

Report On
Importance of Educational Data Mining for Optimized Operations
in Brac University

By

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17104058

An internship report submitted to Brac Business School in partial fulfillment of the
requirements for the degree of
Bachelor of Business Administration

Brac Business School
Brac University
May 2021

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Declaration

It is hereby declared that

1. The internship report submitted is my/our own original work while completing degree at Brac University.
2. The report does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The report does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I/We have acknowledged all main sources of help.

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Supervisor's Full Name & Signature:

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Letter of Transmittal

Sang H Lee, PhD
Professor & Dean,
Brac Business School
Brac University
66 Mohakhali, Dhaka-1212

Subject: Submission of Internship Report

Dear Sir,

I consider it to be a great privilege to have your guidance during my Internship Program and it gives me immense pleasure to be able to submit the Internship report on Brac University as a requirement of the BBA Program. I have created this report in compliance with your directions, as well as Brac Business School's guidelines and I expect this report to be both thorough and fulfilling in terms of desired requirements. Being able to work in Brac University has been quite insightful and I believe, these learnings will help me out in my future endeavors.

Therefore, I hope that you would be kind enough to accept my Internship report.

Sincerely yours,

Alif Hossain

Mohammad Alif Hossain Saad
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Date: May 30, 2021

Non-Disclosure Agreement

This agreement is made and entered into by and between Brac University and the undersigned student at Brac University, Brac Business School.

Alif Hossain

Mohammad Alif Hossain Saad

Acknowledgement

Having a successful Internship Program is really a great pleasure to me. Yet all these will not have been possible if not for hard work, persistence and guidance provided by all those, who contributed to the completion of my Internship report, written in partial fulfillment of the requirements for the degree of Bachelor of Business Administration.

Firstly, I would like to express my deepest gratitude to my Internship Supervisor, Dr. Sang H Lee, Professor & Dean at Brac Business School, for his continuous guidance while preparing this report during my Internship Program and for showing a great deal of patience throughout the time.

I would also like to thank and appreciate the effort of Md. Shamim Ahmed, Deputy Registrar and Deputy Controller of Examinations at Brac University and Lecturer at Brac Business School, for his crucial role in assigning me with tasks and projects, which allowed me to gain hands-on knowledge regarding the operations of higher educational institutes. His constant support throughout my Internship period allowed me to successfully complete my Internship at Brac University.

I express my gratitude towards Mr. Soyeb Ahmed, Assistant Manager - Data & Systems at Brac University for providing me with resourceful data, which lead to the completion of this report.

Above all, I would like to thank God for giving us the gift of wisdom and understanding and for answering my prayers.

Executive Summary

This report is a highlight of my Internship experience at the Office of the Registrar at Brac University and is aimed towards the portraying overview of the organization and my research project – “Importance of Educational Data Mining for Optimized Operations in Brac University.”

The report further analyzes and explores the organizational framework of the university, upon which it conducts its operations and business. Moreover, the report assesses the financial condition of the university, through the means of various financial ratios. An in-depth analysis of the industry competitiveness and the university’s strengths and weaknesses were highlighted through Porter’s Five Forces Model and SWOT Analysis.

Furthermore, the report extensively focuses on how important educational data mining is for optimizing operations in Brac University, through retrieving valuable data and analyzing them. Moreover, with the COVID-19 pandemic playing its role and on-campus operations being disrupted, this research project is aimed towards providing an overview of the different types of data that universities can use for educational data mining and how they can be utilized to make decisions leading to optimized operations. A survey was conducted following the Robust Sustainability Framework, suggested by WEF. After collecting and analyzing the data from the survey, it was found out that the Alternative Hypothesis - *‘Educational data mining can help to reduce the number of students taking retakes and increase quality admission intakes in order to optimize operations’*, was accepted. Thus, establishing a positive relation between data mining and optimized operations. Based on Leavitt’s Model of Organizational Change, recommendations on how to incorporate data mining in Brac University’s operation have been provided, which will help the university to cope with the challenges and grasp opportunities.

Keywords: Data mining; Optimized operations; Financial Performance

Table of Contents

Declaration.....	ii
Letter of Transmittal	iii
Non-Disclosure Agreement	iv
Acknowledgement	v
Executive Summary	vi
Table of Contents	vii
List of Tables	x
List of Figures.....	xi
List of Acronyms	xiii
Glossary	xiv
Chapter 1 Overview of Internship.....	1
1.1 Student Information	1
1.2 Internship Information	2
1.3 Internship Outcomes	4
Chapter 2 Organization Part: Overview, Operations and a Strategic Audit.....	8
2.1 Introduction.....	8
2.2 Overview of the Organization.....	10
2.2.1 Background	10
2.2.2 Vision Mission and Objectives	11
2.2.3 Organizational Structure	12

2.3 Management Practices	12
2.3.1 Decision Making	12
2.3.2 Employment Policy.....	13
2.3.3 Recruitment Process.....	13
2.3.4 Pay Scale.....	14
2.4 Marketing Practices	15
2.4.1 Seven Ps of Service Marketing	15
2.5 Financial Performance & Accounting Practices	19
2.5.1 Accounting Practices	19
2.5.2 Financial Performance	21
2.6 Operations Management and Information System Practices	28
2.6.1 Operations Management	28
2.6.2 Operations Management during COVID-19 Pandemic.....	29
2.6.3 Information System Practices	29
2.7 Industry and Competitive Analysis.....	31
2.7.1 Porter’s Five Forces Model.....	31
SWOT Analysis:	33
2.8 Summary and Conclusions	35
2.9 Recommendation	35

Chapter 3 Project Part: Importance of Educational Data Mining for Optimized Operations in Brac University37

3.1 Introduction.....	37
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3.2 Methodology	41
3.3 Findings and Analysis.....	46
3.3.1. Analysis of the data.....	46
3.3.1.1 Data and Analytics	46
3.3.2. Findings of the study.....	60
3.3.2.1 Evaluation	60
3.4 Summary and Conclusions	62
3.5 Recommendations.....	63
3.5.1 Feedback	63
References.....	65
Appendix A.....	67

List of Tables

Table 1: Office of Registrar Intern's Roles and Duties	3
Table 2: SWOT Analysis	34

List of Figures

Figure 1: Brac University Notebook 2021	4
Figure 2: Admissions Newsletter 2021	4
Figure 3: Logo of Brac University	10
Figure 4: Vision, Mission and Objectives of Brac University	11
Figure 5: List of Schools, Departments, Institutes and Centres of Brac University	12
Figure 6: Total no. of employees in Brac University (as of 2018)	13
Figure 7: Online Portal for Opportunities at Brac University	14
Figure 8: 7 Ps of Service Marketing	15
Figure 9: Advertisement through Brac University's Facebook Page	17
Figure 10: Appreciation Gathering with the Principals (Lunch with the Vice-Chancellor)...	18
Figure 11: Comparison of the Current Ratio of Brac University	21
Figure 12: Comparison of the Total Asset Turnover Ratio of Brac University	22
Figure 13: Comparison of the Debt Ratio of Brac University	23
Figure 14: Comparison of the Operating Profit Margin of Brac University	24
Figure 15: Comparison of the Net Profit Margin of Brac University	25
Figure 16: Comparison of the ROA of Brac University	26
Figure 17: Comparison of the ROE of Brac University	27
Figure 18: Porter's Five Forces Model.....	31
Figure 19: Porter's Five Forces Analysis	33
Figure 20: Robust Sustainability Framework	42
Figure 21: Rating Scale used for the survey	44
Figure 22: Average Outcome of all questions	45
Figure 23: One sample t-test.....	45
Figure 24: Survey outcome of Question 1	47

