the principal centres to the applicable course (Valderrama & Sanchez, 2006: 152).

3.5.4. Other cost accounting models

Saladrigues and Tena (2016) confirm the process of implementing an analytical cost accounting model in Spanish universities. According to the survey of 34 Spanish universities, 97% (33 out of 34) of the respondents of the survey indicated that they had started the development of a cost accounting system at their university (Saladrigues & Tena, 2017: 124). This study further confirms the implementation of cost accounting at

Catalan universities (SUC) and compares these methods to the cost accounting methods implemented at Spanish universities (CANOA). The study concludes that the main difference between the CANOA method and the SUC method is the greater flexibility of the SUC model paired with less standardisation. The objectives of the SUC system are further more general than those of the CANOA system, and the distribution criteria of the cost of research and teaching staff between research and teaching activities differ (Saladrigues & Tena, 2017: 129).

Sobanska and Kalinowski (2013) investigated the process of implementation of cost accounting models at various European countries, including Austria, Finland, The Netherlands, Germany, Poland, Portugal, Sweden, the United Kingdom and Italy (Sobańska & Kalinowski, 2013: 85). This study indicated that there is a wide variation in the degree to which European universities implement “advanced forms of full costing with elements of ABC” (Sobańska & Kalinowski, 2013: 84).

The use of the Resource Cost Model (RCM) can also aid in estimating the costs of programs at universities (Morphew & Baker, 2007: 22). The RCM starts by determining which resources are required to provide the relevant service after which the costs associated with these resources are established and price and quantity data are then synthesised to determine the cost of delivering a particular service (Morphew & Baker, 2007: 23). Morphew and Baker (2007) have developed a regression equation based on the RCM to determine the costs associated with a typical undergraduate specialist module, across different specialist modules, geographical areas and type of institution (Morphew & Baker, 2007: 24–27).

3.6. Summary

Developments in cost accounting include less complicated ABC cost allocation models that require less information and costs to implement, but which will still provide accurate costs of the service as a cost object. Furthermore, a hybrid model, which is a combination of a traditional and an ABC cost allocation model is another development in the field of cost and management accounting that could provide accurate cost estimates of the cost objectives in an organisation (Mohr, 2017: 49). From the information collected on various cost models applied at universities, it seems that the best route to follow to provide accurate cost information for an individual module at a university will be activity-based

costing. The costing of teaching modules in this study focuses on direct teaching costs assigned to faculties. These costs are direct in regard to faculties, but are indirect once the cost objective is specified as a teaching module and therefore requires the allocation of these costs to the cost objective. The methodology of the calculation of the cost of teaching modules applied in this study is explained in chapter 4.

Chapter 4: Research methodology

4.1. Introduction

Chapters 2 and 3 provided an overview of the current literature available on the global as well as local traditional university environment. More specifically, chapter 3 indicated how the field of management and cost accounting is applied within a university setting. Chapter 3 also looked at various cost terms and concepts and how these apply to a university. The literature review in these chapters was followed by an empirical investigation. Chapter 1 indicated that the empirical part of the research performed in this study has a quantitative design with an exploratory case purpose. The aim of this chapter is to specify the quantitative data analysis techniques applied in this study. The description of quantitative techniques is followed by a detailed description of the cost model applied in the calculation of the cost of a teaching module at the selected South African university.

4.2. Quantitative analysis

The research design is the “blueprint” to enable the researcher to achieve the objectives set for a study (Cooper & Schindler, 2011: 727). More formally, the research design is defined as “a framework for the collection and analysis of data” (Bryman et al., 2014: 382). The research design followed in this study is quantitative and required statistical analysis.

Excel and the Statistical Package of Sciences (SPSS) statistical software were used to perform the statistical analyses in this study. The quantitative analyses performed include descriptive statistics, chi-square, one-way analysis of variance (ANOVA), and the Pearson Correlation coefficient. This section defines all the elements utilised in the quantitative analysis of this study.

4.2.1. Descriptive statistics

The empirical research performed in this study applied descriptive statistics as the starting point of the quantitative analyses performed. Descriptive statistics are applied to describe a random variable’s data profile in terms of location, spread and shape characteristics (Cooper & Schindler, 2011: 718; Wegner, 2016: 66). Descriptive statistics aid in depicting the centre as well as the skewness and dispersion of a distribution (Wegner, 2016: 66). A distribution is the arrangement of value counts in descending order of a variable as a result of the tabulation of the observed subject (Cooper & Schindler, 2011: 423). A variable can

be defined as the varying attribute of applicable cases, which forms the basis of data collection and analysis (Bryman et al., 2014: 385; Wegner, 2016: 5). Descriptive statistics serve as an introductory tool for the description of data (Cooper & Schindler, 2011: 423). This section will define certain concepts utilised to describe the data collected in this study.

4.2.1.1. Measures of central tendency

Central tendency refers to the typical values in a distribution. The most familiar measures of the typical value are the mean, median and mode (Cooper & Schindler, 2011: 425; Wegner, 2016: 66).

4.2.1.1.1. Mean

Cooper and Schindler (2011: 425) define the mean as "the average response". The following formula is used to calculate the mean of a distribution (Cooper & Schindler, 2011: 425; Wegner, 2016: 67):

Equation 4.4: Mean of a distribution

$$\bar{x} = \frac{Sum\ of\ all\ observations}{Number\ of\ observations} = \frac{\sum_{i=1}^{n} x_i}{n}$$

In the above equation:

$\bar{X}$ = The arithmetic mean of the sample.

n = The number of data values included in the sample.

X_i = The ith data value of a random variable *x.*

$\sum_{i=1}^{n} x_i$ = The sum of the total number of data values (*n*).

4.2.1.1.2. Median

The median represents the value in the middle of a data set if the members are arranged in descending order (Cooper & Schindler, 2011: 425; Wegner, 2016: 68). This midpoint in a distribution means implies that half of the observed cases in a study fall below and the other half above the determined median (Cooper & Schindler, 2011: 425; Wegner, 2016: 68).

4.2.1.2. Measures of variability (dispersion)

Variability is also referred to as dispersion or spread and is measured by the variance, standard deviation, range, interquartile range and quartile deviation. These measures describe the way in which "scores cluster and scatter in a distribution" (Cooper & Schindler, 2011: 426). The measure of variability applied to a data set influences the level of confidence in the accurate measurement of central location (Wegner, 2016: 79). Standard deviation was used as a measure of variability in this study.

4.2.1.2.1. Standard deviation

The standard deviation of a data set describes the typical distance between the data sets and the mean (Cooper & Schindler, 2011: 426; Bryman et al., 2014: 319; Wegner, 2016: 80–81). This measure is widely used, since it is quite simple to interpret, even though, like the mean, outliers tend to distort it (Cooper & Schindler, 2011: 429; Wegner, 2016: 83). The calculation of the standard deviation starts with the calculation of the variance of a distribution. The variance is a "measure of score dispersion about the mean" (Cooper & Schindler, 2011: 426). The variance is calculated by applying the following formula (Cooper & Schindler, 2011: 426; Wegner, 2016: 80–81):

Equation 4.5: Variance of a distribution in words

$$Variance = \frac{Sum\ of\ the\ squared\ distances\ from\ mean\ for\ all\ cases}{(Number\ of\ cases - 1)}$$

Symbolically, the formula for the variance of a data set is as follows:

Equation 4.6: Symbolic representation of the variance of a distribution

$$s^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n - 1}$$

In the above equation:

s^2 = Variance.

$\bar{x}$ = Mean.

x_i = Individual value.

n = Number of observations.

From the variance, the standard deviation can be calculated as *s* (Cooper & Schindler, 2011: 426; Wegner, 2016: 81)*:*

Equation 4.7: Standard deviation of a distribution

$$s = \sqrt{s^2}$$

In the above equation:

s = Standard deviation.

s^2 = Variance.

4.2.1.3. Measures of shape

The measure in which data scores depart from the "symmetry of a distribution". The measure of shape also indicates relative flat- or peakedness (Cooper & Schindler, 2011: 427). In this study, skewness was used as the primary measure of the data distribution's deviation from symmetry. Skewness is calculated as (Cooper & Schindler, 2011: 427; Wegner, 2016: 86):

Equation 4.8: Skewness of a distribution

$$sk = \frac{n}{(n-1)(n-2)} \sum \left(\frac{x_i - \bar{x}}{s} \right)^3$$

In the above equation:

sk = Pearson's coefficient of skewness.

$\bar{x}$ = Mean.

x_i = Individual value.

n = Number of observations.

s = Standard deviation.

In a symmetrical distribution, *sk* equals 0 (Cooper & Schindler, 2011: 427; Wegner, 2016: 86). If *sk* is positive, the distribution is positively skewed. If *sk* is negative, the distribution is negatively skewed (Cooper & Schindler, 2011: 427; Wegner, 2016: 86). In a positively skewed distribution, the mean exceeds the median, which is greater than the mode. It is identified by a data spread, with a few very large values compared to a large number of

relatively small values (Wegner, 2016: 85). A negatively skewed distribution has a mean smaller than the median, which in turn is smaller than the mode. In this type of distribution, the data set has a few small values compared to a great number of relatively large values (Wegner, 2016: 85).

4.2.3. Chi-square goodness of fit test

The Chi-square (X^2) tests are used for goodness-of-fit tests. It is used to test for significant differences between the observed distribution of a random variable and the expected distribution based on the null hypothesis (H_0) (Cooper & Schindler, 2011: 469; Wegner, 2016: 282). It is important to note that actual counts and not percentages are used in chi-square tests (Cooper & Schindler, 2011: 469). A null hypothesis is a statement made that there exists no significant relationship between two variables based on the sample tested (Bryman et al., 2014: 380; Malhotra et al., 2017: 918).

Chi-square can be applied in one sample, two independent samples, or *k* (any number of samples) independent sample analysis. In this study, one-sample analysis applies. In a one-sample analysis, the expected frequency of objects in different categories is the ground for establishing the null hypothesis. The deviations between the actual and the hypothesised frequencies are then compared. The greater the difference between these deviations, the less probable it is that these deviations occurred by chance (Cooper & Schindler, 2011: 469). X^2 expresses the extent of the difference between the deviations. A larger X^2 indicates a larger divergence from the hypothesis. The following formulas are used to calculate X^2 (Cooper & Schindler, 2011: 469):

Equation 4.9: Chi-square calculation

$$X^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}$$

In this equation:

O_i = The number of observed cases in the *i*th category.

E_i = The number *f* cases expected in category *I* under H_0.

k = The number of categories.

The distribution of X^2 is different at each "number of degrees of freedom (d.f.)" (Cooper & Schindler, 2011: 469). The number of degrees of freedom, at a significance level of α = 0.05 (5%) is presented as (*k* - 1) (the total number of categories utilised in the classification, -1) (Cooper & Schindler, 2011: 469; Wegner, 2016: 283):

Equation 4.10: Degrees of freedom

$$\mathrm{df} = k - 1$$

In the above equation:

df = Degrees of freedom.

k = The number of categories.

The following steps will assist in the use of X^2 as a measure for the goodness of fit, to determine whether the outcomes from a variable provided has a normal distribution (Wegner, 2016: 283):

Step 1: Define the null and alternative hypotheses;

Step 2: Determine the region of acceptance of the null hypothesis;

Step 3: Calculate the sample test statistic (X^2) (X-stat) by applying the formula stated above;

Step 4: Compare the sample test statistic to the region of acceptance; and

Step 5: Draw the statistical and management conclusions.

In this study, the X^2 value was determined by SPSS. Refer to chapter 5 for the results of the application of the chi-square test.

4.2.4. One-way analysis of variance (ANOVA)

The one-way analysis of variance is applied to determine the statistical significance between a parameter and the mean of the distribution of the sample (Cooper & Schindler, 2011: 468). When a researcher wants to compare more than two population means for equality, the *F-statistic* test is used (Wegner, 2016: 298). An ANOVA test is an "inferential hypothesis-testing technique" and follows the same five steps are explained in section 2.3.5. (Wegner, 2016: 298, 300–304):

Step 1: Define the null and alternative hypotheses.

Step 2: Determine the region of acceptance of the null hypotheses.

The ANOVA test is reliant on the *F*-distribution. The critical F-value is determined as follows:

Equation 4.11: Critical F-value

$$F - crit = F_{(\alpha)(k-1,N-K)}$$

Where:

k = Number of samples.

N = Total (combined) sample size.

Step 3: Calculate the sample test statistic.

Equation 4.12: Sample test statistic

$$F - stat = \frac{MST}{MSE}$$

In the above equation:

F – crit = Critical F-value.

F – stat= Sample test statistic.

MST = Mean square treatment.

MSE = Mean square of error.

The critical F-value, as well as the sample test statistic in this study, is determined by SPSS. The results of this test are presented in chapter 5.

4.2.5. Pearson Correlation Coefficient

Commonly used measures of association are categorised as interval and ratio, ordinal and nominal. Due to the nature of the data and the primary objective of this study, interval and ratio measures of association in the form of the Pearson correlation coefficient are utilised in this study. This value ranges from +1 through 0 to -1. The correlation value (symbolised by *r*) measures the strength of the linear association of two numeric values in a sample (Cooper & Schindler, 2011: 493; Wegner, 2016: 335). The correlation coefficient value

measures the magnitude as well as the direction of the applicable relationships (Cooper & Schindler, 2011: 493).

The value of the correlation coefficient indicates the magnitude of the relationship between the two variables and measures the level of unified or opposed interaction between variables (Cooper & Schindler, 2011: 493). The sign of the *r* value indicates the direction of the correlation. A positive correlation indicates that as one variable increases, the other variable also increases. A negative correlation indicates the opposite; as one variable increases, the other variable decreases (Cooper & Schindler, 2011: 493; Wegner, 2016: 337). The formula for calculating the Pearson correlation coefficient (*r*) is as follows:

Equation 4.13: Pearson Correlation Coefficient

$$r = \frac{\sum xy}{\sqrt{(\sum x^2)(\sum y^2)}}$$

In the above equation:

r = The sample correlation coefficient.

x = The values of the independent variable (the variable affecting the dependent variable upon manipulation (Cooper & Schindler, 2011: 720)).

y = The values of the dependent variable (the variable monitored by the researcher which is expected to be affected by a change in the independent variable (Cooper & Schindler, 2011: 717)).

n = The number of paired data points in the sample.

4.2.5.1. Testing the significance of *r*

A sample is statistically significant if the relationship between the variables in the sample is genuine, based on the relationship of variables within a population, and not just due to chance (Cooper & Schindler, 2011: 454; Wegner, 2016: 340). There is a well-defined pattern to test whether a sample is statistically significant (Cooper & Schindler, 2011: 462; Wegner, 2016: 341):

Step 1: State the null and alternative hypothesis.

Step 2: Determine the region of acceptance of the stated null hypothesis.

A level of significance and the degrees of freedom for the F-crit test (refer to section 2.3.4) are required. This selection of the level of significance should take place before data are collected. The most widely used significance level is 0.05 and 0.01. The level of significance depends on how much risk the researcher is willing to accept. The F-value in this study was determined by SPSS.

Step 3: Calculate the sample test statistic (F-stat) (refer to section 4.3.4).

Step 4: Compare the sample test statistic to the region of acceptance

In this study, the comparison of the sample test statistic to the region of acceptance is performed by SPSS and significance at 5% and 1% were indicated.

Step 5: Interpret the test.

In most cases, if the calculated value is larger than the critical value, the null hypotheses are rejected. Management and statistical conclusions are drawn as part of the interpretation of the test of the significance of *r.*

4.2.6. Summary

The main reason behind the use of quantitative research is to assist researchers in establishing relationships between variables (Crous, 2012: 36). In a quantitative study, data are collected and statistically analysed to enable the explanation and prediction of variables (Crous, 2012: 36). The results of the quantitative techniques explained above are presented in chapter 5.

4.3. Data collection

The data used in this study are financial and non-financial information of a specifically selected South African University for the 2017 financial year. The applicable financial data were obtained from the Finance Department of the University and include information on the income from teaching modules as well as information on all the relevant costs involved in presenting these teaching modules.

In addition, non-financial data were collected related to teaching modules from the Higher Education Management Information System (HEMIS). Collected data from HEMIS include information on Teaching Input Units (TIU) and number of enrolments per module for the

selected university. Further data included information on how lecturers spend their time collected from HEMIS and the workload model of the related university, as well as information on the government subsidy received per TIU in the different funding categories as specified by the Department of Higher Education, Science and Technology (DOHET) of South Africa (refer to chapter 3).

Data were gathered for the whole population and then processed to fit the sample selected. The next section explains how the sample in this study was selected.

4.4. Sampling

Wegner (2016:5) defines a sample as “the subset of data values drawn from a population”. Researchers make use of sampling because oftentimes cost, time, and even the possibility that certain items in a population are destroyed during testing makes the recording of every item in a population impossible (Wegner, 2016: 5). A sample is used to investigate a share of an entire population and must therefore be selected carefully to ensure that it represents the population (Cooper & Schindler, 2011: 88). The selection of a sample can take place randomly (probability sampling) or non-randomly (non-probability sampling) (Cooper & Schindler, 2011: 369; Wegner, 2016: 161–162). Probability sampling is a controlled procedure where every member of the population has an equal chance of being included in the sample (Cooper & Schindler, 2011: 369; Wegner, 2016: 162). Non-probability sampling is a method where the selection of members to form part of the sample is not random and every member of the population does not have an equal chance of selection (Cooper & Schindler, 2011: 369; Wegner, 2016: 161). Both non-probability and probability sampling is briefly discussed below.

4.4.1. Non-probability

Non-probability sampling includes convenience, purposive and snowball sampling (Cooper & Schindler, 2011: 385; Wegner, 2016: 161). Each of these methods is briefly discussed below.

Convenience sampling is where a sample is drawn to suit the convenience of the researcher and the sample is easily accessible to the researcher (Cooper & Schindler, 2011: 385; Bryman et al., 2014: 178; Wegner, 2016: 161; Malhotra et al., 2017: 911; Van

Zyl et al., 2017: 136). This sampling design is usually the cheapest and the easiest to perform, but the least reliant (Cooper & Schindler, 2011: 385).

Purposive sampling is when sampling takes place to correspond to specified criteria set by the researcher and consists of Judgment and Quota sampling (Cooper & Schindler, 2011: 385). Judgment sampling takes place when a researcher uses only judgment to select a sample (Cooper & Schindler, 2011: 385; Wegner, 2016: 162). This method of sampling is appropriate when used early in explorative studies (Cooper & Schindler, 2011: 385). Quota sampling is used to improve representation in a sample (Cooper & Schindler, 2011: 385). Quota sampling is designed on the principle that a population is described by certain characteristics. If a sample has the same distribution of the characteristics of the population, then it is most likely a representation of the population (Cooper & Schindler, 2011: 385).

In studies where it is difficult to identify the members of a targeted population (oftentimes due to the sensitivity of the relative information), snowball sampling is used. This method of sampling starts if one member of a population can be identified, who then proposes other members, who each also proposes other members until a sample is selected (Wegner, 2016: 162).

Non-probability sampling could result in the selection of a sample that does not represent the target population and introduces bias into the statistical findings. It is therefore not valid to draw statistical inferences from non-probability sampling, since a sampling error cannot be determined (Wegner, 2016: 162).

4.4.2. Probability sampling

Probability sampling addresses the shortcomings of non-probability sampling. Probability sampling methods include simple random sampling, systematic sampling, stratified sampling and cluster random sampling (Cooper & Schindler, 2011: 377; Wegner, 2016: 162). Each method is briefly discussed below.

