2019

Overhead allocation model for universities - a case for Strathmore University in Kenya

Vincent M. Ndoloka
Strathmore Business School (SBS)
Strathmore University

OVERHEAD ALLOCATION MODEL FOR UNIVERSITIES - A CASE FOR STRATHMORE UNIVERSITY IN KENYA

VINCENT NDOLOKA MUTEI

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTER OF COMMERCE AT STRATHMORE UNIVERSITY

STRATHMORE UNIVERSITY BUSINESS SCHOOL
NAIROBI, KENYA

MAY, 2019

DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

..... [Name of Candidate]

..... [Signature]

..... [Date]

Approval

The thesis of [Name of Candidate] was reviewed and approved* (for examination) ** by the following:

Name of Supervisor
Faculty Affiliation
Institution

Head of School/Institute/Faculty
School Name

Dean, School of Graduate Studies

ABSTRACT

An organization's costing and overhead apportionment system is a system that helps the management with the strategy planning and the system also plays an important role in providing accurate cost information about the products and customers (Elias & Mehrotra, 2018). The pricing of a service or product should consider both the direct and indirect costs incurred. The allocation of indirect costs can be a complex process and if it is properly done, it will ensure fair costing and pricing of products and services while at the same time helping organizations' management identify areas of inefficiency in order to take corrective action.

According to El-Gammal et al (2016), most of the service sector organizations including education institutions are still using the traditional accounting system which allocates the company's overhead costs to the performed services based on a single cost driver. This paper examined the current overhead allocation model used by Strathmore University and provides for an improvement to the current model using Activity-Based Costing. The reason for the study anchoring on Activity based costing is the study by Elias & Mehrotra, (2018), who noted that the upsurge of researchers' and practitioners' attentions towards the implementation of Activity-based costing in organizations were as a result of Activity-based costing's superiority over traditional costing methods and subsequently its significance in enhancing organizational performance.

The specific objectives were to determine challenges with the current overhead absorption model that Strathmore University uses, to identify and explore appropriate data in Strathmore University that may be used for overhead allocation and to develop a data driven overhead allocation model for Strathmore University. The study adopted a one case study methodology. The study found that management of Strathmore University were not happy with its current overhead allocation model. The study also manage found appropriate data in Strathmore University that could used for overhead allocation. An overhead allocation model was developed for library and admissions departments of Strathmore University based on the Activity-based model. The study concluded that the current overhead allocation model developed by Strathmore was overcharging some departments and undercharging others. This study was limited to Strathmore University and in particular its library and admissions departments. Activity-based Costing model was an overall improvement over the existing overhead allocation model. The model developed was on a departmental level. However, as proposed by Naidoo (2011), there is need for further analysis and tracing of activities to the course/product level.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

ABBREVIATION	NAME
FIT	Faculty of Information Technology
SBS	Strathmore Business School
SGS	Strathmore Graduate School
SHSS	School of Hospitality and Social Sciences
SI	Strathmore Institute
SIMS	Strathmore Institute of Mathematical Sciences
SLS	Strathmore Law School
SMC	School of Management and Commerce
SOA	School of Accountancy
STH	School of Tourism and Hospitality
ABC	Activity-Based Costing
SU	Strathmore University

ACKNOWLEDGEMENTS

I wish to express gratitude to God for providing me with good physical and mental health. I am thankful to my supervisor Dr. John Olukuru and other Faculty Members of Strathmore University Business School for providing valuable guidance on how to go about the research process and to my classmates for critiquing my work. I am eternally grateful to my wonderful parents for their constant support and prayers.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

An organization's costing and overhead apportionment system is a system that helps the management with the strategy planning and the system also plays an important role in providing accurate cost information about the products and customers (Elias & Mehrotra, 2018). The authors further noted that this is the only way an organization can ensure financial sustainability. This is crucial as the financial sustainability of institutions has been deemed to be a necessary condition for institutional sustainability (Hollis & Sweetman, 1998). Elias & Mehrotra (2018) observed that producing quality graduates is the main objective of any university and the cost of quality or the cost of poor quality is one that is often difficult to measure in higher education. The authors partly attributed this difficulty to the fact that most accounting systems are not structured to capture important cost-of-quality information especially overhead costs and their allocation to services and products.

Overhead costs may be defined as those costs that cannot be identified with or charged directly to a product or service (Šiškina, Juodis, & Apanavičiene, 2009). Within the department, certain departmental costs are incurred to ensure that all the products/services offered by the department comply with certain desired standards. The organization will also have certain departments which specialize in supporting the income generating departments in a way that each department performs to the best of its abilities and the common good of the organization is achieved. These departmental costs and support related costs, which are also referred to as overheads, are periodically charged to all the accounts of each product/service (Carr & Ng, 1995). The overheads are charged by distributing the total amount among all the product/services accounts using a criterion that the organization's management deems to be most fit and logical. This ensures that all costs are considered when establishing the product/service price together with profit margins. It also helps the organization's management to monitor the profitability of their products in order to take timely strategic decisions that will ensure long-term financial sustainability.

Allocating overhead costs to products has been a source of great difficulty (Kaplan & Thompson, 1971). Traditional overhead allocation models provide for product cost information that can be misleading for pricing and other product related decisions. These problems have brought out the

concept of direct costing where costs expected to vary with production are included in a product costs while other independent costs are considered as periodical costs not allocated to products. In the context of universities, Coy & Goh (1995) observed that it is not easy for universities to develop a model that traces overhead costs to the income generating units, namely the faculties and institutes. On the same issue, Ellis-Newman J. (2003) observed that escalating costs, diminishing resources, increased competition from other universities, and demands from legislators and the public for greater service and accountability are forcing university administrators to consider more effective management of resources and costs with particular focus to overhead allocation and or charging for their services. On the other hand, Tatikonda & Tatikonda (2001) observed that the implementation of a data driven overhead absorption model in higher education institutions can help universities achieve tighter financial management and better resource allocation.

Elias & Mehrotra (2018) pointed out that the traditional costing system is not an appropriate system for the decision-making process because it distorts the allocation of overhead costs, resulting in an ineffective structure for evaluating expenditures. The authors further observed that a proper overhead allocation model will aid universities in identifying opportunities for cost improvement while comparisons of generic support services across different universities may enable the identification of more efficient ways of performing services (i.e. benchmarks of best practice). The authors finally conclude that the increasing computerization of university business processes provide an opportunity to have a system that records transactions and volumes automatically. Furthermore, the authors note that these systems provide additional information on faculty aggregated statistics (e.g. the number of book loans to students in each faculty, the volume of study materials acquired etc. Such additional information provides data that would permit the identification of the main consumers of services which will facilitate more accurate costing of individual study programs.

In the case of Kenyan universities, there is no academic literature available to the public on the overhead absorption models that the universities use.

1.1.1 Overhead Absorption in International Universities

Indirect costs in research, which has been defined as expenses that are not directly associated with any one research project, they include libraries, electricity, administrative expenses, facilities maintenance and building and equipment depreciation, among other things.

The United States began reimbursing universities for indirect costs in the 1950s, as part of a push to encourage more research (Ledford, 2014). An initial cap which was set at 8% but had a significant increase to 20% by 1966, this was with the introduction of allowance of institutions in negotiating their rates. Reimbursement of these overheads are dealt with differently around the world. The United Kingdom bases its calculations on indirect costs on a per project basis whereas Japan has a constant rate of 30%. The European Union recently decided to use a flat rate of 25% meaning no further negotiation room available.

The table on Appendix I below provides details on of top 10 universities that get research funding from the National Institute of Health in the United States with their negotiated overhead rates.

1.1.2 Resource Allocation in African Universities

In Nigeria, it is the universities that decide on resources required, their acquisition and their allocation to their various internal units (Liverpool, Eseyin, & Opara, 1998). The study's aim was to evolve a model for budget estimates and fund allocation to departments and faculties based on the full-time equivalent student count in order to give credence to university budget systems. A global model for budgeting and allocation of funds was arrived at for departments and faculties within each university.

A study by Negash (2008) looks at resource planning for the purpose of universities aligning their resources with an objective of satisfying different ranking systems. The two systems looked at this study were the Times Higher Education Supplement and the Shanghai Jiao Tong University rating systems. A congruent balanced scorecard was developed for a professional academic unit. Due to the different biases and limitations of the rating systems, financial decentralization has been seen to reduce the tension between teaching and research. This also applies to academic units and central administration on the other hand. High rating however, does not imply allocation efficiency within the institutions.

1.1.3 Overhead Absorption Model in Strathmore University

With focus to Kenyan universities, there no academic literature available to the public on the overhead absorption models that the universities use. With focus to one of the Kenyan universities, namely, Strathmore University, the model applied for overhead allocation is based on student population, staff population, space occupied and IT equipment distribution. Every departmental

head is agreeable that they should be charged on account of overheads. However, all the departmental heads think the model used to compute overheads is not fair and equitable. As an example, in two separate meetings between Management Board and Deans of two Faculties on 30th of April 2018 and 7th of May 2018, it was mentioned that the current overhead allocation model used is very disputable. For instance, the current model uses student numbers excluding the business school for costs related to dean of students, career development, sports and clubs among others. The other pool used is staff numbers for departments such as human resources and quality office. Mileage for cars is used for the saloon cars transportation purposes. This shows that there is need to go further into cost drivers that are much more than student numbers.

1.2 Problem Statement

On the other hand, Tatikonda & Tatikonda (2001) observed that the implementation of a data driven overhead absorption model in higher education institutions can help universities achieve tighter financial management and better resource allocation. With focus to the Kenyan universities, there is no published literature that looks at overhead allocation models that they use so as to establish if they are data driven. In the case of Strathmore University, applicability and practicality of their current overhead absorption model is disputed by a number of managers and heads of departments.

The above problem opened up an area of study to determine challenges with the current overhead absorption model of Strathmore University and to identify appropriate data in the institution that may be used for overhead allocation and the intention of developing a data driven overhead allocation model. This model may be used by other universities not only in Kenya but also any other university.

1.3 Research Objectives and Questions

1.3.1 Research Objectives

The research objectives formulated from the above questions are:

1. To determine challenges with the current overhead absorption model that Strathmore University uses.
2. To identify and explore appropriate data in Strathmore University that may be used for overhead allocation.

3. To develop a data driven overhead allocation model for Strathmore University.

1.3.2 Research Questions

The research questions formulated for this particular study are:

1. What are the challenges that Management of Strathmore University is facing with its current overhead absorption model?
2. What data is available in Strathmore University that can be identified and used for overhead allocation?
3. How can Strathmore University develop a data driven overhead allocation model?

1.4 Significance of the Study

In theory, researchers and academicians will benefit from the study in the sense that they may identify a research gap and conduct further study on this area or topic. The research will also help in shedding more information which can be used to carry out other studies on overhead allocation models that may be used not only in Kenyan universities but also other universities in the world.

In practice, the study managers and departmental heads to make better informed financial decisions. Although not trained as accountants, managers and heads of department of various units within a university rely on accounting information for strategic planning and operational decision making. Increased demands for institutional accountability, with university performance and costs under increased scrutiny, place managers under increased pressure to maintain quality services while faced with decreased funding and tighter budgets. A commitment to greater efficiency requires an understanding of cost behavior.

1.5 Scope of the Study

The study was limited to Strathmore University which has 41 departments. Twelve of these departments are the income generating units which are charged overheads using the current overhead absorption model. The other twenty-nine departments represent the support units (also referred to as service departments). The support units' costs constitute the overhead costs of Strathmore University and their total costs are absorbed by the income generating units. The study was further limited to only two of the twenty-nine service departments. The scope of this study was limited to the overheads of library and admissions departments of Strathmore University

together with all its twelve income generating units. See appendix IV for a listing of all the departments of Strathmore University.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Kaplan & Thompson, (1971) observed that the traditional overhead allocation model has been used to estimate the overhead cost for a period and then choosing a measure of production input whose variation may correspond to overhead cost variation. A computed overhead absorption rate would then be used to allocate overhead costs to products. The authors concluded that this overhead absorption rate often failed to include all overhead costs leading to poor measurement of the performance of an entity's products.

Performance measurement is crucial in dealing effectively with increasing the competitiveness and profitability (Tangen, 2003). As observed by Zavadskas et al. (2008), an essential factor of an organization's competitiveness is in pricing of its goods and services since it is the main criterion for the clients in selecting the products or services of an organization. This was further corroborated by Šiškina et al. (2009) who stated that the competitive advantages of an organization's pricing is obtained in two ways, i.e. by modelling direct and indirect costs. The authors also noted that that overhead costs represent a significant part of indirect costs and the absorption of overhead costs is a key task in the pricing computations of costs for products or services. The authors concluded that organizations often fail to adequately evaluate the actual overhead costs and this often leads to financial losses.

As noted by Elias & Mehrotra, (2018), the traditional overhead allocation model was originally used in the manufacturing and created dissatisfaction in allocation of overheads to products. To counter this dissatisfaction, other overhead allocation and costing models were developed.

2.2 Theoretical Literature Review of Various Overhead Allocation Models

2.2.1 Mathematical Model

Kaplan & Thompson (1971), come up with a mathematical model that does not distort the relative profitability of a product. They also include production and sales interdependencies that are not reflected in current direct cost systems. The study uses linear programming models where they assume perfectly competitive markets. In this model, the authors argue that overhead allocation is accomplished in such a manner that the relative profitability of products is not distorted. One of

its main features is highlighting relative profitability of products. It recognizes production and sales interdependencies that aren't reflected in current direct cost systems. The model is built around a linear programming model of the firm's production opportunities.

Overheads are treated as common and allocated to products in a manner that maintains the relative profitability of the products in the optimal solution. A firm is considered with *m* resources that can be used to manufacture *n* products. The resources considered here are material availability, floor space and supervision. Production maybe limited by projected sales which is treated as part of the constraints. Let: $x = (x_1, \ldots., x_n)^T$ be an *n* X 1 column vector where x_j represents the decision variable for product *j*- the number of units of product *j* to be produced in a period $(x \geq 0, j = 1, \ldots., n)^T$. Let a_{ij} be the amount of resource *i* needed to make one unit of good *j* and let *b* be the amount of resource *i* $(i = 1, \ldots., m)$ currently available in a period.

It further assumes that there is a constant per unit selling price of r_j for a good *j* and that the variable cost of manufacturing denoted by c_j is constant over the range of production considered. The per unit profit associated with production is defined by $p_j = r_j - c_j$. The other assumption made is that there are no fixed costs associated with the manufacture of any product.

These linear assumptions provide a first approximation to more complex linear systems enabling the use of statistical cost analysis for estimating relevant linear coefficients. They require that a firm is operating profitably. The authors define the production decision problem for maximizing profits as:

$$\begin{aligned} Max \quad & px \\ Subject\ to \quad & Ax \leq b \\ & x \geq 0 \end{aligned}$$

As observed by Kaplan and Welam (1974), a limitation of the mathematical model is that, as the profitability of a given product increases, either through increased price or decreased variable cost, this product will bear a larger share of the common overhead. Other products which have not improved their profitability will therefore incur a smaller overhead charge (assuming total common overhead remains constant).

2.2.2 One Period Model

Dieter (1994) developed a one period model in a firm which consists of several divisions endowed with private information. This brings about asymmetric information. The headquarters try to

maximize the profit of the firm and, therefore, would like to use the superior information of the divisional managers. The paper tries to find cost allocation schemes that induce truthful reporting by the division managers.

The paper derives conditions under which it may be optimal to make an equal allocation to all divisions or to base allocations on 'ability-to-bear'. The model looks at different departments at one particular period. The headquarters decisions on the procurement of a production factor that impacts on department results. The factor to be acquired is assumed to be a common input and its use by one department does not interfere with the use by any other department. During the investment or procurement time, the future profits of the divisions will be dependent upon the occurring states of the environment.

The paper provides for conditions under which it may be optimal to make an equal allocation to all divisions or on a basis of 'ability-to-bear'. The conditions are of asymmetric information while using common inputs. The paper further shows that when acquisition costs are not allocated, the common input regularly leads to presentation of excessive marginal profit expectations of the common input. The author noted that this model only works in a situation where only the heads of divisions possess private information and this will not always be the situation.

2.2.3 Kaizen Costing

Kaizen training focused on both philosophical and cultural concepts and is based on the belief that the development of an individual's skill benefits both the company and that individual, and that people constantly aim for self-improvement (Imai, 1986). Monden and Hamada (1991) state that Kaizen essentially tries to ensure that everyone in the company continually reconsiders how the task is undertaken and whether there is a better way of doing it. It is not so much a costing routine as the outcome of developing an organizational culture of collaborative learning at all levels of the company. Kaizen costing is an overhead costing and allocation model which focuses on continual small incremental product cost improvement in the manufacturing phase as opposed to improvements in the design and development phase (Modarress, Ansari, & Lockwood, 2005).

As noted by Kaur (2014), one disadvantage of Kaizen costing model is that it is a team-dependent technique. The author further observes that the model will not give the expected results from its application if there is not a proper coordination between the departments and also teamwork attitude in the organization. A team attitude among employees can bring together the knowledge

and experience regarding work for better performance. Thus before application of this model, companies should ensure the teamwork attitude or change the attitude of their workers.

2.2.4 Backflush Costing

The other costing model that the study reviews is backflush costing which is a technique that is associated with Just in Time (JIT) production system that applies cost to the output of a process. The costs however, do not mirror the flow of products through the production process, but are attached to the output which assumes that the back flushed costs are a realistic measure of the costs incurred, (Amahalu, Nweze, & Obi, 2017). However, as noted by Ramezani, and Mahdloo (2014), the acceptance rate of backflush costing and overhead allocation model low and slow. The authors further observed that Backflush costing and overhead allocation model does not comply with Generally Accepted Accounting Principles and cannot be used for external reporting requirements. This can pose a challenge for any organization with specific statutory reporting requirements which require compliance to Generally Accepted Accounting Principles.

2.2.5 Resources, Events and Agents (REA) Accounting Model

The REA model is a technique for capturing information about economic phenomena (McCarthy, 1982). It looks at a business as a set of economic resources, economic events and economic agents with relationships among them. As this model provides for a solid foundation to all business domains, it has its limitations. This model is intended to be a foundation of information systems reducing gaps between businesses and the supporting software. Some of its applications include inventory control and payroll processing by assigning the respective resources, events and agents to the respective activity objective. Having a look at the flow of different economic components:

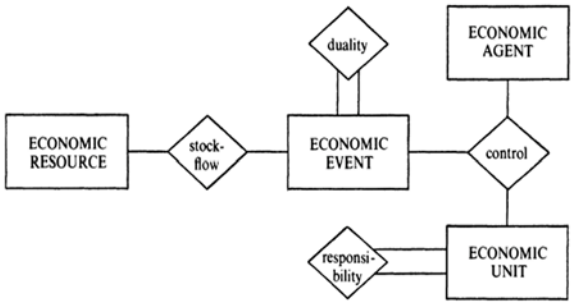


Figure 1 REA Accounting Model Flow

Source: McCarthy (1982)

Nakamura & Johnson (1998) came up with a framework model for the REA due to its limitation on implementation up to the point in time. The authors further noted that framework adaptation faced challenges of achieving high adaptability, uniformity and efficiency. The framework developed also did not support application of specific concepts for organisations due to its generality nature. The above model proves to be crucial in gathering organisational information and building a solid information system, however this model proves lacking in overhead allocation modeling which is one of the objectives of the paper.

2.2.6 Target Costing

Target costing is defined by Helms, Ettkin, Baxter, & Gordon (2005) as a product costing method that works "backward" from traditional cost-plus methods and begins with a targeted sales price for a product. This price is set based on what the customer is willing to pay. It considers not only the preferred current selling price but also the later life cycle pattern of prices. Target Costing originated in Japan and is mainly used there by motor vehicle manufacturers and is used by fewer organizations in America and Australia. The authors further observed that Target Costing works towards cost reduction by involving suppliers and manufacturers as contributors to the design process, thereby focusing the entire chain toward the overarching goal of eliminating costly waste, excess, and unevenness.

In Target Costing, a company sets a target cost through comparison of competitive products. They gather data on the market price and subtract their desired profit margin. This desired profit margin will almost always greater than the cost of capital but is influenced by macro environmental forces as well as shareholder goals. When the product being developed does not meet the target cost and profit, often it is not commercialized.

The paper noted that the Target Costing technique is more useful to those manufacturers who mass produce a make-to-stock item in a competitive market in which customers are most sensitive to price and cost levels. Therefore, it may not be very applicable to service-oriented products. Target Costing requires the hands-on involvement of manufacturing, design engineering product engineering and marketing. While the concept of target costing is intuitively and seemingly simple, the implementation and execution is very difficult. It may therefore be observed that organizations

with a high level of uncertainty in costing of its products due to unpredictable economic situations will find it difficult to correlate with new products.

As noted by Kaur (2014), one disadvantage of Target costing model is that, like Kaizen model, it is a team-dependent technique. The author further observes that the model will not give the expected results from its application if there is not a proper coordination between the departments and also teamwork attitude in the organization. A team attitude among employees can bring together the knowledge and experience regarding work for better performance. Thus before application of this model, companies should ensure the teamwork attitude or change the attitude of their workers.

2.2.7 Activity Based Costing

Johnson & Brennan (2018) define Activity Based Costing (ABC) as a costing method that more closely matches indirect costs to the activities that are believed to drive the size of those costs and to then allocate the costs of those activities to products based on the product usage of those activities. The product usage of activities is measured by the usage of cost drivers determined to be causal factors of those activity overhead costs. Jones & Dugdale (2002) observed that multiple formulations and reviews in the late 1980s and early 1990s saw the dissemination of activity-based costing as it is known today. The authors further note that other theories that link to practices around activity-based costing are activity accounting, total cost accounting, activity-based cost management and activity-based management.