Figure 25: Survey Outcome of Question 2	48
Figure 26: Survey Outcome of Question 2 (Percentage).....	48
Figure 27: Survey outcome of Question 3	49
Figure 28: Survey outcome of Question 3 (Percentage).....	50
Figure 29: Survey outcome of Question 4	50
Figure 30: Survey outcome of Question 4 (Percentage).....	51
Figure 31: Survey Outcome of Question 5	52
Figure 32: Survey outcome of Question 5 (Percentage)	52
Figure 33: Survey outcome of Question 6	53
Figure 34: Survey outcome of Question 6 (Percentage).....	53
Figure 35: Survey outcome of Question 7	54
Figure 36: Survey outcome of Question 7 (Percentage).....	55
Figure 37: Survey outcome of Question 8	55
Figure 38: Survey outcome of Question 8 (Percentage).....	56
Figure 39: Survey outcome of Question 9	56
Figure 40: Survey outcome of Question 9 (Percentage).....	57
Figure 41: Survey outcome of Question 10	57
Figure 42: Survey outcome of Question 10 (Percentage).....	58
Figure 43: Survey outcome of Question 11	59
Figure 44: Survey outcome of Question 11 (Percentage).....	59
Figure 45: Average outcomes of all the Questions.....	61
Figure 46: Leavitt's Diamond Model	64

List of Acronyms

BAS	Bangladesh Accounting Standards
BRAC	Bangladesh Rural Advancement Committee
buX	Brac University X
EDM	Educational Data Mining
IAS	International Accounting Standards
IFRS	International Financial Reporting Standards
LMS	Learning Moodle System
MoE	Ministry of Education
PUFR	Private University Financial Report
ROA	Return on Assets
ROE	Return on Equity
UGC	University Grants Commission

Glossary

Educational Data Mining Educational data mining (EDM) can be defined as a technique for retrieving valuable data, analyzing which can have impact on the decisions made by and educational institute.

Optimized operations Optimized operations refer to the process, which ensures that an organization is running in the most efficient manner and attaining maximum profits by incurring the minimal amount of costs possible, under certain constraints.

Chapter 1

Overview of Internship

1.1 Student Information

I, Mohammad Alif Hossain Saad, bearing the Student ID: 17104058, am currently enrolled in the Bachelors of Business Administration (BBA) program of Brac Business School, Brac University. My undergraduate program initiated in Spring 2017 and I look forward to complete my graduation by 2021, with two special concentrations – Operations Management and Finance.

1.2 Internship Information

1.2.1 Period, Organization Name, Department & Address

I am delighted to have gotten the opportunity to work as an Intern in the Office of the Registrar at Brac University for three months starting from 1st January, 2021. Brac University, which has established itself as one of the reputed higher educational institutions in Bangladesh is currently located in 66, Mohakhali, Dhaka - 1212. However, the university is likely to relocate to its permanent campus, which is strategically located in the centre of communication at KHA 224, Progati Sarani, Merul Badda, Dhaka 1212, by 2023.

1.2.2 Internship Organization Supervisor's Information

As an Intern in the Office of Registrar at Brac University, I worked under the supervision of and was responsible for reporting to Mr. Md. Shamim Ahmed, who is currently serving as the Deputy Registrar and Deputy Controller of Examinations at Brac University. Alongside, Mr. Shamim is associated with Brac Business School as a Lecturer of Finance and Strategic Management.

1.2.3 Job Scope

As an Intern in the Office of Registrar at Brac University, my working hours started from 9:00 AM and lasted till 5:30 PM, 5 days a week except Fridays and Saturdays. During the first month of my internship period, I was provided with enough time to settle in the organization and its working culture. My organizational supervisor played a pivotal role here as he introduced me with my colleagues and assigned me with my roles and responsibilities. This allowed me to understand the key functions of the Office of the Registrar and how the different units in this department are working to successfully complete the tasks.

The major responsibilities which I was assigned with and successfully completed as an Intern of the Office of Registrar, under the supervision of my organizational supervisor are as follows:

Regular Responsibilities

- Preparing documents and formatting paper works for upcoming meetings
- Generating and submitting bills for events to the Accounts Department after getting them approved by the Registrar and Deputy Registrar
- Preparing presentations and other visualizations to aid higher management in decision making
- Following up with vendors (i.e. printing press, restaurants, etc.) involved with different projects and ensuring that the projects are being completed on time
- Visiting vendors' premises to check the quality of raw materials being used in certain projects
- Assisting the Registrar and Deputy Registrar regarding miscellaneous matters of the Registry when asked

Additional Responsibilities

- Translating guidelines and important notices provided by the Ministry of Education and University Grants Commission
- Analyzing data and preparing summary reports on the overall academic performance of the university for 2019 and 2020
- Preparing meeting minutes for specific meetings
- Working closely with the Office of Advancement to prepare a magazine on fundraising
- Editing an email macro for the Student Wing

Projects Completed

- Preparing draft of Academic Catalog 2021-2022
- Designing and publishing of Brac University Notebook 2021
- Designing and publishing of Admissions Newsletter – Spring 2021
- Designing of Fundraising Magazine

Events Organized

- Freshman Orientation – Spring 2021
- New Campus Visit with Academic and Non-Academic Heads - Spring 2021
- Appreciation Gathering – Lunch with the Vice Chancellor
- Vice-Chancellor's Visit to National Martyrs' Monument

Table 1: Office of Registrar Intern's Roles and Duties

1.3 Internship Outcomes

1.3.1 Student's contribution to the organization

The tasks and responsibilities which were assigned to me during my internship period were crucial and time sensitive in nature. Through successful completion of these tasks, I believe, I have contributed towards smooth operations within the organization.

Moreover, the projects which we assigned to me, such as the designing and publishing of Brac University Notebook 2021, were quite sensitive, as it was supposed to be distributed among all the employees of Brac University, starting the top most management. This meant that any sort of mistake was intolerable, be it from the designer's end or from the printing vendor's end.

While working on this project, I had to regularly communicate with the vendor and check the sample copies of the notebook for ensuring maximum quality. I also had to visit the vendor's premises to check the quality of raw materials being used. Through successful completion of this project, I could ensure that proper quality of products were being delivered by the vendor, which resulted in satisfaction of the management due to receiving notebooks of good quality, to be used throughout the year.



Figure 1: Brac University Notebook 2021

In addition to that, successfully designing the Admissions Newsletter of Spring 2021 and ensuring that it was published and shared on time with the students who had applied for their undergraduate admissions in Spring



Figure 2: Admissions Newsletter 2021

2021, allowed Brac University to attract more talents, as the newsletter contained vital information about the university, the facilities it provides and much more.

Furthermore, successfully organizing events such as the “Appreciation Gathering – Lunch with the Vice-Chancellor allowed Brac University to establish a proper liaison with the special guests of the event - the Principals of some of the renowned schools and colleges of Dhaka, who have been producing large number of students for Brac University. The Principals really praised the initiative of the university to invite them for a lunch with the Vice-Chancellor and are looking forward to further collaborations in the near future.