Simple random sampling is easy to implement, but can be time consuming, expensive and requires listed population elements (Cooper & Schindler, 2011: 377). However, this is a pure form of sampling, with each member in the population having an equal probability of being selected as part of the sample (Cooper & Schindler, 2011: 377; Wegner, 2016: 163).

This method is normally implemented by assigning a number to each member of the population, and literally “drawing numbers from a hat” (Wegner, 2016: 163). This method of sampling is usually accomplished with the aid of “computer software, a table of random numbers, or a calculator with a random number generator” (Cooper & Schindler, 2011: 377).

In the instance where a population list exists, systematic random sampling is implemented by the random selection of the first sampling unit. Each subsequent member of the sample is then selected at the same skip interval (*k*) from the previous member (Cooper & Schindler, 2011: 378; Wegner, 2016: 163). The skip interval is determined by applying the following formula (Cooper & Schindler, 2011: 378):

Equation 4.14: Skip Interval

$$k = Skip\ interval = \frac{Population\ size}{Sample\ size}$$

If a population is supposedly heterogeneous in regard to the variable being studied, the population is divided into segments with homogenous members. After this segmentation, a simple random sample can be selected from each segment (Cooper & Schindler, 2011: 379; Wegner, 2016: 164). The results from the study are then weighted based on the ratio of the related segment to the population and the combination of the weighted segments forms the population estimates (Cooper & Schindler, 2011: 379).

When a population is naturally divided into clusters and each cluster has a similar profile to the other clusters, a random cluster is selected as a sample (Cooper & Schindler, 2011: 380; Wegner, 2016: 164). Cluster sampling is alternatively referred to as two-stage sampling, since the units within a cluster can also be randomly selected to ensure the sample is representative of the population (Wegner, 2016: 165).

4.4.3 Summary

The population in this study consists of all the modules presented at the applicable South African university. However, the study requires only teaching modules to be included in the sample. Therefore, specified criteria were applied in rendering the selected sample. The sample in this study was accordingly selected based on purposive sampling.

4.4.4 Describing the sample

4.4.4.1. Population and sample

Secondary HEMIS and financial data related to the selected South African university for the 2017 academic year were used to conduct the study. The selected South African university comprises seven different faculties. The costs included in the financial data can broadly be categorised into direct and indirect costs (using faculties as cost objectives). Direct costs are costs directly assigned to faculties comprising primarily the salary costs (Senior Lecturer Equivalent [SLEs]) and operating expenses. An SLE consists of the full salary of a senior lecturer at the selected South African university. An SLE assigned to a faculty is determined by stating all the relevant lecturers' levels in proportion to a senior lecturer. The sum of these proportions is then multiplied with the salary of a senior lecturer and this amount is assigned to the related faculty as its SLEs. Indirect costs refer to costs that are not incurred by faculties (indirect), encompassing all other costs required to run the day-to-day activities of the university, such as Human Resources (HR), finance, top management salaries, etc. and could be referred to as top management, staff and service-related costs.

In 2017, the population of modules in all faculties comprised 4 088, with 307 674 enrolled students representing 64 168 teaching input units (TIUs) (based on the actual information obtained from the specific university; refer to section 2.5.1.3.1. for an explanation of TIUs). The main focus of this study was on active teaching modules. Of the 4 088 modules, a sample of 3 497 teaching modules was purposively selected applying the following four criteria:

- All modules that were research-related were removed;
- All modules that were related to a specific faculty at the selected university not directly involved in teaching university were removed;
- All modules that had no TIU were excluded from the sample; and
- All modules presented at a National Qualification Framework (NQF) Level 4 were excluded.

Table 4.1 indicates that in terms of sampled modules (86%), enrolments (90%) and TIUs (84%), teaching modules dominate the core activities (population) of the specific university.

Table 4.9: Population versus sampled modules used

	MODULES	ENROLMENTS	TIU
Population	4 088	307 674	64 168
Sample	3 497	276 627	53 616
% of population	**85.5%**	**89.9%**	**83.6%**
Excluded no. of modules	**591**	**31 047**	**10 553**
Service faculty	23	16 120	1 178
No TIU	98	9 585	-
NQF 4	2	1 591	-
Scripts / research	**468**	**3 751**	**9 374**
% Modules excluded	**14.5%**	**10.1%**	**16.4%**
Service faculty	0.6%	5.2%	1.8%
No TIU	2.4%	3.1%	0.0%
NQF 4	0.0%	0.5%	0.0%
Scripts / research	**11.4%**	**1.2%**	**14.6%**

Chapter 5 provides an in-depth discussion of the distribution and composition of the sample. This discussion includes the modules and enrolments per faculty, and NQF level, as well as funding weight (refer to section 5.2 for an explanation of these terms). Section 4.6.2 of this chapter explains the assumptions and methods applied in costing the teaching modules in the selected sample.

4.4.5. Principles applied in the cost allocation to teaching modules

The complexity of the teaching activities at the selected university as explained above, necessitated the standardisation of modules to enable the creation of uniform criteria for the costing of teaching modules. The norm for credits was set at 16 credits per module. All modules in the sample were therefore weighted to represent 16 credits. In addition, the enrolments per module included in the sample were adjusted in accordance with the weighting of a 16-credit module. In terms of the cost allocation, the following calculations were also made:

- Computing the Teaching Income (both tuition and subsidies) per enrolment for teaching modules at different NQF levels and different faculties;
- Calculating the cost of presenting a module (at different NQF levels and in different faculties); and

- Applying the principles of cost-volume-profit analysis to compute the number of enrolments needed to break even per module (at different NQF levels and in different faculties).

Some of the complications encountered were:

- The income per module is predominantly influenced by the number of enrolments, which represents a variable income per module (refer to chapter 4);
- Direct expenses assigned to faculties are not influenced by the number of modules presented, thus are typically fixed costs (over time it is influenced by the number of enrolments, but not the number of modules presented) (refer to chapter 4);
- To determine the percentage of direct costs per faculty that should be regarded as teaching related;
- The issue of whether class size or the number of enrolments influences the cost of presenting the module and to what extent; and
- Using direct costs per faculty, rather than per department or for the university in total to calculate the breakeven point per module.

4.4.5.1. Teaching income

The teaching income calculated per enrolment consists of tuition fee income as well as the teaching input subsidy (derived from the number of teaching input units [TIU] per module) as received from the Department of Higher Education, Science and Technology and calculated using HEMIS data. The teaching output subsidy (TOU) was excluded from the teaching income, since it is difficult to relate it to specific modules. Research and other income were also excluded, since it is not directly related to teaching. The DoHET in South Africa sets most of the earmarked Higher Education budget aside for the National Student Financial Aid Scheme (NSFAS), with a small portion (around 2%) set aside for specific purposes. Earmarked grants, therefore, cannot be related to modules and will not form part of the teaching income per module. The supervision of Master's and Doctoral students was not regarded as a teaching activity and all income related to this supervision will not form part of the teaching income per module for this exercise.

The actual tuition fees per enrolment per module for the 2017 academic year were obtained from the Finance Department at the related University. The use of TIU to determine the total subsidy received from the Department of Higher Education reiterates

why actual enrolments, adjusted to represent the equivalent of enrolments for a 16-credit module, and not full-time equivalent **(**FTE**)** enrolments were used in this study, since it is difficult to relate an FTE to the TIUs per module. The actual tuition fee per enrolment per module was then multiplied by the actual enrolments for each module to obtain the actual tuition fees per module.

Equation 4.15: Total tuition fee per module

$$Total\ tuition\ fee\ per\ module\ =\ Actual\ tuition\ fee\ per\ module\ \times actual\ enrollment$$

The actual TIU for each module as submitted to the DoHET was obtained from the HEMIS data of the university. The TIU of each module was multiplied with R12 800 to calculate the Teaching input subsidy per module. The R12 800 were determined by dividing the total teaching input grant of the 2017/2018 financial year with the funded teaching inputs for the stated period.

Equation 4.16: Teaching input subsidy per module

$$Teaching\ input\ subsidy\ per\ module = total\ teaching\ input\ grant \div funded\ teaching\ inputs$$

The behaviour of both the tuition fees and the teaching input subsidy is variable per enrolment in nature. This implies that the total tuition fee income and teaching input subsidy per module will increase or decrease, with an associated increase or decrease in the enrolments per the related module. It is therefore relatively simple to determine an accurate actual teaching income per module. Thus, the teaching income per module was calculated using TIUs multiplied by R12 800, plus Tuition Fees for the module multiplied by the number of enrolments for the specific module.

Equation 4.17: Teaching income per module

$$Teaching\ income\ per\ module = Total\ tuition\ fee\ per\ module + Total\ teaching\ input\ subsidy\ per\ module$$

The teaching income per module was then standardised to represent the average income per enrolment in a weighted 16-credit module per faculty per NQF level by dividing the total teaching income for a faculty per NQF level with the associated enrolments per 16-credit weighted module.

Equation 4.18: Standard teaching income per module

$$Standard\ teaching\ income\ per\ module = \frac{Total\ teaching\ income\ per\ faculty/enrolments\ per\ 16\ credit\ weighted\ modules\ per\ faculty}{}$$

The teaching income per enrolment per 16-credit weighted module was used in the calculation of a breakeven point (refer to section 2.6.2.2.1.) for a module (number of enrolments needed to cover the direct costs) for each faculty per NQF level. To do the final calculation, direct costs per faculty had to be related to modules.

4.4.5.2. Cost of teaching modules

As stated in section 2.6.1.1., the total cost associated with teaching at the related university can broadly be categorised into direct and indirect costs (using faculties, and not modules, as the cost objective). Both these categories of costs needed to be allocated to individual modules per faculty and per NQF level, but the method of allocation (referring to the direct and indirect costs) will differ, since the nature of these costs and the relationship to the modules presented differ.

4.4.5.2.1. Direct costs

Direct costs consist of the SLE allocation and operating budgets per faculty. Direct costs at the university selected behave as fixed costs per module, since there exists no direct causal relationship between the costs assigned to an individual faculty and the number of modules presented by the related faculty. In the short term these costs do not change with a change in the number of modules presented by the faculty but remain fixed for the period in which it is incurred. These costs can exhibit variable behaviour over a longer period, since direct allocations to faculties are influenced by the number of enrolments per year. However, the number of modules presented has no direct influence on the allocation of direct costs to a faculty. Since there is no causality between the cost and the cost objective (number of modules), the following discretionary decisions had to be made to be able to allocate these costs to modules:

- **Only 60% of faculty direct costs were allocated to the teaching modules in the faculties.** As stated in section 2.6.1.1., the sample in this costing exercise consists of teaching modules only, but faculties perform three main activities, i.e. teaching, supervision of Honours, Master's and Doctoral students (mini-

dissertations, scripts and theses), as well as research. The direct costs provide for the performance of each of these activities and adjustments were needed to represent costs associated with teaching only. According to the financial statements of the said university, approximately 75% of the total income received for the 2017 financial year represent teaching income. According to this university's HEMIS data, academics spend 51% of their time on teaching-related activities, and according to the same university's workload model, academics spend 55% of their time on teaching. A percentage of 60% was chosen as a conservative estimate of the total direct costs per faculty associated with teaching modules, based on the portion of university revenue, the time estimation as per the HEMIS system, and the workload model associated with teaching.

- **Only actual direct faculty (not departmental) costs were allocated to modules.** Actual direct faculty costs are also assigned to the individual departments within a faculty by the dean of the faculty, but this cost will not be utilised to allocate direct costs to modules per department (although the aggregate of the individual departmental costs is the same as the direct/faculty costs). Departmental costs include even more variables in its assignment and will cause too many deviations in the cost calculated per module to provide a benchmark for all modules in the related faculty.

- **80% of direct teaching costs were allocated to modules on a fixed basis with the number of modules as the cost driver, while 20% of direct teaching costs could be associated with the size of the module, thus allocated on a variable basis with the number of enrolments per 16-credit weighted module as the cost driver.** It is important to note that all direct costs are fixed in their behaviour regarding modules. It is, however, recognised that the number of enrolments (size of the class) could lead to the repetition of the module as well as other associated costs such as additional marking costs, consultation hours, etc. Thus, it was also argued that most of the effort to complete the study material such as a study guide, actual preparing and presenting the module as well as setting test and examination papers are fixed per module, irrespective of the number of enrolments (80% of direct teaching costs).

- **Calculation of the number of breakeven enrolments per module per faculty per NQF level.** With both the teaching income per enrolment per 16-credit weighted module, the direct teaching costs per 16-credit module, and enrolment per 16-credit weighted module per faculty per NQF level calculated, the standard breakeven point for a module in a specific faculty and NQF level can be determined. The breakeven point of a module is where the module covers its direct costs (teaching income minus both fixed and variable costs = zero). The formula to calculate the breakeven point is as follows:

Equation 4.19: Breakeven enrolments per module

$$BE = F/(P - V)$$

In the above equation:

F = Mean fixed teaching costs per module per faculty.

F was calculated as follows:

Equation 4.20: Mean fixed teaching costs per module

$$F = \frac{(total\ direct\ cost\ per\ faculty\ \times 60\%) \times 80\%}{total\ number\ of\ weighted\ modules\ per\ faculty}$$

p = mean teaching income per enrolment per 16-credit weighted module per faculty per NQF level.

P was calculated as follows (see Table 5.31):

Equation 4.21: Mean teaching income per enrolment

$$P = \frac{total\ teaching\ income\ per\ faculty\ per\ NQF\ level}{total\ enrolments\ per\ faculty\ per\ NQF\ level}$$

V = Mean variably allocated direct costs per enrolment per 16-credit weighted module per faculty.

V was calculated as follows:

Equation 4.22: Mean variably allocated direct costs per enrolment

$$V = \frac{(total\ direct\ cost\ per\ faculty\ \times 60\%) \times 20\%}{enrolments\ per\ faculty}$$

What is also important to note is that this breakeven number of enrolments differ per faculty and different NQF levels (refer to chapter 5), although no additional costs were added for higher NQF levels, which is a highly conservative approach to follow for both NQF 8 and 9 modules. NQF 8 and 9 modules are typically presented by more senior, higher-paying staff, which could add to the cost of presenting them.

4.5. Summary

The research in this study is conducted based on a quantitative design. This chapter started with an explanation of the quantitative data analysis techniques applied. A discussion of the collected data and applied sampling method followed the discussion of the data analysis techniques and concluded that a purposive sample was drawn for this study. However, to enable the application of quantitative research techniques, the empirical investigation in this study required the calculation of teaching income as well as direct costs per module.

A specific university was selected to obtain the required module data from. For the selected sample, the gathered teaching income and direct costs were allocated to the modules, based on the assumptions described in this chapter as a result of the knowledge obtained from the review of the literature. The allocation of teaching income and direct costs to modules enabled the computation of the breakeven number of enrolments per module for each faculty as a benchmark at the various NQF levels.

The breakeven enrolments per module for the individual faculties per NQF level provide a valuable benchmark. If faculties reconsider all modules with enrolments below the breakeven guidelines it could a) assist faculties and departments to optimise the use of both human and financial resources; b) create stakeholder awareness of the level of cross-subsidizing of modules at all levels; c) provide top and faculty management with financial information to take strategic decisions (such as discussions around the size and shape of the selected university); d) potentially be able to lower tuition costs to students; and e) to avail human capacity to increase research outputs.

Chapter 5 will provide the detailed results of the application of the calculated benchmark, as described in the previous paragraph, to quantitatively establish the financial viability of teaching modules at the selected university. Chapter 5 will also provide the results of the

quantitative data analysis techniques applied to the data gathered for this study, as explained in section 4.3.

Chapter 5: Empirical analysis and results

5.1. Introduction

Chapter 4 contained an explanation of the research methodology followed in this study and included an in-depth explanation of the quantitative research methodology applied in chapter 5, namely an exploratory case-study approach. Chapter 5 begins with the clarification of the basic terminology used in the statistical analysis of the study, followed by a description of the composition of the sample used, selected based on the information contained in chapter 4. This description includes the sampled enrolments and modules in various faculties and at different NQF levels. All these variables at the three different campuses related to the responding university are also illustrated.

The chapter continues with an analysis of teaching income related to modules. The enrolments and Teaching Input Units (TIUs), as variables related to teaching income, are also illustrated. The results of the teaching income calculations as described in chapter 4 are presented per enrolment per 16-credit weighted module.

The next part of this chapter explains the elements involved in calculating the breakeven number of enrolments per module, based on the formulas explained in chapter 4. Part of the breakeven calculation is the results of the fixed cost calculation per module and the variable cost calculation per enrolment. The weighting of modules is clarified and the results presented.

Specific relationships amongst the variables explained in chapter 4 and the direct profit, calculated as part of the breakeven calculation, are explored in the last part of this chapter. The chapter concludes with a discussion of the results of the calculations performed in this study.

5.2. Defining the variables used in this chapter

Variables used in this study include modules, weighted modules, enrolments, weighted enrolments, NQF level, NQF weighting, funding weights, faculties and credits. Each of these variables is briefly explained below.

a **Module:** A module represents an organisation of content related to obtaining a degree, represented by a determined number of credits over a specified timeframe. An undergraduate degree would typically contain 14 to 28 modules.

b **Weighted module:** The modules as described in (a) are weighted to represent 16 credits by multiplying each module by the related module's credits as a fraction of 16.

c **Enrolment:** An enrolment refers to an actual student registered for the related module.

d **Enrolment weighted to represent a 16-credit module:** The enrolments in this study as described in (c) multiplied by the related module's credits in proportion to 16 credits to represent a 16-credit module (refer to section 4.6.2.).

e **NQF level:** The NQF level at which a module is offered represents the module's grade on the National Qualifications Framework as determined by the South African Qualifications Authority (SAQA). NQF levels 5 to 7 typically represent undergraduate modules, while an NQF 8 level represents the final year of a four-year qualification or at the honours level following a three-year qualification. NQF 9 level represents a Master's degree module and an NQF 10 level represents a research module to obtain a doctorate degree (excluded for the purpose of this study).

f **NQF weighting:** The modules in this study can also be presented at an NQF weighting of 1, 2 or 3 based on their NQF levels as described in (e). An NQF weighting of 1 (W1) represents modules at an NQF level of 5 to 7, NQF weighting 2 (W2) represents modules at an NQF 8 level and NQF weighting 3 (W3) represents modules at an NQF level 9.

g **Funding weight:** Funding weight (FW) refers to the factor by which the government subsidy per TIU of a module is multiplied based on the grid as specified by the Department of Higher Education, Science and Technology (see Table 5.1.). Table 5.1 contains a comparison of the NQF level, NQF weighting and funding weight for the different CESM categories in the funding model for TIUs. An undergraduate contact Latin module, for example, falls into a Classification of Educational Subject Matter (CESM) category 2: languages, linguistics and literature according to Table 5.1. The TIU related to a Latin module will be multiplied by a factor of 1.5 to determine

the amount of the government grant (subsidy) paid out for this module. Table 5.1 contains a comparison of the NQF level, NQF weighting and funding weight for the different CESM categories in the funding model for TIUs.

Table 5.10: Comparison of NQF level, NQF weighting and funding weights

Undergraduate/ post-graduate	NQF level	NQF weighting	Funding weights			
			CESM 1	CESM 2	CESM 3	CESM 4
Undergraduate	5-7	1	1.0	1.5	2.5	2.5
4th year/ honours	8	2	2.0	3.0	5.0	7.0
Master's	9	3	3.0	4.5	7.5	10.5
Doctoral	10	4	4.0	6.0	10.0	14.0

h **Faculty:** A collection of departments at a university concerned with the division of a similar body of knowledge.

i **Credits:** Credits refer to the notional study hours that are required to master the content of a module. Notional hours encompass assessments as well as study time and ten notional hours are equivalent to one credit.