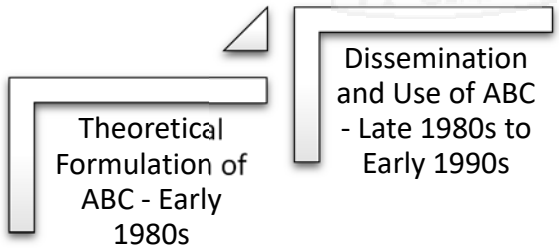


Figure 1 Evolution of ABC

Source: Jones & Dugdale (2002)

Naiseku & Oluyinka (2016) observed that all techniques that are appropriate for manufacturing companies are also appropriate for service companies. They also observed that the most common

techniques in manufacturing companies include Activity Based Costing, Target Costing, Life Cycle Costing, Throughput Accounting and Kaizen Costing. The authors further observed that Activity Based Costing is the most commonly used technique in Service sector. Chouhan, Soral, & Bibhas (2017) noted that ABC model is used for the purpose of significant improvement for overhead accounting systems by providing the best information required for managerial decision. The authors further observed that ABC presents more accurate cost allocation basis in this age of rapid technological change and global competition.

With respect to advantages of Activity-based costing, Ellis-Newman, (2003) observed that it has many benefits for managerial decision making, ranging from decisions concerning the overall strategic direction of an organization to matters of operational efficiency. Another benefit observed by the author is Activity-based costing provides for a more accurate costing of products or services and this provides managers with an understanding of what drives costs, making them more visible for cost-benefit analyses. Another advantage of Activity based costing is that it helps managers to gain awareness of the true costs of providing services which helps them make choices that better utilize limited resources (Onat et al., 2014). Activities that are not value-adding can be eliminated so that resources are channeled to activities that are the most beneficial to the organization and increase efficiency, particularly where quality considerations need to be made (Ng & Ritter, 2016). According to El-Gammal et al. (2016), the main challenge for not applying the Activity-based costing is lack of commitment of the parties involved including the necessity to change internal culture and the availability of time and financial resources.

In a university setting, Ellis-Newman & Robinson (1998) found that Activity-Based Costing provides universities management with a detailed cost analysis of activities and services together with assisting management in understanding what causes certain costs.

2.3 Empirical Review and Application of Activity Based Costing

According to El-Gammal et al (2016), most of the service sectors such as telecommunications, insurance, banking, education, and auditing firms are still using the traditional accounting system which allocates the company's overhead costs to the performed services based on a single cost driver, which is in most cases the direct labor. The authors further observed that this type of allocation, results in misrepresentation of costs which in today's competitive market decreases

market share and available funding resources. As noted by Elias & Mehrotra, (2018), the upsurge of researchers' and practitioners' attentions towards the implementation of Activity-based costing in organizations were as a result of Activity-based costing's superiority over traditional costing methods and subsequently its significance in enhancing organizational performance. The authors also observed that many organizations from different industries, including universities have focused their attentions towards the implementation of Activity-based costing due to its ability to provide accurate costing information and enhance organizational performance. It is on the basis of this observation that the current study focused its overhead absorption model for Strathmore University on Activity-based costing.

2.3.1 Application of Activity-based Costing in Universities

A study by Coy & Goh (1995) on the allocation of overheads in tertiary education institutions in New Zealand reveals the concept of allocating costs of department to an arbitrary cost driver. The author concluded that the solution of linking accounting data to strategic plan has been an impediment before introduction of the ABC system. Looking at overhead allocation models from the perspective of activity-based costing in universities, (Goddard & Ooi, 1998), looked at the development of an activity-based as a two-stage process. The stages involved pooling of overheads and then assigning to products by activity-cost drivers. This study looked at the University of Southampton where the central overhead was the main library which cuts its service across all faculties and supports both teaching and research. The cost allocation was done in two stages: the first involved analyzing staff activities within each of the library's divisions (service providers) and second stage involved relating these to activities more identifiable with 'service users.' The users are identifiable with faculties, departments or courses, where their activities are the final determinant of the allocation. The number of cost pools to be determined was dependent on size, large cost pools are complex and time consuming and availability of information. L. Tatikonda and R. Tatikonda (2001) discussed the implementation of Activity-based Costing in higher education institutions and concluded that its implementation as an overhead absorption model helped universities achieve tighter financial management and better resource allocation. The authors concluded that the ABC system may provide benefits to academic institutions, such as: better cost information, better identification of resource needs, better distribution of scarce resources, better course and program mix, better cost control, and better public relations tool.

McChlery, McKendrick, & Rolfe (2007) introduce the concept of linking value analysis and ABC in higher education, where value analysis has been defined as a systematic and creative way of improving the value of a product, service or process. It breaks down operations into key functions at departmental/business unit levels defining its outputs and inputs. This sort of analysis however poses a great challenge due to the valuation of outputs due to the wide variation in defining education let alone valuing it.

This system has been seen to benefit institutions by enabling them to have tighter financial management and resource allocation. A study by Ismail (2010) has tried to come up with a working ABC system from a paper model. The model developed was a faculty wide model instead of a university one. The study found that the ABC results would be useful for the Ministry of Higher Education in their state in order to make appropriate budget allocations among universities according to teaching, research, publication and consultation. The information also helped institutions to discover a classification as either a research or a teaching university.

A cost analysis looks at private universities in South Africa sees that tracing mainly occurs at the faculty or departmental level rather than a course or student type level. The implication of this is that there is an improper analysis of costs and its cost drivers are lacking (Naidoo, 2011). By adopting Activity-based costing, management of Universities will identify processes and activities that are not value-adding and eliminate them thereby channeling resources to activities that are most beneficial to the organization Ng & Ritter, (2016). As observed by Elias & Mehrotra, (2018), many organizations from different industries, including universities have focused their attentions towards the implementation of Activity-based Costing.

2.4 Literature Gap

As noted by Elias & Mehrotra, (2018), the upsurge of researchers' and practitioners' attentions towards the implementation of Activity-based costing in organizations were as a result of Activity-based costing's superiority over traditional costing methods and subsequently its significance in enhancing organizational performance. However, there is no published literature on overhead allocation models in Kenyan universities with specific focus to Activity-based costing. Furthermore, the study on Elias & Mehrotra (2018) focused on activity based costing for a University in the Kingdom of Bahrain and was limited to library overheads. This study will bring focus to the application of Activity-based model with focus to the Strathmore University which

operated in the Kenyan context. The study will also apply activity based costing not only to library overheads of Strathmore but will also extend the same to Admissions department.

2.5 Conceptual Framework

The conceptual framework was informed by the objectives of the study which were namely to determine challenges with the current overhead absorption model that Strathmore University uses, to identify and explore appropriate data in Strathmore University that may be used for overhead allocation and to develop a data driven overhead allocation model for Strathmore University.

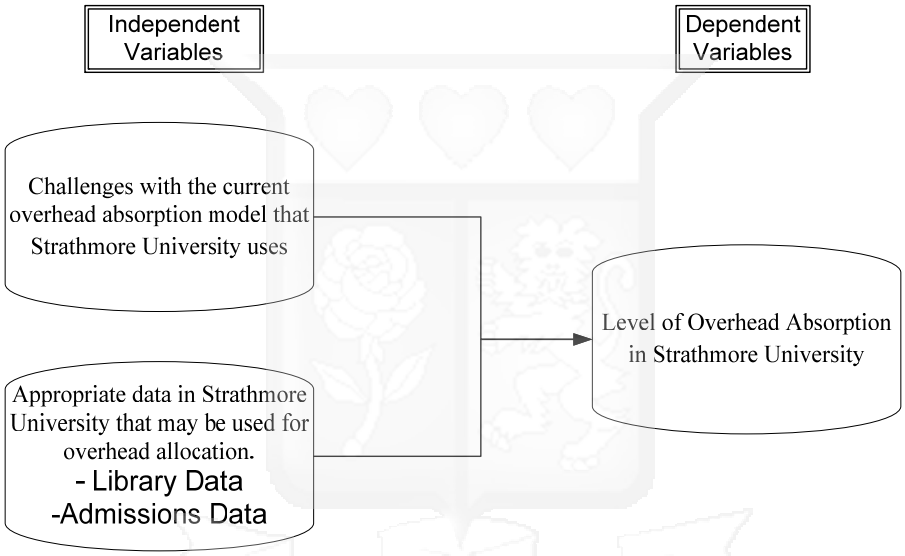


Figure 2 Conceptual Framework

Source: Researcher (2019)

2.6 Operationalization Table

The operationalization table shows the variable information of the study. A representation of the independent and dependent variables is presented together with the indicators that the study intends to measure. The indicators that is the main point of focus of this study is presented in the table. The primary data collected was grouped into categorical variables through the interview questions to get the sentiment of managers on current overhead allocation model, budget of the department, management work experience and Likert questions on the perception of current overhead model.

The secondary data, the study used student numbers by usage in the library and admissions department to come up with relevant cost driver rates.

Library				
Variable	**Operational Definition**	**Indicators**	**Measurement Scale**	**Citation**
Book Acquisitions	This is the ordering of books, invoice processing and physical processing.	• Number of orders • Number of LPOs • Number of acquisitions	Weighting	Elias & Mehrotra (2018)
Circulation Section	This is the book loans, returns and its shelving	• Number of loans • Stock Numbers • Items shelved	Weighting	Elias & Mehrotra (2018)
Users Education Program	This involves the orientation process and other activities	• Orientation • Security and luggage handling	Weighting	Elias & Mehrotra (2018)
Admissions				
Sales and Marketing	This is the sales and marketing carried out	• Sales • Marketing	Weighting	Researcher (2019)
Admission Process	This is the process for admitting a student	• Interviews • Feedback • Record keeping • Follow up	Weighting	Researcher (2019)
Enrolment Process	This process is for students who are enroled into programs.	• Enrolment Processing • Issuing IDs	Weighting	Researcher (2019)

Table 1 Operationalization Table

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology that was used in the research. It covers the research philosophy, design, population, data collection, data analysis, research quality and ethical consideration.

3.2 Research Philosophy

The study adopted positivist approach to research. The positivist research approach assumes that a single, objective reality exists independently of what a researcher perceives (Hudson & Ozanee, 1988). In a nutshell, the positivist approach involves the manipulation of theoretical propositions using the rules of formal logic (Lee, 1991). The positivist approach was appropriate for this study as it used secondary data to determine relationship between variables. The use of secondary quantitative data allowed the researcher to be impartial when conducting the study and be objective.

3.3 Research Design

This study uses a one case study methodology. Over the past two decades there has been a call on researchers to study accounting in its practical setting (Elias & Mehrotra, 2018). This study illustrates the implementation of Activity-based costing of Library Services and Admission Services in Strathmore University. The study is based on an approach which includes interviews with staff in management position, identification of library and admissions departments' activities and relevant cost drivers, analysis of library and admissions departments' records and allocation of costs into cost pools and calculation of activity costs.

3.4 Population and Sampling

Strathmore University as of 2018 had a total of 41 departments which were grouped into either income generating units or service classified as either income generating units or support units. 12 of these departments are income generating units and are charged overheads (8 academic departments/faculties/schools, 2 research centers, a catering department and a medical center). The

other 29 departments are business support units (also called service department) and the costs in these departments are apportioned to the income generating units as overheads. The list of all departments can be referred to Appendix IV. More details of Strathmore University may be obtained from the institution's annual reports which are available on its website. A questionnaire was designed and administered on managers or departmental heads of all the 12 income generating units together with managers or departmental heads of Library Department and Admissions Department. The questionnaire was administered to collect both qualitative and quantitative data relating to challenges with the current overhead allocation model, activities that are carried out in Library and Admissions departments together with Managers' perceptions on Activity-based costing.

3.5 Data Collection Method

The study obtained primary data from interviewing managers of income generating units, library, and admissions departments. The questionnaire was also used to get information on activities of the Library and Admissions departments. This was done by administering a questionnaire via face to face interviews or telephone conversations. See appendix V for more details of the questionnaire.

The study retrieved secondary data relating to costs incurred by Admissions and Library departments covering a period of eight years. These costs, which form part of overall Strathmore University overheads was retrieved from the University's Financial Management System (Kuali). In the case of the Library, data was retrieved from the Library Management System (KOHA). For Admissions, data was retrieved from the Academic Management System (AMS).

3.6 The ABC Model Formulation

An ABC approach calculates the overheads charged to a faculty as the product of activity cost drivers and the faculties usage of that activity. The idea of such a costing system is to charge to each faculty the support services that the faculty consumes. The model framework that was looked at is represented by the figure below:

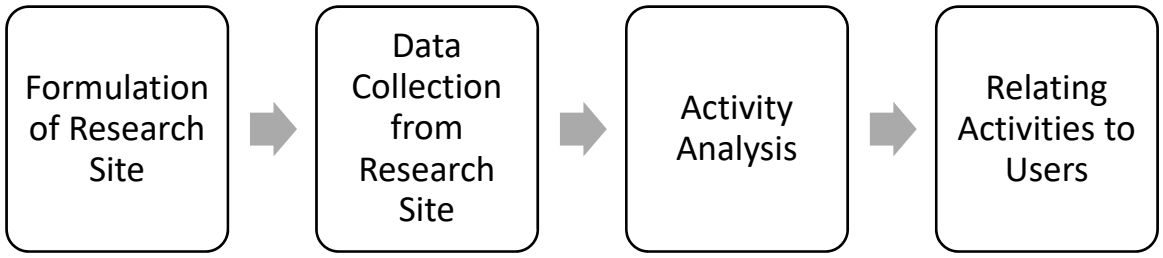


Figure 3 ABC Model Framework

Source: Researcher (2019)

3.6.1 Formulation of Research Site

In this stage, the choice of the departments that were used in the model was determined. The proposed departments are Admissions Department and Library Department. The determination on the choice of these sites was due to availability of data for these departments and the fact that Strathmore University was willing to provide data for this research to be done.

3.6.2 Users Activity Analysis

Within each of the departments' divisions, there are activities that are undertaken, which common to all faculties are varying on degree of utilization. With these activities there are a number of staff tasked with the completion of the activities and the costs that are incurred when the allotted staff is working on the activity. These are the overarching costs to be used for the different divisions in the departments.

3.6.3 Relating Activities to Users

This is the core focus of the ABC model. The service users in each division are the identification points for the faculties and are the final determinants of the allocation. To simplify the model, the service use will not be distinguished based on staff and students but the faculty/department as a whole.

Once the above determinations have been made, an ABC model was formulated to compute the cost driver rates. Once these rates have been computed across time, a weighted average was used

to model an equitable and fair overhead allocation for the departments. The model represented in equation form is as follows:

$$C_{j,t} = \frac{P_{i,t}}{A_{j,t}}$$

Where: $C_{j,t}$ represents the cost driver rate for faculty *j* at time *t.*

$P_{i,t}$ represents the cost pool for division *i* at time *t.*

$A_{j,t}$ represents the allocation to faculty *j* at time *t.*

The long run cost driver rate to be distributed to each faculty AC_j was represented as:

$$AC_j = \sum \frac{C_{j,t}}{n}$$

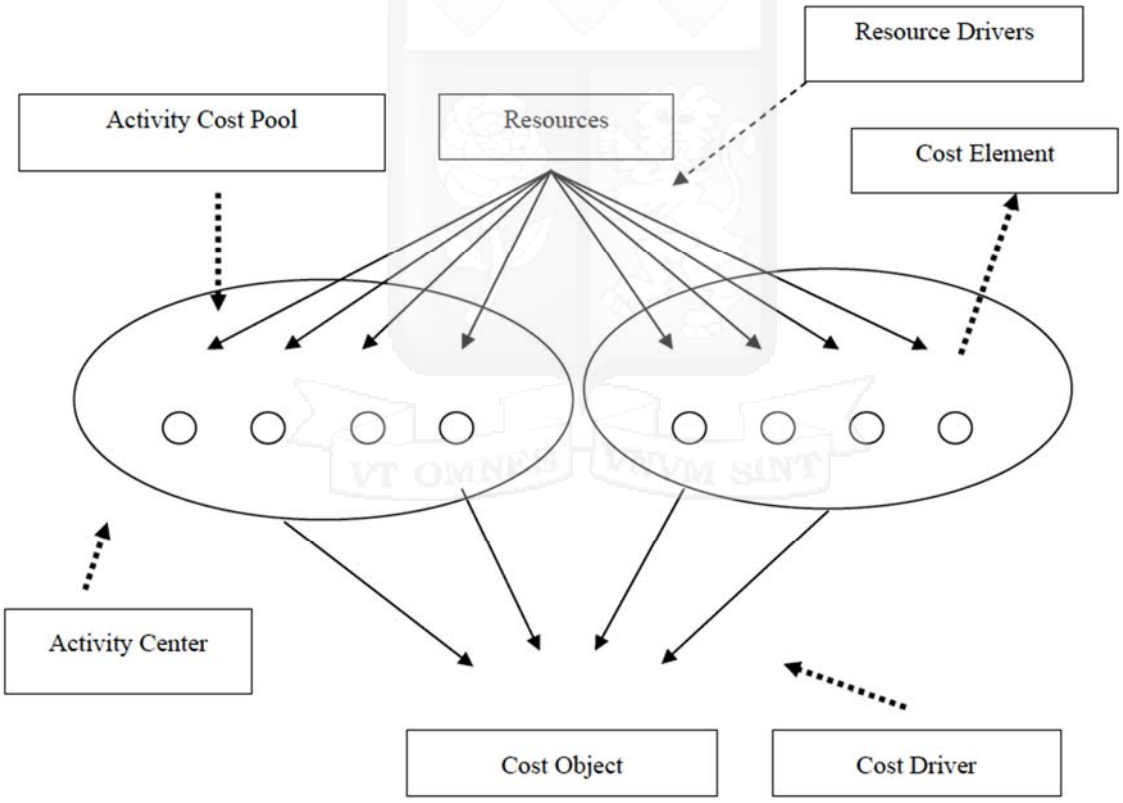


Figure 4 ABC Model Methodology

Source: Goddard & Ooi (1998)

The above figure indicates how relations of activities to users of the actual activities, outputs the cost drivers. The above figure is iterated over time periods for the case of this study to see how allocations have been carried out across time.

3.7 Ethical Considerations

The information obtained for this research is sensitive and confidential to the institution and was treated with utmost integrity and secrecy in order not to leak any information that may harm the institutions stakeholders. The analysis was done in an effective manner in which only clarity for the purposes of methodology clarity is revealed and not confidential information.

The researcher will ensure that the information obtained is known and willingly available with approval from owners of the information.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS

4.1 Introduction

This chapter outlines the data analysis process by moving towards the aforementioned activity-based costing model. The model formulation was jointly done through the Python programming language mainly for data cleaning and excel for mathematical computations. This chapter starts by looking at some descriptive statistics of the obtained data from the library and admissions department and how the data cleaning process was conducted. A short questionnaire was developed to understand how managers in the institution view the current model. The chapter will also look at the obtained results to come up with comparative inferences to the current model implemented in the institution.

4.2 Survey Results and Descriptive Statistics

4.2.1 Survey Results

A total of 17 employees were interviewed and this were Management staff in all the 12 income generating units together with their Division Heads. These included Heads of Division in Academics and Research and these are indirectly involved in the budget preparation process of all units of SU. Faculty Managers or Deans of all the Schools and Faculties were interviewed as these are directly involved in the budget preparation exercise. Directors or Managers of the two Independent Research Centers (@iLab and Strathmore Energy Research Center) were interviewed because they are directly involved in the budget preparation exercise. Directors or Managers of all Auxiliary Units and their Division Head were also interviewed because they are directly involved in the budget preparation exercise. Heads of Library and Admissions department were interviewed to establish the activities carried out. From the chart in the following page, it is observed that all the key players that are directly involved in the budget preparation exercise of all the units were interviewed. These are represented by either their Dean (13% of population interviewed), Managers (47% of population interviewed), and Director (20% of population interviewed). It may be further observed that the other 20% of population interviewed represent the Division Heads of

the three income generation units namely Academics, Research and Auxiliary Units.