Due the ongoing COVID-19 pandemic, even though it became quite challenging at times, I have been able to successfully complete all the tasks assigned to me on time and with efficiency.

1.3.2 Benefits to the student

Brac University, since its inception in 2001 has grown to become one of the most reputed private universities in Bangladesh. Being able to work as an Intern in a organization of such scale was indeed quite rewarding, in terms of exploring my area of special concentration and gaining hands-on experience.

Being a student with special concentrations such as Operations Management and Finance, we were taught how manufacturing companies or corporate houses carry out these functions. However, being able to work in a higher educational institute, especially in the Office of the Registrar at Brac University, allowed me to learn and understand how universities carry out their day-to-day operations.

Moreover, the responsibilities and projects which were assigned to me allowed me to work closely with various departments of the university, such as Procurement, Accounts, Admissions, Advancement and Office of the Controller of Examinations. Being able to connect

with such wide array of departments carrying out vital functions in the university helped me to clearly understand the roles of these departments and how pivotal of a role they play together to ensure smooth operations on and off campus.

Furthermore, this internship opportunity evolved me as person by allowing me to acquire certain traits in aspects such as time management, communications, instantaneous decision making and work-life balance.

1.3.3 Problems/Difficulties

My internship experience at Brac University was indeed a fruitful one, filled with learning opportunities, however, there were certain hurdles which came in the way.

Firstly, since my classroom lessons on operations management were more emphasized on manufacturing companies and corporate houses, it was challenging for me to relate some of the concepts from operations management in such a diverse industry.

Secondly, while undertaking projects, it was difficult for me to understand the technical terms usually used by the vendors, specially while discussing about the raw materials and their quality, as I was comparatively new to such setting.

Thirdly, restrictions on sharing data was a major drawback for me as it refrained me from sharing internal university data while preparing this report.

Lastly, with limited access to first-hand data, I had to heavily rely on secondary data for carrying out my research.

1.3.4 Recommendations

Brac University has allowed me to explore my areas of special concentration, especially operations management, through this internship opportunity. However, I believe, this

experience can be enhanced by providing the future interns with appropriate training on dealing with vendors and making them aware of the technical terms.

Moreover, a relaxed policy on sharing university data can help interns make a significant betterment in their research reports. Alternatively, increasing access to first-hand data might also help in this regard.

Lastly, I would like to suggest Brac University to provide more internship opportunities to undergraduate students, not only in the Office of the Registrar or the Accounts Department, but in various other functions, so that they can explore their relevant areas of concentration and get the chance to gain hands-on experience, which will act as a life-long learning and allow them to excel in their upcoming future.

Chapter 2

Organization Part: Overview, Operations and a Strategic Audit

2.1 Introduction

Objective

The objective of this report is to understand how Brac University is currently operating and performing, which will allow me to analyze and figure out the shortcomings the organization is facing. Getting to know about the organization in details would aid me to indicate which sets of data can be mined to improve the operations of the university and ensure optimization.

Methodology

In order to prepare this report and to learn about the organization in details, I had to collect and analyze both qualitative and quantitative data. These data were collected using both primary and secondary resources. My organizational supervisor played a pivotal role here, to help me get the access to such resources.

I had to interview my colleagues who work in various departments of the university to understand how the departments operate. Moreover, I had to read through the Employment Policies and Accounting Manual of Brac University to learn about the management and accounting practices. Furthermore, the Annual report of Brac University was deeply analyzed to understand the financial health, which the university possess at the moment.

Scope

This report encompasses details about Brac University and its current practices in terms of management, marketing, finance and accounting, operations and information technology. Readers of the report will be able to get an in-depth idea of how operations in Brac University

is currently being managed, and will be able to understand its contribution in the financial health of the university.

Limitation

While preparing this report, the only problem which I had faced was the restriction on sharing data. On my quest of learning about Brac University and its operations, I had come across several data which were not available for being shared. However, with the help of my colleagues, I was able to reach out for alternatives, which helped me to prepare and complete this report.

Significance

The most significant outcome of preparing this report was that it allowed me to get a clear picture of how the various departments of Brac University operates to achieve a common vision. This helped me to understand the strengths and weaknesses of the organization. Moreover, the report aided me to understand how service sector operations vary from that of the manufacturing sector, while allowing me to learn and explore about my special concentration – operations management.

2.2 Overview of the Organization

2.2.1 Background

Brac University started its journey in the higher education sector of Bangladesh in 2001. Ever since, it has only expanded horizons to grow into one of the finest, reputed private universities of the country. The university follows a liberal arts approach to education that fosters innovative ideas and significantly boosts the field of tertiary education. While aiming to maintain the highest standards of education, the university aspires to address the needs of the dynamic modern world.



Inspiring Excellence
Figure 3: Logo of Brac University

Brac University aims to instill in its students a sense of dedication towards working for national growth, prosperity and community development, based on BRAC's experience of finding solutions to problems faced by extreme poverty. Throughout the years, the university has been operating with the motto – Inspiring Excellence.

The university has been accredited by the University Grants Commission (UGC) and has been authorized by the Ministry of Education. English is used as the medium of teaching and instructions at Brac University.

Throughout the years, Brac University has built a solid reputation for delivery sincere, customized support to its stakeholders, while promoting a technologically-friendly environment. Moreover, with the launching of projects such as BRAC Onnesha – the first Nano Satellite from Bangladesh and BRACU Mongol-Tori, a competitive Mars rover, the university has set a new benchmark in the field of science and education in Bangladesh.

Furthermore, in the QS Asia University Rankings 2018, Brac University secured the 228th position out of 400 private universities, making it the top ranked private university of Bangladesh for that year.

2.2.2 Vision Mission and Objectives

The Senior Management of Brac University agreed to a set of new vision, missions and objectives on 24th February, 2020 in Sylhet. These are as follows:



Figure 4: Vision, Mission and Objectives of Brac University

Relentless efforts are being put by the Senior Management of the university to achieve these objectives by 2024.

2.2.3 Organizational Structure

Brac University is serves its students with state-of-the-art higher education and a smooth learning experience through its various Schools, Departments, Institutes and Centres.

Schools	Departments	Institutes	Centres
<ul style="list-style-type: none"> •Brac Business School •Graduate School of Management •James P. Grant School of Public Health •School of Architecture and Design •School of Data and Sciences •School of Engineering •School of Humanities and Social Sciences •School of Law •School of Life Sciences 	<ul style="list-style-type: none"> •Department of Architecture •Department of Computer Science and Engineering •Department of Economics and Social Sciences •Department of Electrical and Electronic Engineering •Department of English and Humanities •Department of Mathematics and Natural Sciences •Department of Pharmacy 	<ul style="list-style-type: none"> •Brac Institute of Educational Development •Brac Institute of Governance and Development •Brac Institute of Languages 	<ul style="list-style-type: none"> •Centre for Climate Change and Environmental Research •Centre for Emotional Intelligence and Innovation •Centre for Entrepreneurship Development •Centre for Inclusive Architecture and Urbanism •Centre for Peace and Justice •Professional Development Centre

Figure 5: List of Schools, Departments, Institutes and Centres of Brac University

2.3 Management Practices

2.3.1 Decision Making

As a higher educational institute, Brac University’s highest policy-making body is the Board of Trustees (BoT). This body is in charge of setting and maintaining the highest standards of education and administration in the university.