The cost objective of a university in this study is the teaching of a module. As explained in section 1.1.3., the teaching of a module at a university is the delivery of a service and determining the cost of a service is difficult and complex. The variables explained above differ significantly amongst the modules of the selected university, which confirms the complexity and diversity of the services delivered (presenting teaching modules) and, in turn, the complexity of determining the cost related to the service.

5.3. Hypotheses tested

In this chapter, most of the variables described in section 5.2 will be tested to determine the strongest driver of direct profit per module at the selected university. These tests will be performed based on the following hypotheses:

H1o: There is no significant relationship between the faculty in which a module is presented and the direct profit per module.

H1a: There is a significant relationship between the faculty in which a module is presented and the direct profit per module.

H2o: There is no significant relationship between the funding weight of a module and the direct profit per module.

H2a: There is a significant relationship between the funding weight of a module and the direct profit per module.

H3o: There is no significant relationship between the NQF weighting of a module and the direct profit per module.

H3a: There is a significant relationship between the NQF weighting of a module and the direct profit per module.

H4o: There is no significant positive relationship between the number of credits assigned to a module and the direct profit per module.

H4a: There is a significantly positive relationship between the number of credits assigned to a module and the direct profit per module.

H5o: There is no significantly positive relationship between the number of enrolments per module and the direct profit per module.

H5a: There is a significantly positive relationship between the number of enrolments per module and the direct profit per module.

For the purpose of this study, a *p*-level $p<0.01$ is seen as a strong significance; however, a level of $p<0.05$ is also acceptable. A *p*-level of $p>0.05$ will lead to an acceptance of the null hypothesis (refer to section 4.3.5.1). The results of the testing of the above hypotheses are stated in section 5.5 of this chapter. However, an understanding of the composition of the purposively selected sample (refer to section 4.5.3) is required before the stated hypotheses can be tested. The next section will provide a detailed description of the diversity of the sample as well as the impact of this diversity of the sample on the complexity of the calculations performed in this study.

5.4. Describing the sample

The process of analysing the selected data that were applied in this study is described in the section that follows. The population of modules from the selected South African university consisted of 4 088 modules. From this population, a sample of 3 497 modules was purposively selected as explained in section 4.5.3.

The modules in the population, as well as the sample, are presented by various faculties, at different NQF levels and at campuses situated in several locations. Tables 5.2 and 5.3 illustrate the diversity of the population and the sample regarding both the number of modules presented as well as the differences in terms of the number of modules excluded per faculty and at different NQF levels.

Table 5.2 illustrates that only teaching modules were included in the sample since many of the NQF level 9 (only structured Master's modules included) and all the NQF level 10 modules were excluded, as they are research related and not relevant to the study. NQF 4 modules are also excluded since these modules represent secondary school-equivalent levels of learning and this study relates only to university modules. Although most of the NQF level 8 modules are presented at Honours level, NQF 8 could also refer to a fourth year module in the case of a four- or five-year undergraduate degree. For the purpose of this study, NQF level 8 modules will be regarded as postgraduate modules (in line with the funding weights).

Table 5.11: Modules per NQF level

	NUMBER OF MODULES			
NQF level	**POPULATION**	**SAMPLE**	**EXCLUDED**	**% INCL**
NQF 4	2	-	2	0.0%
NQF 5	609	566	43	92.9%
NQF 6	973	950	23	97.6%
NQF 7	779	744	35	95.5%
NQF 8	940	915	25	97.3%
NQF 9	600	322	278	53.7%
NQF 10	185	-	185	0.0%
TOTAL	**4 088**	**3 497**	**591**	**85.5%**

When the inclusion and exclusion criteria are applied to faculties (see Table 5.3), it is clear that Faculty 6 (1 027), Faculty 1 (663) and Faculty 4 (614) present most teaching modules per faculty. As a percentage, 30.1% of Faculty 3 and 24.5% of Faculty 7 modules were excluded from the sample and 172 (14.3%) modules in Faculty 6 were excluded from the sample.

Table 5.12: Modules per faculty

	Number of modules			
Faculties:	**Population**	**Sample**	**Excluded**	**% incl**
Service Faculty	2	**-**	2	0.0%
FAC 1	722	**663**	59	91.8%
FAC 2	539	**511**	28	94.8%
FAC 3	578	**404**	174	69.9%
FAC 4	705	**614**	91	87.1%
FAC 5	200	**170**	30	85.0%
FAC 6	1 199	**1 027**	172	85.7%
FAC 7	143	**108**	35	75.5%
TOTAL	**4 088**	**3 497**	**591**	**85.5%**

The sample of 3 497 modules is presented across all three campuses of the university. These campuses are situated in different geographic areas. The sampled modules are presented in Table 5.4 per campus as well as NQF level. From Table 5.4 it is clear that Campus 1 offers the largest number of modules with 2 673 (76.4%) of the total number of modules in the sample. No structured Master's modules (NQF level 9) are presented at Campuses 2 and 3. Table 5.4 also shows that 64.6% (3 497) of all modules offered are at an undergraduate level. Campus 3 offers the largest portion of its modules at an undergraduate level (95.2%) while at Campus 1, 43.0% of the modules offered are at NQF levels 8 and 9 (predominantly postgraduate modules).

Table 5.13: Modules per campus and NQF level

Modules:	**Campus 1**	**Campus 2**	**Campus 3**	**Total**	**Campus 1/ Total**
NQF 5	314	101	151	566	**55.5%**
NQF 6	600	197	153	950	**63.2%**
NQF 7	609	121	14	744	**81.9%**
NQF 8	828	71	16	915	**90.5%**
NQF 9	322	0	0	322	**100.0%**
TOTAL	**2 673**	**490**	**334**	**3 497**	**76.4%**
NQF5-7: Total	**57.0%**	**85.5%**	**95.2%**	**64.6%**	

Table 5.5 combines the number of modules versus the enrolments per module for the three campuses. Most of the modules are presented at the Main Campus (Campus 1), and what is positive is that the excluded modules from the sample were lower than 17% for all the campuses individually. The sample consists, therefore, of a similar ratio of modules and enrolments from the various campuses as illustrated in Table 5.5.

Table 5.14: Population versus sample modules and enrolments per campus

	Population	Campus 1	Campus 2	Campus 3
Modules	*4 088*	*3 210*	*527*	*351*
Sample	3 497	2 673	490	334
Excluded	**591**	**537**	**37**	**17**
% Included	85.5%	83.3%	93.0%	95.2%
Enrolments	*307 674*	*194 609*	*46 719*	*66 346*
Sample	276 627	178 420	41 974	56 233
Excluded	**31 047**	**16 189**	**4 745**	**10 113**
% Included	**89.9%**	**91.7%**	**89.8%**	**84.8%**

The sample refers not only to the number of modules but also to the number of enrolments associated with these modules. As illustrated in Table 5.5, the highest percentage of modules excluded on a specific campus is 16.7% (Campus 1) with 15.2% (Campus 3) the highest percentage of enrolments excluded in the sample. It could thus be concluded that the sample is truly reflective of both the number of modules and enrolments at all three campuses, in all seven faculties, as well as at NQF levels 5 to 9.

Table 5.6 indicates that the most students are enrolled in Faculty 1 (71 296) and the lowest number of students are enrolled in Faculty 7 (1 523). This table further shows the variance in the percentage of enrolments over the different NQF levels which range from 1.1% at NQF 9 to 38.7% at NQF 6. This demonstrates the difficulty in costing modules due to the disparity in the enrolment distribution across faculties and NQF levels.

Table 5.15: Number of enrolments per faculty and per NQF level

Faculties:	TOTAL	NQF5	NQF6	NQF7	NQF8	NQF9
FAC 1	**71 296**	22 273	38 734	8 822	1 467	-
FAC 2	**45 607**	9 336	19 346	11 977	4 004	944
FAC 3	**14 396**	2 310	2 914	5 498	3 223	451
FAC 4	**52 890**	23 083	18 145	10 182	1 436	44
FAC 5	**34 831**	10 195	7 969	6 705	9 816	146
FAC 6	**56 084**	22 715	19 747	8 090	4 339	1 193
FAC 7	**1 523**	855	100	194	219	155
TOTAL	**276 627**	**90 767**	**106 955**	**51 468**	**24 504**	**2 933**
% of TOTAL	**100,0%**	**32,8%**	**38,7%**	**18,6%**	**8,9%**	**1,1%**

The information in Tables 5.2 to 5.6 is summarised in Table 5.7. In addition to the variance in the number of modules presented at undergraduate versus postgraduate level, the number of enrolments at each of these levels also varies. Table 5.7 is used to illustrate

these differences in the number of enrolments and modules at an undergraduate as well as postgraduate level within the different faculties.

Table 5.16: Number of enrolments and modules per faculty: under- versus postgraduate

	Undergraduate		Postgraduate	
Faculties	**Enrolments**	**Modules**	**Enrolments**	**Modules**
FAC 1	69 829	592	1 467	71
FAC 2	40 659	322	4 948	189
FAC 3	10 722	213	3 674	191
FAC 4	51 410	451	1 480	163
FAC 5	24 869	91	9 962	79
FAC 6	50 552	555	5 532	472
FAC 7	1 149	36	374	72
TOTAL	**249 190**	**2 260**	**27 437**	**1 237**

As seen in Table 5.7, undergraduate enrolments comprise 249 190 students enrolled in 2 260 modules, whereas postgraduate enrolments consist of only 27 437 students enrolled in 1 237 modules. Table 5.7 further illustrates the diversity in the modules and enrolments per faculty. Faculty 7 has 1 149 students enrolled in only 36 modules undergraduate, but 374 students enrolled in 72 modules at a postgraduate level. Faculty 1 has 69 829 students enrolled in 592 modules undergraduate and 1 467 students enrolled in 71 modules postgraduate. The sampled modules and enrolments are not only presented in different faculties as indicated in Table 5.7, but also at different NQF levels. Table 5.8 indicates the difference in the number of modules and enrolments amongst the various NQF levels.

Table 5.17: Modules and enrolments per NQF level

NQF level:	Modules	% Module	Enrolments	% Enrol
NQF 5	566	16.2%	90 767	32.8%
NQF 6	950	27.2%	106 955	38.7%
NQF 7	744	21.3%	51 468	18.6%
NQF 8	915	26.2%	24 504	8.9%
NQF 9	322	9.2%	2 933	1.1%
TOTAL	**3 497**	**100.0%**	**276 627**	**100.0%**

Table 5.8 shows that the largest number of modules is presented at an NQF 6 level (27.2%). In addition, 43.4% of modules are presented at NQF 5 and 6 levels but have 71.5% of all the enrolments. The opposite is true about NQF levels 8 and 9. More than 35% of the modules are presented predominantly at postgraduate level, representing only 10% of all enrolments. Table 5.8 clearly illuminates the decrease in the number of enrolments associated with higher NQF levels, specifically NQF 7, 8 and 9.

The decrease in the enrolments associated with higher NQF levels is reiterated in Table 5.9 by indicating the modules and enrolments per NQF weighting (refer to section 5.2, f). Table 5.9 illustrates that most of the modules, 2 260 (64.6%), are presented at an undergraduate level, which represents NQF W1. Most enrolments are also at this level, namely 249 190 (90.1%). The lowest number of modules and enrolments is at NQF W3, which is primarily structured Master's modules with 322 (9.2%) modules, but only 2 933 (1.1%) enrolments.

Table 5.18: Modules and enrolments at different NQF weightings

NQF Weight	Modules	% Module	Enrolments	% Enrol
NQF W 1	2 260	64.6%	249 190	90.1%
NQF W 2	915	26.2%	24 504	8.9%
NQF W 3	322	9.2%	2 933	1.1%
TOTAL	**3 497**	**100.0%**	**276 627**	**100.0%**

The modules and enrolments presented in Table 5.9 can also be presented based on the funding weight (refer to section 5.2, g) influencing the government grant paid out per module. Table 5.10 summarises the sampled modules and enrolments per funding weight.

Table 5.19: Modules and enrolments at different funding weights for Ministry of Higher Education group 2

Funding Weight:	Modules	% Module	Enrolments	% Enrol
FW 1	513	14.7%	82 651	29.9%
FW 1.5	1 541	44.1%	127 823	46.2%
FW 2.5	250	7.1%	9 067	3.3%
FW 3.5	1 193	34.1%	57 086	20.6%
TOTAL	**3 497**	**100.0%**	**276 627**	**100.0%**

As seen in Table 5.10, modules part of the Ministry of Higher Education's Group 2 (refer to Table 5.1), representing a funding weighting of 1.5, have the highest number of modules (1 541) and represents 44.1% of the modules in the sample. The highest number of enrolments is also funded at a weighting of 1.5 (127 823 enrolments, 46.2%). The lowest number of modules and enrolments are funded at a weighting of 2.5 (7.1% and 3.3%, respectively). Figure 5.1 presents the information contained in Tables 5.9 and 5.10 graphically.

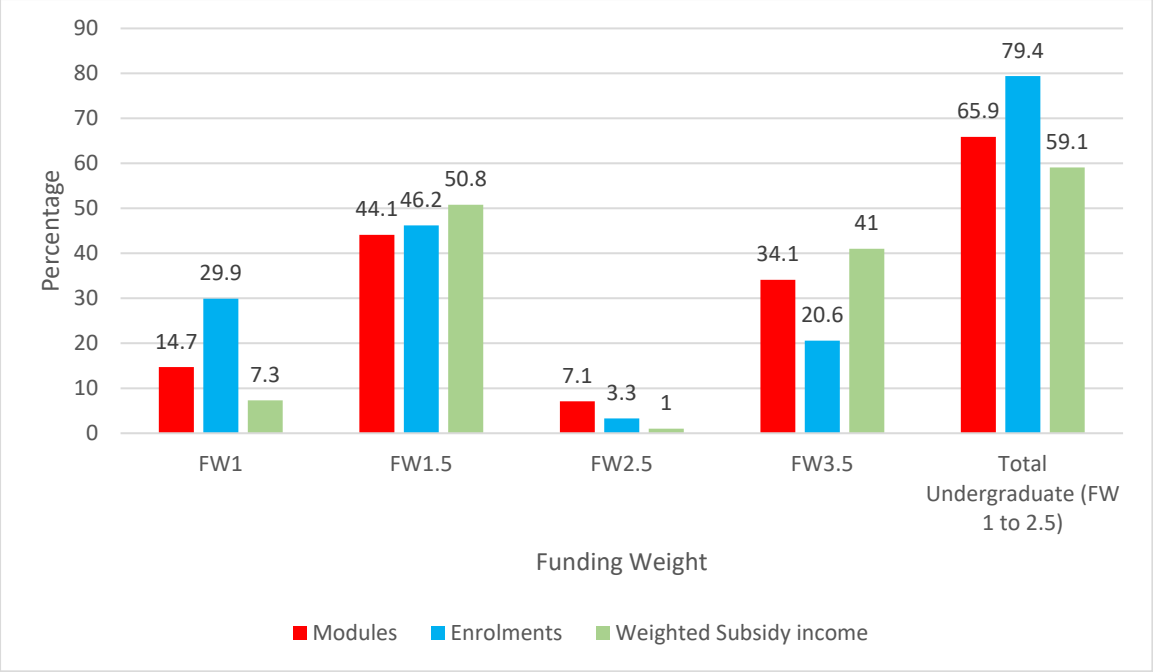


Figure 5.10: Comparison between modules, enrolments and weighted subsidy income

Figure 5.1 demonstrates the percentage distribution of modules, enrolments and weighted subsidy income at the different funding weights. The funding weights at undergraduate level are typically from 1 to 2.5 (refer to Table 5.1). The total income at undergraduate level represents 59.1% of total income, undergraduate modules 65.9% of all modules and enrolments 79.4% of all enrolments. The question is whether the additional subsidies compensate sufficiently for the lower levels of enrolments in the NQF W 2 and W 3 modules as indicated in Table 5.9.

Table 5.11 adds to the great variance in the distribution of the sampled modules and enrolments. This table indicates that the enrolments per module differ between the different campuses with Campus 1 at 66.7 and Campus 3 at 168.4. Campus 3 has the highest number of enrolments per module, while Campus 1 presents the most modules (76.4%), but has relatively lower levels of mean enrolments per module with a mean of 66.7.

Table 5.20: Sampled mean class sizes per campus (enrolments per module)

	TOTAL	Campus 1	Campus 2	Campus 3
No. Modules *(n)*	3 497	2 673 (76.4)	490 (14.0%)	334 (9.6%)
Module Enrolment	276 627	178 420 (64.5%)	41 974 (15.2%)	56 233 (20.3%)
Enrolment per Module	**79.1**	**66.7**	**85.7**	**168.4**

The enrolments per module do not only differ amongst the campuses, but also among the various faculties and different NQF levels. Table 5.12 highlights the difference between postgraduate and undergraduate modules and enrolments by showing the mean enrolments per module for undergraduate modules as 110.3 (100%) and for postgraduate modules as 22.2 (100%), which is significantly lower than the mean for undergraduate modules or the university mean enrolments per module of 79.1 (100%). Table 5.12 further illustrates the percentage of students enrolled in each module compared to the mean enrolments for the university as a whole for undergraduate and postgraduate programs. Faculty 5 has 247.9% mean enrolments per undergraduate and 568.5% mean enrolments per postgraduate module compared to the university mean whereas Faculty 7 has 28.9% undergraduate and 23.4% postgraduate enrolments per module compared to the university mean. This illustrates the uneven distribution of modules and enrolments among faculties as well as at undergraduate and postgraduate levels.

Table 5.21: Enrolments per module for different faculties: under- and postgraduate

	Undergraduate		Postgraduate		Total	
Faculties	**NQF5-7 enrolment**	**Faculty/ Total mean**	**NQF8-9 enrolment**	**Faculty Total mean**	**Enrolment per module**	**Faculty Total mean**
FAC 1	118.0	107.0%	20.7	93.2%	107.5	135.9%
FAC 2	126.3	114.5%	26.2	118.0%	89.3	112.8%
FAC 3	50.3	45.7%	19.2	86.7%	35.6	45.0%
FAC 4	114.0	103.4%	9.1	40.9%	86.1	108.9%
FAC 5	273.3	247.9%	126.1	568.5%	204.9	259.0%
FAC 6	91.1	82.6%	11.7	52.8%	54.6	69.0%
FAC 7	31.9	28.9%	5.2	23.4%	14.1	17.8%
MEAN	**110.3**	**100.0%**	**22.2**	**100.0%**	**79.1**	**100.0%**

When comparing the number of enrolments and modules offered per faculty a further trend of uneven distribution is observed. This is caused by the organisational structure of faculties. Each faculty consists of various departments and each of these departments offer different modules. Tables 5.13 to 5.19 compare the median and mean enrolments per module for each department within a faculty. When comparing the mean and median enrolments per module per department in each faculty it is clear that there is no uniformity in the distribution of enrolments per module. The departmental mean and median enrolments per module not only differ from department to department within a faculty, but also differ from the mean and median enrolments per module for the related faculty. Tables 5.13 to 5.19 illustrate the difference in the mean and median enrolments per module for the departments within the various faculties.

Table 5.13 indicates that Faculty 1 has a mean of 107.5 enrolments per module and a median of 30.5 enrolments per module. The median represents only 27.9% of the mean. This means that there are more modules with a small number of enrolments and fewer modules with large number of enrolments in this faculty, causing a positive skewness in the faculty.