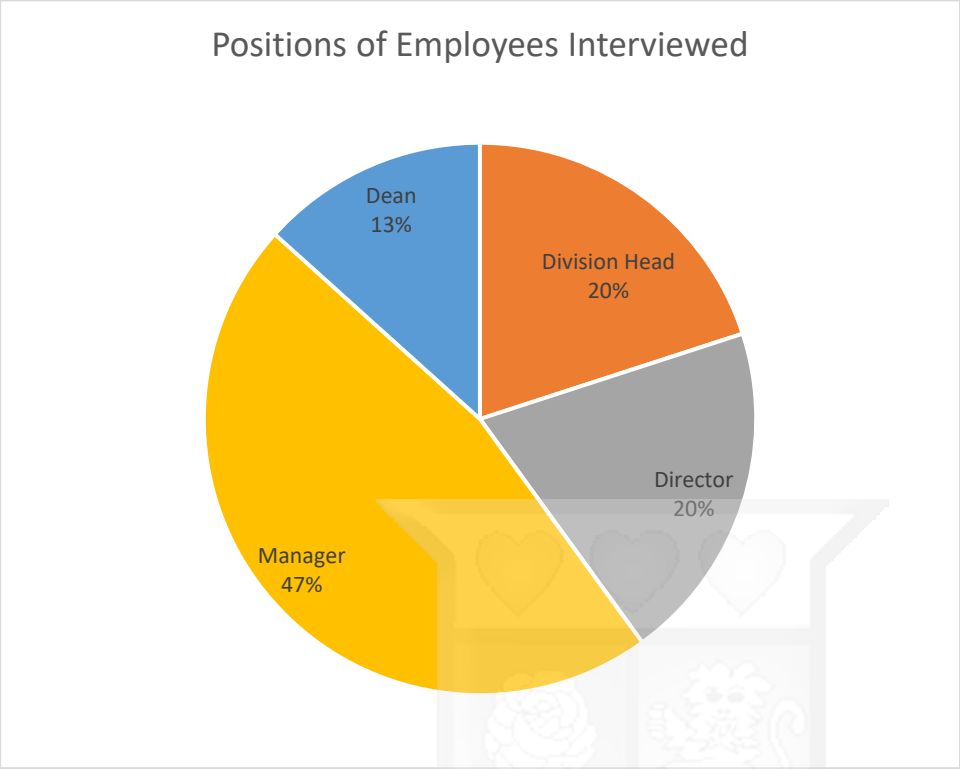


Figure 5 Employee Positions

Source: Researcher (2019)

Looking at the employee experience in the organization, it is seen that more than 86% of the staff interviewed have over one year experience (20% + 13% + 40% + 13%) and have therefore gone through a full budgeting cycle and are therefore familiar with overheads charged to their units. It may be further observed that more than 66% of the staff interviewed have more than two years' experience and have gone through the budgeting cycle more than once (13% + 40% + 13%). This level of experience is vital for both descriptive and diagnostic analytics of the departmental data which key for the success of the new model. The chart in the following page is a visual representation of the above observation:

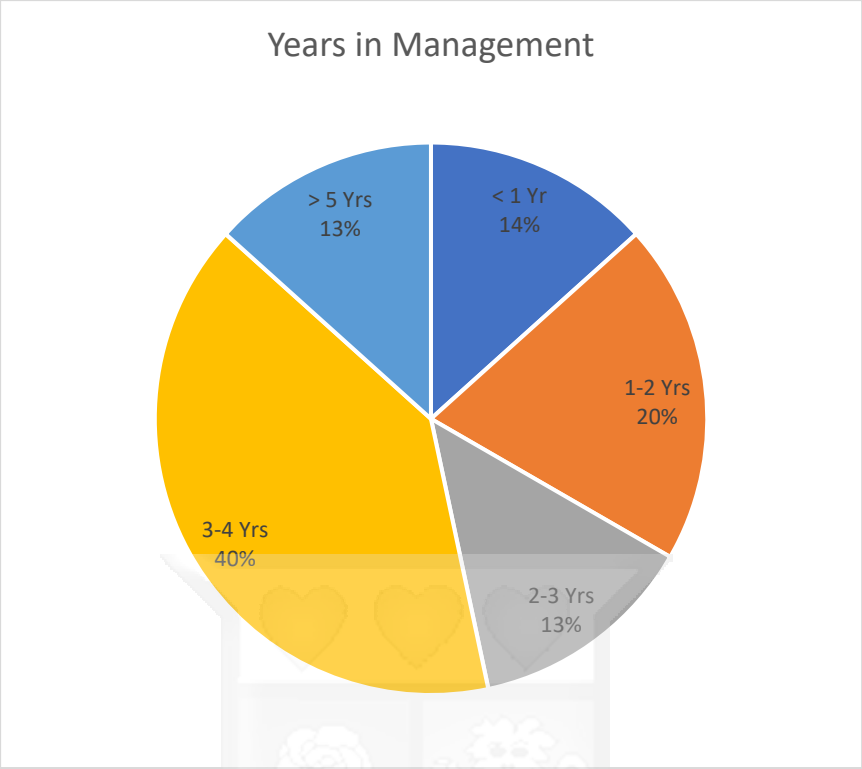


Figure 6 Years in Management

Source: Researcher (2019)

Due, to overhead allocation modeling, employee involvement in budget allocation is important to understand in order to understand the respondent's financial role in the institution. The discussion here lies within the level of employee's involvement in budget preparation of annual budgets together with budgets for pricing of new projects/products. This is especially important as employees directly involved in the budget preparation exercise have access to a lot of data and will therefore provide crucial data that is relevant when charging overheads via Activity Based Model. With the survey conducted, 20% of these employees are not directly involved in the budget preparation exercise and these are the three division heads interviewed as mentioned in Section 1 above. The other 80% represent managers of the twelve income generating units that are directly involved in the budget preparation process and are therefore familiar with the overheads charged to their departments.

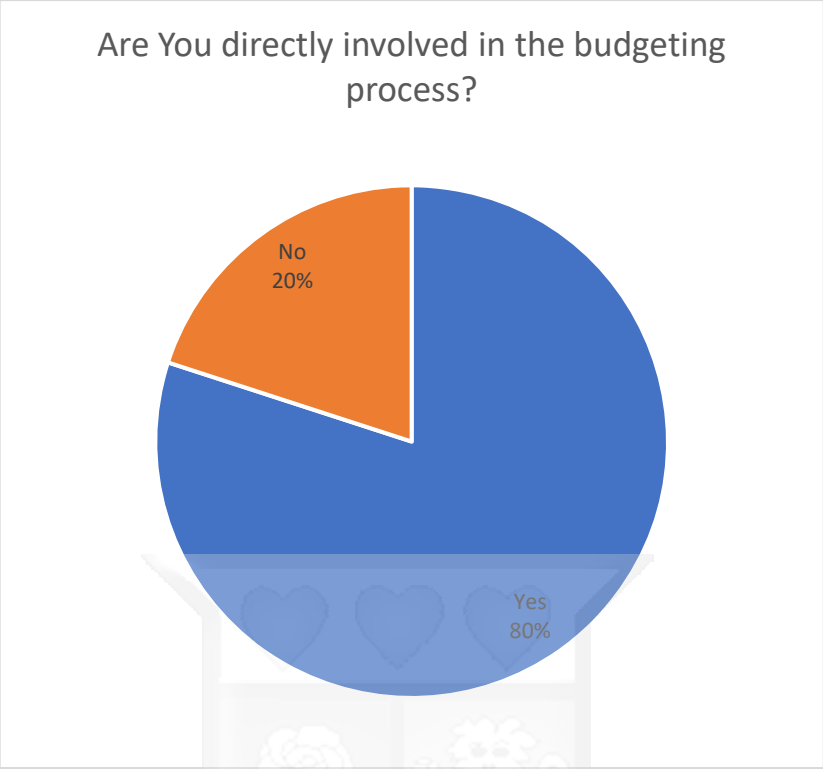


Figure 7 Budget involvement process

Source: Researcher (2019)

Some departments in the institution generate more revenue than others, looking at this from the survey results indicate that that over 67% of the persons interviewed were from departments that generate annual revenue of over Kshs. 200M. Over 54% of persons interviewed were from departments that generate annual revenue of over Kshs. 250M. This represents 100% of the revenue of all income generating units. This is represented by the following figure:

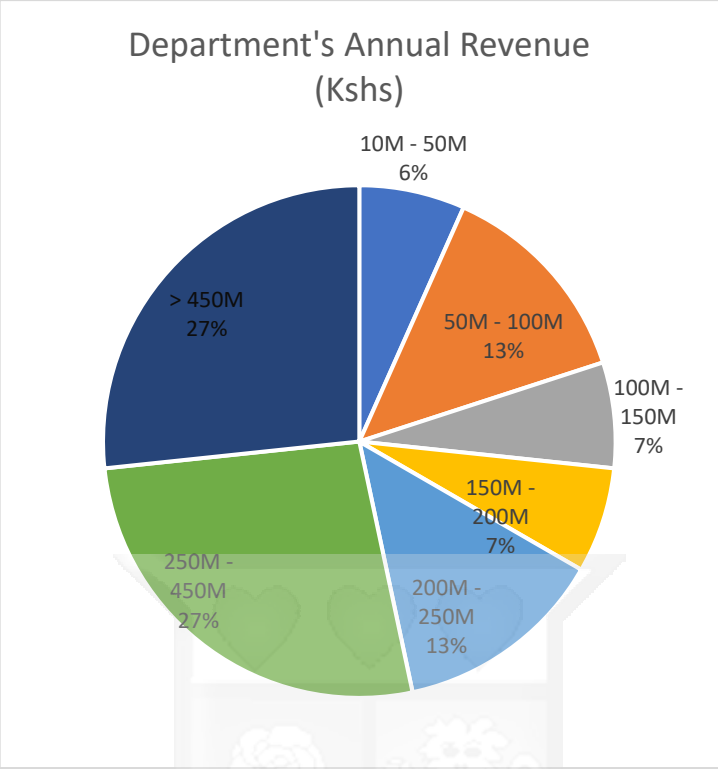


Figure 8 Departmental Revenue

Source: Researcher (2019)

To understand, the importance that an overhead allocation model has to the department, product pricing was used as a factor to determine whether the models have an impact on the departments price their products. It was observed that the division heads actually price their products based on the overhead allocation model:

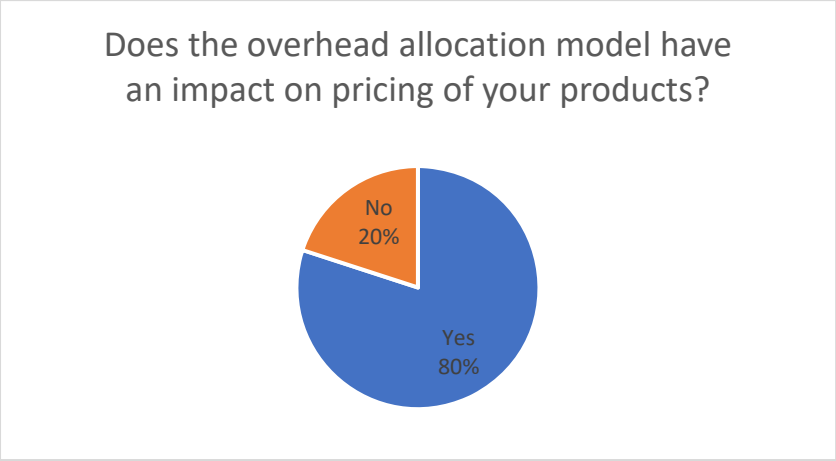


Figure 9 Does OAM have an impact on product pricing?

Source: Researcher (2019)

With the impact of product pricing in mind, the respondents were asked on their sentiments with the current overhead allocation model, the results found that none of the respondents felt that the overhead model is okay. It may further be noted that over 40% of the respondents felt that it overcharged their departments while 34% of the respondents felt that the model was complicated and 26% of the respondents felt that the model favored some departments. This shows that the current overhead absorption model has challenges and is not positively favored. Employees interviewed stated that charging overheads based on student numbers, as is currently the case, would overcharge some departments and also favor others especially the independent research centers that have no students. This infographic is a visual representation of the sentiments discussed:

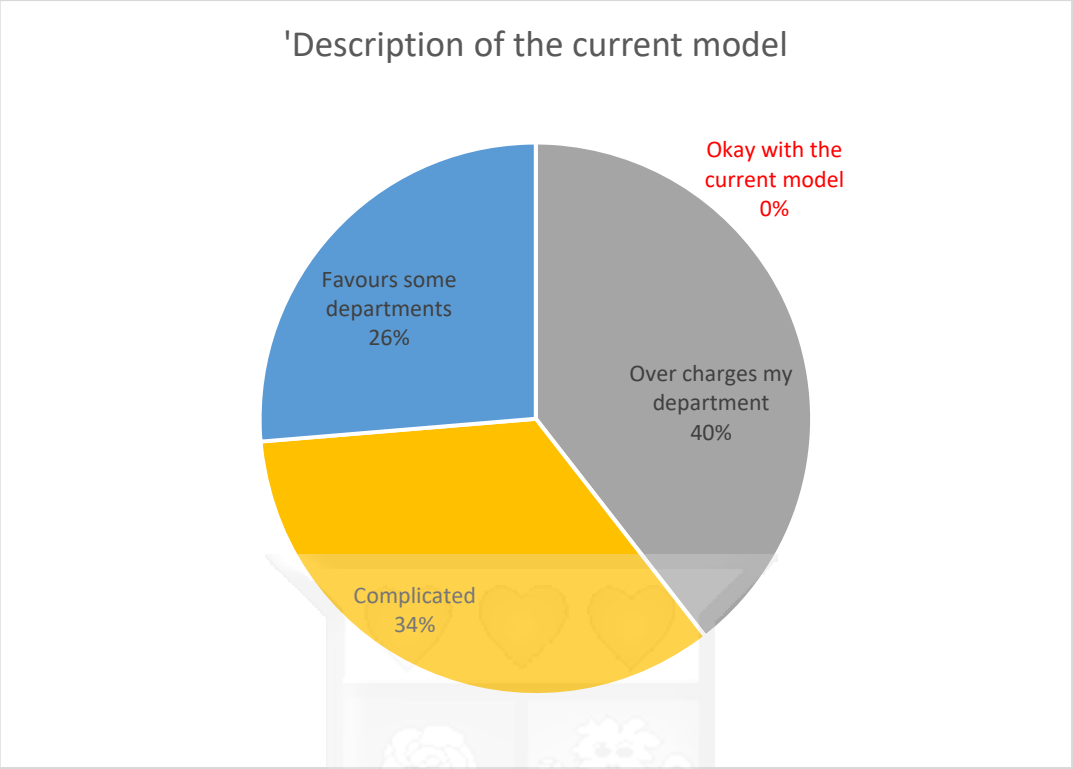


Figure 10 Sentiments on current overhead allocation model

Source: Researcher (2019)

The survey results have clearly indicated that the current overhead model is not satisfactory across all departments. With the suggestion of a new overhead allocation model, the department heads were asked on their familiarity with the Activity Based Model as suggested by this study. Over 73% of the staff interviewed were familiar with Activity Based Costing. This implies a high likelihood of acceptance as an overhead absorption model which majority of staff perceive to be more acceptable.

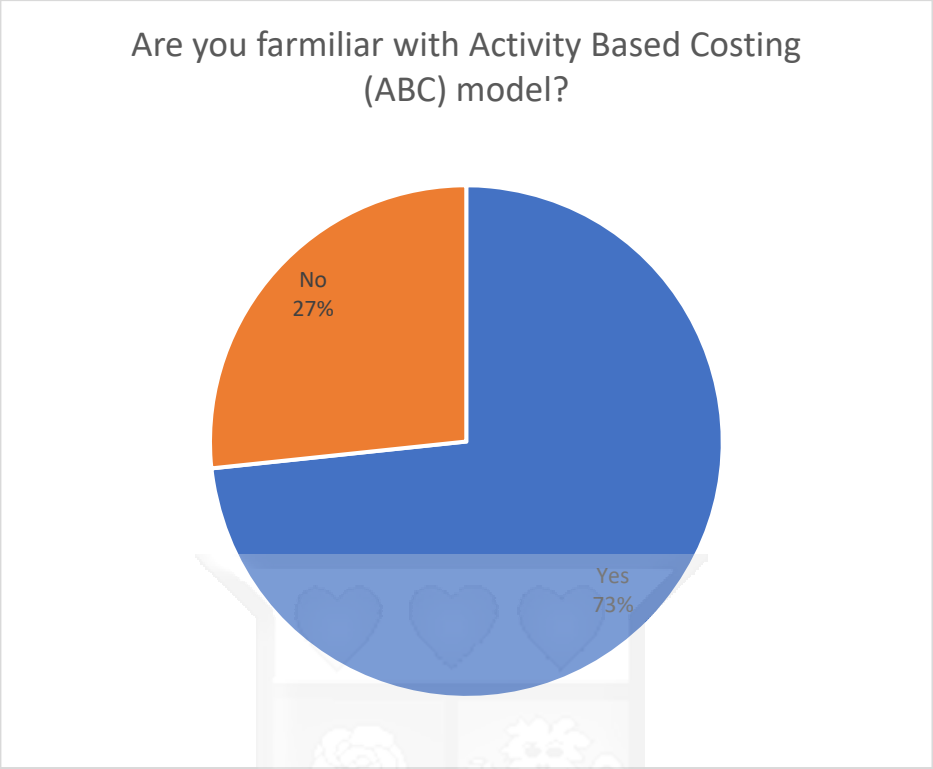


Figure 11 Familiarity with ABC

Source: Researcher (2019)

Knowing that majority of the respondents were familiar with Activity Based Costing, the survey went further to ask them on how they would rate the fairness of ABC as a costing model. None of the interviewed staff (except those who are not familiar with ABC) felt that ABC is unfair. It may be further observed that 46% of interviewed staff felt that ABC would be a very fair model for overhead allocation. This shows that ABC model has a higher acceptance than the current overhead model where none of the interviewed stated that they were not okay with it.

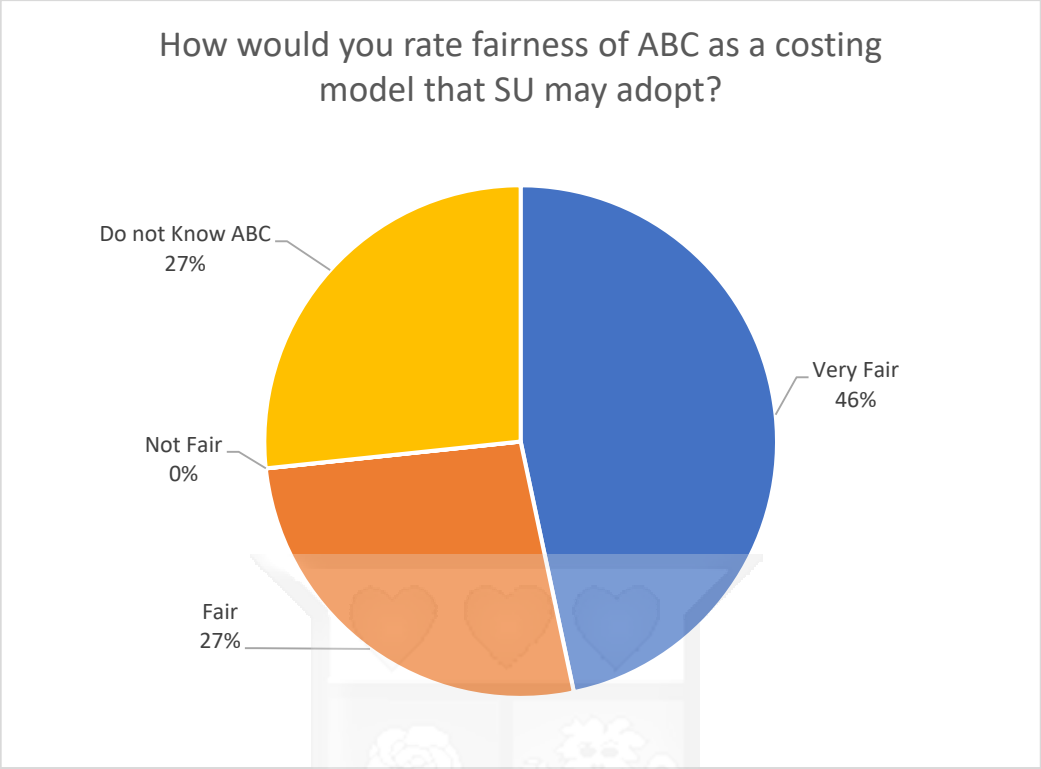


Figure 12 Fairness of an ABC Model

Source: Researcher (2019)

4.2.2 Revenues and Current Overheads Trend Analysis

Seeing that departments are currently not satisfied with the in place overhead allocation model. It is an indication that a new model is to be developed. Prior to model development, an understanding of the current and past financial statements was looked at to see how revenues and overhead allocation was trending over time. Some of the departments that were looked at were:

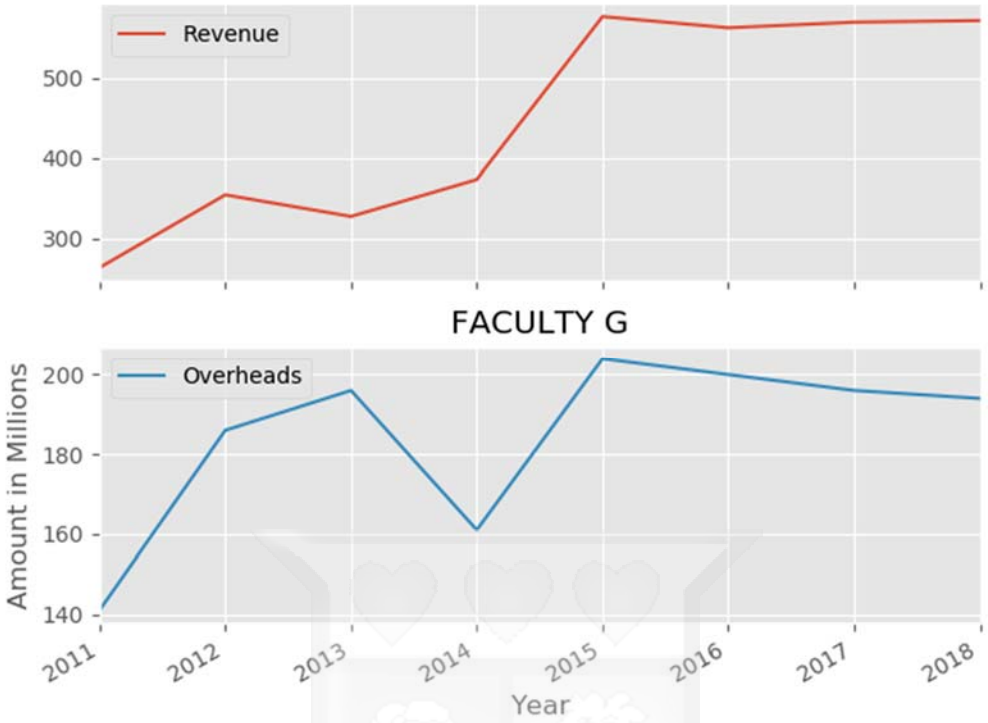


Figure 13 Faculty G Revenue vs Overheads

Source: Researcher (2019)

The revenue is seen to increase over the years, this is in line with the overhead costs. However, a slight increase/decrease in revenues shows a significant increase/decrease in overheads. An interesting observation in the year 2013-2014 where there was a significant drop in overhead costs.

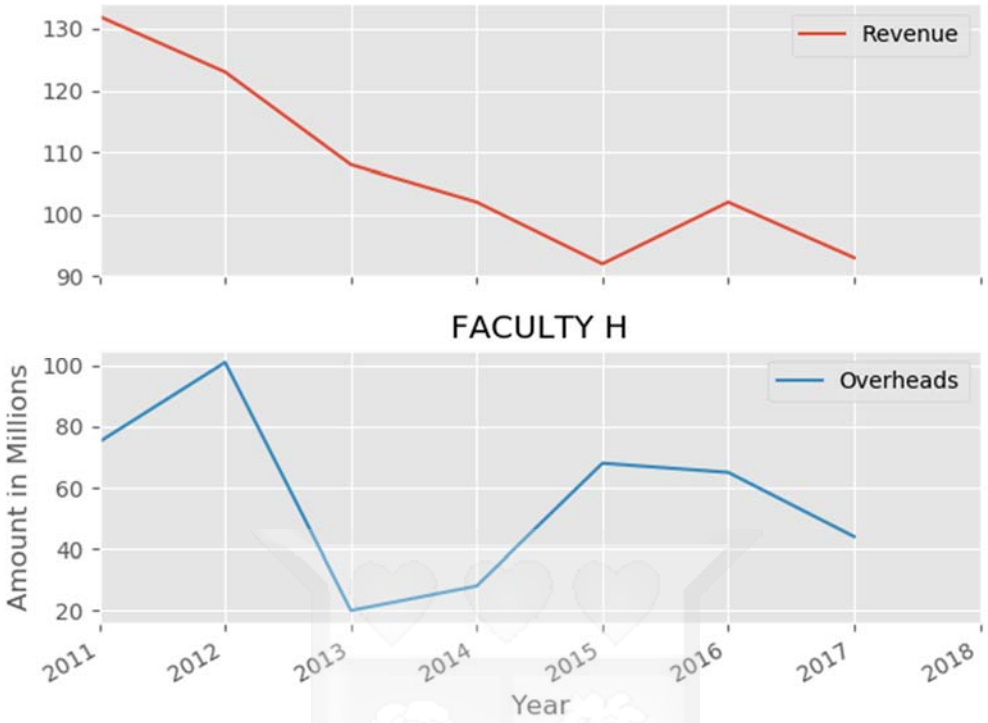


Figure 14 Faculty H Revenue vs Overheads

Source: Researcher (2019)

The graph indicates a decrease in revenues coupled with a decrease in overheads. The decrease in 2012 and 2013 is sharper in overhead allocation. There is an interesting relationship observed as that of the previous illustration. However, the directly proportionate relationship is not consistent with the year 2014-2015.