The Syndicate is the university’s highest executive body, with regulatory and supervisory authority of the university’s research, administration and management of operations.

Moreover, the university’s academic policies are recommended by the Academic Council, consisting of Academic Heads, which also specifies the curricula and courses that will help the university meet high educational benchmarks.

2.3.2 Employment Policy

The recruiting processes and policies are outlined in the Employment Guideline of Brac University. The aim of this guideline is to define Brac University's recruitment and selection process, as well as to ensure that recruitment and selection decisions are taken fairly and in accordance with propriety, fairness, and justice.

The university maintains a single guideline for all of its workers that specifies non-discrimination against women and transgender people.

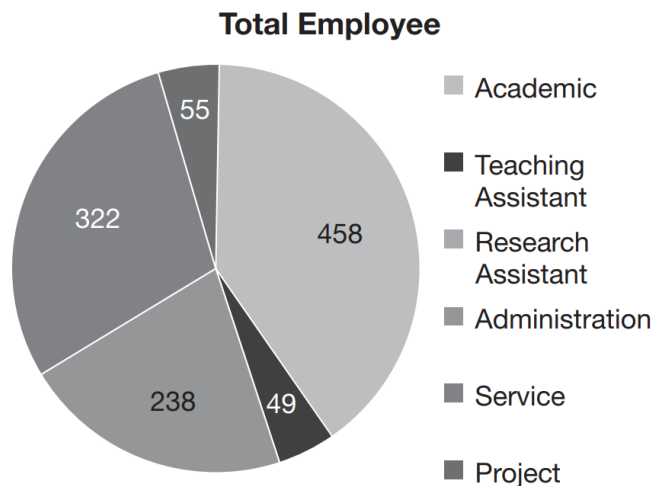


Figure 6: Total no. of employees in Brac University (as of 2018)

Moreover, Brac University employs, encourages, and retains workers and prospective employees based on individual performance, regardless of age, sex, caste, colour, disability, ethnic heritage, race, sexuality, culture or other social backgrounds. This allows the management team to ensure that the university is offering an equal employment opportunity. However, the university would not employ anyone below the age of 18, be it contractual or permanent.

2.3.3 Recruitment Process

The primary goal of the recruiting process is to recruit, select and hire staff who are suitable for the university's current and potential future needs. Moreover, the recruiting process at Brac University is inextricably linked to the university’s corporate strategy. This ensures that

qualified individuals are encouraged to apply for the vacant positions while allowing the university’s pool of knowledge and skills to expand exponentially.

Furthermore, centered on a dynamic recruiting process, Brac University hires the right applicant for the specific role. As a result, employees are hired via newspaper advertisements, headhunting, campus campaigns, and drop-in CVs. To recruit the best employee, a well-structured and formal process is practiced. An individual who has been sentenced by a court of law or an international court is ineligible for any position in the university.

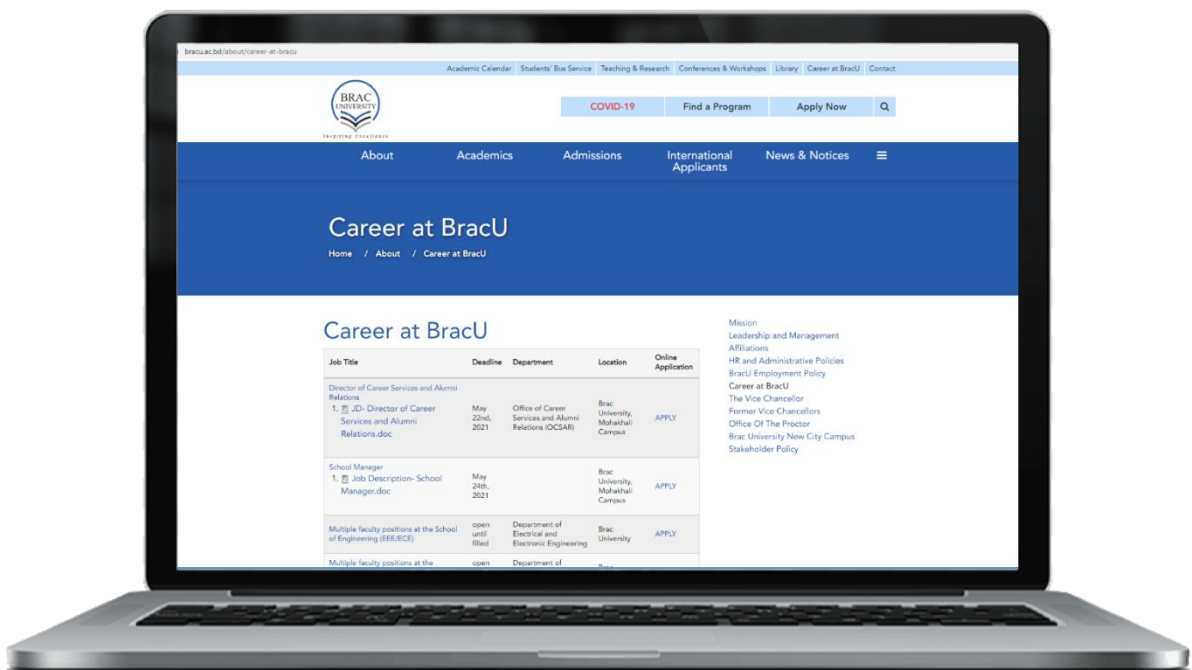


Figure 7: Online Portal for Opportunities at Brac University

2.3.4 Pay Scale

A salary scale is followed which determines how much an employee is paid. Every position has a specific Job Profile, based on which the pay rate is determined. However, the minimum wage for Brac University employees is higher than the minimum wage of BDT 8,250 set by the Government of Bangladesh.

2.4 Marketing Practices

Brac University has grown into one of the finest private universities in the country. Of course, it brings its own advantages. Every semester thousands of students apply and get admitted in the university. With upcoming the upcoming new schools and departments being formed; the numbers are expected to rise further.

Moreover, the concept of building an international university in Bangladesh is still quite fresh, therefore, the university not only looks forward to attract more national talents, but international talents as well.

2.4.1 Seven Ps of Service Marketing

In this part of the report, the concept of marketing mix will be used to highlight the marketing practices of Brac University. Seven factors (7 P's) will be analyzed which are controlled by the university to influence its target market.



Figure 8: 7 Ps of Service Marketing

Product

Since Brac University is operating in the higher educational sector and providing services such as education, the primary product of the university can be determined to be the degrees that it offers to its students.

The university is constantly updating the curriculum to make sure that the learning materials are up to date and are meeting the growing needs of the students and the modern world. This is how, by constantly developing its offerings, the university is attracting more students.

Price

The price factor of the marketing mix can be determined as the tuition fees which Brac University charges for its degrees. Being one of the top private universities, the tuition fees of Brac University are slightly above the market average.

As of 2021, the tuition fee per credit at Brac University is BDT 6,000. While additional fees per semester, which includes IT facility, Library and Student Activities, amounts to BDT 7,000. Students who get newly admitted have to pay a non-refundable admission fee of BDT 25,000.

However, Brac University provides a wide range of scholarships to its students based on different categories, which attract students to get enrolled in the university and attain education of good quality.