Table 5.22: Faculty 1 mean and median enrolments per module

			Enrolments per Module		
	Modules	**Enrolments**	**Median**	**Mean**	**% Median /Mean**
Fac1Dept1	14	2 322	147.0	165.9	88.6%
Fac1Dept2	12	1 686	121.0	140.5	86.1%
Fac1Dept3	2	22	11.0	11.0	100.0%
Fac1Dept4	2	749	374.5	374.5	100.0%
Fac1Dept5	107	17 560	82.0	164.1	50.0%
Fac1Dept6	107	3 316	15.0	31.0	48.4%
Fac1Dept7	12	103	8.0	8.6	93.2%
Fac1Dept8	159	12 123	44.0	76.2	57.7%
Fac1Dept9	248	33 415	30.5	134.7	22.6%
Total: Fac 1	**663**	**71 296**	**30.0**	**107.5**	**27.9%**

The departments within the faculty (with the exception of Departments 3 and 4, which have normal distributions) have medians relative to the departmental mean enrolments per module varying from 93.2% to as little as 22.6%, indicating the skewness of the distribution of enrolments per module. The bigger the difference between the median and the mean enrolments per module, the more skewed the distribution of enrolments per module.

As seen from Table 5.14, Faculty 2 has a mean of 89.3 and a median of 39 enrolments per module. The median for this faculty represents 43.7% of the mean indicating a positive skewness in the Faculty. The range of median enrolments per module as a percentage of the mean for the departments in this faculty ranges from 108.7% to 40.0%.

The information in Table 5.14 also indicates that all the departments of Faculty 2, with the exception of Department 3, have positively skewed distributions of enrolments per module since the median enrolments per module is lower than the mean. Department 3 has a median exceeding its mean by 8.7%, which indicates a negatively skewed distribution as well as that Department 3 has relatively more modules with an above-average number of students enrolled.

Table 5.23: Faculty 2 mean and median enrolments per module

			Enrolments per Module		
	Modules	**Enrolments**	**Median**	**Mean**	**% Median / Mean**
Fac2Dept1	39	8 876	136.0	227.6	59.8%
Fac2Dept2	66	12 624	104.5	191.3	54.6%
Fac2Dept3	10	276	30.0	27.6	108.7%
Fac2Dept4	44	5 445	49.5	123.8	40.0%
Fac2Dept5	35	6 197	127.0	177.1	71.7%
Fac2Dept6	54	3 375	42.0	62.5	67.2%
Fac2Dept7	263	8 814	25.0	33.5	74.6%
Total: Fac2	**511**	**45 607**	**39.0**	**89.3**	**43.7%**

The first interesting aspect to note from Table 5.15 is that Faculty 3, with 23 departments, has significantly more departments than Faculties 1(9) or 2(7). Faculty 3 further has a mean of 35.6 enrolments per module and a median representing only 47.7% of the mean. The median of 17.0 enrolments per module is substantially lower than all the other faculties' median enrolments. In contrast with the other faculties, Faculty 3 has six departments with medians exceeding their means, indicating a negative skewness. The remaining departments, with the exception of Departments 5, 7, 14 and 15 with normal distributions, have positively skewed distributions of enrolments per module. A positively skewed distribution means that these departments have many modules with low student enrolments, with only a few modules that have many student enrolments.

Table 5.24: Faculty 3 mean and median enrolments per module

			Enrolments per Module		
	Modules	**Enrolments**	**Median**	**Mean**	**% Median / Mean**
Fac3Dept1	60	5 155	76.0	85.9	88.5%
Fac3Dept2	10	297	7.0	29.7	23.6%
Fac3Dept3	6	34	2.0	5.7	35.3%
Fac3Dept4	41	1 252	17.0	30.5	55.7%
Fac3Dept5	2	11	5.5	5.5	100.0%
Fac3Dept6	4	17	1.0	4.3	23.5%
Fac3Dept7	1	11	11.0	11.0	100.0%
Fac3Dept8	25	74	2.0	3.0	67.6%
Fac3Dept9	3	17	6.0	5.7	105.9%
Fac3Dept10	7	38	5.0	5.4	92.1%
Fac3Dept11	3	5	1.0	1.7	60.0%
Fac3Dept12	6	21	4.0	3.5	114.3%
Fac3Dept13	27	200	5.0	7.4	67.5%
Fac3Dept14	1	7	7.0	7.0	100.0%
Fac3Dept15	2	7	3.5	3.5	100.0%
Fac3Dept16	4	287	74.0	71.8	103.1%
Fac3Dept17	3	131	58.0	43.7	132.8%
Fac3Dept18	27	262	8.0	9.7	82.4%

			Enrolments per Module		
	Modules	Enrolments	Median	Mean	% Median / Mean
Fac3Dept19	21	775	43.0	36.9	116.5%
Fac3Dept20	36	838	20.0	23.3	85.9%
Fac3Dept21	14	352	37.5	25.1	149.1%
Fac3Dept22	34	1 227	20.5	36.1	56.8%
Fac3Dept23	67	3 378	46.0	50.4	91.2%
Total: Fac3	**404**	**14 396**	**17.0**	**35.6**	**47.7%**

Although Table 5.16 shows that the range of the coverage of the mean enrolments per module by the median reaches from 108.6% to 7.4% for Faculty 4. Table 5.16 further indicates that Department 23 has a normal distribution of enrolments per module and Department 7 has a negatively skewed distribution of enrolments per module. Based on the data contained in Table 5.16, all the other departments have positively skewed distributions of enrolments per module, with a small number of modules with high student enrolments and a large number of modules with low student enrolments.

Table 5.25: Faculty 4 mean and median enrolments per module

			Enrolments per Module		
	Modules	Enrolments	Median	Mean	% Median / Mean
Fac4Dept1	49	3 575	35.0	73.0	48.0%
Fac4Dept2	53	1 439	6.0	27.2	22.1%
Fac4Dept3	16	1 576	11.5	98.5	11.7%
Fac4Dept4	41	7 006	108.0	170.9	63.2%
Fac4Dept5	17	332	17.0	19.5	87.0%
Fac4Dept6	45	6 647	11.0	147.7	7.4%
Fac4Dept7	16	140	9.5	8.8	108.6%
Fac4Dept8	17	467	9.0	27.5	32.8%
Fac4Dept9	21	2 254	39.0	107.3	36.3%
Fac4Dept10	14	202	12.0	14.4	83.2%
Fac4Dept11	93	596	6.0	6.4	93.6%
Fac4Dept12	19	295	5.0	15.5	32.2%
Fac4Dept13	28	3 232	82.5	115.4	71.5%
Fac4Dept14	12	267	5.5	22.3	24.7%
Fac4Dept15	11	206	16.0	18.7	85.4%
Fac4Dept16	17	71	3.0	4.2	71.8%
Fac4Dept17	14	568	9.5	40.6	23.4%
Fac4Dept18	10	70	50	7.0	71.4%
Fac4Dept19	16	4 030	104.0	251.9	41.3%
Fac4Dept20	47	13 129	93.0	279.3	33.3%
Fac4Dept21	21	1 218	52.0	58.0	89.7%
Fac4Dept22	35	5 234	78.0	149.5	52.2%
Fac4Dept23	2	336	168.0	168.0	100.0%
Total: Fac4	**614**	**52 890**	**13.0**	**86.1**	**15.1%**

Faculty 5 has the lowest number of departments (4) as illustrated in Table 5.17. Faculty 5 further has the highest median (149) and mean (204.9) number of enrolments per module of all the faculties at this specific South African university. The portion of the mean enrolments per module represented by the median for Faculty 5 ranges from 19.4% to 79.4%. These percentages indicate that all the departments in Faculty 5 have positively skewed distributions of enrolments per module, with all the departments' means exceeding the medians, indicating that the modules in these departments primarily have low numbers of student enrolments which makes the distribution of enrolments per module positively skewed.

Table 5.26: Faculty 5 mean and median enrolments per module

			Enrolments per Module		
	Modules	**Enrolments**	**Median**	**Mean**	**% Median / Mean**
Fac5Dept1	9	2 881	62.0	320.1	19.4%
Fac5Dept2	57	14 428	201.0	253.1	79.4%
Fac5Dept3	70	8 769	44.0	125.3	35.1%
Fac5Dept4	34	8 753	182.0	257.4	70.7%
Total: Fac 5	**170**	**34 831**	**149.0**	**204.9**	**72.7%**

Table 5.18 shows that Faculty 6 has the same number of departments as Faculty 3 and Faculty 4 (23). The median enrolments per module for Faculty 6 is 20 and the mean, 54.3. Departments 4, 8, 19 and 20 have medians exceeding their means, indicating that the distribution of enrolments per module is negatively skewed for these departments. All the other departments have positively skewed distributions. Table 5.18 further indicates that 19 out of the 23 departments have median scores lower than the mean enrolments per module, which again highlights that a high number of modules have low student numbers.

Table 5.18: Faculty 6 mean and median enrolments per module

			Enrolments per Module		
	Modules	**Enrolments**	**Median**	**Mean**	**% Median / Mean**
Fac6Dept1	37	6 035	37.0	163.1	22.7%
Fac6Dept2	46	2 580	26.5	56.1	47.2%
Fac6Dept3	43	2 656	36.0	61.8	58.3%
Fac6Dept4	25	995	42.0	39.8	105.5%
Fac6Dept5	12	476	33.5	39.7	84.5%
Fac6Dept6	81	7 333	64.0	90.5	70.7%
Fac6Dept7	66	8 800	20.5	133.3	15.4%
Fac6Dept8	4	91	24.0	22.8	105.5%
Fac6Dept9	50	2 124	15.0	42.5	35.3%
Fac6Dept10	40	1 044	13.5	26.1	51.7%
Fac6Dept11	6	131	21.5	21.8	98.5%

			Enrolments per Module		
	Modules	Enrolments	Median	Mean	% Median / Mean
Fac6Dept12	51	2 821	10.0	55.3	18.1%
Fac6Dept13	54	2 763	13.0	51.2	25.4%
Fac6Dept14	61	2 479	20.0	40.6	49.2%
Fac6Dept15	68	2 117	5.0	31.1	16.1%
Fac6Dept16	100	2 350	17.0	23.5	72.3%
Fac6Dept17	59	2 481	12.0	42.1	28.5%
Fac6Dept18	56	3 566	36.5	63.7	57.3%
Fac6Dept19	22	408	24.0	18.5	129.4%
Fac6Dept20	58	1 763	5.0	30.4	16.4%
Fac6Dept21	16	446	30.0	27.9	107.6%
Fac6Dept22	36	2 079	19.5	57.8	33.8%
Fac6Dept23	36	546	14.5	15.2	95.6%
Total: Fac 6	**1027**	**56 084**	**20.0**	**54.6**	**36.6%**

Faculty 7 has the smallest median (6) as well as mean (14.1) enrolments per module of all the faculties at the responding university, as illustrated in Table 5.19. The median represents 42.5% of the mean enrolments per module and most departments in Faculty 7 have median enrolments per module scores exceeding their mean enrolments per module, indicating that these departments have negatively skewed distributions of enrolments per module. A negatively skewed distribution of enrolments per module indicates that there are many modules with high student enrolment numbers.

Table 5.19: Faculty 7 mean and median enrolments per module

			Enrolments per Module		
	Modules	Enrolments	Median	Mean	% Median / Mean
Fac7Dept1	4	6	1.5	1.5	100.0%
Fac7Dept2	8	33	4.0	4.1	97.0%
Fac7Dept3	17	737	2.0	43.4	4.6%
Fac7Dept4	8	106	11.5	13.3	86.8%
Fac7Dept5	10	79	9.5	7.9	120.3%
Fac7Dept6	9	78	10.0	8.7	115.4%
Fac7Dept7	12	93	9.0	7.8	116.1%
Fac7Dept8	28	290	6.0	10.4	57.9%
Fac7Dept9	12	101	10.0	8.4	118.8%
Total: Fac 7	**108**	**1 523**	**6.0**	**14.1**	**42.5%**

Tables 5.13 to 5.19 illustrate that there are substantial differences between the mean and the median enrolments per module amongst the departments within a faculty as well as amongst the faculties. These tables indicate that some departments offer a large number of modules with a relatively small number of enrolments, while others offer a small number of modules with large number of enrolments.

Table 5.27: Summary table

Faculty	Modules	Enrolments	Departments	Median	Mean
FAC 1	663	71 296	9	30.0	107.5
FAC 2	511	45 607	7	39.0	89.3
FAC 3	404	14 396	12	17.0	35.6
FAC 4	614	52 890	23	13.0	86.1
FAC 5	170	34 831	4	149.0	204.9
FAC 6	1 027	56 084	23	20.0	54.6
FAC 7	108	1 523	9	6.0	14.1

Table 20 demonstrates that all faculties have an overall positive skewness in their data. Within faculties there are departments that have a negative skewness. A total of 8 departments (9.2%) in the faculties are perfectly distributed, 63 (72.4%) are positively skewed and 16 (13.8%) are negatively skewed.

Tables 5.13 to 5.20 serve as an indication of the great difference between the enrolments of the various modules from department to department within and amongst the faculties. The high difference between the mean and median enrolments per module indicate the highly skewed distribution of enrolments per module throughout the responding university. These tables confirm both the need and complexity to cost individual modules with the intent to set guidelines for each individual faculty (refer to chapter 4).

Tables 5.21 and 5.22 illuminate the skewness of the distribution of enrolments per module as mentioned in the previous paragraph by indicating the variation in class size. When comparing the distribution of modules according to class size, a further uneven distribution is noted. More than 42% of undergraduate module enrolments (Table 5.21) have fewer than 30 enrolments per module, but serves only 4.3% of undergraduate student enrolments. By contrast, only 95 (4.2%) undergraduate modules have more than 500 students enrolled per module, but servicing 33.1% of all undergraduate modules at the selected university.

Table 5.28: Enrolments per module categories – undergraduate

Categories	Modules	% Modules	Enrolments	% Enrolments	Enrolments per Module
1-30	959	42.4%	10 701	4.3%	11.2
31-100	648	28.7%	37 339	15.0%	57.6
101-200	333	14.7%	47 334	19.0%	142.1
201-500	225	10.0%	71 429	28.7%	317.5
501 +	95	4.2%	82 387	33.1%	867.2
TOTAL	**2 260**	**100.0%**	**249 190**	**100.0%**	**110.3**

The postgraduate module enrolments (Table 5.22) indicate a similar trend to the undergraduate modules in Table 5.21. More than 58% of the postgraduate modules have fewer than 10 enrolments, while 111 (9%) of 1 237 modules have more than 50 enrolments and service 53.6% of the NQF level 8 and 9 postgraduate students.

Table 5.22: Enrolments per module categories – postgraduate

Categories	Modules	% Modules	Enrolments	% Enrolments	Enrolments per Module
1-10	719	58.1%	3 039	11.1%	4.2
11-20	203	16.4%	3 025	11.0%	14.9
21-30	116	9.4%	2 913	10.6%	25.1
31-50	88	7.1%	3 765	13.7%	42.8
51+	111	9.0%	14 695	53.6%	132.4
TOTAL	**1 237**	**100.0%**	**27 437**	**100.0%**	**22.2**

Tables 5.21 to 5.22 illustrate the composition of the sampled modules and enrolments. Table 5.4 show that the sampled modules are representative of the population regarding the three campuses. Tables 5.6 to 5.10 and 5.12 focus on the sampled modules versus the number of enrolments per campus, per faculty, per NQF level and NQF weighting, as well as per funding weight. It is clear from the first 22 tables that a) the sample is an accurate reflection of the population in terms of both modules and enrolments; b) the number of modules differs significantly at the various campuses, faculties, NQF levels and funding weights; and c) the number of enrolments per module in different faculties, NQF levels and funding weights vary significantly. These characteristics of the sample increased the complexity of the discretionary decision-making regarding the methodology and basis of cost allocation.

Tables 5.23 to 5.25 show the skewness of the mean enrolments per module, as discussed in the previous paragraph, between faculties, NQF weightings and funding weights. These tables also indicate that there exist significant differences (0.000 at 0.01 level) between

the mean enrolments per module in the various faculties, NQF weighting and funding weights.

Table 5.29: Skewness of mean enrolments per module per faculty

Faculties	Number	Mean	Median	Z-value (skewness)	Std. Dev.
FAC 1	663	107.5	30.0	7.07	250.9
FAC 2	511	89.3	39.0	4.33	160.8
FAC 3	404	35.6	17.0	2.00	44.6
FAC 4	614	86.1	13.0	3.50	176.0
FAC 5	170	204.9	149.0	1.24	216.4
FAC 6	1 027	54.6	20.0	9.05	138.5
FAC 7	108	14.1	6.0	6.86	41.5
TOTAL	**3 497**	**79.1**	**22,0**	**6.75**	**175.4**
Significance		**0.000****			

****. The standard deviation is significant at the 0.01 level (1-tailed)**

Table 5.30: Skewness of mean enrolments per module per NQF weighting

Faculties	Number	Mean	Median	Z-value (skewness)	Std. Dev.
NQF W1	2 260	110	42	5.77	208
NQF W2	915	27	9	7.15	60
NQF W3	322	9	5	4.43	13
TOTAL	**3 497**	**79**	**22**	**6.75**	**175**
Significance		**0.000****			

****. The standard deviation is significant at the 0.01 level (1-tailed)**

Table 5.31: Skewness of mean enrolments per module per funding weight

Faculties	Number	Mean	Median	Z-value (skewness)	Std. Dev.
FW 1.0	513	161	66	5.54	289
FW 1.5	1 541	83	23	4.00	162
FW 2.5	250	36	23	6.07	64
FW 3.5	1 193	48	13	10.35	124
TOTAL	**3 497**	**79**	**22**	**6.75**	**175**
Significance		**0.000****			

****. The standard deviation is significant at the 0.01 level (1-tailed)**

The following formula illustrates the calculation of skewness utilised in this study.

Equation 5.23: Measure for skewness

$$z_{skewness} = \frac{\text{skewness}}{\sqrt{\frac{6}{\text{N}}}}$$

z = Measure for skewness

n = Number of sampled variables

Skewness = Refer to section 4.3.1.3.

A z-value exceeding ±2.58 indicates an abnormal (skewed) distribution (Hair et al., 2006: 80-81). As evident from Table 5.23, five of the seven faculties at this South African university, with the exception of Faculty 3 and Faculty 5, have non-normal distributions of enrolments per module in the faculties. All NQF weightings as well as funding weights have skewed distributions of mean enrolments per module as the z-values exceed 2.58.

The distribution of the sample does not only differ in regard to the enrolments per module, but also in regard to the number of credits (refer section 5.2 (i)) assigned to the modules. These credits influence the TIUs (refer to section 2.5.1.3.1) per module and, therefore, the amount of government subsidy received for each module. Table 5.26 summarises the wide range of credits per module.

Table 5.32: Number of modules at different credit levels

Credits	Modules	% Modules	Cumulative
1 - 7	191	5.5%	5.5%
8	658	18.8%	24.3%
9 - 11	48	1.4%	25.7%
12	203	5.8%	31.5%
13 - 15	12	0.3%	31.8%
16	**1 543**	**44.1%**	**75.9%**
17 - 19	4	0.1%	76.0%
20	186	5.3%	81.4%
21 - 23	2	0.1%	81.4%
24	194	5.5%	87.0%
25 - 31	43	1.2%	88.2%
32	269	7.7%	95.9%
33 +	144	4.1%	100.0%
Total	**3 497**	**100.0%**	

From Table 5.26 it is evident that the range of credits assigned to modules varies from 1 to more than 32 credits per module, which adds to the diversity of the sample in this study. The wide range of credits assigned to modules complicates the calculation of both the income and cost of a module since there is no uniform, standardised cost objective (such as all modules having the same number of credits).