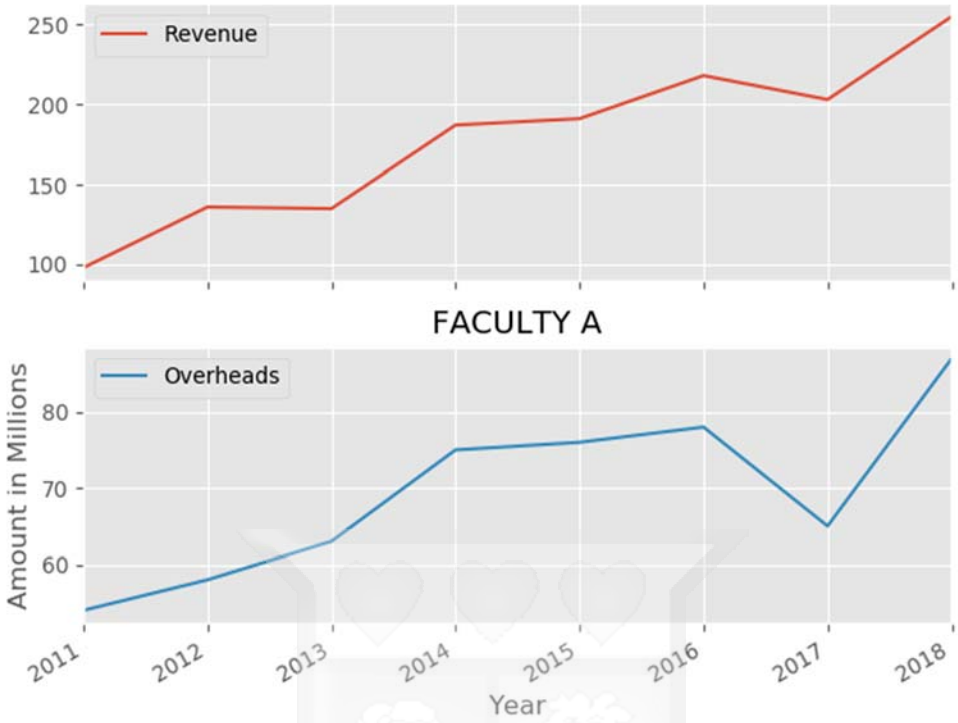


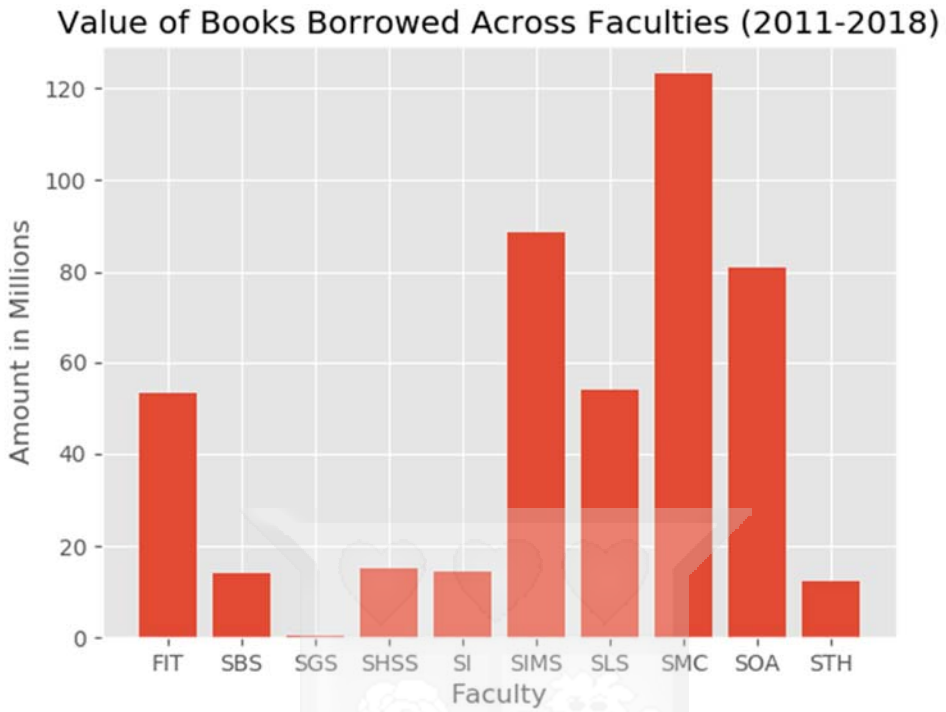
Figure 15 Faculty A Revenue vs Overheads

Source: Researcher (2019)

This can be further used to confirm that with the survey results, that department heads actually price their products with the amount of overheads allocated to them. Seeing that overhead is a crucial component in product pricing, it's importance and fairness cannot be overlooked due to push forward effects to the end target market of the product being offered. This can lead to discontent, hence bad for organizational satisfaction and success.

4.2.3 Library Descriptive Statistics

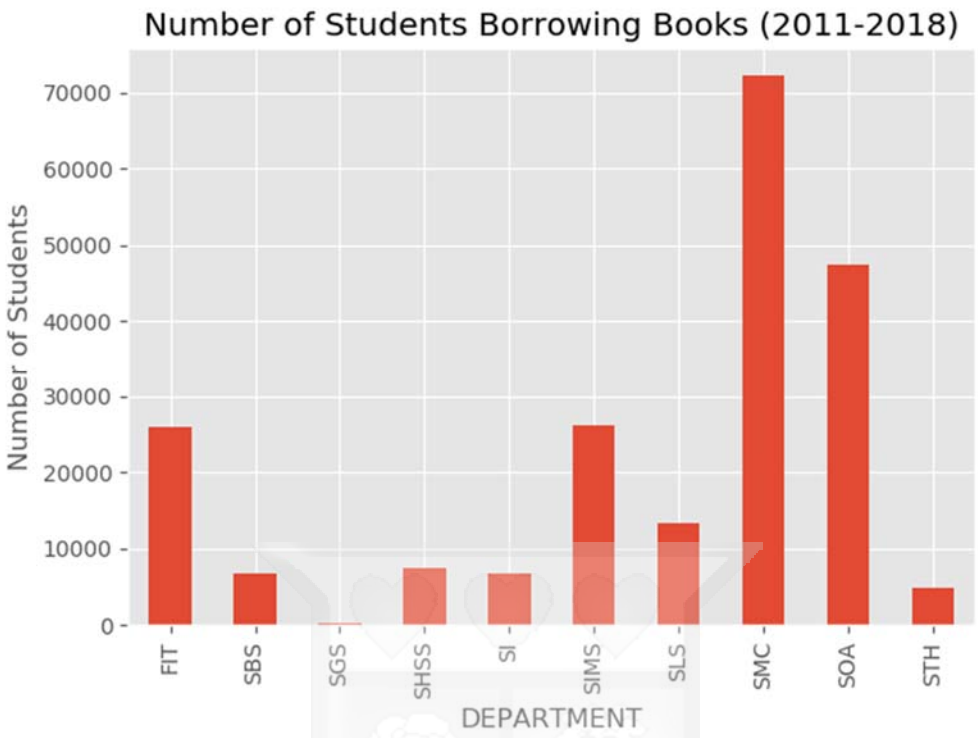
The library data was obtained from the Library Management in two sets as there was an introduction of a biometric system in 2016. The first one indicated the value of the books borrowed by faculty and the number of borrowers in that faculty. Two bar graphs indicating this are shown below:



Source: Researcher (2019)

Figure 16 Lending Value per Faculty

The amount in millions represent the total value of books borrowed in a span of 7 years from the year 2011-2018. The top three faculties in book value are SMC, SOA and SIMS respectively. An interesting observation with the SIMS faculty which has been in existence since 2015 yet it commands a high value in books borrowed.



Source: Researcher (2019)

Figure 17 Lending Based on Number of Students

The previous graph is a representation of the number of students visiting library and borrowing books. The weakness in this is that it does not reflect the total number of students utilizing the library workspace. The top 3 faculties that are borrowing books from the above observation are SMC, SOAand a tie between SIMS and FIT. The difference between SIMS and FIT in value of books borrowed poses an interesting observation which may be interpreted as SIMS books being pricier than FIT books given they have the same number of people visiting and borrowing books from the library.

Looking at how number of students and value of books borrowed varied over time for the top 3 faculties with most hits:

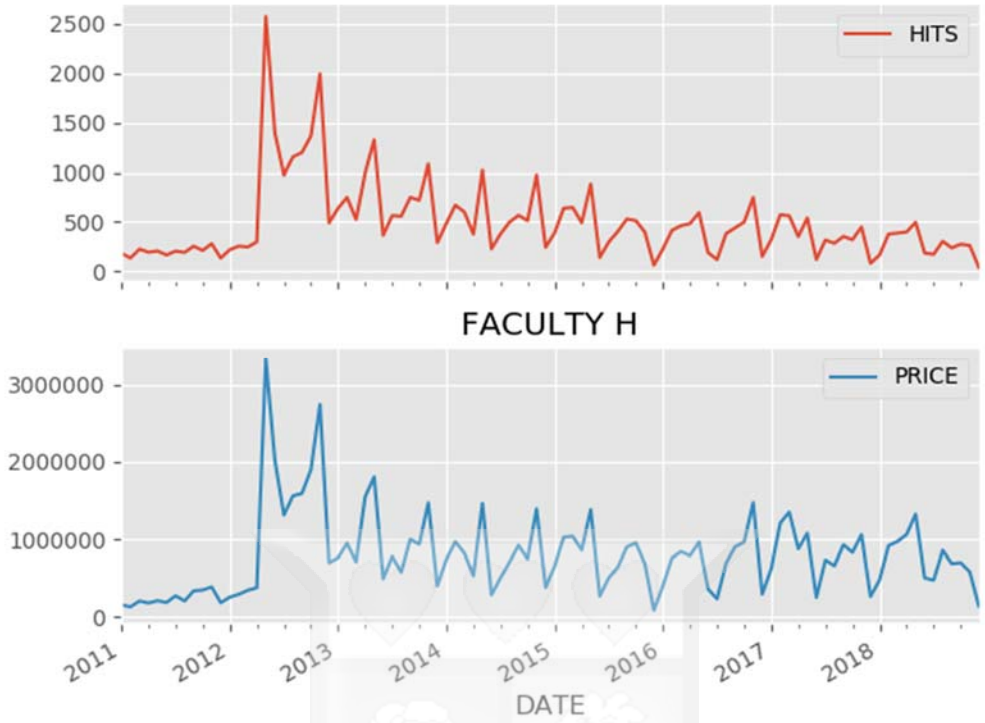


Figure 18 Faculty H Number vs Price

Source: Researcher (2019)

The above trend analysis graph from the FACULTY H indicates that the number of students borrowing books from the library and the value of books borrowed have some correlation. The drop in numbers from 2013 could be an indication of the introduction of degree programs hence less investment by the university in professional courses which is the main focus of this faculty. The cycles in the upward and downward spikes indicate the academic calendar dates for the running of the courses. Peaks are assumed to be towards examination periods.

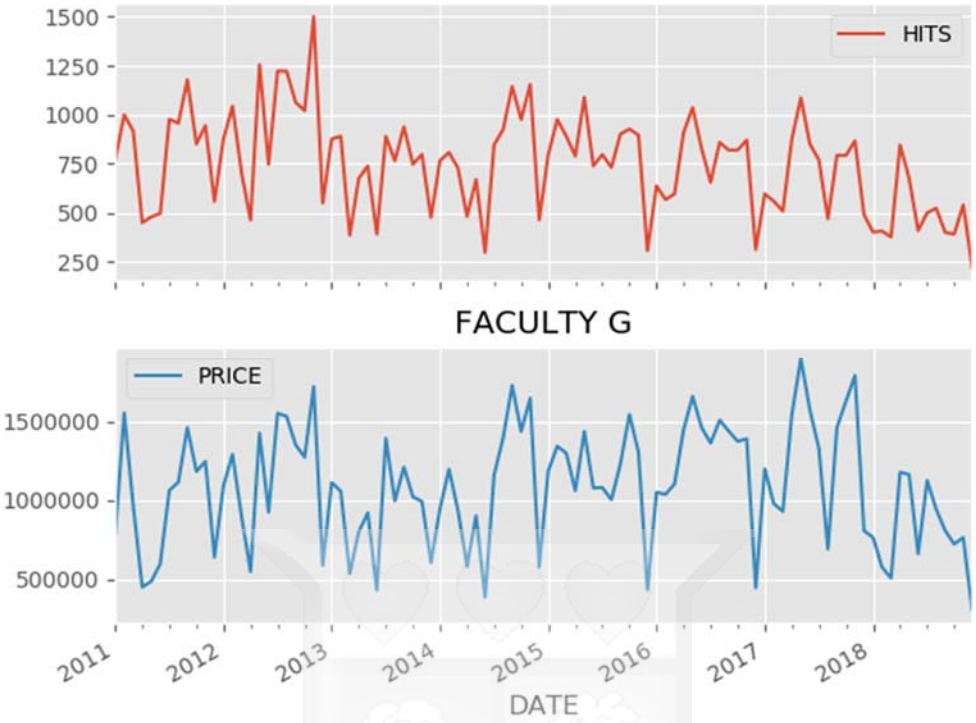


Figure 19 Faculty G Number vs Price

Source: Researcher (2019)

The other top faculty to look at its trend over time is FACULTY G which has degree programs. The trend observed here shows that there is an increase in the value of the books borrowed after mid-2014. Interestingly the number of the books that are borrowed, represented by the HITS graph on the top slightly reduce. This could be an indicator towards the increase in the price of books utilized by this particular faculty.

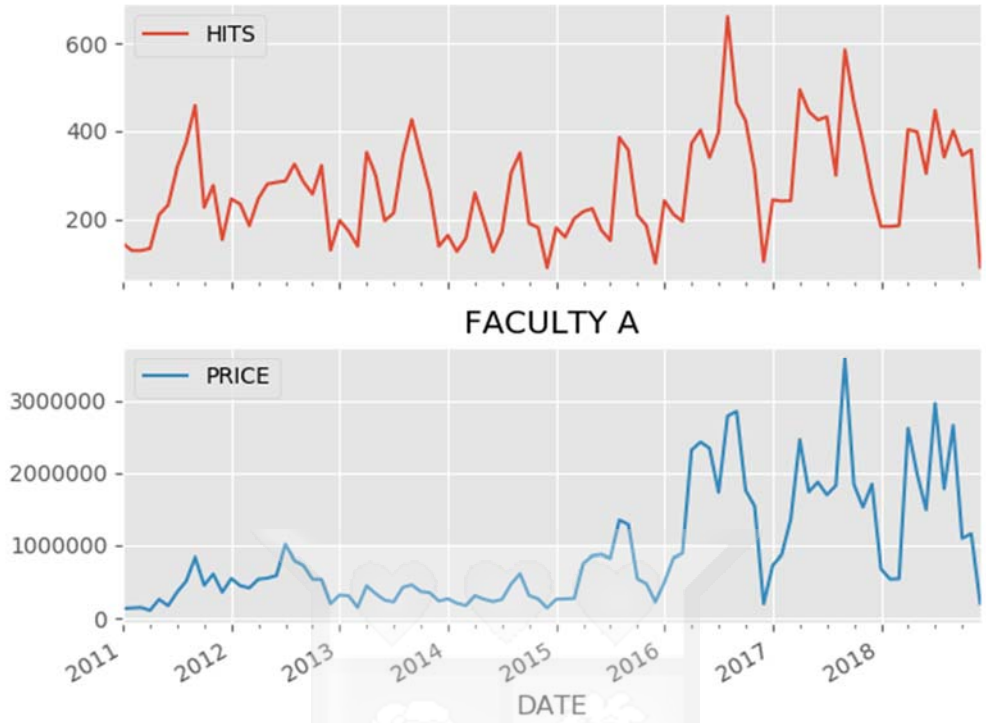
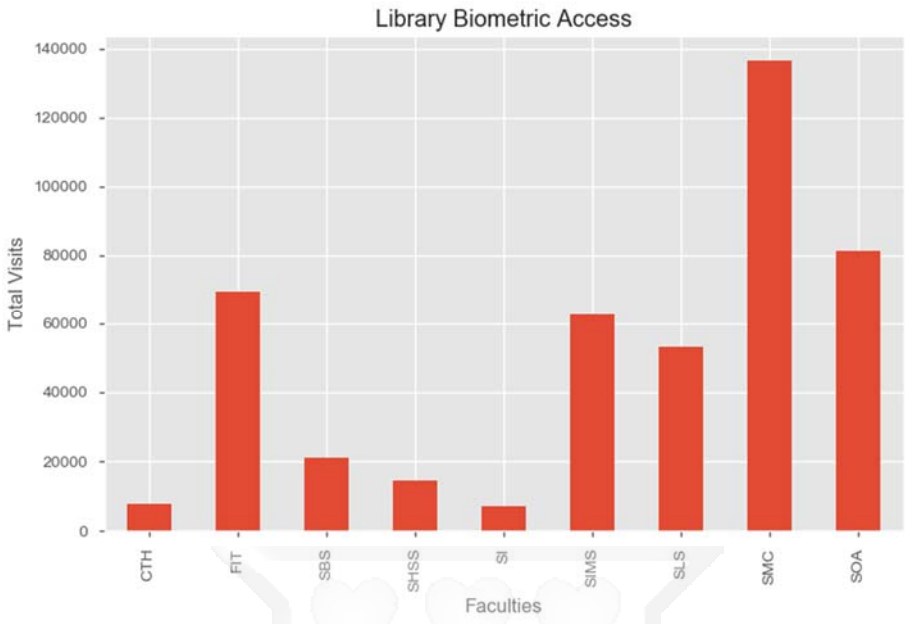


Figure 20 Faculty A Number vs Price

Source: Researcher (2019)

The other observation under the books borrowed dataset to look at is that of FACULTY A which is a faculty that was recently created as a result of a merger between two faculties. The graph indicates a trend of increase in use and value after 2015. This is when the merger happened, this also indicates that the library started to make huge investments in book value towards the faculty. The spikes are a similar indication of academic calendar patterns in accordance to the academic year for the faculty. It is safe to assume that the sharp increases are towards examinations periods as observed in previous graphs.

The data obtained from the biometric system represents the number of students accessing library facilities through the system entry point. This dataset however, is not indicative of the time spent, books borrowed or any other form of utility in the building apart from the access point.



Source: Researcher (2019)

Figure 21 Biometric Access Data

This data is consistent with the observations that we have seen earlier apart from a small difference between SIMS and FIT based on the number of visits. An unobservable factor between the two datasets above is that they both cover different time periods with the first one covering 2011-2018 while the second is covering 2016-2018. Another important factor is the seasonality of the dataset, that is the academic period for the different faculties does not run annually and has different periods of spike and downturns.

A look at the trend analysis in order to delve deeper into the understanding of this data was done. The top 3 faculties in the library visits department will be looked at, as was the case with the lending of books data. A first look will be again at the FACULTY H dataset:

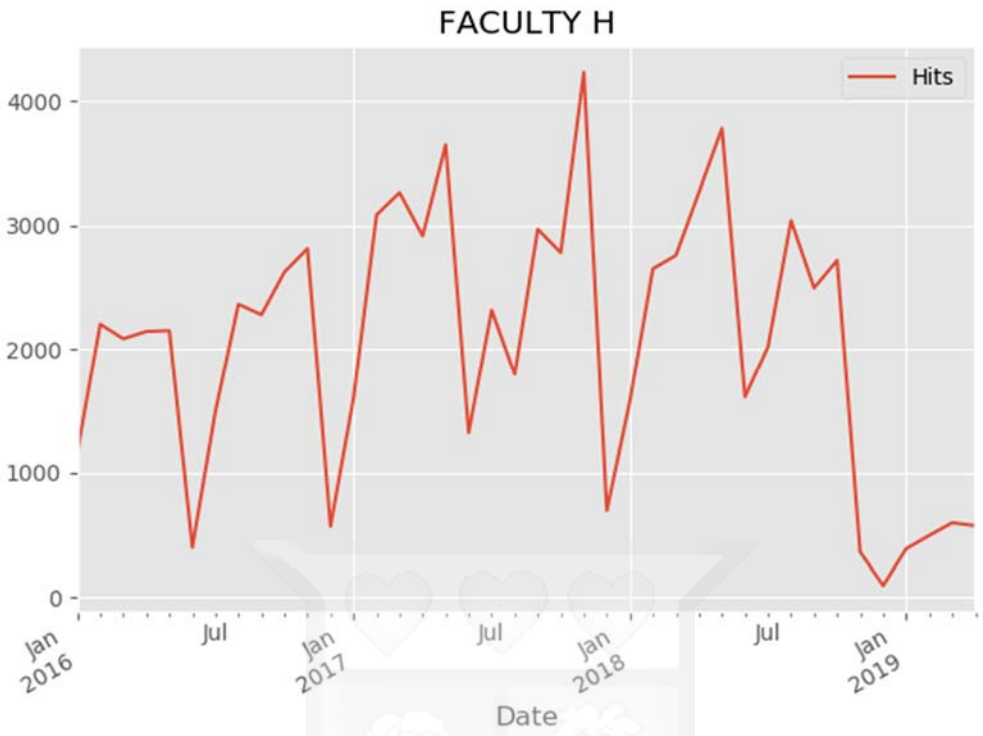


Figure 22 Faculty H Biometric Access

Source: Researcher (2019)

The main professional examinations from FACULTY H, are during the month of June and December, this can be observed with the downward spike in the above graph. The year 2017 had one of the highest peaks of library visits in the faculty. There is a general upward trend in the number of visits although this drops slightly after the year 2017.