Place

Brac University is strategically located in the centre of the city in Mohakhali, which makes it easily accessible for students. This is indeed a major factor for students deciding to get enrolled in the university, as they look forward to study in locations where easy access to transportation and safety exists.

The new campus of Brac University is being developed in Merul Badda, which will supposedly attract more students as the location is also known as the centre of communication, which is easily accessible by almost all the parts of the city.

Promotion

Promotion includes all the tools that the university uses to approach its target market. Over the years, Brac University has published its admission circulars in the reputed national daily newspapers to inform potential student about the admission window. Recently, Brac University has also been promoting its admission windows through its official Facebook Page, while reaching potential students digitally.

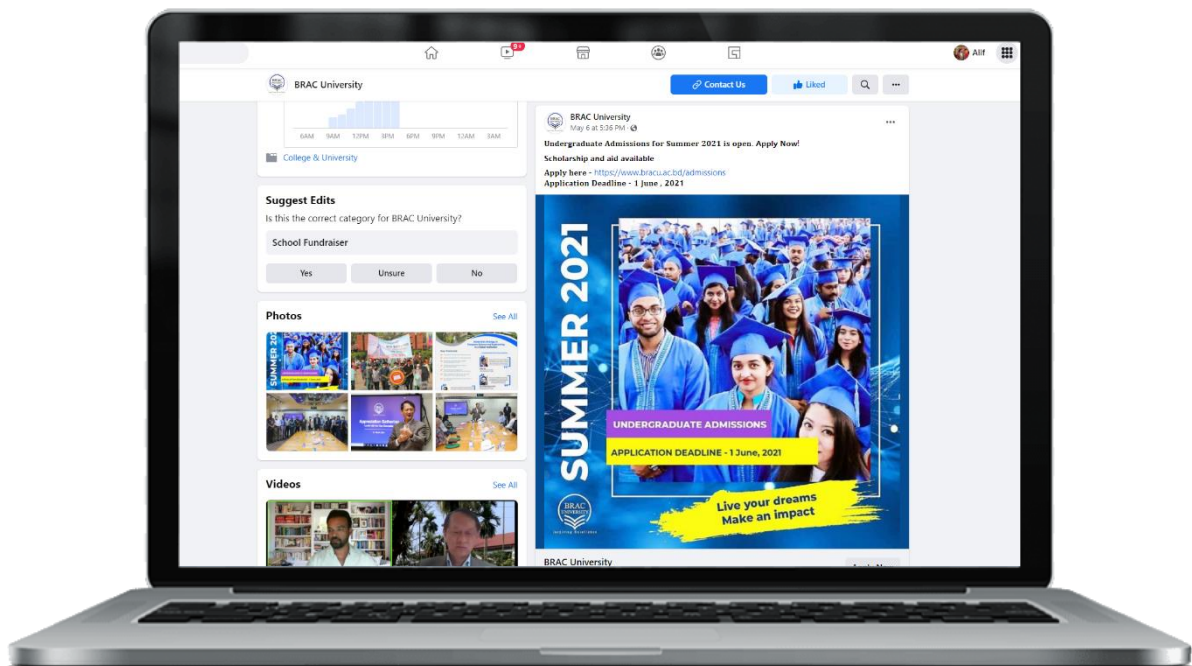


Figure 9: Advertisement through Brac University's Facebook Page

Moreover, Brac University has recently started focusing more on its outreach campaigns and activities. For example, on March 2021, Vice-Chancellor Vincent Chang invited the Principals of the renowned schools and colleges of Dhaka for lunch at Brac University premises in order to appreciate their efforts in continuing education in their respective organizations, despite the pandemic. Valuable insights about Brac University was shared in the Appreciation Gathering

and this opened up new opportunities to collaborate with the schools and colleges of Dhaka in the near future, who have been producing large number of students for the university over the years.



Figure 10: Appreciation Gathering with the Principals (Lunch with the Vice-Chancellor)

People

All university personnel who work with potential students, as well as those who are registered students, are included in the people aspect of the marketing mix. These individuals may include both academic, administrative or even support staff. The reputation of the university's academic staff plays an important role in the choice process of a student.

Recently renowned national and international personnel, with years of experience in higher education, have joined Brac University in both academic and administrative roles. These indeed play a vital role behind how potential students perceive the quality of education and student service in Brac University.

Process

Both institutional and bureaucratic duties of the university are covered by process, including everything from managing inquiries to admission, course evaluations to exams and publication of results as well. By ensuring that these processes are carried out smoothly, the university can achieve students' satisfaction.

With its new vision underway, Brac University is focusing on becoming a student-centric university. This means that the needs and experience of the students will be prioritized in the decision-making process. As students' experience enhance, word of mouth will spread much quickly and university will be able to attract national and international candidates.

Physical Evidence

The tangible components of the service offering are physical evidences. The target audiences of a university evaluate a multitude of concrete factors, ranging from the teaching materials to the appearance of the university's buildings and lecture facilities.

With Brac University's permanent campus being developed underway and the arrival of renowned academic and administrative staff, the university has certainly been in good shape, in terms of physical evidence and it will surely positively influence the decision making of the target market.

2.5 Financial Performance & Accounting Practices

2.5.1 Accounting Practices

The financial performance of an organization portrays how successful it is in terms of operating and sustainability. A proper analysis of the financial performance can also lead the management of the organization to understand the key areas where it needs to focus on, in order to attain efficiency in operations and maximize its profit to become sustainable in the long run.

Brac University is no different. The dedicated Finance and Accounts Department of Brac University plays a critical role in boosting operational efficiency and assisting management in decision making. The department currently operates under the supervision of Mr. Ariful Islam, who is serving Brac University as the Chief Financial Officer.

As an educational institute, Brac University has to follow certain rules and regulations set by the University Grants Commission (UGC) and the Ministry of Education while preparing its annual reports. As a result, to maintain utmost accuracy and transparency, the university conducts two types of audits:

- Internal Audit
- External Audit

Internal Audit and Compliance Department is responsible for conducting audits throughout the year. Each year, an external audit is performed. The Ministry of Education (MoE) receives three audit company profiles. Through the Ministry of Education, the Chancellor then chooses one enterprise who performs the audit. As a result, BRAC University conducts a true and fair audit of accounting and management information.

BRAC University adheres to the ICAB-adopted IFRS standards. However, not all IFRS standards are directly relevant to financial reporting since many IFRS standards are more appropriate to listed firms and small medium businesses, whereas BRAC University is a learning institution. As a result, the University Grants Commission (UGC) creates "The Financial Transactions Recording and Annual Financial Reporting Format" known as Private University Financial Report (PUFR)" for private institutions. The PUFR, however, is in compliance with Bangladesh Accounting Standards (BAS), International Accounting Standards (IAS), and International Financial Reporting Standards (IFRS).