Modules had to be normalised to represent a uniform cost objective. From Table 5.26 it is clear that the majority (44.1%) of modules have 16 credits, which is usually a module presented over a six-month period (semester). For the purpose of this study a 16-credit module was therefore used as the standardised measurement of the credits related to a

module in this study. A weighted module will represent a 16-credit module for all the calculations in this study. Table 5.27 shows the adjusted modules after they have been weighted to represent a norm of 16 credits.

Table 5.33: Weighted modules per faculty per NQF level

Faculties:	TOTAL	NQF 5	NQF 6	NQF 7	NQF 8	NQF 9
FAC 1	**472.6**	89.6	276.5	43.5	63.0	
FAC 2	**456.6**	47.7	95.0	95.6	144.8	73.6
FAC 3	**627.0**	37.0	61.5	133.3	225.3	169.9
FAC 4	**739.1**	126.0	146.8	195.5	240.0	30.9
FAC 5	**213.9**	28.0	25.5	35.3	53.5	71.7
FAC 6	**1 072.1**	96.0	215.8	208.8	438.1	113.5
FAC 7	**145.7**	11.0	7.0	19.0	43.0	65.7
TOTAL	**3 727.1**	**435.3**	**828.0**	**730.9**	**1 207.6**	**525.3**
% of Actual	**106.6%**	**76.9%**	**87.2%**	**98.2%**	**132.0%**	**163.1%**

The weighting of modules to ensure all modules represent 16 credits, increases our sample from 3 497 modules to 3 727.1 weighted modules, as seen in Table 5.27. Weighting the sample caused an increase of 6.6% in the total modules included (it implies that more modules had a weighting of more than one, as opposed to those modules with a weighting of lower than one). As for unweighted modules, Faculty 6 still presents the highest number of weighted modules (1 072.1: 1 027 unweighted), with Faculty 7 still presenting the lowest number of weighted modules (145.7: 108 unweighted). Table 5.27 further illustrates that the highest impact of the weighting of modules was at an NQF 9 level, where the weighted modules represent 163.1% of the original sampled modules. This is expected since credits usually increase with an increase in the NQF level. The process illustrated in Table 5.27 had the smallest impact on NQF 7 modules. The weighted modules represent 98.2% of the sampled modules at this NQF level. This indicates that there are more modules with fewer than 16 credits than 16-credit modules.

Weighting modules requires an adjustment to the number of enrolments to relate accurately to the weighted modules. Table 5.28 shows the results of the adjustment process for enrolments to represent a 16-credit weighted module.

Table 5.34: Number of enrolments (per 16-credit weighted module) per faculty and per NQF level

Faculties:	TOTAL	NQF 5	NQF 6	NQF 7	NQF 8	NQF 9
FAC 1	**46 077**	10 261	28 795	5 782	1 239	
FAC 2	**47 861**	8 615	18 410	14 050	5 902	885
FAC 3	**17 629**	2 072	3 429	5 397	5 824	907
FAC 4	**57 935**	25 241	19 469	10 996	2 093	136
FAC 5	**37 785**	9 515	7 958	6 384	13 591	338
FAC 6	**51 215**	19 222	18 010	7 501	4 839	1 645
FAC 7	**1 408**	650	100	185	252	222
TOTAL	**259 910**	**75 575**	**96 169**	**50 295**	**33 739**	**4 133**
% of Actual	**94.0%**	**83.3%**	**89.9%**	**97.7%**	**137.7%**	**140.9%**

The total number of enrolments in the sample decreased to 94%, as indicated in Table 5.28, with the weighting of modules. The biggest impact was at an NQF level 9 level (in line with the increased weighted modules), where the enrolments in the sample increased with 40.9% with the weighting of modules. NQF level 7, again in line with the impact of the module weightings, had the lowest impact, with the number of enrolments per 16-credit weighted module representing 97.7% of the sampled enrolments.

Tables 5.27 and 5.28 illustrated the effect of weighing modules to represent 16 credits. The uniformity of modules in terms of credits means that a breakeven point can be determined per faculty in terms of 16-credit modules. The next section of this chapter focuses on the calculation of the number of breakeven enrolments per faculty and NQF level.

5.5. Cost-volume-profit analysis of modules

Section 5.4 of this chapter provided a detailed overview of the modules and enrolments per campus, faculty, department, NQF level and funding weight of the related South African university forming part of the sample of this study. This section will analyse the teaching income as well as the direct costs related to the sampled modules and enrolments to determine the number of breakeven enrolments per module in the various faculties at different NQF levels in line with the methodology of this study discussed in chapter 4.

5.5.1. Teaching income

The teaching income for the selected university consists of the subsidy received from the government as well as the tuition income received from class fees (refer to section

4.6.2.1.). The first portion of teaching income is the government subsidy received based on the TIUs of a module, which is related to the number of enrolments, funding weights and the NQF levels of the specific module. The second part of teaching income, tuition income received, is directly dependant on the number of students enrolled in a module. Table 5.29 indicates the teaching income per faculty split between the subsidy and the tuition portion. This table further shows the percentage of teaching income that is received from the government in the form of a subsidy, as well as each faculty's percentage contribution to total teaching income.

Table 5.35: Teaching income per faculty

		Income (R '000)				
Faculties	**Modules**	**Subsidy**	**Tuition**	**Total Teaching**	**% Subsidy Income / Total Teaching Income**	**% Faculty Teaching Income Contribution**
FAC 1	663	53 748	123 694	177 442	30.3%	11.9%
FAC 2	511	103 831	165 451	269 282	38.6%	18.0%
FAC 3	404	111 140	63 260	174 400	63.7%	11.7%
FAC 4	614	120 957	176 632	297 589	40.6%	19.9%
FAC 5	170	40 803	98 702	139 505	29.2%	9.3%
FAC 6	1027	251 684	177 619	429 304	58.6%	28.7%
FAC 7	108	4 117	4 417	8 534	48.2%	0.6%
Total	**3497**	**686 280**	**809 775**	**1 496 056**	**45.9%**	**100.0%**

From Table 5.29 it is evident that the portion of the subsidy income received from government and the tuition fees charged to students varies greatly amongst faculties. Faculty 5's teaching income comprises 29.2% government subsidy and 70.8% tuition income from students, as opposed to Faculty 3 receiving 63.7% of its teaching income from the government, with only 36.3% of the total teaching income collected from students as tuition fees. The variance in the ratio between subsidy and tuition income provides proof that the tuition fees at this university is not related to the funding weights assigned to modules as determined by the Department of Higher Education, Science and Technology.

Table 5.29 further indicates that Faculty 6 received the highest portion of the total income of all the faculties at this university at 28.7%. Faculty 6 also received the highest amount of subsidy (R251 684 429) and tuition income (R177 619 380). Faculty 7 received the lowest amount of subsidy (R4 116 672) and tuition income (R4 416 980). Apart from the highest- and lowest-earning faculties, no other faculties are ranked in the same order in regard to their subsidy and tuition income received.

The total teaching income presented in Table 5.29 is calculated per module in Table 5.30. Table 5.30 indicates the skewness of the distribution of the teaching income per module for each faculty by comparing the median and the mean teaching income per module.

Table 5.36: Teaching income split per module per faculty

	Income per module						
Faculties	**Subsidy**		**Tuition**		**Teaching**		**TOTAL**
	Median	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median / Mean**
FAC 1	23 654	81 068	58 800	186 567	81 720	267 635	30.8%
FAC 2	52 864	203 191	85 250	323 779	151 142	526 970	26.2%
FAC 3	105 158	275 099	67 830	156 584	174 721	431 682	40.1%
FAC 4	53 920	196 999	55 900	287 674	115 901	484 673	22.7%
FAC 5	131 213	240 018	427 340	580 602	585 525	820 619	68.1%
FAC 6	103 168	245 068	64 020	172 950	179 182	418 017	40.0%
FAC 7	24 019	38 117	18 215	40 898	48 611	79 015	53.5%
Total	**67 200**	**196 248**	**65 000**	**231 563**	**136 668**	**427 811**	**30.9%**
Significance		**0.000****		**0.000****			

****. The standard deviation is significant at the 0.01 level (1-tailed)**

From Table 5.30 it is clear that all seven faculties have a positively skewed distribution of teaching income per module as illustrated by the positive difference between the mean and the median. This implies that there are a few modules on campus earning a high teaching income per module with a large number of modules earning a low teaching income per module.

From Table 5.30 can further be observed that the size of the median income per module for subsidy income ranges from R23 654 in Faculty 1 (lowest) to R131 213 in Faculty 5 (highest). The median for tuition income has an even wider range, with the highest median income per module being R427 340 for Faculty 5 and the lowest R18 215 for Faculty 7. If the mean subsidy income per module is compared per faculty, Faculty 3 has the highest mean subsidy income per module at R275 099 and Faculty 7 has the lowest mean subsidy income per module at R38 117. For tuition income, the ranking of mean income per module for the faculties varies from the mean subsidy income per module, with the highest income belonging to Faculty 5 at R580 525 to the lowest tuition income per module being R40 898 for Faculty 7. Table 5.30 indicates a significant difference (0.000 at 0.01 level) of subsidy income and tuition, confirming the complexity of the income distribution.

Table 5.31 indicates that both the median and mean teaching income per module varies greatly amongst faculties and benchmarking should, as a minimum, take place at the

faculty level. The skewed distribution of the teaching income per module for the faculties as discussed in the previous paragraph is confirmed in Table 5.31. Table 5.31 confirms that there exists a significant difference (0.000 at a 0.05 level) between the mean teaching income per module for the various faculties. The median teaching income per module for all faculties in Table 5.31 is lower than the mean which indicates that all faculties have positively skewed distributions. Table 5.31 further confirms that only Faculties 3 (z-value 2.14) and 5 (z-value 2.38) have distributions of teaching income per module that are not highly skewed.

Table 5.37: Skewness of mean teaching income per module per faculty

		Teaching income per module			
Faculties	**Modules**	**Mean**	**Median**	**Z-value (skewness)**	**Std. Dev.**
FAC 1	663	267 635	81 720	4.37	526 915
FAC 2	511	526 970	151 142	3.73	991 094
FAC 3	404	431 682	174 721	2.14	555 581
FAC 4	614	484 673	115 901	3.36	925 138
FAC 5	170	820 619	585 525	2.38	972 546
FAC 6	1 027	418 017	179 182	5.31	753 989
FAC 7	108	79 015	48 611	4.03	123 116
TOTAL	**3 497**	**427 811**	**136 668**	**4.21**	**782 760**
Significance		**0.000****			

****. The standard deviation is significant at the 0.05 level (1-tailed)**

Tables 5.29 to 5.31 illustrated the mean and median teaching income per module for the different faculties. These three tables indicated the skewness of the mean teaching income distribution and the significant difference of the mean teaching income per module among the different faculties. Tables 5.32 to 5.34 display the mean and median income per module at the different NQF levels.

Table 5.32 clearly indicates the decrease in teaching income as the NQF level increases. The Teaching income for NQF weighting 1 is R1 192 114 905. This amount decreases to R256 602 832 for NQF weighting 2, with an even further decrease to R47 337 821 for NQF weighting 3. Table 5.32 confirms that the tuition fees set by the selected university is not related to the government subsidy received. The ratio of the subsidy portion of teaching income increases with an increase in NQF level (from 42.7% for NQF weighting 1 to 67.8% for NQF weighting 3).

Table 5.38: Teaching income per NQF level

		Income				
NQF level:	**Modules**	**Subsidy**	**Tuition**	**Total Teaching**	**% Subsidy Income / Teaching Income**	**% NQF Teaching Income contribution**
NQF 5	566	165 128	200 044	365 172	45.2%	24.4%
NQF 6	950	217 526	306 052	523 578	41.5%	35.0%
NQF 7	744	126 010	177 355	303 365	41.5%	20.3%
Undergraduate (W1)	**2260**	**508 664**	**683 451**	**1 192 115**	**42.7%**	**79.7%**
NQF 8 (W2)	915	145 541	111 062	256 603	56.7%	17.2%
NQF 9 (W3)	322	32 076	15 262	47 338	67.8%	3.2%
Postgraduate	**1237**	**177 616**	**126 324**	**303 941**	**58.4%**	**20.3%**
Total	**3497**	**686 280**	**809 775**	**1 496 056**	**45.9%**	**100.0%**

From Table 5.32 can further be deducted that undergraduate modules produce the biggest portion of total teaching income (79.7%). Modules at an NQF level 6 produce the highest total teaching income (R523 577 681) and modules on an NQF 9 level produce the lowest total teaching income (R47 337 821).

The total teaching income at the different NQF levels is calculated per module in Table 5.33. Table 5.33 compares the median and mean income per module for all three income elements mentioned and, as with the enrolments per module explained earlier in this chapter, the mean and the median is not the same; in fact, Table 5.33 shows that at all NQF levels, the median is lower than 42% of the mean. This confirms that the distribution of the mean subsidy, tuition and teaching income per module at the different NQF levels is positively skewed. Table 5.33 shows that there exists a significant difference for both the mean subsidy and tuition income per module amongst the different NQF levels.

Table 5.39: Teaching income split per module per NQF level

	Income per Module						
NQF level:	**Subsidy**		**Tuition**		**Teaching**		**TOTAL**
	Median	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median / Mean**
NQF 5	76 186	291 745	115 355	353 435	200 494	645 180	29.7%
NQF 6	76 890	228 975	109 813	322 160	199 230	551 134	33.9%
NQF 7	83 725	169 368	86 140	238 381	178 366	407 749	41.7%
Undergraduate	**78 963**	**225 072**	**103 408**	**302 412**	**192 678**	**527 484**	**34.6%**
NQF 8	67 200	159 061	42 090	121 379	117 415	280 440	39.0%
NQF 9	33 600	99 614	17 840	47 398	58 642	147 012	35.0%
Postgraduate	**58 454**	**143 586**	**35 778**	**84 389**	**102 116**	**213 726**	**41.3%**
Total	**67 200**	**196 248**	**65 000**	**231 563**	**136 668**	**427 811**	**30.9%**
Significance		**0.000****		**0.000****			

****. The standard deviation is significant at the 0.01 level (1-tailed)**

The skewed distribution of the teaching income per module at the different NQF weightings is observed in Table 5.34. This table confirms that there exists a significant difference between the mean teaching income per module at the different NQF weightings. The final observation from Table 5.34 is that the distribution of mean teaching income per module is highly skewed at all three NQF weightings since the z-values exceed 2.58.

Table 5.40: Skewness of teaching income per module per NQF weighting

		Teaching Income			
Faculties	**Number**	**Mean**	**Median**	**Z-value (skewness)**	**Std. Dev.**
NQF W 1	2 260	527 484	193 010	3.70	894 947
NQF W 2	915	280 440	117 415	5.20	509 782
NQF W 3	322	147 012	58 642	4.44	292 713
TOTAL	**3 497**	**427 811**	**136 668**	**4.21**	**782 760**
Significance		**0.000****			

****. The standard deviation is significant at the 0.05 level (1-tailed)**

Tables 5.32 to 5.34 illustrated the mean and median teaching income per module at different NQF levels. These three tables indicated the skewness of the mean teaching income distribution as well as the significant difference of the mean teaching income per module among the various NQF weightings.

The data contained in Tables 5.29 to 5.34 can be summarised in Table 5.35, which contains the total teaching income per faculty as well as NQF level. From Table 5.35 can be deducted that the teaching income decreases with an increase in NQF level (24.4% at NQF 5 and 3.2% at NQF 9). The biggest contributors to teaching income are therefore undergraduate modules (NQF 5-7; 79.7%).

Table 5.41: Total teaching income per faculty per NQF level (R '000)

Faculties:	**Total**	**NQF 5**	**NQF 6**	**NQF 7**	**NQF 8**	**NQF 9**
FAC 1	177 442	39 332	105 915	25 603	6 593	-
FAC 2	269 282	40 522	94 614	82 490	42 476	9 180
FAC 3	174 400	17 875	27 639	44 922	73 045	10 918
FAC 4	297 589	115 506	105 012	58 613	17 622	836
FAC 5	139 505	33 626	29 327	23 401	51 716	1 437
FAC 6	429 304	114 831	160 532	67 317	63 300	23 324
FAC 7	8 534	3 480	539	1 019	1 852	1 643
TOTAL	**1 496 056**	**365 172**	**523 578**	**303 365**	**256 603**	**47 338**
% of Total	**100.0%**	**24.4%**	**35.0%**	**20.3%**	**17.2%**	**3.2%**

The single highest teaching income in Table 5.35 is R160.5 million for Faculty 6 at an NQF 6 level. From Table 5.35 it seems that the higher funding weight associated with postgraduate modules does not ensure that postgraduate modules have a higher teaching income compared to undergraduate modules. Teaching income information in this section has been illustrated per faculty and NQF level, but can also be indicated by funding weight as seen in Table 5.36.

Table 5.42: Teaching income split per funding weight

		Income (R'000)				
Funding weight	**Modules**	**Subsidy**	**Tuition**	**Teaching**	**% Subsidy Income /Teaching Income**	**% FW Teaching Income/Total**
FW 1.0	513	77 934	175 048	252 982	30,8%	16,9%
FW 1.5	1 541	267 050	406 870	673 920	39,6%	45,0%
FW 2.5	250	53 199	37 607	90 806	58,6%	6,1%
FW 3.5	1 193	288 098	190 250	478 348	60,2%	32,0%
TOTAL	**3 497**	**686 280**	**809 775**	**1 496 056**	**45,9%**	**100,0%**

Table 5.36 confirms the irregular patterns identified in Table 5.29 and 5.32 in regard to the ratio of subsidy versus tuition income. In Table 5.36 it is observed that the subsidy portion of teaching income increases with an increase in funding weight. This observation means that the tuition fees set by the related university are not necessarily in line with what the government regards as sufficient compensation for a module. At a funding weight of 1.0, the total teaching income is R253.0 million of which 30.8% is income received from government. At a funding weight of 3.5, the total teaching income is R478.3 million of which 60.2% was received from the government subsidies.

Table 5.37 explains the teaching income per module at the different funding weights from the perspective of the z-values and significant differences. Table 5.37, therefore, illustrates that the distribution of teaching income per module per funding weight is highly skewed based on the z-value explained in section 5.2. For all the funding weights, the median teaching income per module is lower than the mean teaching income per module which again confirms that the distribution of the mean teaching income per module for all funding weights is positively skewed. The last conclusion from Table 5.37 is that the mean teaching income per module does not differ significantly (0.075) amongst the different funding weights. If the funding weights per module had such a big influence, it is expected that the mean teaching income per module will be the highest at FW 3.5, which is not the case, as the highest mean is found at FW1.

Table 5.43: Skewness of teaching income per module per funding weight

		Teaching income per module per funding weight			
Funding weight	**Number**	**Mean**	**Median**	**z-value**	**Std. Dev.**
FW 1.0	513	493 143	183 950	3.40	790 314
FW 1.5	1 541	437 326	117 357	3.86	853 835
FW 2.5	250	363 222	199 576	4.60	542 371
FW 3.5	1 193	400 962	139 661	5.13	722 402
TOTAL	**3 497**	**427 811**	**136 668**	**4.21**	**782 760**
Significance		**0.075**			

Teaching income varies significantly amongst faculties and NQF levels, as well as between undergraduate and postgraduate NQF levels. Teaching income, as well as its main contributors, i.e. government subsidy received and tuition income per module, have significantly skewed distributions of which the majority are positively skewed. The skewness reiterates the reason why individual modules' income was taken into account in the process of setting certain benchmarks per faculties in this study. The next section illustrates the cost allocation that was done as part of the calculation of the breakeven enrolments per module explained in section 4.6.2.2.