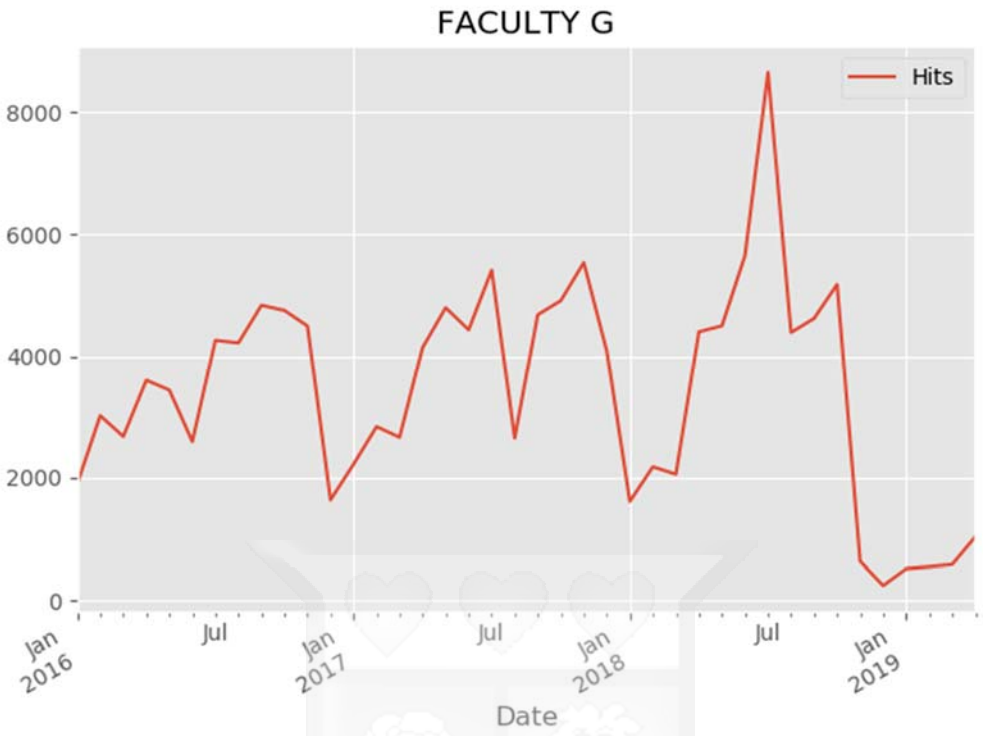


Figure 23 Faculty G Biometric Access

Source: Researcher (2019)

There is a general upward trend in the FACULTY G graph, with the highest number of visits recorded in the year 2018. The same year also observed the lowest number of library visits interestingly. The other trend to look at would be that of Faculty of Information Technology:

The FACULTY B trend is similar to that of FACULTY G, the peak number of library visits were observed in 2018, although this is almost half the number that FACULTY G recorded.

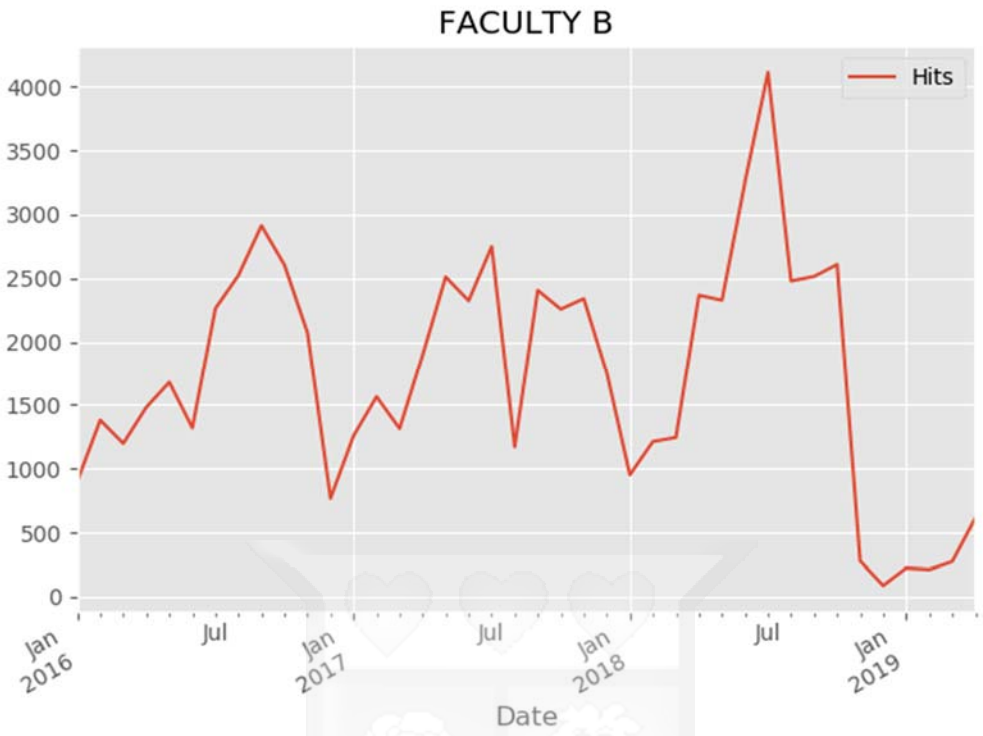


Figure 24 Faculty B Biometric Access

Source: Researcher (2019)

4.2.4 Admissions Department Descriptive Statistics

Data was obtained from the admissions office from a span period of 2011-2018. The data covers the core activities carried out by the admissions office based on numbers of applications made to the department, number of admissions and number of enrolled students. Looking at the individual graphs respectively:

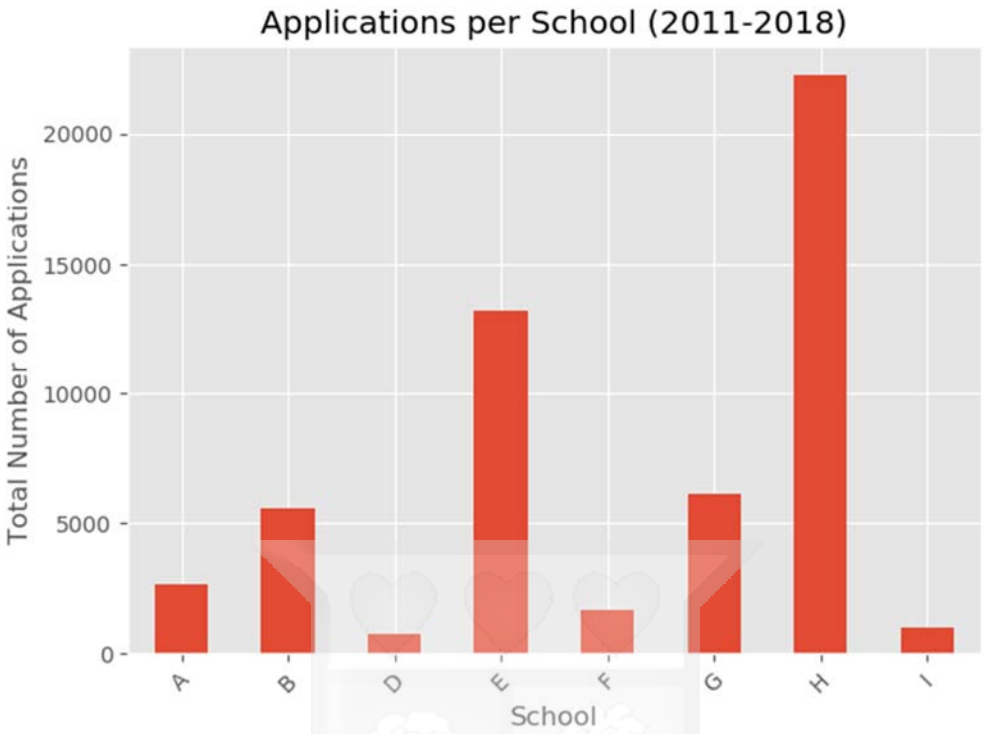


Figure 25 Number of Applications per School

Source: Researcher (2019)

This data indicates that FACULTY H receives the greatest number of applications. The observation is not surprising as the course run by the faculty are short and run for about 3-6 months per certification. Another factor contributing to this is that the faculty is the oldest running faculty in the institution. Looking at the admissions made per faculty, the numbers remain similar to the one for applications made per faculty.

FACULTY H has the highest number of admissions as it had applications. The figures of admissions are strikingly similar if not almost the same. This is an observation that would require further investigation into the cause of it. A quick interpretation would be that the university has a low rejection rate.

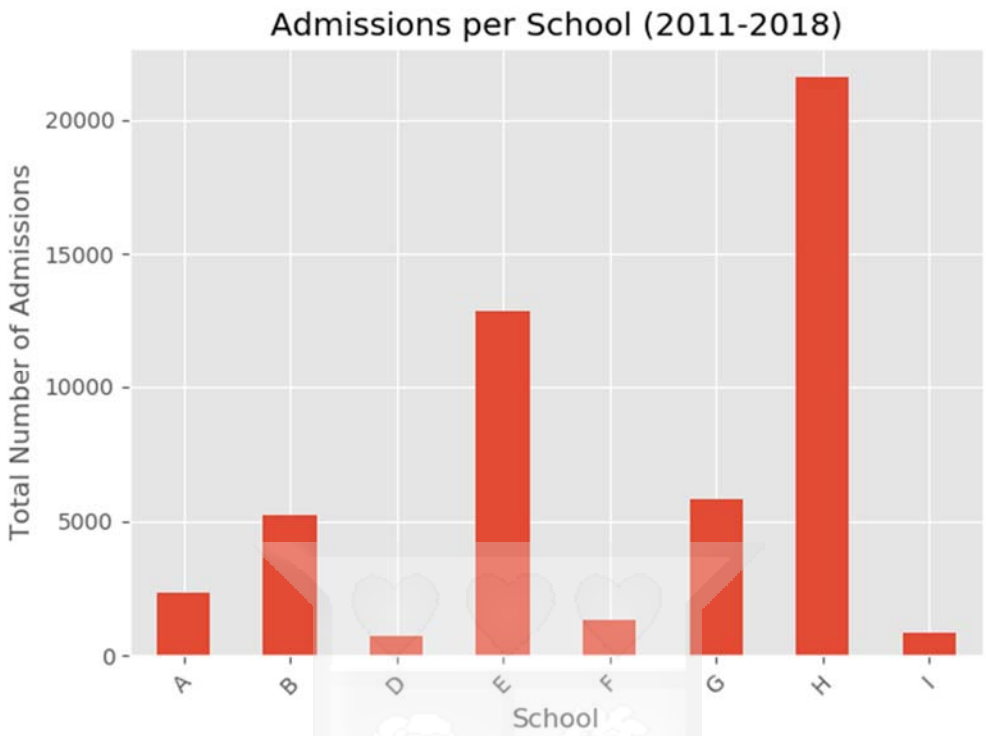


Figure 26 Number of Admissions per School

Source: Researcher (2019)

The enrolments done by the different faculties shows the stark difference in numbers enrolled which drop down significantly this can be observed by the change on the y-scale of the graph. The enrolments graph represents the total number of enrolments over the given time period. The determining factors of the enrolment size are derived from faculty capacity for classes, degree/certification cycle and the availability of academic programs. Faculties with the highest number of academic programs such as FACULTY H have higher enrolment numbers as compared to FACULTY E which has only a single degree program during that time period. The same case applies to FACULTY I. Another factor is the establishment of faculties, the newer faculties report lower admission process figures.

The admissions process activities are core to the business of the institution hence an efficient resource allocation process to the different departments is crucial to a fair and equitable approach for overhead allocation.

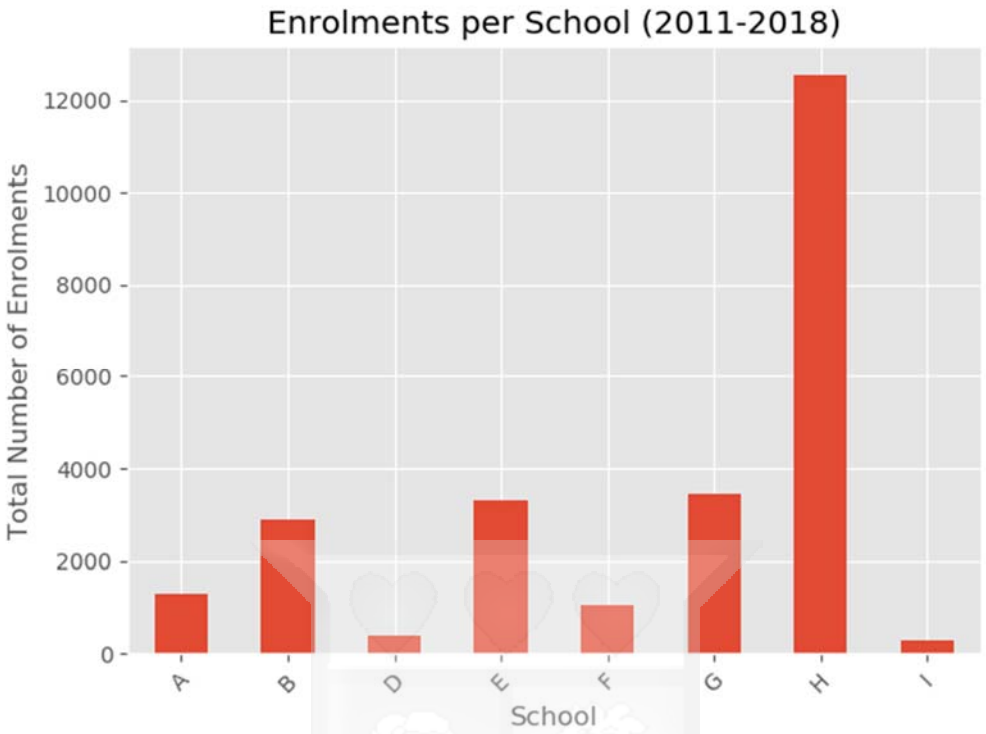


Figure 27 Number of Enrolments per School

Source: Researcher (2019)

A deeper look into trend analysis for the different faculties recording the highest numbers is seen as shown below:

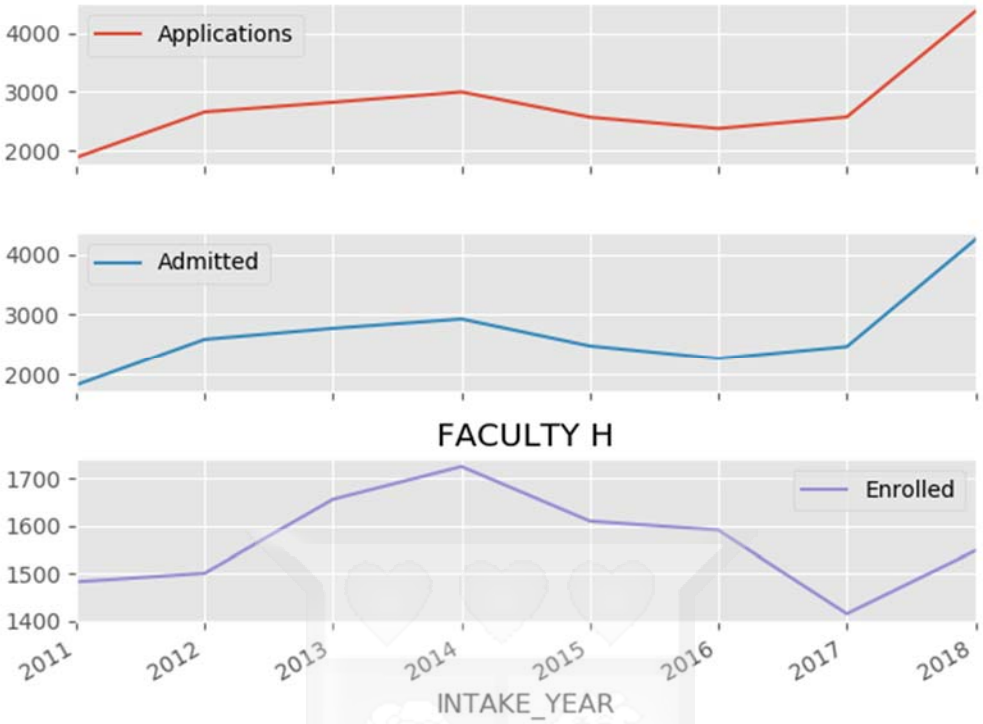


Figure 28 Faculty H Admission Trends

Source: Researcher (2019)

An interesting observation is seen in 2017, where the enrolment numbers drop down to 1,400 whereas the highest enrolment into the faculty was observed in 2014. The numbers between admissions and enrolment drop by at least 1,000. However, the applications and admission numbers are not entirely different. Looking at another department known as Faculty E:

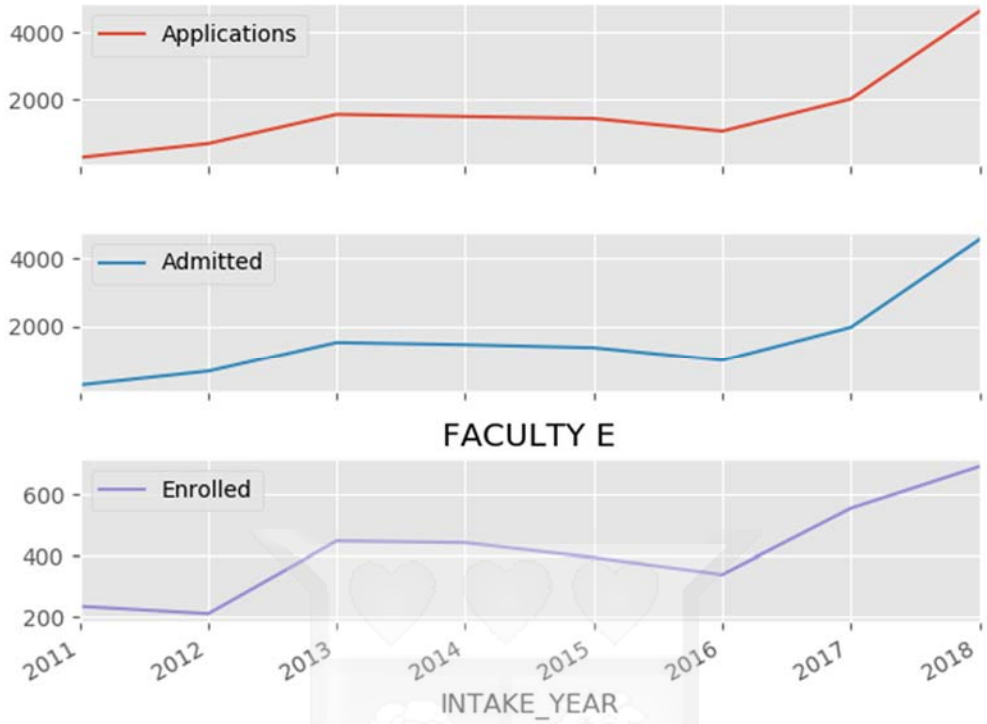


Figure 29 Faculty E Admissions Trend

Source: Researcher (2019)

With Faculty E there is a general upward trend in the three categories of number of applications, number of admissions and the enrolment numbers. The highest numbers are recorded after 2017 in all three categories. Looking at the FACULTY G, the highest enrolment was observed in 2013 with the lowest being 2017. Thereafter, an increase has been observed in the enrolment numbers. The applications, admissions and enrolment have seen a correlated trend. This means that enrollment is high when the admissions and application numbers are high too.