2.5.2 Financial Performance

In order to assess the financial performance of Brac University, a certain set of ratios were calculated for the last 5 years, which focused on aspects such as liquidity, asset management, debt management and profitability of Brac University. The ratios which were calculated to assess the performance are as follows:

Liquidity Ratio:

- Current Ratio:

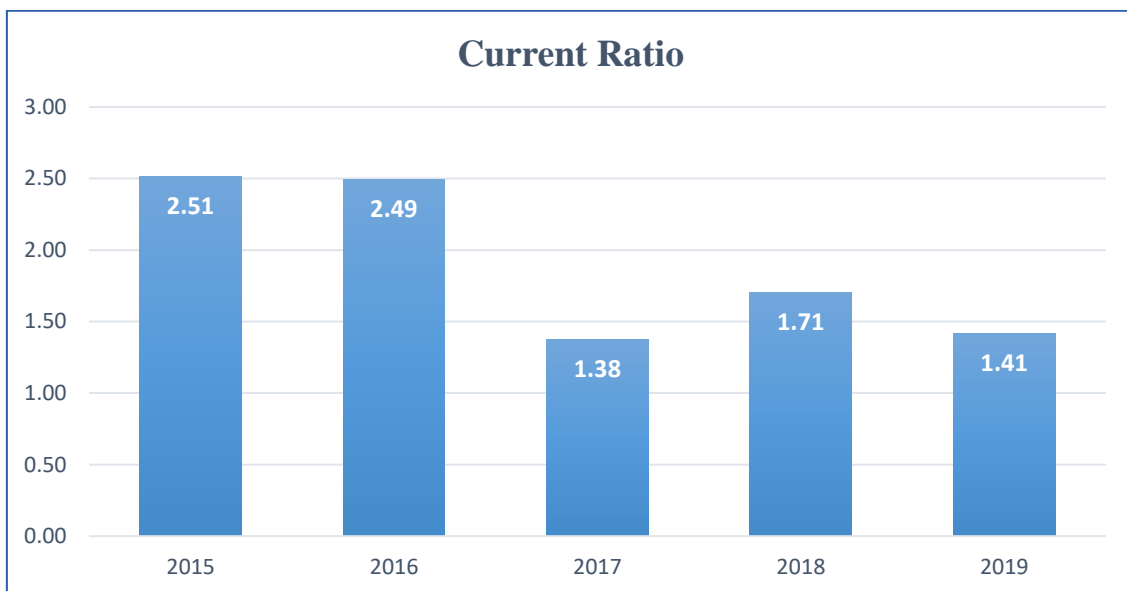


Figure 11: Comparison of the Current Ratio of Brac University

The Current Ratio portrays how much Current Assets a company possesses against its Current Liabilities.

At the end of 2019, Brac University had a Current Ratio of 1.41:1. This means that for every BDT 1 of Current Liability, Brac University had a Current Asset of BDT 1.41. The university is performing quite decently, considering this aspect.

However, comparing the performance of the last 5 years, we can see that the Current Ratio of Brac University is following to decreasing trend as it fell from 2.51:1 in 2015 to 1.41:1 in 2019.

Asset Management Ratio:

- Total Asset Turnover

The Total Asset Turnover Ratio portrays how efficiently a company is using its Current Assets to generate Revenue.

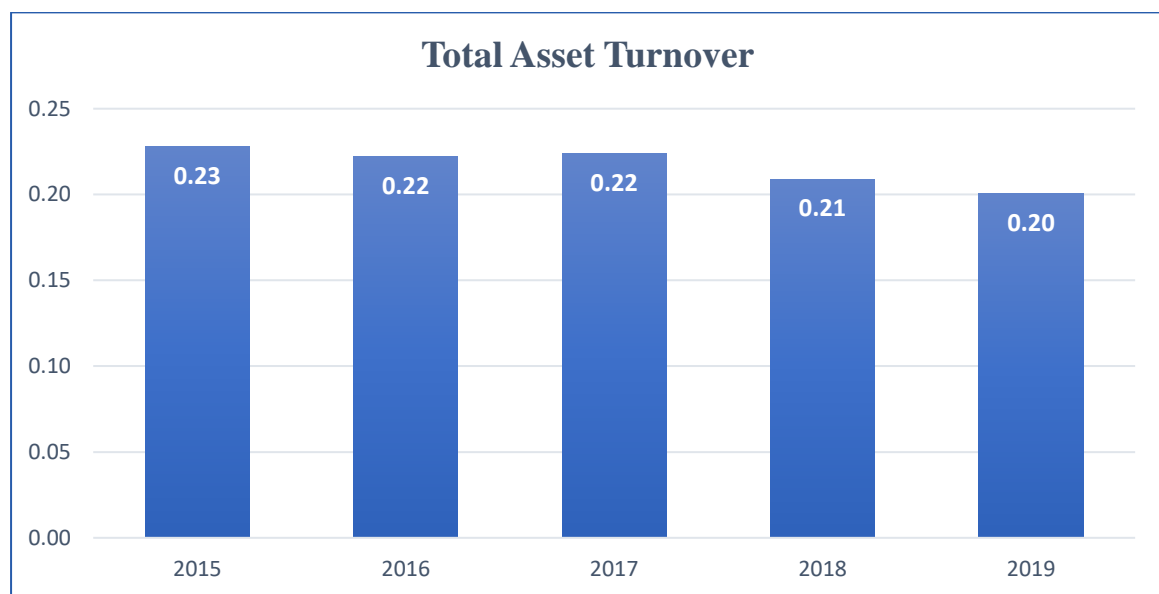


Figure 12: Comparison of the Total Asset Turnover Ratio of Brac University

At the end of 2019, Brac University's Total Asset Turnover Ratio amounted to 0.20:1. This means that for every BDT 1 worth of Total Assets, the university generated BDT 0.20 of Revenue.

While comparing the performance of the last 5 years, we can see that the Total Asset Turnover Ratio for Brac University has been following a decreasing trend as it fell from 0.23:1 in 2015 to 0.20:1 in 2019. This reflects that a scope of improvement exists in this area for the university, to better utilize their assets to generate revenue.

Debt Management Ratio:

- Debt Ratio:

The Debt Ratio, also known as the Debt to Asset Ratio of a company shows how much debt as company has used to finance its assets. The higher the ratio is, the higher is the degree of leverage and financial risk.

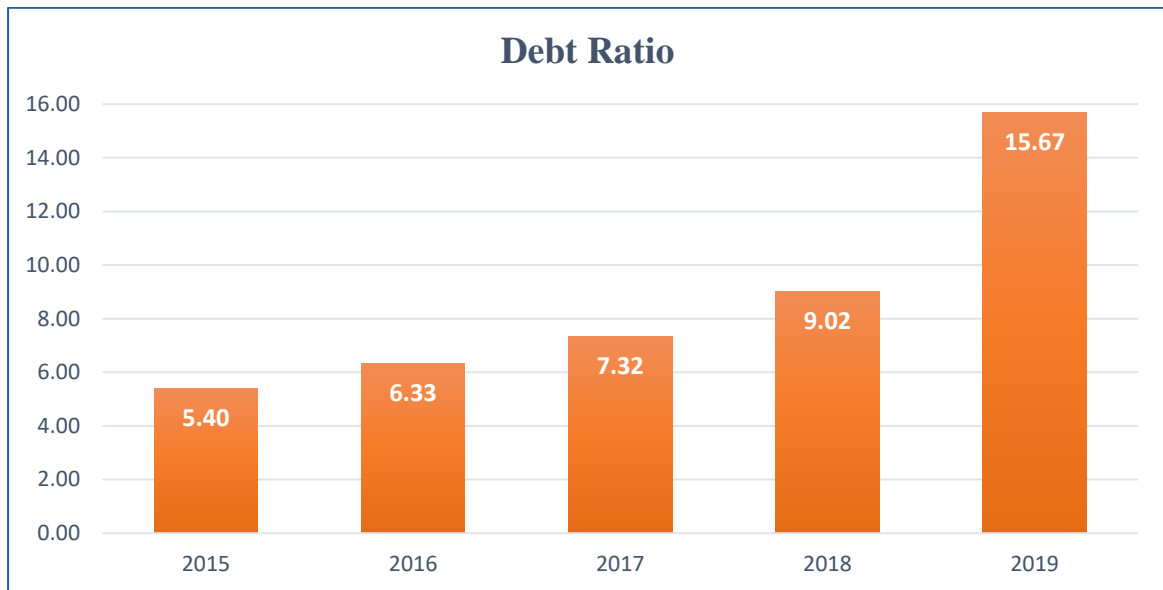


Figure 13: Comparison of the Debt Ratio of Brac University

At the end of 2019, Brac University had a Debt Ratio of 15.67%. This means that 15.67% of the university's assets were financed by debt.