5.5.2. Cost Allocation and calculation of breakeven enrolments

The total teaching income as illustrated Table 5.29 to Table 5.37 is utilised to calculate a benchmarked breakeven number of enrolments per module per faculty and NQF level. The breakeven point formula was explained in section 4.6.2.2.1 and requires the calculation of total teaching income per enrolment per 16-credit weighted module (see Table 5.28). Table 38 illustrates the teaching income per enrolment per 16-credit weighted module for each faculty per NQF level at the selected South African university.

Table 5.44: Teaching income per enrolment per 16-credit weighted module

		Teaching income per enrolment per 16-credit weighted module				
Faculties:	**Total**	**NQF 5**	**NQF 6**	**NQF 7**	**NQF 8**	**NQF 9**
FAC 1	**3 851**	3 833	3 678	4 428	5 321	
FAC 2	**5 626**	4 704	5 139	5 871	7 197	10 371
FAC 3	**9 893**	8 626	8 061	8 324	12 542	12 034
FAC 4	**5 137**	4 576	5 394	5 330	8 419	6 136
FAC 5	**3 692**	3 534	3 685	3 665	3 805	4 256
FAC 6	**8 382**	5 974	8 914	8 975	13 082	14 183
FAC 7	**6 060**	5 355	5 388	5 524	7 350	7 413
TOTAL	**5 756**	**4 832**	**5 444**	**6 032**	**7 606**	**11 455**

Evident from Table 5.38 is that Faculty 3 has the highest teaching income per enrolment per 16-credit weighted module at R9 893. The lowest teaching income per enrolment per 16-credit weighted module is R3 692 in Faculty 5. From an NQF level perspective, NQF 9 has the highest teaching income per enrolment per 16-credit weighted module at an amount of R11 455, and NQF 5 the lowest at an amount of R4 832. The teaching income per weighted module increases with an increase in the NQF level. This increase is as expected since the funding weight increases with an increase in the NQF level, which leads to an increase in teaching income.

The breakeven formula (see section 4.6.2.2.1.) requires the total fixed cost of an organisation as well as the variable cost per cost object. Tables 5.39 and 5.40 highlight the results of the cost allocation performed in this study based on the assumptions explained in section 4.6.2.2.1. Although most, if not all, of the direct costs of the related university could be regarded as fixed costs, the discretionary decision was taken that the size of a module (number of enrolments) does have an effect on the associated cost of presenting the module. Thus, 80% of the direct teaching costs were allocated per module as fixed costs, while the other 20% per enrolment per module were allocated as variable costs. Illustrated in Table 5.39 is that the university as a whole has R550.6 million as the fixed portion (80%) of teaching-related costs (60% of direct costs). The variable portion of teaching-related costs for the university as a whole amounts to R137.7 million. The total cost per faculty (actual cost) is also shown in Table 5.39 in the same ratio.

Table 5.45: Fixed allocated cost per module and variable allocated cost per enrolment

ASSUMPTIONS:					
FIXED	**80%**		**per Module**		
VARIABLE	**20%**		**per Enrolment**		
	Direct		**Direct**		
FACULTIES	**Costs ('000)**	**% Teach**	**Teach Cost**	**Fixed**	**Variable**
FAC 1	138 737	60%	83 242	66 594	16 648
FAC 2	148 382	60%	89 029	71 223	17 806
FAC 3	190 759	60%	114 455	91 564	22 891
FAC 4	194 515	60%	116 709	93 367	23 342
FAC 5	51 014	60%	30 609	24 487	6 122
FAC 6	406 850	60%	244 110	195 288	48 822
FAC 7	16 851	60%	10 110	8 088	2 022
TOTAL	**1 147 108**	**60%**	**688 265**	**550 612**	**137 653**

Table 5.40 illustrates the fixed costs per module as well as the variable costs per enrolment for the various faculties at the related university. For the purpose of this section, module

will refer to the weighted modules illustrated in Table 5.27 and enrolments refer to the enrolments related to a 16-credit weighted module as illustrated in Table 5.28.

Table 5.46: Direct fixed allocated cost per module and variable allocated cost per enrolment

FACULTIES	Direct Fixed Costs ('000)	Weighted Modules	Direct Fixed Cost/Module	Direct Variable Costs ('000)	Enrolments per weighted module	Direct Variable Cost/Enrolment
FAC 1	66 594	473	**140 902**	16 648	46 077	**361.3**
FAC 2	71 223	457	**155 978**	17 806	47 861	**372.0**
FAC 3	91 564	627	**146 036**	22 891	17 629	**1 298.5**
FAC 4	93 367	739	**126 321**	23 342	57 935	**402.9**
FAC 5	24 487	214	**114 458**	6 122	37 785	**162.0**
FAC 6	195 288	1 072	**182 161**	48 822	51 215	**953.3**
FAC 7	8 088	146	**55 519**	2 022	1 408	**1 436.0**
TOTAL	**550 612**	**3 727**	**147 733**	**137 653**	**259 910**	**529.6**

The total direct fixed allocated cost per module for the university as a whole amounts to R147 733 as illustrated in Table 5.40. Faculties 1, 3, 4, 5 and 7 have direct fixed allocated costs per module less than the university norm, while Faculties 2 and 6 have direct fixed allocated costs per module exceeding the university norm. The variable allocated cost per enrolment as derived from Table 5.40 for the university as a whole is R529.60. Faculties 1, 2, 4, and 5 have a direct variable allocated cost per enrolment less than the university's cost. Faculties 3, 6 and 7's direct variable allocated cost per enrolment exceeds the university's cost. These results, with the exception of Faculty 7, is in line with the fact that both Faculties 3 and 6 are at the funding weight of 3.5, thus regarded by government to be more expensive to present.

Table 5.41 provides the results of using the amounts in Tables 5.38 to 5.40 to calculate the number of breakeven enrolments per faculty per NQF level. The number of breakeven enrolments for undergraduate modules (NQF 5 to 7) for the university as a whole is 34.3, 30.1 and 26.9 for NQF level 5, 6 and 7 respectively. The breakeven enrolments for the university as a whole decrease substantially from undergraduate to postgraduate programs. The breakeven number of enrolments for the responding university for NQF level 8 and 9 are 20.9 and 13.5 respectively. This decrease in the required breakeven number of enrolments from undergraduate to postgraduate modules are applicable to all faculties at the related university, as illustrated in Table 5.41 and, again, is aligned with the increase in the NQF weightings (increase in subsidies) for the postgraduate modules.

Another notable observation from Table 5.41 is that the number of breakeven enrolments per module decreases in line with an increase in funding weights associated with a faculty. Faculty 1, for example, is funded at a weighting of one, while Faculty 6 is funded at a 3.5 weighting. The breakeven enrolments for an NQF level 6 for Faculty 1 are 42.5, but 22.9 for Faculty 6.

Table 5.47: Breakeven enrolments per faculty module per NQF level (direct expenses only

Faculties:	TOTAL	NQF 5	NQF 6	NQF 7	NQF 8	NQF 9
FAC 1	**40.4**	40.6	42.5	34.6	28.4	
FAC 2	**29.7**	36.0	32.7	28.4	22.9	15.6
FAC 3	**17.0**	19.9	21.6	20.8	13.0	13.6
FAC 4	**26.7**	30.3	25.3	25.6	15.8	22.0
FAC 5	**32.4**	33.9	32.5	32.7	31.4	28.0
FAC 6	**24.5**	36.3	22.9	22.7	15.0	13.8
FAC 7	**12.0**	14.2	14.0	13.6	9.4	9.3
TOTAL	**28.3**	**34.3**	**30.1**	**26.9**	**20.9**	**13.5**

Where the enrolments of a module are lower than the breakeven norm set in Table 5.41, the module will incur a direct loss. Modules with enrolments exceeding the breakeven norm set in Table 5.41 will have a direct profit. The next section analyses the direct profit or loss of the various faculties, NQF levels and funding weights.

5.5.3. Direct profit

Direct profit is calculated when the direct costs of a cost objective are deducted from the direct income. Table 5.35 illustrated how great the difference in the teaching income per faculty and NQF level is while Table 5.40 revealed the difference in the direct expenses per faculty. These differences in the distribution of teaching income and direct expenses amongst faculties and NQF levels imply that the direct profit or loss also differ among faculties and NQF level. Table 5.41 indicated the minimum enrolments per module per faculty and NQF level required to break even. Tables 5.42 to 5.44 show the impact of the break-even number of enrolments, calculated in the previous section, by splitting the sampled modules between those making a direct profit and a direct loss (negative direct profit) per faculty (Table 5.42), NQF level (Table 5.43) and funding weight (Table 5.44).

Table 5.48: The number of modules making a positive and negative direct profit per faculty

		Direct Profit or Loss		
Faculties:	**Modules**	**Profit**	**Loss**	**%Loss**
FAC 1	663	301	362	54.6%
FAC 2	511	328	183	35.8%
FAC 3	404	213	191	47.3%
FAC 4	614	273	341	55.5%
FAC 5	170	119	51	30.0%
FAC 6	1027	516	511	49.8%
FAC 7	108	31	77	71.3%
TOTAL	**3497**	**1781**	**1716**	**49.1%**

Table 5.42 demonstrates that in Faculties 1, 4 and 7, more than 50% of the modules are making a direct loss, while only Faculties 2 and 5 have more than 64% of their modules presented at a direct profit.

Table 5.49: The number of modules making a positive and negative direct profit per NQF level

		Direct Profit or Loss		
NQF level:	**Modules**	**Profit**	**Loss**	**% Loss**
NQF 5	566	369	197	34.8%
NQF 6	950	579	371	39.1%
NQF 7	744	411	333	44.8%
Undergraduate (W 1)	**2260**	**1 359**	**901**	**39.9%**
NQF 8 (W 2)	915	359	556	60.8%
NQF 9 (W 3)	322	63	259	80.4%
Postgraduate	**1237**	**422**	**815**	**65.9%**
TOTAL	**3497**	**1 781**	**1 716**	**49.1%**

Table 5.50: The number of modules making a positive and negative direct profit per funding weight

		Direct Profit or Loss		
Funding weights:	**Modules**	**Profit**	**Loss**	**% Loss**
FW 1.0	513	303	210	40.9%
FW 1.5	1 541	795	746	48.4%
FW 2.5	250	144	106	42.4%
FW 3.5	1 193	539	654	54.8%
FW Total	**3 497**	**1 781**	**1 716**	**49.1%**

Table 5.43 clearly indicates that most of postgraduate modules are not profitable, with 65.9% of the sampled modules operating at a direct loss, whereas only 39.9% of undergraduate modules are incurring a direct loss. From Tables 5.42 to 5.44 it is deducted that 49.1% of the sampled modules are making a direct loss. These tables confirm for one

traditional South African university the threat to its financial sustainability, as stated in the background to this study (refer to section 1.1).

According to Table 5.44, the overall trend is that the percentage of modules making a loss increases with an increase in funding weight. The monetary direct profits and direct losses per module for each faculty are presented in Table 5.45. Faculty 3 incurs the highest direct loss per module at R189 749, whereas the highest profit per module is incurred in Faculty 5 (R982 162). Table 5.45 further illustrates that the direct profits per module and direct losses per module differ amongst the faculties.

Table 5.51: Direct profit and direct loss per module per faculty

	Direct Profit			Direct Loss		
Faculties:	**Modules**	**Total ('000)**	**Per Module**	**Modules**	**Total ('000)**	**Per Module**
FAC 1	301	119 612	397 381	362	- 25 412	- 70 199
FAC 2	328	193 304	589 341	183	- 13 051	- 71 318
FAC 3	213	96 186	451 579	191	- 36 242	- 189 749
FAC 4	273	216 501	793 045	341	- 35 621	- 104 461
FAC 5	119	116 877	982 162	51	- 7 981	- 156 482
FAC 6	516	248 054	480 725	511	- 62 860	- 123 014
FAC 7	31	2 392	77 162	77	- 3 969	- 51 543
TOTAL	**1 781**	**992 927**	**557 511**	**1 716**	**- 185 136**	**- 107 888**

Tables 5.46 indicates that the difference in the mean direct profit or loss per module amongst faculties is significant (0.000 at 0.01 level). From Table 5.46 can also be deducted that the distribution of the mean direct profit per module is greatly skewed for all faculties except Faculty 3 and Faculty 5. These two faculties have a skewness measure below 2.58 (refer to section 5.4). Finally, Table 5.46 indicates that all faculties' median direct profit or loss per module is lower than the mean direct profit per module, which implies that the mean direct profit per module distribution for all faculties is positively skewed. The implication of this positively skewed distribution is that the selected university have a large number of modules earning a small direct profit (or a loss), with only limited modules earning a large direct profit.

Table 5.52: Skewness of direct profit per module per faculty

		Direct profit per Module per Faculty			
Faculties:	**Number**	**Mean**	**Median**	**Z-value (skewness)**	**Std. Dev.**
FAC 1	663	142 081	- 18 072	4.39	475 690
FAC 2	511	352 745	27 311	3.90	896 833
FAC 3	404	148 377	2 337	1.30	489 376

		Direct profit per Module per Faculty			
Faculties:	**Number**	**Mean**	**Median**	**Z-value (skewness)**	**Std. Dev.**
FAC 4	614	294 593	- 26 043	3.26	849 241
FAC 5	170	640 569	445 234	2.09	930 977
FAC 6	1 027	180 325	751	4.88	646 905
FAC 7	108	- 14 600	- 24 106	3.30	97 133
TOTAL	**3 497**	**230 995**	**2 286**	**4.07**	**703 698**
Significance		**0.000****			

****. The standard deviation is significant at the 0.01 level (1-tailed)**

Table 5.43 revealed that relatively more modules are incurring a direct loss at postgraduate level than at undergraduate level. The amounts accompanying this information are presented in Table 5.47. This table indicates that 1 359 undergraduate modules are operating at a direct profit, incurring a mean direct profit of R623 735 per module, while only 422 postgraduate modules are incurring a profit of R344 243 per module. Postgraduate modules also incur greater direct losses per module (-R145 719) compared to undergraduate modules (-R73 668).

Table 5.53: Direct profit and direct loss per module per NQF level

	Modules with Direct Profit			Modules with Direct Loss		
NQF level:	**Modules**	**Total ('000)**	**Per Module**	**Modules**	**Total ('000)**	**Per Module**
NQF 5	369	273 241	740 491	197	- 11 329	- 57 510
NQF 6	579	378 441	653 612	371	- 26 918	- 2 556
NQF 7	411	195 974	476 822	333	- 28 127	- 84 465
Undergraduate (W 1)	**1 359**	**847 656**	**623 735**	**901**	**- 66 375**	**- 73 668**
NQF 8 (W 2)	359	130 038	362 222	556	- 74 644	- 134 252
NQF 9 (W 3)	63	15 233	241 791	259	- 44 117	- 170 336
Postgraduate	**422**	**145 271**	**344 243**	**815**	**- 118 761**	**- 145 719**
TOTAL	**1 781**	**992 927**	**557 511**	**1 716**	**- 185 136**	**- 107 888**

Table 5.48 serves as an indication that the differences in direct profit per module within the different NQF weightings are significant (0.000 at 0.01 level). From Table 5.48 can also be seen that only NQF W 3 has a distribution of mean direct profit per module that is not highly skewed, since the NQF W 3's skewness measure is below 2.58 (refer to section 5.4). Therefore, although this NQF weighting's distribution is not normal, the data can be used for further analysis without any further adjustments.

Table 5.54: Skewness of direct profit per module per NQF weighting

		Direct Profit per Module per NQF weighting			
Faculties:	**Number**	**Mean**	**Median**	**Z-value (skewness)**	**Std. Dev.**
NQF W 1	2 260	345 700	50 975	3.65	794 492
NQF W 2	915	60 539	- 53 748	5.22	455 155
NQF W 3	322	- 89 703	- 87 609	1.96	287 226
TOTAL	**3 497**	**230 995**	**2 286**	**4.07**	**703 698**
Significance		**0.000****			

****. The standard deviation is significant at the 0.01 level (1-tailed)**

The increase in the NQF level of a module causes a higher funding weight at which the government subsidy will be received. Table 5.47 indicated that the direct profit per module decreases as the NQF level increase. Table 5.49 enhances the findings in Table 5.47 since it illustrates that the direct profit per module decreases with an increase in funding weight. The direct profit per module decreases from R634 852 at funding weight 1 to R515 802 at funding weight 3.5 which means that it would be incorrect to promote modules funded at a higher funding weight, expecting that these modules earn a higher direct profit.

Table 5.55: Direct profit and direct loss per module per funding weight

	Modules with Direct Profit			Modules with Direct Loss		
Funding weights:	**Modules**	**Total ('000)**	**Per Module**	**Modules**	**Total ('000)**	**Per Module**
FW 1.0	303	192 360	634 852	210	- 20 219	- 96 281
FW 1.5	795	477 951	601 196	746	- 64 352	- 86 263
FW 2.5	144	44 599	309 714	106	- 11 547	- 108 933
FW 3.5	539	278 017	515 802	654	- 89 018	- 136 114
TOTAL	**1 781**	**992 927**	**557 511**	**1 716**	**-185 136**	**-107 888**

Table 5.50 indicates that the distribution of the mean direct profit per module at all four funding weights is skewed since the skewness measure at all four funding weight levels is above 2.58 (see section 5.4). Table 5.50 further confirms that the mean direct profit per module amongst funding weights differs significantly (0.000 at 0.01 level).

Table 5.56: Skewness of direct profit per module per funding weighting

		Direct profit per module per funding weight			
Faculties:	**Number**	**Mean**	**Median**	**Z-value (skewness)**	**Std. Dev.**
FW 1.0	513	335 558	57 176	3.13	719 200
FW 1.5	1 541	268 396	4 012	3.93	780 323
FW 2.5	250	132 208	24 322	4.90	475 728
FW 3.5	1 193	158 423	- 27 051	4.57	618 375
TOTAL	**3 497**	**230 995**	**2 286**	**4.07**	**703 698**

		Direct profit per module per funding weight			
Faculties:	**Number**	**Mean**	**Median**	**Z-value (skewness)**	**Std. Dev.**
Significance		**0.000****			

****. The standard deviation is significant at the 0.01 level (1-tailed)**

Tables 5.42 to 5.50 confirm the financial crisis, as described in chapter 1, traditional universities are facing, with a large number of teaching modules being presented at a loss. These tables reiterate that university and faculty management have important strategic decisions to make to ensure that this institution remains financially sustainable in the future.

This chapter started with a description of the complexity of the sample in this study based on different variables impacting the diversity of the modules (services) presented. It further illustrated the results of the breakeven enrolments calculation per faculty and NQF level. The impact of the breakeven number of enrolments was seen illustrated in the last few tables in this section where the modules per faculty and NQF level were sorted in terms of whether it incurred a direct profit or direct loss. Tables 5.1 to 5.49 serve as evidence of the need for accurate costing information regarding the modules at universities to enable administrators and faculty managements at these institutions to make the required decisions to aid in the future financial sustainability of these institutions. The next part of this chapter explores the relationship between the variables described in the preceding tables. These relationships will assist in determining how the different factors and variables described in this section affect the financial viability of teaching modules at the selected South African university.