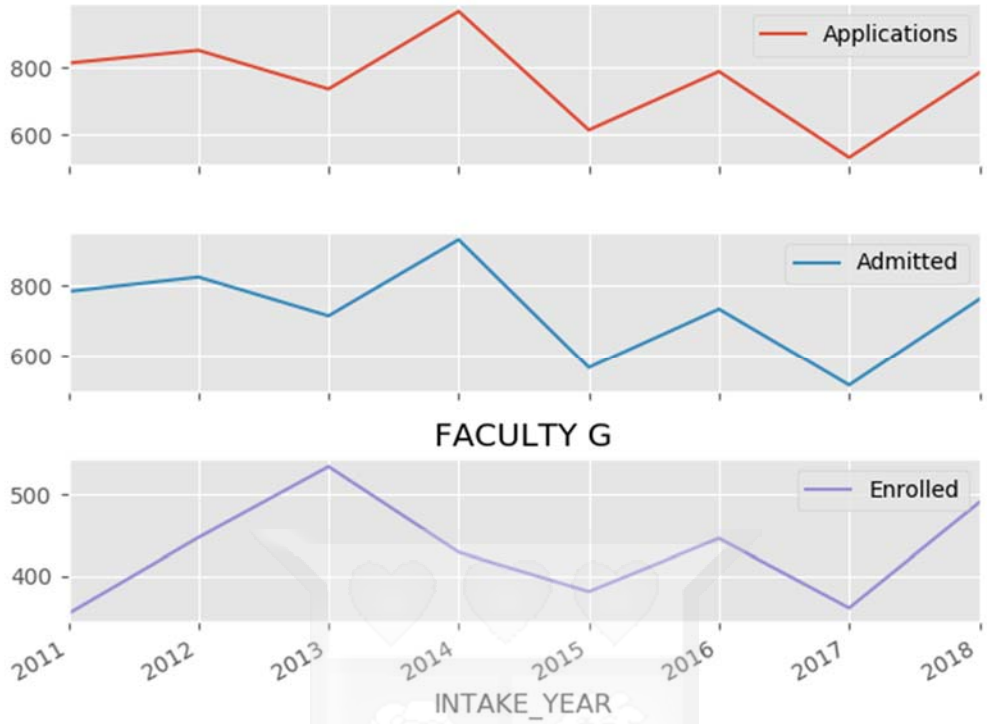


Figure 30 Faculty G Admissions Trend

Source: Researcher (2019)

4.3 Model Data Analysis

4.3.1 Test Statistics and Test Regression

For the test statistics, a Pearson correlation matrix was computed to calculate the correlation between indirect costs, direct costs, library and admissions overheads and revenue. The yielded results were as follows:

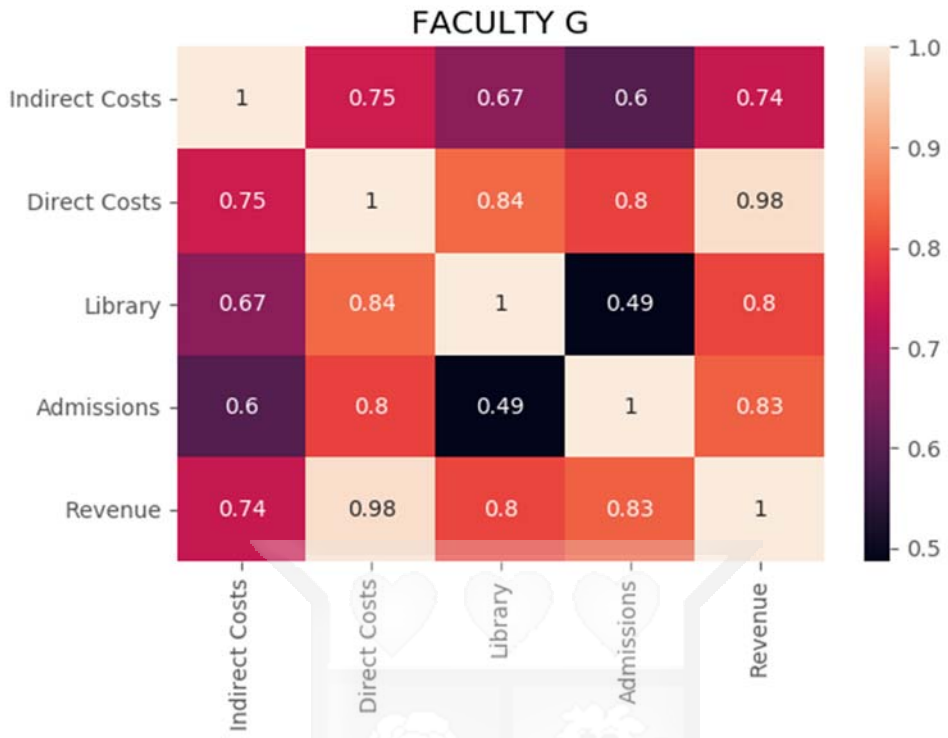


Figure 31 Faculty G Correlation Matrix

Source: Researcher (2019)

For Faculty G, the highly correlated variables were between revenue and direct costs with a 0.98 correlation. Whereas, the lowest correlation was between library and admissions with a 0.49 correlation coefficient. Looking at Faculty B:

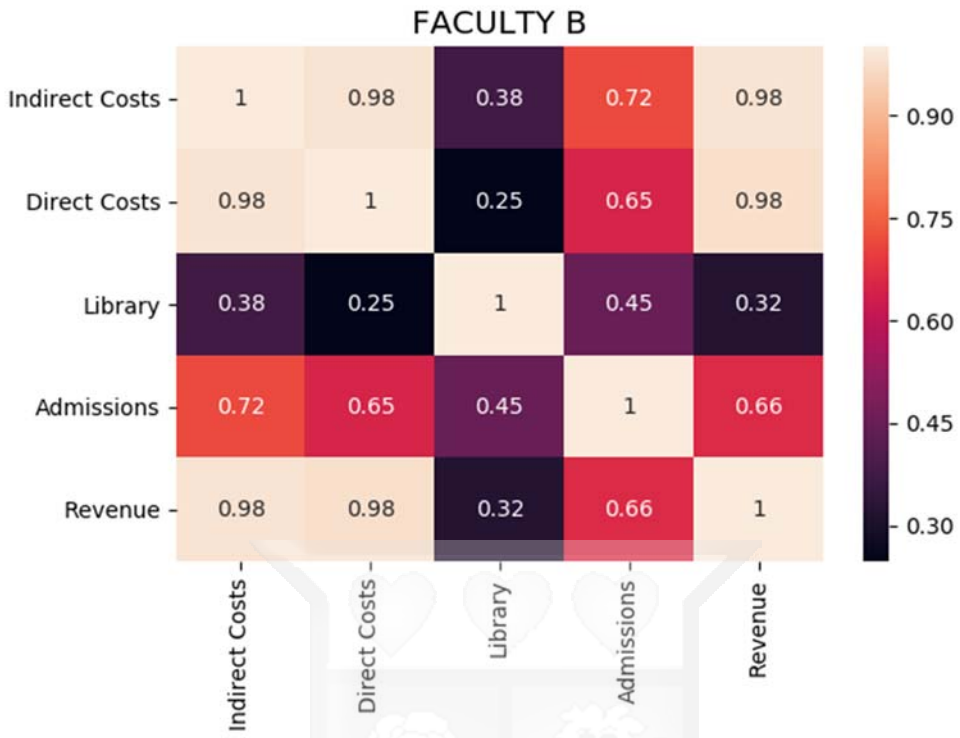


Figure 32 Faculty B Correlation Matrix

Source: Researcher (2019)

There were generally high correlations between variables in this faculty, this could be due to the faculty not being charged overheads during the period of study. The lowest correlations were between the library and direct costs. Furthermore, some regression analysis was carried out in the form of:

$$y = \beta_0 + \sum_{i=1}^{n} \beta_i X_i + \varepsilon$$

y is the dependent variable

β_0 is the intercept

β_i is the coefficient

X_i is the independent variable

ε is the error term

The output of the regression for Faculty H yielded satisfactory results where revenue was the dependent variable, given the independent variables indirect costs and direct costs:

Coefficient:	Value	p-value	t-statistic
Intercept	116.4256***	0.016	4.032
Indirect Costs	0.2405	0.346	1.068
Direct Costs	-0.2979	0.359	-1.034

Table 2 Faculty H Regression Output

Source: Researcher (2019)

The intercept indicates that, with nil values on direct costs and indirect costs, the revenue amount would be at around 116 million. The intercept also yielded a p-value of less than 0.05 making it a significant variable at 95% confidence interval. Indirect costs (overheads) are seen to increase the revenue whereas direct costs have an inverse relationship with revenue.

A regression on revenue against library and admissions was also conducted for Faculty G and the following results were obtained:

Coefficient:	Value	p-value	t-statistic
Intercept	-263.998***	0.088	-2.117
Library	45.2984***	0.027	3.107
Admissions	34.3605***	0.019	3.432

Table 3 Faculty G Regression Output

Source: Researcher (2019)

The above variables are all significant at 95% confidence interval, with a negative revenue value at no library and admission cost showing the need for these activities for the faculty to make money hence importance of an optimal overhead allocation model need. Both library and admission costs increase revenue.

Further regression analysis was done to probe the financial data, looking at the relationship between direct costs as the dependent variable and library and admission costs as the independent variables for Faculty G:

Coefficient:	Value	p-value	t-statistic
Intercept	-7.6959	0.963	-0.049
Library	-2.8093	0.889	-0.147
Admissions	29.4536	0.135	1.782

Table 4 Faculty B Regression Output

Source: Researcher (2019)

All the variables in the above regression are not significant due to lower than 90% confidence interval indicated by the high p-values. The intuition brought out is that direct costs are lower than 0 given nil library and admission costs, whereas library has a negative effect and admissions has a positive effect towards direct costs. Looking at Faculty G results on the other hand:

Coefficient:	Value	p-value	t-statistic
Intercept	-174.387***	0.042	-2.719
Library	28.4078***	0.013	3.736
Admissions	16.6935***	0.023	3.241

Table 5 Faculty G Regression Output

Source: Researcher (2019)

The above results indicate a similar negative value on direct costs when the two independent variables are zero. However, a direct relationship is observed with the library and admission costs with all variables being significant at 95% confidence interval. These results are an indicator to

further investigate how direct and indirect costing interacts with revenue, this shows the importance of overhead allocation.

4.3.2 Library Data Analysis Process

The data analysis process commenced with data cleaning in Python Programming language. This involved converting dates to the required date formats, dropping departments/faculties that are non-academic as this paper focuses on the academic aspect of the institution and merging duplicated dates in the dataset for a single date per period. It is important to note that the data was monthly in nature hence aggregating the monthly usage into one observation due to similar date entries.

Post data cleaning phase, the main activities carried out in the department were laid out in order to come up with an Activity-Based model. These activities were given weights and two overarching activities which were reading and lending. Under each of the activities, services carried out under the activity were broken down further. The breakdown under reading services included: Books procurement, ordering & tagging, books shelving services and books check-out services. Under the lending process: security luggage services, maintaining order and books maintenance.

The assumptions necessary for the model to be developed were the library access dataset was used for reading, whereas the value of books borrowed dataset was used for lending. The other assumption was to equally weight the services conducted under each activity as it was arbitrary and no specific value could be obtained hence the equal weighting assumption. The computation of the cost driver was done by getting the total cost that the library incurred, and dividing it by the total number of activities. This can be defined by this equation:

$$Cost\ Driver = \frac{Total\ Overhead\ Cost}{Total\ number\ of\ activities}$$

The total number of activities is computed by multiplying the total weighting by the total number of students Once the cost driver is computed, the rate is multiplied by the weighting of the service and the total number of students who utilised the specific activity. This apportionment is iterated through each faculty which when summed up gives the total overhead cost initially stated.

$$Absorption = Cost\ Driver * Service\ Weighting * Number\ of\ users$$

Library Visits Yr 2018			
	School	Reading	Lending
	SIMS	23,800	3,635
	FIT	23,438	2,089
	SBS	9,398	1,119
	SGS	-	6
	SHSS	6,598	1,876
	SI	6,193	863
	SLS	20,106	3,485
	SMC	44,133	5,705
	SOA	28,422	3,307
	STH	-	879
	Total	**162,088**	**22,964**
Activities		**b**	
Lending Services	Book Procurment, Ordering & Tagging		1
	Books Shelving Services		1
	Books Check-out Services		1
Reading Services	Security Laugage Services	1	
	Maintaining Order	1	
	Books Maintenance	1	
Total Activities Per Student Per Visit		**3**	**3**
Total number	486,264	68,892	555,156
Total Annual Library Costs (b)			**30,285,569**
Library Cost Per Activity Per Student (b)/(a)			**54.55**

Table 6 Library ABC Model

Source: Researcher (2019)

Once the absorption cost is computed, a comparative analysis to how the costing was previously done is looked at to compare the changes and determine if the difference is significant. This table is an illustration of the differences:

FACULTY	COST UNDER ABC MODEL	COST UNDER CURRENT MODEL	OVER/(UNDER) CHARGE	PROPORTION (%)
FACULTY A	4,490,005	3,064,741	-1,425,264	-46.51
FACULTY B	4,177,743	7,807,141	3,629,398	46.49
FACULTY C	1,721,210	3,103,119	1,381,909	44.53
FACULTY D	1,386,853	2,012,093	625,240	31.07
FACULTY E	1,154,783	0	-1,154,783	0
FACULTY E	3,860,898	3,218,252	-642,646	-19.97
FACULTY G	8,156,476	10,071,431	1,914,955	19.01
FACULTY H	5,192,761	0	-5,192,761	0
FACULTY I	143,857	1,008,787	864,930	85.74
TOTAL	**30,284,586**	**30,285,564**	**978**	

Table 7 ABC Library Overhead Allocation Results

Source: Researcher (2019)

The above table indicates a significant difference between two costs in a particular year (2018). Most of the faculties are overcharged overheads whereas others are undercharged if not charge at all. This is an encouraging observation as it is an indicator of the absorption model being applied unfairly. The graphed results provide for a clear picture for analysis:

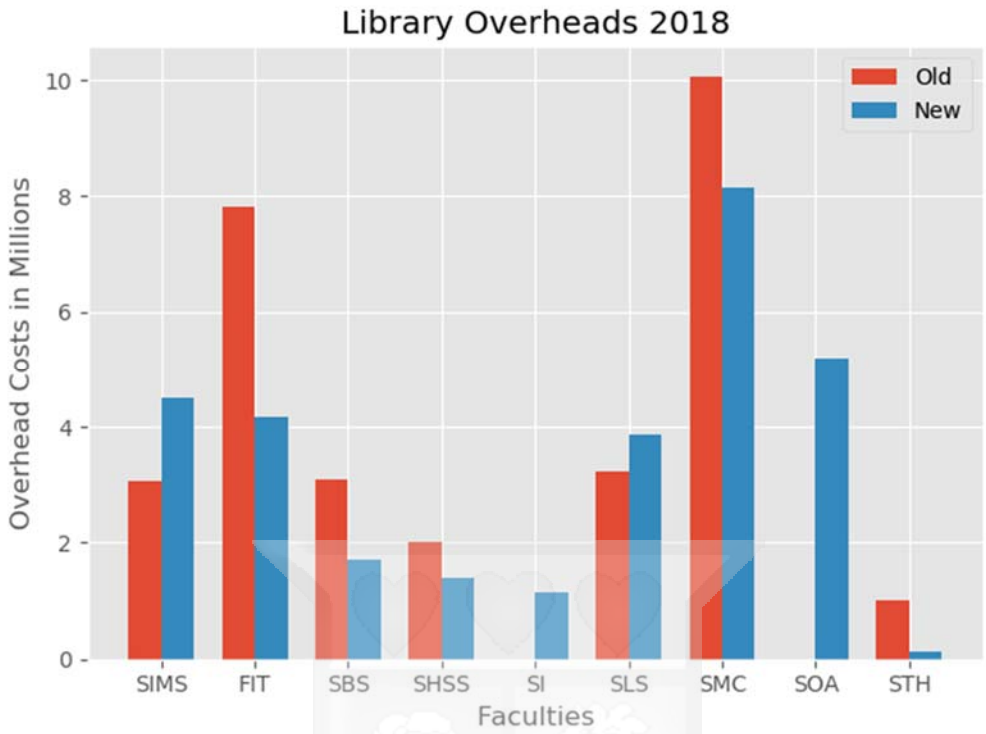


Figure 33 Library Overheads Comparison Chart

Source: Researcher (2019)

The above figure indicates that the faculties that were previously overcharged are FACULTY B, FACULTY B and FACULTY G among others with FACULTY B having the highest disparity. Whereas, the undercharged faculties were mainly FACULTY H, SI and FACULTY A with FACULTY H coming from an overhead allocation cost of zero.

4.3.3 Library Overheads Sensitivity Analysis

As seen from the above analysis, some faculties will experience a financial shock with the implementation of the ABC model for overhead allocation. Due to this, to ensure an ease of transitioning, a sensitivity analysis was carried out to reduce and observe the financial shock. The analysis will aid in an accepting environment for the model especially for these departments.

The assumptions made for this analysis was in dropping some of the activities in the department, in this case, the reading services was combined into one activity known as general library maintenance as this is what forms a significant part of the service during reading time. With the

new activity, the cost driver rate used was same as above as the sensitivity will be applied to FACULTY H for illustration purposes. The new overhead becomes:

FACULTY	COST UNDER ABC MODEL	COST UNDER SENSITIVE ABC MODEL	PROPORTION OF EASE (%)
FACULTY H	5,192,761	2,091,736	59.72

Table 8 Library ABC Sensitivity Analysis

Source: Researcher (2019)

More than half of the overhead cost is redistributed equally to be shared among the other faculties. Such sensitivity analysis is crucial in easing faculties into the ABC model and can help in sustainability of the negatively affected departments.

4.3.4 Admissions Data Analysis Process

The admissions data followed a similar cleaning process as to the library data. The data had a structure that was monthly in nature from the year 2011, some faculties that were not of interest in the study were dropped from the main set. Merging duplicated rows provided for a clean and aggregated output to be loaded into the absorption of overheads.

The admissions dataset consisted of students who applied, admitted, rejected, enrolled and not enrolled data points. This formed the base of the study's analysis by identified the main activities carried out by the admissions department to fulfil these duties. The identified activities consisted of: sales, marketing, interview process and record filing. The aforementioned activities are carried out among all the different activities from the applications to students who did not enroll. The activities specific to enrolment included enrolment processing and issuance of ID's. Whereas the student who did not enroll a follow up process/service is utilized. These services provided by the admissions department similarly have an equal weight as discussed earlier.

The analysis involved matching the number of users in each of the five core activities and getting their total activity by multiplying by the weights of the process in that particular activity. An illustration to clarify this process is presented in the following page. The total number of admitted students is multiplied by the total weight of the processes, in this case, 5. This gives the total number of activities under Admitted which is seen to be 59,055. The same is done for all the other activities and a summation of it done. This is then divided by the total amount to get the cost driver.

The process is the same with the library cost driver computation with an elaborative example. The mathematical representation of this is given as:

$$C_i = \frac{A}{\sum T}$$

Where: C is the cost driver rate.

A is the amount.

T is the total activity per process.

The following table is an indicator of how the analysis process and activities were weighted to get the cost driver, the total number of activities is what was summed up and divided by the total cost incurred by that department as represented by the formula above to come up with the cost driver rate:

Admissions Services Population 2018						
	Interviewed			Admitted		
Population	Admitted	Rejected	**Total**	Enrolled	Not Enrolled	**Total**
SIMS	407	59	**466**	257	150	**407**
FIT	953	85	**1038**	503	450	**953**
SBS	0	0	**0**	0	0	**0**
SHSS	365	15	**380**	150	215	**365**
SI	4550	89	**4639**	690	3860	**4550**
SLS	304	50	**354**	230	74	**304**
SMC	761	24	**785**	490	271	**761**
SOA	4242	134	**4376**	1548	2694	**4242**
STH	229	11	**240**	47	182	**229**
Total	**11811**	**467**	**12278**	**3915**	**7896**	**11811**
Sales	1	1				
Marketing	1	1				
Interview Procees	1	1				
Feedback on Interview Outcome	1	1				
Filling of Records	1	1				
Enrollment Processing				1		
Follow up					1	
Issuance of ID				1		
Total Activities Per Student	5	5		2	1	
Total number of activities (a)	59,055	2,335		7,830	7,896	77,116
Total Annual Admission Costs (b)						**38,784,009**
Admission Cost Per Activity Per Student (b)/(a)						**502.93**

Table 9 Admissions ABC Model

Source: Researcher (2019)

The admission cost per activity per student as shown by the cost driver formula above came to around sh. 500. This was then multiplied across faculties of interest and the results obtained were as shown in the following page. The admissions department results are consistent with the results that were obtained from the library. Some faculties were seen to have been overcharged in accordance to their use of activities in that department. On the other hand, faculties like the Strathmore Institute were undercharged for their use of services from the admissions department.

FACULTY	COST UNDER ABC MODEL	COST UNDER CURRENT MODEL	OVER/(UNDER) CHARGE	PROPORTION (%)
FACULTY A	1,505,775	3,589,579	2,083,804	58.05
FACULTY B	3,342,478	9,144,116	5,801,638	63.45
FACULTY D	1,214,577	2,356,664	1,142,087	48.46
FACULTY E	14,300,836	6,946,559	-7,354,277	-105.87
FACULTY E	1,158,752	3,769,379	2,610,627	69.26
FACULTY G	2,603,169	11,796,166	9,192,997	77.93
FACULTY H	13,916,094	0	-13,916,094	0
FACULTY I	742,325	1,181,543	439,218	37.17
TOTAL	**38,784,006**	**38,784,006**	**0**	

Table 10 ABC Admission Overhead Allocation Results

Source: Researcher (2019)

A visual representation gives an intuitive view of overhead allocation differences between the old and the new model, the huge difference in faculties like FACULTY H and FACULTY E show the

worries and unfairness that the department heads felt when stating that the current model is not fair. The new model sees a significant reduction in charges:

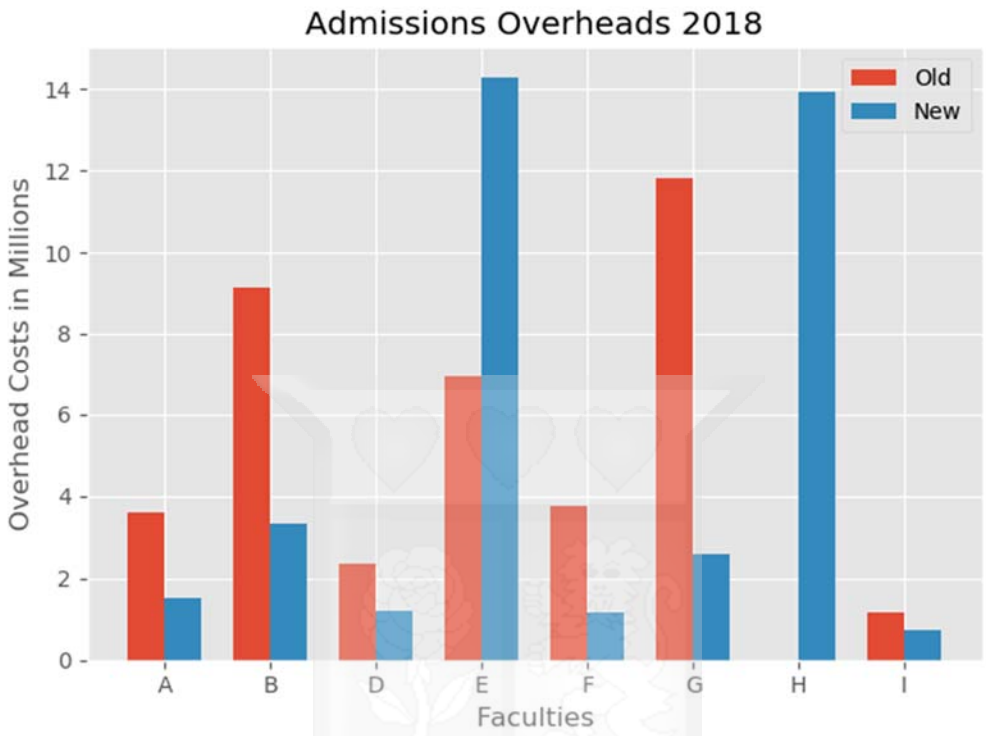


Figure 34 Admissions Overheads Comparison Chart

Source: Researcher (2019)

4.3.5 Admissions Overheads Sensitivity Analysis

Similar to the sensitivity analysis done to the library overhead allocation model, some activities were merged into one. For the case of admissions, the follow up activity for unenrolled students was dropped. The interview process had filing of records and feedback of the process merged into it. This enabled reduction of activities hence reduction on cost. The results were as follows with the ABC cost driver rate:

FACULTY	COST UNDER ABC MODEL	COST UNDER SENSITIVE ABC MODEL	PROPORTION OF EASE (%)
FACULTY D	14,300,836	7,693,332	46.2

Table 11 Admissions Sensitivity Analysis

Source: Researcher (2019)

The resulting lower cost, is an indication of ease of process. The use of sensitivity analysis is a suggestion to some of the ways higher education institutions can apply their assumptions to an overhead allocation model. It provides as a guideline and is subject to change upon the agreement of stakeholders.