While analyzing the performance of the last 5 years, we can see that the Debt Ratio of the university has been following an increasing trend, as it rose from 5.40% in 2015 to 15.67% in 2019. This means that the degree of leverage of the university is now greater, compared to its previous years, however, the financial risk is also higher.

Profitability Ratios:

- Operating Profit Margin

The Operating Profit Margin portrays how much profit a company makes on each BDT of sales, from its operations, before subtracting taxes and interest charges.

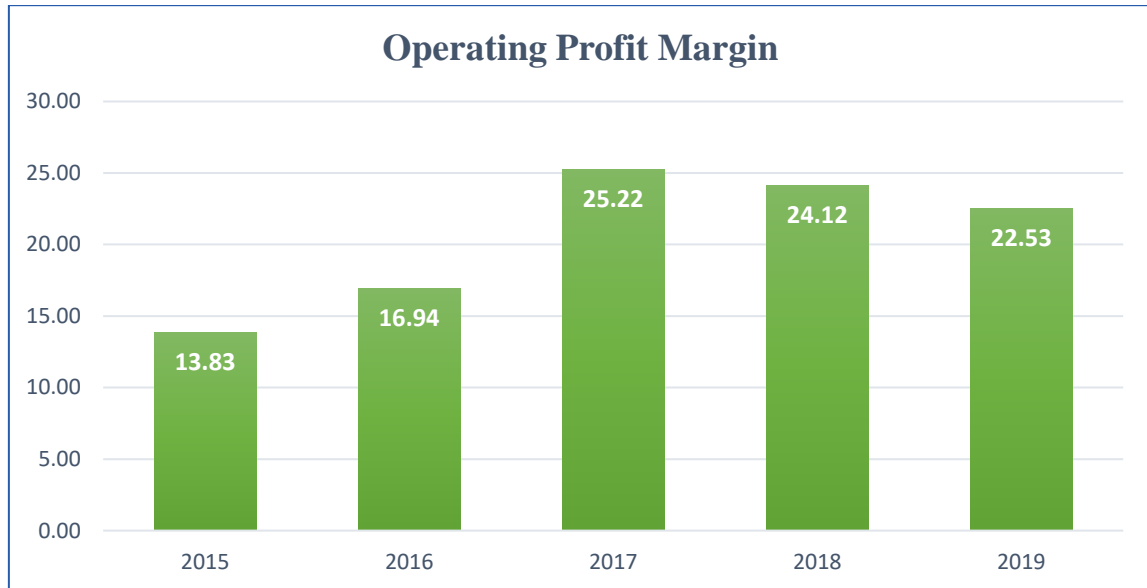


Figure 14: Comparison of the Operating Profit Margin of Brac University

At the end of 2019, Brac University's Operating Profit Margin was 22.53%. This means that for every BDT 100 of revenue generated, the university was making BDT 22.53 of operating profit.

While comparing the performance of the last 5 years, we can see that the Operating Profit Margin of Brac University has been following an increasing trend as it rose from 13.83% in 2015 to 22.53% in 2019. This shows that the university has been performing well in this aspect and has been able to control its operating costs properly.

- Net Profit Margin

The Net Profit Margin shows how much net income or profit a company generates from its revenue.

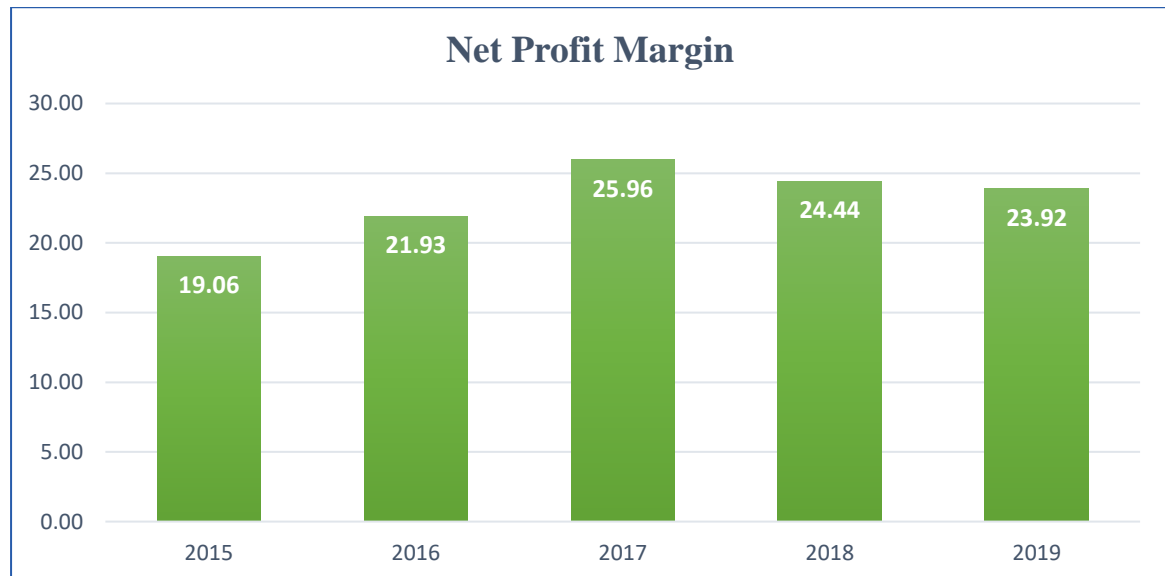


Figure 15: Comparison of the Net Profit Margin of Brac University

At the end 2019, Brac University attained a Net Profit Margin of 23.92%. This means that for every BDT 100 of revenue generated, the university was making a net profit of BDT 23.92.

While comparing the performance of the last 5 years, we can see that the Net Profit Margin of the university has been following an increasing trend as it rose from 19.06% in 2015 to 23.92% in 2019. This shows that the university has been performing decently in this aspect as well.

- Return on Assets (ROA)

The Return on Assets (ROA) is an indicator which portrays how much profit a company generates by utilizing its assets efficiently.