5.6. The drivers of direct profits

The strategic drive at the university chosen is often to promote the faculties with the highest funding weights and postgraduate programmes (NQF levels 8 and 9) (University of the Free State, 2018b: 7). Their reasoning behind it is that faculties and departments with higher funding weights get up to 3.5 times the subsidy per module than those with lower funding weights. The same logic is applied with NQF levels 8 and 9. These modules receive two and three times as much subsidy as undergraduate modules. A similar argument is applied for modules with higher credits. The research question addressed in this section is to test the validity of such a strategic approach. This section will explore which of the variables mentioned in this chapter (faculties, NQF weighting, funding weights,

credits or enrolments) are the best drivers for the direct profit of teaching modules at the related South African university.

The first relationship analysed is between faculties and the direct profit per module. The ANOVA table testing the significance of the difference of the mean direct profit per module amongst faculties is illustrated in Table 5.51.

Table 5.57: ANOVA table for direct profit per module per faculty

Faculties:	df	Mean Square	F	Sig.
Between Groups	6.00	9 287 628 143 170.85	19.35	0.000**
Within Groups	3 490.00	480 075 452 265.70		
Total	3 496.00			

****. The standard deviation is significant at the 0.01 level (1-tailed)**

Table 5.51 indicates that the mean direct profit per module differs significantly amongst faculties (0.000). This significance is illustrated in Table 5.51.

Table 5.58: Mean direct profit per module per faculty

Faculties:	Mean Direct Profit (R)
FAC 1	142 081
FAC 2	352 745
FAC 3	148 377
FAC 4	294 593
FAC 5	640 569
FAC 6	180 325
FAC 7	- 14 600
Total	230 995

Table 5.52 confirms the significant difference between the mean direct profit per module amongst the different faculties stated in Table 5.51 since the mean direct profit per module ranges from R640 569 to -R14 600 within the different faculties. Also evident from Table 5.52 is that a higher funding weight does not necessarily ensure a higher direct profit. This finding is illustrated by the direct profit per module for Faculty 5 (R640 569), with departments primarily funded at a weighting of 1, which is significantly higher than Faculty 3 (R148 377) and Faculty 6 (R180 325), which have departments primarily funded at a weighting of 3.5. Table 5.52 provides valuable information to the university regarding the financial viability of modules since it indicates that the profitability of faculties varies. This information should be taken into account in the strategic direction of the related university.

Table 5.53 provides more information on the direct profit per module at the different funding weights. Table 5.53 indicates that there is a significant difference (0.000 at 0.01 level) in the direct profit per module amongst the different funding weights.

Table 5.59: ANOVA table for direct profit per module per funding weight

Funding weights:	df	Mean Square	F	Sig.
Between Groups	3	5 495 760 800 042	11.195	0.000**
Within Groups	3 493	490 896 597 442		
Total	3 496			

****. The standard deviation is significant at the 0.01 level (1-tailed)**

The significant difference in the direct profit per module amongst the different funding weights indicated in Table 5.53 is confirmed in Table 5.54. Table 5.54 provides the mean direct profit per module at the different funding weights. From Table 5.54 can be deducted that the relation between the mean direct profit per module and the different funding weights is negative since the mean direct profit per module decreases from R335 558 at funding weight 1 to R158 423 at funding weight 3.5.

Table 5.60: Mean direct profit per module per funding weight

Funding Weight:	Mean Direct Profit (R)
FW 1.0	335 558
FW 1.5	268 396
FW 2.5	132 208
FW 3.5	158 423
Total	230 995

Table 5.54 further confirms the finding in Table 5.52 that an increase in funding weight does not necessarily mean an increase in the direct profit of a module, which is in contrast to the strategic direction of the selected university to promote modules funded at a higher weighting, including modules at a higher NQF level, which also have a higher funding weight.

The significant difference in the mean direct profit per module at the different NQF levels is presented in Tables 5.55 and 5.56. Table 5.55 indicates that the difference in the mean direct profit amongst the different NQF levels is negative, since the direct profit per module decreases with an increase in NQF level, and significant (0.000 at 0.01 level). This significance is confirmed in Table 5.56, which indicates that the mean direct profit per module decreases from R462 741 at an NQF 5 level to -R89 703 at an NQF 9 level.

Table 5.61: ANOVA table for direct profit per module per NQF level

NQF level:	df	Mean Square	F	Sig.
Between Groups	4	27 121 089 695 256	58.364	0.000**
Within Groups	3 492	464 692 078 604		
Total	3 496			

****. The standard deviation is significant at the 0.01 level (1-tailed)**

Table 5.62: Mean direct profit per module per NQF level

NQF level:	Mean Direct Profit (R)
NQF 5	462 741
NQF 6	370 024
NQF 7	225 600
NQF 8	60 539
NQF 9	- 89 703
Total	**230 995**

The decreasing direct profit per module associated with higher NQF levels indicated in Table 5.56 confirms that the selected university's strategic drive should be to promote undergraduate (NQF 5 to NQF 7) rather than postgraduate (NQF 8 and NQF 9) teaching modules. This strategy could aid in ensuring the future financial sustainability of the university.

Evident from Tables 5.51 to 5.56 is that neither the faculty in which a module is presented, the funding weight associated with a module, nor the NQF level of a module can be accepted as the primary driver of the direct profit of a module. Table 5.57 provides insight into enrolments and credits as possible drivers of the direct profit of a module at the selected university.

Table 5.63: Correlation matrix between the direct profit, credits and module enrolments

	Direct Profit	
Factors:	**Pearson Correlation**	**Sig.**
Credits	-0.017	0.162
Module Enrolments	0.781	0.000**

****. Correlation is significant at the 0.01 level (1-tailed).**

The first variable explored in Table 5.57 as a possible driver of the direct profit of a module is the number of credits. Table 5.57 indicates that there is a weak negative correlation (- 0.017) between the direct profit of a module and the number of credits assigned to the module. The difference in the direct profit of a module at different credit levels is also not significant (0.162).

Table 5.57 also tested the correlation between the direct profit of a module and the number of students enrolled in the module. Table 5.57 indicates that there is a significant difference in the direct profit per module with different numbers of student enrolments (0.000). The correlation in Table 5.57 between the number of students enrolled in a module and the direct profit of a module is positive and very strong (0.781).

The strong correlation between the number of students enrolled in a module and the direct profit of the module focuses the conversation on the biggest driver of the financial viability of modules to be the number of enrolments in the related modules. The findings in Table 5.57 also confirms that the breakeven number of enrolments provides a valuable tool in examining the direct profitability of a module. The number of breakeven enrolments for modules within the different faculties per NQF level was utilised in this study as part of the determination of the financial viability of modules (refer to section 4.6.2.2.1).

5.6.1. Caution regarding skewed data

The data utilised to determine the correlations amongst faculties, NQF levels, credits and enrolments versus the direct profit of a module are highly skewed (refer to Table 5.46, 5.48 and 5.50). Natural logs were applied to decrease the skewness of the data, but resulted in similar levels of significance. It was therefore decided not to include the results with the Natural Logs for the analyses performed in the previous section, as it did not change the significance of the relationships. Tables 5.58, 5.59 and 5.60 illustrate the significant difference in the natural logs for direct profit amongst different faculties, NQF weightings and funding weights.

Table 5.64: ANOVA table for direct profit per module per faculty

Faculties:	df	Mean Square	F	Sig.
Between Groups	6	3.138	22.240	0.000
Within Groups	3 490	0.141		
Total	3 496			

****. The standard deviation is significant at the 0.01 level (1-tailed)**

Table 5.65: ANOVA table for direct profit per module per NQF weighting

NQF weightings:	df	Mean Square	F	Sig.
Between Groups	2	23.359	175.665	0.000
Within Groups	3 494	0.133		
Total	3 496			

***. The standard deviation is significant at the 0.01 level (1-tailed)*

Table 5.66: ANOVA table for direct profit per module per funding weight

Funding weights:	df	Mean Square	F	Sig.
Between Groups	3	2.722	18.895	0.000
Within Groups	3 493	0.144		
Total	3 496			

****. The standard deviation is significant at the 0.01 level (1-tailed)**

Tables 5.58 to 5.60 indicate that the mean natural logs for direct profit per module differ significantly amongst faculties, NQF weightings and funding weights. Since the difference in direct profit per module also differs significantly amongst faculties, NQF weightings and funding weights, the same results are provided using the direct profit, compared to using natural logs (for direct profits) to compare means.

Table 5.61 indicates the strength of the relationship between the number of students enrolled in a module, the number of credits assigned to a module and the direct profit per module to the natural logs for direct profit per module. The correlation between the number of enrolments in a module and the direct profit of that module has a strong positive correlation of 0.781. This correlation decreases by a small margin to 0.702 when natural logs are applied. The same change in correlation occurs between the credits assigned to a module and the natural logs for direct profit versus normal direct profit. The correlation between the number of credits and direct profit is a weak correlation of -0.017. This correlation becomes significant, but negative (-0.217) when natural logs are applied, which is still the opposite of what was expected. It was expected that modules with more credits would be positively related to direct profits.

Table 5.67: Correlation matrix between the direct profit, credits, module enrolments and natural logs for direct profit

	Module Enrolments	Credits	Natural Logs Direct Profit
Credits	-.083** (0.000)		
Natural Logs Direct Profit	.702** (0.000)	-.217** (0.000)	
Direct Profit	.781** (0.000)	-0.017 (0.162)	.900** (0.000)

****. Correlation is significant at the 0.01 level (1-tailed).**

From Table 5.61 can be deduced that similar results in terms of significance and direction (correlation) are derived if the skewed data are utilised versus the utilisation of natural logs for direct profit. The most important result from Table 5.61 is that the number of enrolments in a module is the strongest driver of the direct profit of a module.

5.7. Summary

This chapter started with a discussion of the distribution and composition of the sample utilising the variables defined in section 5.2. The description of the sample confirmed the complexity of the teaching modules as the cost objective at a university. This complexity, together with the complexity already accompanying a service as a cost objective (refer to section 3.2), reiterates the need for a methodology to cost modules as developed in this study. It also further provides some justification for the number of assumptions and discretionary decisions made in costing the sampled modules in this study (refer to section 4.6.2).

The next part of the chapter provided the cost, volume and profit analyses of the sampled modules. This information was provided for the teaching income (tuition fees plus subsidies), direct costs and direct profit or losses for the sampled teaching modules within the different faculties, as well as at various NQF levels and funding weights applicable to the selected university. This information was also utilised to determine the breakeven number of enrolments required per modules in the different faculties and NQF levels. An average of 30 enrolments are required to break even for undergraduate modules (NQF 5 to 7), 21 for NQF 8 and 14 for NQF 9 level modules. Modules with enrolments below the set breakeven norm incur direct losses whereas modules with enrolments exceeding the breakeven norm incur direct profits.

The final part of this chapter was used to determine the primary drivers of the direct profit of a module with the intent to justify the focus of this study. Even though NQF levels, funding weights and credits influence the direct profit of a module, none of these variables was found to be the primary driver of the direct profit of a module. The number of students enrolled in a module was found to be the primary driver of the direct profit of the related module. This finding confirms the use of breakeven enrolments as a benchmark for the profitability of modules.

Chapter 6 will utilise the findings in this chapter to provide the results of the hypotheses tested stated in section 5.3. This chapter will further focus on how the study addressed the research problem and objectives stated in section 1.2. The findings from chapter 5 will also be applied to make certain recommendations which will be stated in chapter 6.

Chapter 6: Conclusions and recommendations

6.1. Introduction

Chapter 1 of this study highlighted the threat to the financial sustainability of universities not only in South Africa, but worldwide. This threat is summarised in the stated quote by Professor Clayton Christensen that half of the universities and colleges in the United States (US) could be bankrupt by 2027 (Nazeeri, 2017: para. 1). The background to this study in chapter 1 introduced the impact of student protests on South African universities and reiterated that these universities face an uncertain financial future, in part as a result of the countrywide protests, but to a larger extent as a result of tuition fees increasing at a rate exceeding the consumer price index, which has made university education unaffordable for the majority of students (University of Stellenbosch, 2017: 2–3).

The literature review in chapter 2 of this study provided more context to the statement of Professor Christensen by explaining the origin and definition of traditional universities. This chapter explored the history and impact of student protests on the related universities and explained the funding structure of South African universities. Chapter 3 explored how management and cost accounting assist decision-makers by providing accurate and relevant information. The findings from the literature review, specifically the different costing models available to cost teaching modules at a university, were applied in the calculation of the cost of teaching modules as explained in chapter 4. Chapter 5 provided an in depth quantitative analysis of the sample of this study as well as the findings from the calculations applied and analyses done in this study.

Chapter 6 will discuss the implications of the findings in chapter 5. The chapter starts with the conclusions drawn from the review of literature as presented in chapters 2 and 3 of this study as well as the findings from the empirical part of this study as presented in chapter 5. The discussion of the deductions and conclusions of the results of this study is focused on the financial viability of teaching modules by applying costing principles as stated in chapter 4, taking cognisance of the primary and secondary objectives as stated in section 1.2. The conclusions drawn in this chapter are based on the empirical part of this study and the statistical analyses in chapter 5. The breakeven number of enrolments per teaching module per faculty and NQF level are also discussed as well as the different drivers of direct profit at the selected South African university.

The recommendations in this chapter focus on the challenges faced by universities, specifically in regard to financial sustainability, taking the primary and secondary objectives of this study into consideration. This chapter concludes with suggestions for possible future research.

6.2. Conclusions from the study

This section discusses the conclusions drawn from the study. The conclusions on the complexity of the application of management and cost accounting at universities, costing models available to universities, and the results of the hypotheses tested are discussed in this section.

6.2.1. Complexity of the application of management and cost accounting at universities

Chapter 1 of this study indicated that a university is a service organisation. The application of management and cost accounting principles, as stated in section 1.1.3, is challenging in service organisations, primarily due to the intangibility of services as well as the lack of a clear input-output relationship. The costing of the output of service organisations varies significantly from production organisations since the measurement of the output of delivering a service is difficult; the majority of the costs in a service organisation are period costs, with fixed labour making up the biggest portion of the input costs incurred in delivering a service. This challenge is further increased in the university environment, since universities deliver multiple services of which teaching and research are two of the most prominent services. The fixed labour costs of a service organisation is an indirect cost, at least if the cost of specific services is the cost objective, which means that the biggest share of the costs of a university requires a form of allocation amongst the various services; in this case, the different teaching modules presented.

The allocation of costs to teaching modules is further complicated by the organisational structure of the selected university as described in chapter 5. The selected university offers 4 088 modules in seven faculties and at five different NQF levels. Each module has a number of credits assigned to it that varies from one to over 120 credits. The complexity of the university environment necessitated that various assumptions and discretionary decisions were required to enable the costing of teaching modules. These assumptions were explained in section 4.6.2.

6.2.2. Costing models available for universities

Chapter 1 investigated the costing structure of universities. From the review of literature in chapter 1 it is deduced that fixed labour cost makes up the biggest portion of the total cost the responding university incurs (refer to section 1.4.2). Since there exists no causality between the costs incurred and the modules delivered by the university, cost allocation techniques were required.

Chapter 3 investigated the various techniques available to allocate the costs of a university. Most of the literature reviewed suggested the application of an Activity-based cost (ABC) allocation model. An ABC allocation model provides more accurate cost allocation than arbitrary allocation as applied in a traditional cost allocation model, but is expensive and time-consuming to implement. Before an organisation implements an ABC allocation model, the organisation must consider whether the benefit derived from an ABC allocation model exceeds the high cost of implementation. Due to the mixture of advantages and disadvantages of the implementation of an ABC allocation model, many organisations prefer to implement a combination of a traditional and an ABC allocation model.

The model described in this study to calculate the cost of teaching modules at the related university (see chapter 4) utilises some ABC cost allocation principles by determining the activities that cause the identified types of costs. However, it is also more simplified since it selects to allocate the costs based on the most appropriate arbitrary cost driver. This simplification is to ensure that the costing of teaching modules remains beneficial to the university. This was also necessary having more than 276 000 student enrolments in 3 497 sampled modules with very different characteristics in terms of NQF levels, credits, funding weights and faculties, thus limiting the usefulness of ABC.

6.2.3. Results of the hypotheses testing

The results of the costing of teaching modules, as described in chapter 4 were used to test the hypotheses stated in chapter 5. These hypotheses were reliant on applying independent t-testing, ANOVA tests and Pearson correlation tests, and are focused around the drivers of the direct profit of a module.

Since these tests were applied to a sample of modules, the determination of the significance (*p*-level) in these tests is important. For the purpose of this study, a *p*-level $p<0.01$ was seen as a strong significance; however, a level of $p<0.05$ was also acceptable.

A *p*-level of $p>0.05$ led to the acceptance of the null hypothesis since this meant that any correlation between variables was coincidental and not as a result of the effect of the independent variable on the dependant variable (refer to section 4.3.5.1). The results of the hypotheses testing performed in chapter 5 are discussed below.

H1o: There is no significant relationship between the faculty in which a module is presented and the direct profit per module.

Tables 5.50 and 5.51 indicate that there exists a significant difference between the mean direct profit per module amongst the various faculties. This significant difference implies that hypothesis 1 (H1o) is rejected since there is a significant relationship between the faculty a module is presented in and the direct profit of the module. This relationship warrants taking the faculty that presents a module into account when considering the financial viability of a module. The marketing strategy at the responding university was to promote the faculty with both the highest funding weights and highest teaching income (same faculty). However, Tables 5.50 and 5.51 established a significant difference amongst the mean direct profit per module amongst the various faculties, but it was not the faculty with the highest funding weight and teaching income that was the most profitable per module.

H2o: There is no significant relationship between the funding weight of a module and the direct profit per module.

H2o is rejected since Tables 5.52 and 5.53 indicate that the difference in the mean direct profit per module amongst the different funding weights is significant ($p<0.01$). This finding confirms that there exists a significant relationship between the direct profit of a module and the weighting at which the module is funded. Modules with a funding weight of 1 had a significantly higher mean direct profit per module than modules with a funding weight of 3.5. This indicates that the relationship between the funding weight and the mean module direct profit is significantly negative, implying that those departments with the highest funding weights are the least profitable, again confirming that conventional wisdom, thus the marketing strategy at the responding university might be wrong.

H3o: There is no significant relationship between the NQF weighting of a module and the direct profit per module.

The findings in chapter 5 reject this hypothesis. Table 5.54 indicates that there is a significant difference in die mean direct profit per module amongst the different NQF levels. Table 5.55 indicates that undergraduate modules (NQF levels 5 to 7) had modules with a mean direct profit per module significantly exceeding that of postgraduate modules (NQF levels 8 and 9). This relationship between the mean direct profit and the NQF level at which a module is presented is significant and negative. Given the significance of the negative relationship, it is clear that undergraduate modules (NQF 5 to 7) are much more profitable than postgraduate modules (NQF 8 to 9), while the marketing strategy of the university is focused on postgraduate modules with higher subsidies.

The findings from testing the first three hypotheses, based on an independent *t*-test, were that the faculty with the highest levels of subsidy or highest teaching income does not necessarily have the highest direct profit and is therefore not the primary driver of the direct profit of a module. Neither can the size of the funding weight nor the NQF level with the highest subsidy at which a module is presented be utilised as the primary driver of the direct profit of a module. Although all three these hypotheses were rejected, the significance was negative, thus contrary to expectations. The Pearson correlation coefficient was applied to determine the primary driver of the direct profit of a module by testing hypotheses 4 and 5.

H4o: There is no significant positive relationship between the number of credits assigned to a module and the direct profit per module.

Table 5.56 rejects H4o by indicating that the relationship between the number of credits assigned to a module and the direct profit of that module is negative, but not significant ($p>0.01$). The number of credits assigned to a module can therefore not be regarded as the primary driver of the direct profit of a module.

H5o: There is no significant positive relationship between the number of enrolments per module and the direct profit per module.