4.4 Conclusion

In conclusion, we see that an activity-based model considers different aspects and processes in a department. This allows for an open analysis and definitive results for absorption purposes. The costs considered show an overcharge for most of the departments which links to the questionnaire results that all departmental heads show that the current model is not a fair one. The outlook of an establishment of an activity-based absorption model is positive, this is seen in this case where not the entirety of the student population as the old model deems, partakes fully in the activities of the department. Some departments indicate higher participation than other departments. However, the model should not be taken in its entirety as a rubric for absorption modeling as some of the assumptions are prone to review especially in weighting of the different activities.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter will look at the findings of the study, link it to literature and how any gaps have been filled by answering the research questions. Furthermore, some applications of the developed model will be looked at, possible improvements within the higher education sector and the institution of interest. The concerns for further development presented will be a good stepping stone for further research to be done.

5.2 Challenges with the Current Overhead Absorption Model at SU

As noted by Elias & Mehrotra, (2018), the traditional overhead allocation models created dissatisfaction in allocation of overheads to products. From the survey results, the current model implemented in Strathmore University was deemed to be unsatisfactory as earlier observed by the department heads and various managers. Actually, none of the managers in all the income generating units were satisfied with the current overhead model. Some of the reasons were overcharging of their departments or favoring other departments. Further survey analysis, showed that some departments were not being charged overheads eg. FACULTY H was not being charged admissions department overheads and yet they were using their services. This was an encouragement on spearheading the research to guide the institution towards a new model. The suggestion of the Activity-Based model was well received and majority of the managers who knew it and deemed the model to be fair. This is consistent with the observation by Elias & Mehrotra, (2018), that the upsurge of researchers' and practitioners' attentions towards the implementation of Activity-based costing in organizations were as a result of Activity-based costing's superiority over traditional costing methods and subsequently its significance in enhancing organizational performance.

5.3 Identification of Data in SU that may be used for Overhead Allocation

Observation from this study has shown that, through the use of available data in Strathmore University, a reliable Activity Based Model for absorption of overheads can be developed. This is consistent with the observation by L. Tatikonda and R. Tatikonda (2001) that the implementation

of a data driven overhead absorption model in higher education institutions can help universities achieve tighter financial management and better resource allocation. The data utilized was that of student application process numbers, student enrollment numbers, library book lending and library visits data. Previous literature on absorption of overheads in the education sector such as that by Goddard & Ooi (1998), did not test the actual applicability of the system in their case which was library services. With the availability and use of the data, this study was able to come up with a relevant activity based model.

The data could further be used for education analytics in order to understand patterns in the use and optimal allocation of resources, this could be helpful during peak academic periods and the university is operating at full capacity. In addition to this, the data could be utilized for looking at improvement points in terms of services and facilities.

5.4 Developing a Data Driven Overhead Allocation Model for SU

An Activity-based Overhead allocation model for Library and Admission departments of Strathmore University. This model is better than the current one. This is consistent with the earlier observation by Elias & Mehrotra (2018) that the traditional costing system is not an appropriate system for the decision-making process because it distorts the allocation of overhead costs, resulting in an ineffective structure for evaluating expenditures. This study showed inaccuracies with the current Strathmore University overhead allocation model where it was overcharging some departments at the expense of the other.

From the data acquired, an overhead allocation model was developed using activity-based costing as suggested by (Coy & Goh, 1995). They used arbitrary cost drivers for their model, similarly in this study's case, cost drivers that are relevant to the activity carried out were used as opposed to the previous model where the total student population per faculty was used to compute overhead allocation. This was seen with the use of drivers such as sales and enrolment processing for admissions department and book processing and shelving for library department.

The use of these cost drivers helped determine which academic faculties made the most use of resources and differences could be seen. An example from the results will be the FACULTY H, previously, the faculty was not charged admission or library overheads despite it being one of the biggest users of the services provided by these departments. The benefit of these arbitrary cost

drivers can be clearly seen adding to the general advantage of activity-based costing of clarity and ease of implementation.

Through the linking of thoughts on an activity-based model in the aforementioned literature, a viable and implementable model was developed by this study. The results provided for an insight that saw different faculties being over or undercharged based on their use. This will affect the faculty performance reviews and the surplus or deficit each faculty experienced before. The weakness in the old model comes out clearly which is in-line with the negative sentiments towards the model as seen with the questionnaire analysis. All department heads, were not satisfied with the outcomes of the previous model and were willing to look into a new model.

5.5 Recommendations

The model developed in this study was on a departmental level which is a viable starting point. This study was also limited to Strathmore University and in particular its library and admissions departments. However, as proposed by Naidoo (2011), there is need for further analysis and tracing of activities to the course/product level. This will improve management practices and resource allocation. An example would be the use of information to find underperforming courses or courses that need more resources. This has an impact on improving the quality of education provided by a higher education institution.

A value based analysis can be used with the implemented model as proposed by (McChlery, McKendrick, & Rolfe, 2007). This will involve the determination of the inputs and outputs of the faculty which might be difficult to peg a value on. However, a simple analysis by looking at drop out rates against the use of library resources might prove handy in determining whether the performance of students in a particular faculty is correlated to particular resources. Such an analysis can lead to further strategic development in the institution and the education sector as a whole for benchmarking purposes. Strategy information through such models has been deemed important by (Ismail, 2010).

5.6 Conclusion

The discussion reveals the importance of overhead allocation models having a good and sustainable model for implementation within a higher education institution. The information on resource allocation and strategy implementation could be the edge for profitability and strategic

soundness that an institution is aiming for. The overall effect of having a good overhead allocation model is an improvement on departmental level management and quality service in the higher education sector.

REFERENCES

Šiškina, A., Juodis, A., & Apanavičiene, R. (2009). Evaluation of the competitiveness of construction company overhead costs. *Journal of Civil Engineering and Management*, 215-224.

Amahalu, N. N., Nweze, L. C., & Obi, J. C. (2017). Effect of Backflush Accounting in Financial Performace of Quoted Food and Beverage Firms in Nigeria. *International Journal of Medical and Health Science*.

Babbie, E. (2010). *The Practice of Social Research (12th Ed).* Wadsworth Cengage Learning.

Carr, C., & Ng, J. (1995). Total Cost Control: Nissan and its UK Supplier Partnerships. *Management Accounting Research*, 347-365.

Chouhan, V., Soral, G., & Bibhas, C. (2017). Activity Based Costing Model for Inventory Valuation. *Management Science Letters 7*, 135-144.

Coy, D., & Goh, H. (1995). Overhead Cost Allocations by Tertiary Education Institutions. *Journal of Institutional Research in Australasia*, 31-43.

Creswell, J. W. (2014). *Research design: qualitative, quantitative, and mixed method approaches (4th ed.).* Thousand Oaks: SAGE Publications.

Damitio, J. W., & Schmidgall, R. S. (1993). Allocation of Overhead Costs in Lodging Properties. *The Journal of Hospitality Financial Management*, 45-55.

Dieter, P. (1994). On the Allocation of Overhead Costs. *European Accounting Review*, 49-70.

Elias, H., & Mehrotra, A. (2018). Activity-Based Costing of Library Services in Universities-A Case Study of a Private University. *Economics*, 165-176.

Ellis-Newman, J. (2003). Activity-based costing in user services of an academic library.

Ellis-Newman, J., & Robinson, P. (1998). The Cost of Library Services: Activity-Based Costing in an Australian Academic Library. *The Journal of Academic Librarianship*, 373-379.

Goddard, A., & Ooi, K. (1998). Activity-Based Costing and Central Overhead Cost Allocation in Universities: A Case Study. *Public Money and Management*, 31-38.

Helms, M. M., Ettkin, L. P., Baxter, J. T., & Gordon, M. W. (2005). Managerial Implications of Target Costing. *Competitiveness Review: An International Business Journal*, 49-56.

Hollis, A., & Sweetman, A. (1998). Microcredit:What can we learn from the past? *World Development*, 1875-1891.

Hudson, L. A., & Ozanee, J. L. (1988). Alternative ways of seeking knowledge in consumer research. *Journal of Consumer Research*, 508-521.

Innes, J., & Falconer, M. (1997). The Application of Activity-based Costing in the United Kingdom's Largest Financial Institutions. *Service Industries Journal*, 190-203.

Ismail, N. A. (2010). Activity-Based Management System Implementation in Higher Education Institution: Benefit and Challenges. *Campus-Wide Information Systems*, 40-52.

Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Towards a definition of mixed methods research. *Journal of mixed methods research*, 112-133.

Johnson, S., & Brennan, P. (2018). Northflow Solutions Inc: Using ABC to create a new pricing model. *Journal of Case Studies*, 108-114.

Jones, T. C., & Dugdale, D. (2002). The ABC bandwagon and the juggernaut of modernity. *Accounting, Organization and Society*, 121-163.

Kaplan, R. S., & Thompson, G. L. (1971). Overhead Allocation via Mathematical Programming Models. *The Accounting Review*, 352-364.

Langfield-Smith, K., Thorne, H., & Hilton, R. W. (2006). *Management Accounting: Information for Creating and Managing Value*. North Ryde: McGraw-Hill.

Ledford, H. (2014). Keeping the Lights On. *Nature*.

Lee, A. S. (1991). Integrating positivist and interpretive approaches to organizational research. *Organization science*, 342-365.

Liverpool, S. L., Eseyin, G. E., & Opara, E. I. (1998). Modelling for Resource Allocation to Departments and Faculties in African Universities. *Higher Education*, 139-153.

McCarthy, W. E. (1982). The REA accounting model: A generalized framework for accounting systems in a shared data environment. *Accounting Review*, 554-578.

McChlery, S., McKendrick, J., & Rolfe, T. (2007). Activity-Based Management Systems in Higher Education. *Public Money & Management*, 315-322.

Modarress, B., Ansari, A., & Lockwood, D. L. (2005). Kaizen Costing for Lean Manufacturing. *International Journal of Production Research*, 1751-1760.

Naidoo, M. (2011). Using Activity-Based Costing to Manage Private Universities in South Africa. *Problems and Perspectives in Management*, 109-116.

Naiseku, T., & Oluyinka, I. O. (2016). Cost Accounting Techniques Adopted by Manufacturing and Service Industry within the Last Decade. *International Journal of Advances in Management and Economics*, 48-61.

Nakamura, H., & Johnson, R. E. (1998). Adaptive framework for the REA accounting model. *In Proceedings of OOPSLA '98 Business Objective Workshop IV.*

Negash, M. (2008). Resource Allocation Challenges in South African Universities. *The South African Journal of Accountability and Auditing Research*.

Stringer, E. T. (2013). *Action Research (4th Ed.).* California: Thousand Oaks.

Tangen, S. (2003). An Overview of Frequently Used Performance Measures. *Work Study*, 347-354.

Tatikonda, L. U., & Tatikonda, R. J. (2001). Activity-Based Costing FOR HIGHER EDUCATION INSTITUTIONS. *Management Accounting Quaterly*.

World Health Organization. (2015). *Protocol for Survey to Determine Direct and Indirect Costs due to TB and to Estimate Proportion of TB-Affected Households Experiencing Catastrophic Total Costs Due to TB.*

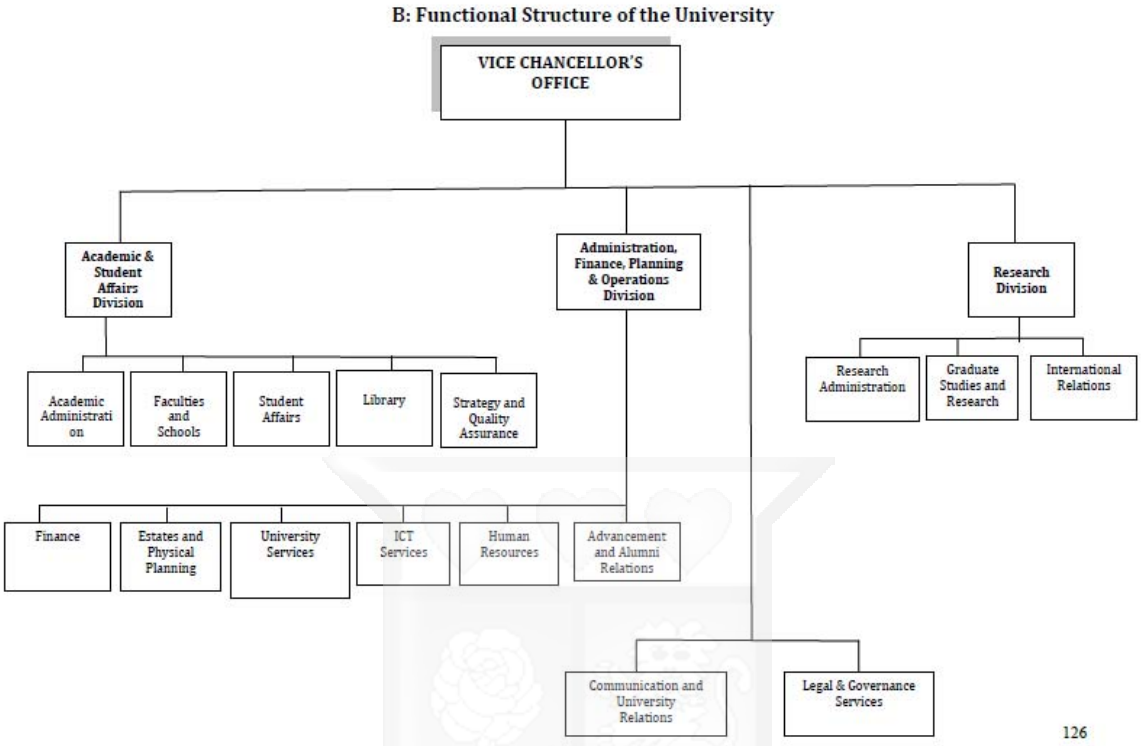
Zavadskas, E. K., Turskis, Z., & Tamošaitiene, J. (2008). Contractor selection of construction in a competitive environment. *Journal of Business Economics and Management*, 181-187.

APPENDICES

APPENDIX I: OVERHEAD ABSORPTION RATES IN AMERICAN UNIVERSITIES

Institution	Total Funding ($)	Negotiated (%)	Calculated (%)
John Hopkins University	574, 844, 637	62	43
University of California, San Francisco	501, 656, 900	57	32
University of Washington	454, 274, 167	55	32
University of Pennsylvania	451, 194, 908	60	41
University of Michigan	412, 016, 862	56	40
University of Pittsburgh	396, 728, 993	53	35
University of North Carolina at Chapel Hill	383, 752, 058	52	32
University of California, San Diego	362, 004, 733	55	37
Stanford University	357, 812, 990	57	43
Duke University	350, 249, 092	57	39

APPENDIX II: FUNCTIONAL STRUCTURE OF THE UNIVERSITY



Source: Strathmore University Statutes (2013)

APPENDIX III: LETTER OF INTRODUCTION

Strathmore University

P.O. Box 59857-00200

Nairobi, Kenya

January, 2019

Dear Respondent;

RE: REQUEST TO COLLECT RESEARCH DATA.

I am a student at Strathmore University pursuing a Master's Degree in Commerce. I am currently doing a study on the **overhead allocation model using data analytics - a case of Strathmore University**. The objectives of the study are to determine the challenges in the current overhead allocation model in the institution and also to come up with an optimal overhead allocation model for the institution. Data from the participants will be collected through questionnaires.

The research study is in partial fulfillment of the award of Master's Degree. I humbly request you to participate in this study which will surely make this research a success. I would like to assure you that the information collected will be treated with strict confidentiality. To ensure that confidentiality is realized, you are respectfully requested not to write your name in the questionnaire. Your voluntary involvement and cooperation in this study will be extremely appreciated.

Thank you in advance

Yours Faithfully,

Vincent Mutei Ndoloka

Admission No: 029715

APPENDIX IV: LIST OF DEPARTMENTS

Department Type	Department Name
Income Generating Units	@iLab
	Catering Services
	Faculty of Information Technology
	School of Humanities & Social Sciences
	School of Law
	School of Management & Commerce
	School of Tourism & Hospitality
	Strathmore Business School
	Strathmore Energy Research Centre
	Strathmore Institute of Management & Technology
	Strathmore Institute of Mathematical Sciences
	Strathmore University Medical Centre
Support Units	Administration Services
	Admission Services
	Advancement and External Relations
	Alumni Office
	Career Development Services
	Chaplain
	Community Service Centre
	Dean of Students
	DVC - Academic & Student Affairs
	DVC - Research & Innovation
	DVD - Planning & Development
	Examination Services
	Finance Department
	Financial Aid
	Housekeeping
	Human Resources
	ICT
	Internal Audit
	Legal Services
	Library
	Office of Registrar
	Office of Vice Chancellor
	Procurement
	Research Services Office
	Security and Safety
	Strategy
	Strathmore Graduate Studies
	Student Mentoring Services
	University Relations
	University Secretary

APPENDIX V: QUESTIONNAIRE FOR MANAGERS OF INCOME GENERATING UNITS

SECTION 1: PROFILE OF EMPLOYEE INTERVIEWED: POSITION IN ORGANIZATION, AND YEARS OF EXPERIENCE

Employee Name:

Name of your department (tick where appropriate)

a. @iLab [ ]
b. Catering Services [ ]
c. Faculty of Information Technology [ ]
d. School of Humanities & Social Sciences [ ]
e. School of Law [ ]
f. School of Management & Commerce [ ]
g. School of Tourism & Hospitality [ ]
h. Strathmore Business School [ ]
i. Strathmore Energy Research Centre [ ]
j. Strathmore Institute of Mathematical Sciences [ ]
k. Strathmore Institute of Management & Technology [ ]
l. Strathmore University Medical Centre [ ]
m. Others: specify

1. What is your position in the organization? Tick where appropriate
   a. Division Head [ ]
   b. Director [ ]
   c. Dean [ ]
   d. Manager [ ]

2. How Many Years have you been in your current position? Tick where appropriate
   a. Less than one year [ ]
   b. Between one and two years [ ]
   c. Between two and three years [ ]

d. Between three and four years [ ]
e. Between four and five years [ ]
f. Over five years [ ]

SECTION 2: DIRECT INVOLVEMENT IN BUDGET PREPARATION, RANGE OF DEPARTMENT'S ANNUAL BUDGET AND IMPACT OVERHEADS ON PRICING OF A DEPARTMENT'S PRODUCTS – INCOME GENERATING UNITS ONLY

3. Are you directly involved in the budgeting process? Tick where appropriate
   a. Yes [ ]
   b. No [ ]
4. What range is your Department's Annual Revenue (Kshs)? Tick where appropriate
   a. Between Kshs. 10M and 50M [ ]
   b. Between Kshs. 50M and 100M [ ]
   c. Between Kshs. 100M and 150M [ ]
   d. Between Kshs. 150M and 200M [ ]
   e. Between Kshs. 200M and 250M [ ]
   f. Between Kshs. 250M and 450M [ ]
   g. Over Kshs. 450M [ ]
5. Does the current overhead allocation model have an impact on pricing of your products? Tick where appropriate
   a. Yes [ ]
   b. No [ ]

SECTION 3: CHALLENGES WITH THE CURRENT OVERHEAD ALLOCATION MODEL – INCOME GENERATING UNITS ONLY

6. Please answer the following questions by indicating the degree to which you agree with each of the statements.

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I am okay with the current overhead allocation model					
The current model overcharges my department creating risk of overpricing my products or making losses					
The current model is very complicated and I cannot tell nor control what I am charged for					
The current model favors some departments					
Any other comment					

SECTION 3: ACTIVITY BASED MODEL OF OVERHEADS ALLOCATION MODEL – INCOME GENERATING UNITS ONLY

7. Are you familiar with Activity Based Costing (ABC) model?
    c. Yes [ ]
    d. No [ ]

8. If your answer to Q7 above is Yes, how would you rate fairness of ABC as a costing model that SU may adopt?.

Statement	**Very Fair**	**Fair**	**Indifferent**	**Unfair**	**Very Unfair**
Fairness of ABC as a costing model that SU may adopt					

9. Apart from ABC model, is there another model you may recommend as ideal for SU?

SECTION 4: ACTIVITIES CARRIED OUT BY LIBRARY AND ADMISSIONS DEPARTMENTS AND GATHERING OF DATA TYPE FOR DEVELOPMENT OF AN OVERHEAD ALLOCATION MODEL– LIBRARY AND ADMISSIONS DEPARTMENTS ONLY

Employee Name:

Name of your department (tick where appropriate)

a. Library Department [ ]

b. Admissions Department [ ]

10. Provide a list of the activities that are carried out by your department together with a detained description of the activity