The findings of the first four hypotheses established that the faculty in which a module is presented, the funding weight at which a module is funded, the NQF level and the number of credits do influence the direct profit per module, but, contrary to expectations, the direct profit decreased at higher funding weights, higher NQF levels and more credits per module. The primary driver of the direct profit of a module is therefore the number of students enrolled in the module. This is confirmed by Table 5.56, that rejects H5o by

indicating that the correlation between the number of students enrolled in a module and the direct profit of that module is significant (p<0.01), positive and very strong (*cor.*=0.781). Based on the confirmation that the number of enrolments is the primary driver of the direct profit of a module, the number of breakeven enrolments for a module was calculated.

6.2.4. The number of breakeven enrolments per module per faculty per NQF level

The very strong positive correlation between the number of students enrolled in a module and the direct profit of that module confirms the application of the breakeven enrolments per module as a measure of the financial viability of the teaching modules of the selected university. The rejection of H2o and H3o necessitated taking the individual faculties and NQF levels into account when calculating the number of breakeven enrolments per module.

Table 5.40 provides the number of breakeven enrolments per module for the different faculties per NQF level. This table indicates that, as an average, 30 enrolments per module are required for an undergraduate module (NQF levels 5 to 7) to break even. Any module at this NQF level with fewer than 30 enrolments' teaching income will not cover its direct cost. The inclusion of modules with fewer than 30 enrolments at an undergraduate level must be reconsidered as part of the curriculum for the selected university. Although the funding weights did affect the breakeven levels of enrolment per module in a faculty (higher funding weights needed fewer enrolments), the number of enrolments still provided the main driver of direct profits.

For postgraduate modules (NQF levels 8 and 9), the breakeven number of enrolments is 20.9 (NQF 8) and 13.5 (NQF 9). Any modules with enrolments higher than 20.9 and 13.5 respectively will make a direct profit, while modules with fewer than the stated number of breakeven enrolments will incur a direct loss. These lower levels of breakeven enrolments for modules with higher NQF levels confirm that subsidies do impact direct profits, but only with sufficient number of enrolments.

The conclusions drawn in this section add to the success of this study to the extent that the objectives of this study are achieved. The next section addresses the objectives stated in chapter 1 and explains how the conclusion stated in section 5.2 aids in the achievement of these objectives.

6.3. Achievement of research objectives

The primary and secondary research objectives of this study were stated in section 1.2. The success of this study is reliant on the measure in which these research objectives have been realised. This section discusses the measure in which the research performed in this study met the set objectives.

6.3.1. Primary objectives revisited

The primary objective of this study was to determine the financial viability of teaching modules presented at a South African university, using management accounting and cost allocation techniques that could assist the administrators of the university in offering affordable modules to students. The primary objective was achieved by applying the management and cost accounting principles and the understanding of the cost and funding structure as identified through the review of literature in chapters 2 and 3 on the sampled modules of the responding university as presented in chapter 5.

In chapter 5, the breakeven number of enrolments per module for each faculty of the selected university per NQF level were calculated. These breakeven figures were used as benchmarks for the modules in the seven faculties at the various NQF levels. All modules with enrolments below the breakeven benchmark incurred direct losses and are not financially viable. All modules with enrolments exceeding the breakeven benchmark incurred direct profits and are financially viable, at least in their ability to recover their direct costs.

The calculations performed to determine the breakeven enrolments per module were used to determine the primary driver of the direct profit of a module. As stated in section 6.2, the primary driver of the direct profit of a module is the number of students enrolled in the module, which justifies why enrolments were used as the benchmark for the financial viability of teaching modules at the related university. The recommendations made in section 6.3 are based on the findings from the analyses performed to determine this driver.

6.3.2. Secondary objectives revisited

The first objective identified as a secondary objective of this study was to describe the changing environment of and the challenges faced by universities. Chapter 2 of this study addressed this objective by reviewing the available literature in this field. Chapter 2

investigated the origin of traditional universities in South Africa, and the cause and outcome of protests at universities both globally and locally. This chapter focused on the current decreasing relevance of universities amidst the educational challenges created by the 4IR and also researched how South African universities are funded. Chapter 2 highlighted one of the threats to the financial sustainability of universities in South Africa namely the decreasing government funding. The relevance of universities was also explored in chapter 2 which concluded that the Fourth Industrial Revolution (4IR) threatens the traditional way of providing higher learning by changing how universities teach their students (online versus face-to-face and on-campus) as well as the skills students need to be taught (Yang et al., 2018: 224–225). From chapter 2 it is clear that universities need to rethink their current way of doing business and take some critical strategic decisions (refer to section 2.6) (Lapovsky, 2018: para. 1). All the information obtained as part of the stated literature review was utilised to achieve the first secondary objective.

The next secondary objective of this study was to explore the application of management and cost accounting principles for decision making in service organisations, with specific reference to universities. The findings of the review of literature as detailed in chapter 3 of this study address this objective. However, the literature confirmed that the application of management and cost accounting is complicated in a university setting by the product offered (teaching a module), which is a service, as well as the multiple services provided (of which teaching and research are the two primary services) (Saladrigues & Tena, 2017: 120). The conclusions stated in section 6.2 include the findings from the literature review stated in the achievement of this objective.

The third secondary objective of this study was to explain why different cost information is required to achieve different outcomes. Chapter 3 of this study explored the type of cost information required for various purposes. Part of the findings from the achievement of this objective were used to perform the empirical research as explained in the cost model applied in this study stated in section 4.6.2.

The fourth secondary objective of this study was to explain the methodology applied in determining the cost of a teaching module at a South African university. This methodology was explained in section 4.6.2 and formed the basis of the empirical part of this study, the results of which form part of the conclusions stated in section 6.2.

The second-last secondary objective forming part of this study was to apply the stated methodology to calculate the cost per teaching module at a South African university. The results of these calculations were explained and quantitatively analysed in chapter 5. The conclusions drawn from these results are stated in section 6.2.

The final secondary objective of this study was a discussion of the different ways in which the calculation of the cost per teaching module could benefit a university, such as using the breakeven analysis as a benchmark to indicate viability. This objective is addressed in the next section which discusses the recommendations to the selected university that could be implemented as a result of the research performed in this study.

6.4. Recommendations

The selected university has a specific strategy that focuses on promoting a) faculties that are funded at a higher funding weight; and b) postgraduate modules (NQF 8 and 9), rather than undergraduates modules (NQF 5 to 7), regardless of the number of enrolments in these modules. The conclusions stated in the previous section suggest that the selected university's financial sustainability is dependent on critically challenging its current strategy. Even though the current strategy of the related university is to promote research, the costing of research modules falls outside the mandate of this study and commenting on the financial viability of these modules can therefore not take place. The recommendations in this section are from a financial viability perspective based on cost accounting principles and will focus only on teaching modules which formed part of the scope of this study.

The first recommendation is that the direct profit per module should be part of the strategic considerations of the related university. This requires a change in the current strategy, since the university should not only promote faculties funded at a higher funding weight and earning the highest teaching income, but should consider the direct profit of the individual modules.

The negative relationship between the mean direct profit per module and the NQF level at which a module is presented is in contrast with the current strategic direction of the selected university, which promotes postgraduate modules (NQF level 8 and 9) over undergraduate modules (NQF levels 5 to 7). The university should reconsider this strategy and focus on promoting undergraduate modules with sufficient enrolments since these

modules provide a higher direct profit per module for the university, as opposed to postgraduate modules with insufficient enrolments.

The final recommendation is as a result of the very strong correlation between the direct profit of a module and the number of students enrolled in the modules at the selected university. This finding focuses the strategic direction of the university on promoting modules with higher enrolments and reconsidering the presentation of modules with lower enrolments to decrease the threat to the financial sustainability of the selected university. The number of breakeven enrolments per module calculated in section 5.2.2 should be used to determine whether a module is still financially viable. If a module has fewer than the prescribed number of breakeven enrolments, the university should consider terminating the module, unless there exists a strong strategic motivation to continue the presentation of the module.

The recommendations made in this chapter are subject to certain limitations to the research performed in this study. These limitations are set out in the next section.

6.5. Limitations

The field of research in the application of management and cost accounting in service organisations is limited (Terzioglu & Chan, 2013: 29). However, the research regarding management and cost accounting application at universities is on the increase, but in spite of this increase, the management of the selected university failed to determine the cost of presenting teaching modules based on sound management and cost accounting principles. Determining the method of cost allocation and assignment was, therefore, based on various assumptions made by the researcher (refer to chapter 4.6.2.). These assumptions were derived from institution-specific information and might require adaptation when it is applied to another university. It was also not possible to benchmark the results of this study to other universities since, as specified in section 3.5, no other university could be found that performed an extensive cost allocation to all modules in all faculties as was performed in this study.

The calculations performed in this study were based on the data of only one South African university for one specific year. The use of only one university's data limits the interpretation of the results of this study, since it cannot necessarily be generalised to universities. However, the researcher is convinced that a significant contribution in the

methodology of costing teaching modules at a university was made, since the approach followed in this study was unique and no other similar methodology, according to the knowledge of the researcher, could be found in other scientific research in the world.

Even though a university is in essence a not-for-profit organisation, section 1.2.1 stated that the primary objective of this study was to determine the cost of teaching modules in order to determine their financial viability. The sample described in table 4.1 reiterated that only teaching modules were utilised in this study. This was another limitation since no similar exercise was performed to cost research modules at the related university. As stated in section 6.2.3, the strategic direction of the selected university is to focus on increasing research outputs and promote postgraduate modules, but commenting on the financial viability of these modules falls outside of the mandate of this study. It is also important to note that due to various characteristics of presenting research modules, the costing of these modules becomes nearly impossible. These characteristics include the one-on-one approach followed in most research modules as well as the difference in the timeframe in which students obtain their degrees.

Another important limitation of this study is that it focuses predominantly on the financial viability of modules and the results are not necessarily aligned with the academic objectives of traditional state-funded universities. However, theory confirmed that universities cannot sustain the levels of cross-subsidizing, specifically in South Africa where affordable tertiary education to ensure employability is needed. Thus, these limitations do not affect the validity of the results presented in this chapter, but must be considered when interpreting them. The next section explores areas for further research that the researcher could explore.

6.6. Contribution of the study

Chapter 1 of this study pointed out various challenges faced by universities. These challenges emphasise that universities are at a crossroad where decision-makers at these organisations are required to make serious decisions to ensure their future sustainability. Traditional accounting systems do not provide sufficient data to assist in this decision-making process (Moore, 1998: 43; Cokins & Capusneanu, 2011: 75). Implementing a separate and simplified management and cost accounting system could aid management in their decision-making process (Moore, 1998: 43). Research in the field of management

and cost accounting focuses traditionally on large manufacturing or trading organisations (Chand & Ambardar, 2013: 1; Terzioglu & Chan, 2013: 29). The lack of research in regard to the application of management and cost accounting in service organisations poses a problem since the characteristics of service organisations vary significantly from manufacturing organisations (Chand & Ambardar, 2013: 2). Management and cost accounting can, therefore, not simply be applied to service organisations in the same manner as manufacturing organisations. Terzioglu and Chan (2013: 32) point out the findings of various authors that traditional accounting systems cannot meet the information needs of service organisations. One of the main differences between service and manufacturing organisations is the portion of fixed costs forming part of the total cost of the organisation (Terzioglu & Chan, 2013: 32). Chand and Ambar (2013: 2) point out that the average number of employees is one of the major differences between manufacturing and service organisations. Terzioglu and Chan (2013: 32) confirm the fact that service organisations are more labour intensive, with a large portion of the labour cost being fixed or a period cost. The allocation of fixed costs to services is, therefore, a challenge contributing to the difficulty of costing services.

The application of management and cost accounting in universities are even more complex than other service organisations due to the diversity of the service delivered (teaching modules) by the organisation. This diversity includes modules delivered with varying number of student enrolments and credits assigned to the modules. Modules at universities are also presented at different NQF levels and receive government funding by applying various weightings as indicated in this study (refer to section 5.4). Cropper and Drury (1996: 1) pointed out in 1996 already the lack of research on the application of management and cost accounting at universities, but very little research has since been done to solve this problem. This study does not solve the gap in the theory surrounding management and cost accounting practices in service organisations, but rather contributes to how management and cost accounting can be applied in a service organisation with a service as diverse as the teaching modules costed in this study. The significance of the contribution of this study is further emphasised by the cost allocation performed, since there is a lack of causality between costs incurred by universities and the activity to which the cost is related (Cropper & Drury, 1996: 5).

One of the solutions to increase the accuracy of cost allocation, especially where the cost objective is as diverse as teaching modules at a university, is an Activity-based cost (ABC)

allocation model. ABC was introduced as a cost allocation solution to the shortcomings of traditional cost allocation, which is primarily the lack of accuracy due to the use of arbitrary drivers to allocate indirect costs to a cost objective (see section 1.4.3) (Narong, 2009: 11). However, the application of an ABC allocation model is complex, expensive and time consuming and the cost of implementation must be weighed against the benefits obtained from implementing such a system (Bazrafshan, 2017: 165; Sorros et al., 2017: 311). Chapter 5 illustrated the complexity of the cost objective (teaching modules) at the selected university. This complexity was due to various factors. Firstly, the sample in this study consisted of 3 497 modules, with 267 627 students enrolled in these modules. The sampled modules were also presented at three campuses and in seven different faculties across five NQF levels. In addition, these sampled modules have varying numbers of credits assigned to it. The aforementioned factors complicate the cost allocation exercise to such a degree that the benefits of implementing an ABC allocation model do not exceed the cost of the implementation of such a system. However, the model developed in this study to assign costs to the cost objective utilises certain principles of ABC allocation, but follows a unique approach since no conventional cost allocation model researched in this study deals sufficiently with the complexity of the cost objective of the related university.

Apart from the complexity of the cost objective (teaching modules) offered by universities, they are faced with an increasing amount of competition and have to date been reactive and not proactive in addressing the challenges faced (Coetzee et al., 2019: 31). As Smit (2002: 6) states: “Pushed and pulled by enlarging, interacting streams of demand, universities are pressured to change their curricula, alter their faculties, modernise their increasing expensive plant and equipment – and to do so more rapidly than ever.”

The pace at which technology is changing is faster than at any other time in the history of mankind (Coetzee et al., 2019: 3). One of the major threats to the traditional university is the 4IR. The 4IR will not only change the skills required by graduates, but the presentation of these skills need to adapt to the technological revolution (Coetzee et al., 2019: 24). It is estimated that almost 50% of the knowledge a first-year student enrolled in a four-year technical degree acquires will be outdated by the time this student graduates (World Economic Forum [WEF], 2016: 20). The 4IR will require universities to “foster innovation and creativity” to ensure they meet the demands of the 4IR calling for students to be equipped with suitable skills and knowledge (Rodny-Gumede, 2019: para. 1; Coetzee et al., 2019: 4). According to Naledi Pandor (2019b: para. 2) only 11 out of 26 universities in

South Africa have responded to the required skills of the 4IR by introducing relevant modules and degree programs.

Universities must become dynamic and adaptable on demand to respond to the constant changes required to adjust sufficiently to the demands of the 4IR (Coetzee et al., 2019: 3–4). The 4IR necessitates the creation of creative human resources to aid in future job creation and problem-solving (Hong, 2017: 92). A major challenge is that academic staff will need to be retrained to be able to address the skills students need to be taught. Universities, however, need financial and human capacity to address the challenges faced by the 4IR and to develop the required modules and programs. The contribution of this study is confirmed by the widespread implementation of almost all the findings from this study across the seven faculties at the related university that has already been set in motion. From the implementation of the findings of this study at the related university, capacity is already being created since the focus is on decreasing the number of modules not making a direct contribution or synchronising the presentation of modules with similar outcomes. This process frees up valuable time for academics that could be applied to upskill them for the requirements of the 4IR and to increase research outputs. This process further provides financial capacity since lecture venues can be utilised more effectively while class and exam timetables can also be executed more cost effectively. These possible outcomes address both the financial and human capacity required by the changes the 4IR will bring to universities. The effects of the application of these findings are yet to be determined. The next section explores areas where further research could be performed following this study.

6.7. Suggestions for further research

The research performed in this study focused on the calculation of the cost of teaching modules. This costing was performed for one university based on 2017 data. The research started in this study can be expanded to cover more than one year to draw conclusions on how costs behave when a variable changes over a period of time exceeding one year.

The costing of modules at various universities can be considered. This might provide a strong justification for the breakeven enrolments per module benchmarks set that could enhance a university’s financial competitiveness across the industry.

The cost of modules at different universities can be compared to identify the possible similarities and differences in the required discretionary decisions made in this study to enable the costing of modules. A study comparing the cost of modules at various universities could further identify the primary drivers of the direct profit of modules. This comparison could further provide details on possible other factors (like the number of faculties) that could influence the profitability of modules.

This study focused on the costing of teaching modules only. The costing of research modules can also be performed. Research forms an important part of the services provided by a traditional university and provides further funding opportunities for universities and could therefore add to the financial sustainability of universities.

6.8. Summary

The luxury of being a traditional university, predominantly funded by government with the freedom to increase tuition fees as needed, might not be a viable option in the current economic and political climate. However, making these crucial strategic decisions to address the critical external and internal challenges that most South African universities are facing, requires brave and bold strategic decisions as well as relevant and accurate financial (costing) information.

The primary objective of this study was to determine the cost of teaching modules at the related university. The methodology applied to determine the cost of these modules as set out in chapter 4 is unique. Although this methodology is in line with the costing methodologies applied at other universities (refer to section 3.5), the researcher is convinced that the assumptions applied in the costing of teaching modules are not applied at any other university that was researched as part of the literature review of this study. This study, therefore, makes a significant contribution to the field of management and cost accounting application at universities, a field in which limited research has been undertaken up to date (refer to section 3.2).

In addition to the unique methodology developed as part of this study, the findings from this study provide valuable information on the financial viability of the respondent university. The discovery of enrolments as the primary driver of the direct profit a module provides insight into the current strategic direction of the related university that could influence the future financial sustainability of the said institution. All indications are that the

responding university could save significant amounts of money by critically assessing the current modules being presented. University officials often argue that their primary function is to render a service to the country and their community and that profitability is not a strategic issue. However, if there is little need (in terms of number of enrolments) for a specific module, the question can be asked what a traditional university's value to the community is. The potential strategic value of this study is not to turn a university into a profit-orientated business, but a) to assist faculties and departments to optimise the use of both human and financial resources and to enable the retraining of staff to address the challenges of the 4IR; b) to create stakeholder awareness of the level of cross-subsidizing of modules at all levels; c) to provide top management with financial information to take strategic decisions (such as discussions involving the number of enrolments at the university and in modules as well as rationalising the presentation of modules); d) to potentially be able to lower tuition costs to students and lighten the subsidy pressure on government; and e) to avail human and financial capacity to increase research outputs.

This chapter described the conclusions reached from the research performed in this study as well as the recommendations that could be made from these conclusions. The title of this study focuses on determining the financial viability of teaching modules by performing a costing exercise of these modules. This mandate was reiterated in the objectives addressed in this study (section 1.2.1 and 1.2.2). The results of the empirical portion of this study in Chapter 5 focused on addressing the main objective of costing modules and the conclusions drawn comment on the financial viability of teaching modules even though it might be in conflict to the strategic objective of the selected university to increase research outputs.

The conclusions and recommendations in this chapter fulfil the main function of management and cost accounting which is to provide accurate and relevant (cost) information to aid decision-makers in their decision-making process. This information could be what is needed in order for traditional universities to make the required changes to their current business model and ensure their future financial sustainability.

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