Activity Name	Activity Description	Output of activity

11. What percentage of your time do you spent every month for each of the activities mentioned in No. 8 above?

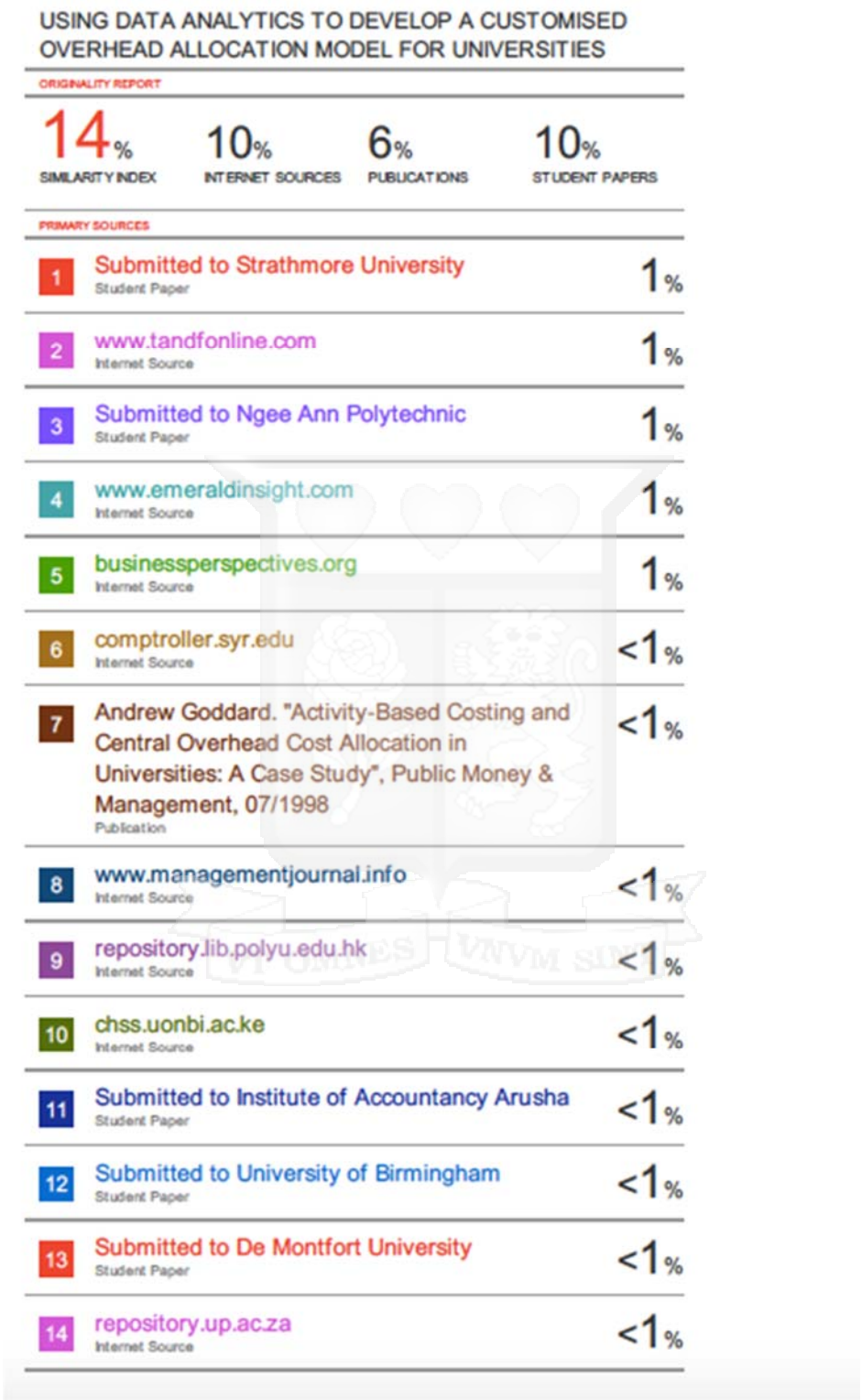
Activity Name	Percentage of time spent on an activity in a month

12. Do you have data records that can provide details of the output of your activities as shown below? Where there are no records available, please indicate either ‘record available’ or ‘no record available’

Data Records on Activities carried out	Data Records available per School	Data Records available per Program/Project

Thank you for your participation.

APPENDIX VI: TURNITIN RESULTS



USING DATA ANALYTICS TO DEVELOP A CUSTOMISED OVERHEAD ALLOCATION MODEL FOR UNIVERSITIES

ORIGINALITY REPORT

14%	10%	6%	10%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Strathmore University Student Paper	1%
2	www.tandfonline.com Internet Source	1%
3	Submitted to Ngee Ann Polytechnic Student Paper	1%
4	www.emeraldinsight.com Internet Source	1%
5	businessperspectives.org Internet Source	1%
6	comptroller.syr.edu Internet Source	<1%
7	Andrew Goddard. "Activity-Based Costing and Central Overhead Cost Allocation in Universities: A Case Study", Public Money & Management, 07/1998 Publication	<1%
8	www.managementjournal.info Internet Source	<1%
9	repository.lib.polyu.edu.hk Internet Source	<1%
10	chss.uonbi.ac.ke Internet Source	<1%
11	Submitted to Institute of Accountancy Arusha Student Paper	<1%
12	Submitted to University of Birmingham Student Paper	<1%
13	Submitted to De Montfort University Student Paper	<1%
14	repository.up.ac.za Internet Source	<1%

APPENDIX VII: LIBRARY ABC MODEL

	Library Visits 2018			
	School	Reading	Lending	
	A	23,800	3,635	
	B	23,438	2,089	
	C	9,398	1,119	
	99	-	6	
	D	6,598	1,876	
	E	6,193	863	
	F	20,106	3,485	
	G	44,133	5,705	
	H	28,422	3,307	
	I	-	879	
	Total	**162,088**	**22,964**	
Services		**b**		
Lending Services	Book Procurement, Ordering & Tagging		1	
	Books Shelving Services		1	
	Books Check-out Services		1	
Reading Services	Security Luggage Services	1		
	Maintaining Order	1		
	Books Maintenance	1		
Total Activities Per Student Per Visit		**3**	**3**	
	Total number of activities (a)	486,264	68,892	555,156
	Total Annual Library Costs (b)			**30,285,569.03**
	Library Cost Per Activity Per Student (b)/(a)			**54.55**
Services	Overhead Charge (Kshs)			
Lending Services	Book Procurement, Ordering & Tagging	-	198,301.10	198,301.10
	Books Shelving Services	-	198,301.10	198,301.10

	Books Check-out Services	-	198,301.10	198,301.10
Reading Services	Security Luggage Services	1,298,367.56	-	1,298,367.56
	Maintaining Order	1,298,367.56	-	1,298,367.56
	Books Maintenance	1,298,367.56	-	1,298,367.56
	A Total	**3,895,102.69**	**594,903.29**	**4,490,005.98**
Lending Services	Book Procurement, Ordering & Tagging	-	113,961.76	113,961.76
	Books Shelving Services	-	113,961.76	113,961.76
	Books Check-out Services	-	113,961.76	113,961.76
Reading Services	Security Luggage Services	1,278,619.28	-	1,278,619.28
	Maintaining Order	1,278,619.28	-	1,278,619.28
	Books Maintenance	1,278,619.28	-	1,278,619.28
	B Total	**3,835,857.85**	**341,885.27**	**4,177,743.12**
Lending Services	Book Procurment, Ordering & Tagging	-	61,045.10	61,045.10
	Books Shelving Services	-	61,045.10	61,045.10
	Books Check-out Services	-	61,045.10	61,045.10
Reading Services	Security Laugage Services	512,691.53	-	512,691.53
	Maintaining Order	512,691.53	-	512,691.53
	Books Maintenance	512,691.53	-	512,691.53
	C Total	**1,538,074.58**	**183,135.29**	**1,721,209.87**
Lending Services	Book Procurment, Ordering & Tagging	-	327.32	327.32
	Books Shelving Services	-	327.32	327.32
	Books Check-out Services	-	327.32	327.32
Reading Services	Security Laugage Services	-	-	-
	Maintaining Order	-	-	-
	Books Maintenance	-	-	-
	99 Total	**-**	**981.96**	**981.96**
Lending Services	Book Procurment, Ordering & Tagging	-	102,341.91	102,341.91

	Books Shelving Services	-	102,341.91	102,341.91
	Books Check-out Services	-	102,341.91	102,341.91
Reading Services	Security Laugage Services	359,942.40	-	359,942.40
	Maintaining Order	359,942.40	-	359,942.40
	Books Maintenance	359,942.40	-	359,942.40
	D Total	**1,079,827.21**	**307,025.74**	**1,386,852.95**
Lending Services	Book Procurment, Ordering & Tagging	-	47,079.46	47,079.46
	Books Shelving Services	-	47,079.46	47,079.46
	Books Check-out Services	-	47,079.46	47,079.46
Reading Services	Security Laugage Services	337,848.33	-	337,848.33
	Maintaining Order	337,848.33	-	337,848.33
	Books Maintenance	337,848.33	-	337,848.33
	E Total	**1,013,545.00**	**141,238.39**	**1,154,783.39**
Lending Services	Book Procurment, Ordering & Tagging	-	190,118.11	190,118.11
	Books Shelving Services	-	190,118.11	190,118.11
	Books Check-out Services	-	190,118.11	190,118.11
Reading Services	Security Laugage Services	1,096,847.82	-	1,096,847.82
	Maintaining Order	1,096,847.82	-	1,096,847.82
	Books Maintenance	1,096,847.82	-	1,096,847.82
	F Total	**3,290,543.47**	**570,354.32**	**3,860,897.80**
Lending Services	Book Procurment, Ordering & Tagging	-	311,226.34	311,226.34
	Books Shelving Services	-	311,226.34	311,226.34
	Books Check-out Services	-	311,226.34	311,226.34
Reading Services	Security Laugage Services	2,407,598.98	-	2,407,598.98
	Maintaining Order	2,407,598.98	-	2,407,598.98
	Books Maintenance	2,407,598.98	-	2,407,598.98
	G Total	**7,222,796.93**	**933,679.03**	**8,156,475.96**

Lending Services	Book Procurment, Ordering & Tagging	-	180,407.63	180,407.63
	Books Shelving Services	-	180,407.63	180,407.63
	Books Check-out Services	-	180,407.63	180,407.63
Reading Services	Security Laugage Services	1,550,512.73	-	1,550,512.73
	Maintaining Order	1,550,512.73	-	1,550,512.73
	Books Maintenance	1,550,512.73	-	1,550,512.73
	H Total	**4,651,538.18**	**541,222.88**	**5,192,761.06**
Lending Services	Book Procurment, Ordering & Tagging	-	47,952.31	47,952.31
	Books Shelving Services	-	47,952.31	47,952.31
	Books Check-out Services	-	47,952.31	47,952.31
Reading Services	Security Laugage Services	-	-	-
	Maintaining Order	-	-	-
	Books Maintenance	-	-	-
	I Total	**-**	**143,856.94**	**143,856.94**

APPENDIX VIII: ADMISSIONS ABC MODEL

Population 2018							
	Interviewed			Admitted			
Population	Admitted	Rejected	**Total**	Enrolled	Not Enrolled	**Total**	
A	407	59	**466**	257	150	**407**	
B	953	85	**1038**	503	450	**953**	
C	0	0	**0**	0	0	**0**	
D	365	15	**380**	150	215	**365**	
E	4550	89	**4639**	690	3860	**4550**	
F	304	50	**354**	230	74	**304**	
G	761	24	**785**	490	271	**761**	
H	4242	134	**4376**	1548	2694	**4242**	
I	229	11	**240**	47	182	**229**	
Total	**11811**	**467**	**12278**	**3915**	**7896**	**11811**	
Sales	1	1					
Marketing	1	1					
Interview Procees	1	1					
Feedback on Interview Outcome	1	1					
Filling of Records	1	1					
Enrollment Processing				1			
Follow up					1		
Issuance of ID				1			
Total Activities Per Student	5	5		2	1		
Total number of activities (a)	59,055	2,335		7,830	7,896		77,116
Total Annual Admission Costs (b)							**38,784,009.00**
Admission Cost Per Activity Per Student (b)/(a)							**502.93**
Overhead Charge							

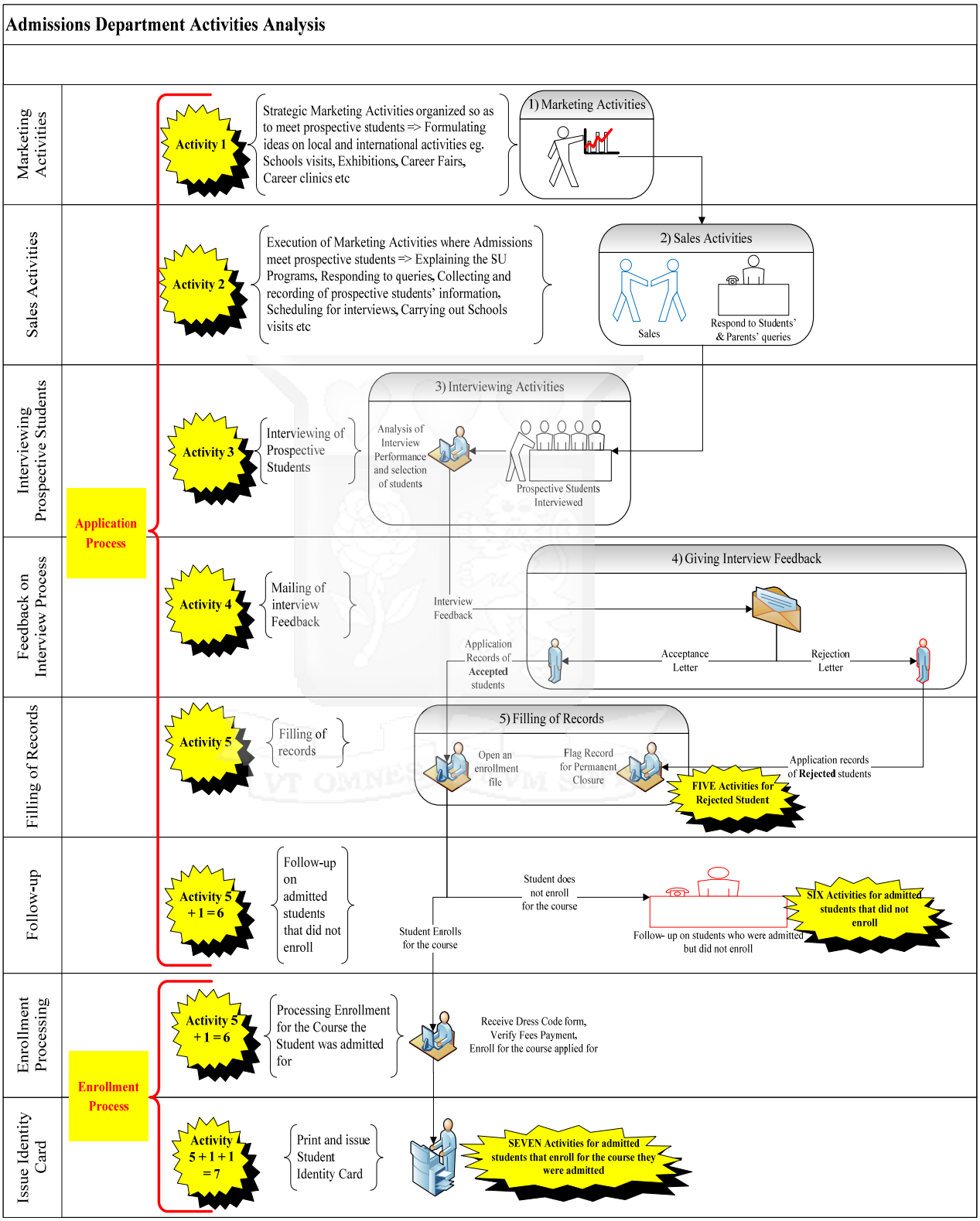
Sales	204,692.82	29,672.92	-	-	-	-	234,365.74
Marketing	204,692.82	29,672.92	-	-	-	-	234,365.74
Interview Procees	204,692.82	29,672.92	-	-	-	-	234,365.74
Feedback on Interview Outcome	204,692.82	29,672.92	-	-	-	-	234,365.74
Filling of Records	204,692.82	29,672.92	-	-	-	-	234,365.74
Enrollment Processing	-	-	-	129,253.21	-	-	129,253.21
Follow up	-	-	-	-	75,439.61	-	75,439.61
Issuance of ID	-	-	-	129,253.21	-	-	129,253.21
SIMS Total	**1,023,464.11**	**148,364.58**	**-**	**258,506.41**	**75,439.61**	**-**	**1,505,774.72**
Sales	479,293.02	42,749.12	-	-	-	-	522,042.14
Marketing	479,293.02	42,749.12	-	-	-	-	522,042.14
Interview Procees	479,293.02	42,749.12	-	-	-	-	522,042.14
Feedback on Interview Outcome	479,293.02	42,749.12	-	-	-	-	522,042.14
Filling of Records	479,293.02	42,749.12	-	-	-	-	522,042.14
Enrollment Processing	-	-	-	252,974.18	-	-	252,974.18
Follow up	-	-	-	-	226,318.84	-	226,318.84
Issuance of ID	-	-	-	252,974.18	-	-	252,974.18
FIT Total	**2,396,465.10**	**213,745.58**	**-**	**505,948.35**	**226,318.84**	**-**	**3,342,477.88**
Sales	-	-	-	-	-	-	-
Marketing	-	-	-	-	-	-	-
Interview Procees	-	-	-	-	-	-	-

Feedback on Interview Outcome	-	-	-	-	-	-	-
Filling of Records	-	-	-	-	-	-	-
Enrollment Processing	-	-	-	-	-	-	-
Follow up	-	-	-	-	-	-	-
Issuance of ID	-	-	-	-	-	-	-
	-	-	-	-	-	-	
SBS Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Sales	183,569.73	7,543.96	-	-	-	-	191,113.69
Marketing	183,569.73	7,543.96	-	-	-	-	191,113.69
Interview Procees	183,569.73	7,543.96	-	-	-	-	191,113.69
Feedback on Interview Outcome	183,569.73	7,543.96	-	-	-	-	191,113.69
Filling of Records	183,569.73	7,543.96	-	-	-	-	191,113.69
Enrollment Processing	-	-	-	75,439.61	-	-	75,439.61
Follow up	-	-	-	-	108,130.11	-	108,130.11
Issuance of ID	-	-	-	75,439.61	-	-	75,439.61
SHSS Total	**917,848.65**	**37,719.81**	**-**	**150,879.23**	**108,130.11**	**-**	**1,214,577.80**
Sales	2,288,334.99	44,760.84	-	-	-	-	2,333,095.83
Marketing	2,288,334.99	44,760.84	-	-	-	-	2,333,095.83
Interview Procees	2,288,334.99	44,760.84	-	-	-	-	2,333,095.83
Feedback on Interview Outcome	2,288,334.99	44,760.84	-	-	-	-	2,333,095.83
Filling of Records	2,288,334.99	44,760.84	-	-	-	-	2,333,095.83
Enrollment Processing	-	-	-	347,022.23	-	-	347,022.23
Follow up	-	-	-	-	1,941,312.76	-	1,941,312.76
Issuance of ID	-	-	-	347,022.23	-	-	347,022.23

SI Total	**11,441,674.94**	**223,804.19**	**-**	**694,044.46**	**1,941,312.76**	**-**	**14,300,836.35**
Sales	152,890.95	25,146.54	-	-	-	-	178,037.49
Marketing	152,890.95	25,146.54	-	-	-	-	178,037.49
Interview Procees	152,890.95	25,146.54	-	-	-	-	178,037.49
Feedback on Interview Outcome	152,890.95	25,146.54	-	-	-	-	178,037.49
Filling of Records	152,890.95	25,146.54	-	-	-	-	178,037.49
Enrollment Processing	-	-	-	115,674.08	-	-	115,674.08
Follow up	-	-	-	-	37,216.88	-	37,216.88
Issuance of ID	-	-	-	115,674.08	-	-	115,674.08
SLS Total	**764,454.77**	**125,732.69**	**-**	**231,348.15**	**37,216.88**	**-**	**1,158,752.49**
Sales	382,730.31	12,070.34	-	-	-	-	394,800.65
Marketing	382,730.31	12,070.34	-	-	-	-	394,800.65
Interview Procees	382,730.31	12,070.34	-	-	-	-	394,800.65
Feedback on Interview Outcome	382,730.31	12,070.34	-	-	-	-	394,800.65
Filling of Records	382,730.31	12,070.34	-	-	-	-	394,800.65
Enrollment Processing	-	-	-	246,436.08	-	-	246,436.08
Follow up	-	-	-	-	136,294.24	-	136,294.24
Issuance of ID	-	-	-	246,436.08	-	-	246,436.08
SMC Total	**1,913,651.57**	**60,351.69**	**-**	**492,872.15**	**136,294.24**	**-**	**2,603,169.65**
Sales	2,133,432.31	67,392.72	-	-	-	-	2,200,825.03

Marketing	2,133,432.31	67,392.72	-	-	-	-	2,200,825.03
Interview Procees	2,133,432.31	67,392.72	-	-	-	-	2,200,825.03
Feedback on Interview Outcome	2,133,432.31	67,392.72	-	-	-	-	2,200,825.03
Filling of Records	2,133,432.31	67,392.72	-	-	-	-	2,200,825.03
Enrollment Processing	-	-	-	778,536.83	-	-	778,536.83
Follow up	-	-	-	-	1,354,895.49	-	1,354,895.49
Issuance of ID	-	-	-	778,536.83	-	-	778,536.83
SOA Total	**10,667,161.56**	**336,963.61**	**-**	**1,557,073.65**	**1,354,895.49**	**-**	**13,916,094.31**
Sales	115,171.15	5,532.24	-	-	-	-	120,703.38
Marketing	115,171.15	5,532.24	-	-	-	-	120,703.38
Interview Procees	115,171.15	5,532.24	-	-	-	-	120,703.38
Feedback on Interview Outcome	115,171.15	5,532.24	-	-	-	-	120,703.38
Filling of Records	115,171.15	5,532.24	-	-	-	-	120,703.38
Enrollment Processing	-	-	-	23,637.75	-	-	23,637.75
Follow up	-	-	-	-	91,533.40	-	91,533.40
Issuance of ID	-	-	-	23,637.75	-	-	23,637.75
STH Total	**575,855.73**	**27,661.19**	**-**	**47,275.49**	**91,533.40**	**-**	**742,325.81**
Grand Total	**29,700,576.42**	**1,174,343.34**	**-**	**3,937,947.90**	**3,971,141.33**	**-**	**38,784,009.00**

APPENDIX IX: ADMISSIONS DEPARTMENT ACTIVITIES



APPENDIX X: LIBRARY DEPARTMENT ACTIVITIES