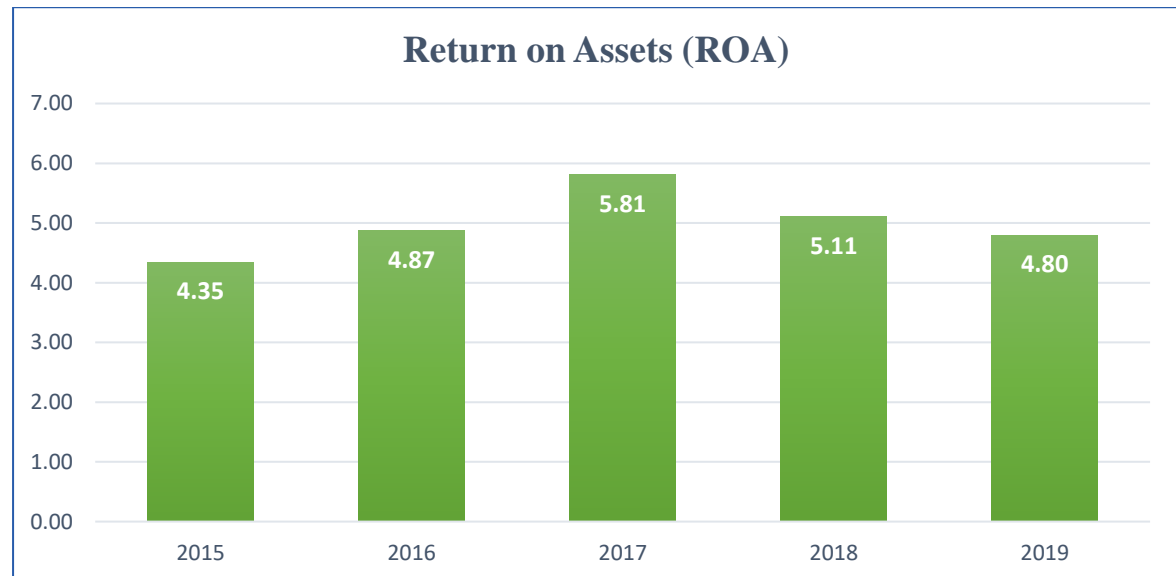


Figure 16: Comparison of the ROA of Brac University

At the end of 2019, Brac University’s ROA amounted to 4.80%, which means that for every BDT 100 worth of total assets, the university was able to generate a net profit of BDT 4.80. If we consider the previous years’ performances, we can see that Brac University’s ROA has been following an increasing trend, as it rose from 4.35% in 2015 to 4.80% in 2019. This shows that Brac University is better utilizing their assets than before, which has resulted in increased revenue and profits.

- Return on Equity

The Return on Assets (ROA) is an indicator which portrays how much profit a company generates by managing its equity efficiently.

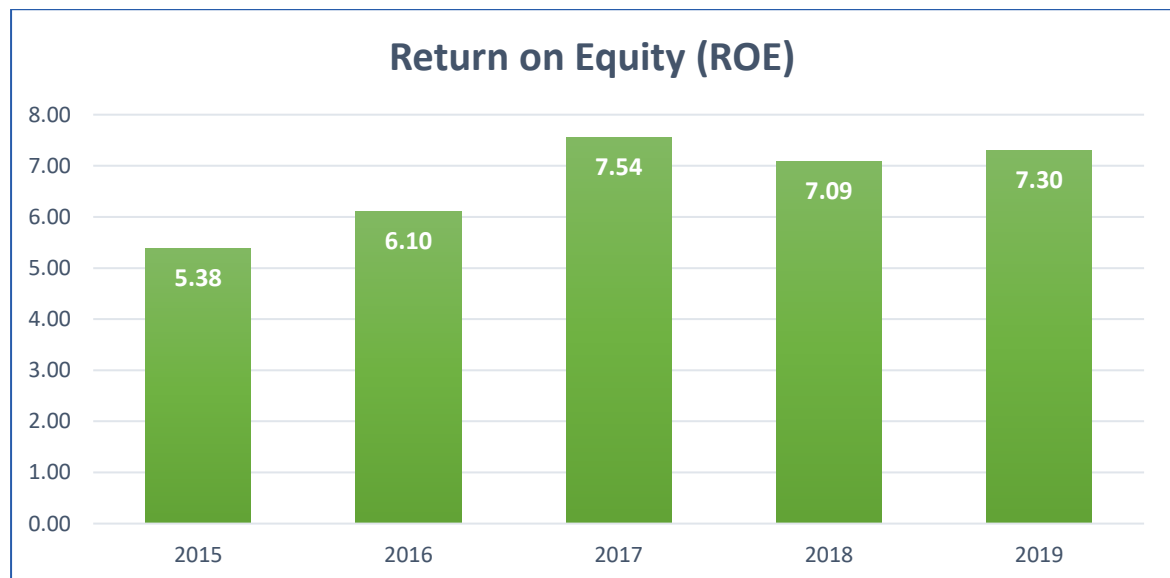


Figure 17: Comparison of the ROE of Brac University

At the end of 2019, Brac University's ROE amounted to 7.30%, which means that for every BDT 100 of investment, the university was able to generate a net profit of BDT 7.30.

If we consider the previous years' performances, we can see that Brac University's ROE has been following an increasing trend, as it rose from 5.38% in 2015 to 7.30% in 2019.

This shows that Brac University is better utilizing their assets than before, which has resulted in increased revenue and profits.

Based on the analysis of the ratios of Brac University, we can conclude that the university is performing decently in all aspects, especially in terms of Debt Management and Profitability, compared to its previous years. However, there is a scope for the university to improve its financial performance in terms of Liquidity and Asset Management, by proper utilization and management of its Current and Non-Current Assets.

2.6 Operations Management and Information System Practices

2.6.1 Operations Management

Throughout the years, Brac University has been focusing on ensuring that its operations are being carried out smoothly. The university operations can be split in to two segments – Academic Operations and Administrative Operations.

The Academic Operations are carried out by the Office of the Registrar, who are in charge of the following activities:

- Assessing demand for courses
- Ensuring the arrangement of a smooth pre-advising session
- Assigning classrooms to courses and sections
- Preparing class schedules to be followed across the semester
- Preparing exam timetables for each semester
- Ensure the timely publication of results at the end of each semester

The Administrative Operations on the other hand are carried out by the Operations Team of the university, who are in charge of the following activities:

- Ensuring security of university premises
- Maintaining hygiene and cleanliness across all university facilities
- Maintenance of university transportation
- Assisting in the arrangement of events on and off the campus
- Recording and maintaining the assets of the university
- Providing additional support to all other departments upon need

2.6.2 Operations Management during COVID-19 Pandemic

Similar to all other organizations, the COVID-19 pandemic changed Brac University's approach to operations as well. The pandemic disrupted on-campus academic operations, as consecutive lockdowns were enforced by the Government to tackle and combat the first and second wave of Coronavirus. As a result, on-campus education was switched to online education, which allowed students to continue learning, while staying in the safe borders of their homes.

Online education is currently being carried out using platforms like buX, Google Meet, Google Classrooms, Zoom, etc. which allows teachers to interact with students and share learning materials. The Office of the Registrar along with the Academic departments are currently ensuring that the necessary arrangements are being made for students to continue learning online, while the Operations Team are ensuring the security and maintenance of Brac University's campus and assets.

2.6.3 Information System Practices

Being one of the finest private universities of the country, Brac University adopts the technical changes, as per the demand of the modern world. The university's dedicated IT Department is responsible for ensuring the soundness of the technical aspects of Brac University.

Currently, Brac University utilizes a wide range of software and platforms in order to preserve the records of thousands of students and staff and to enhance the learning experience of students.

These software and platforms include:

- **USIS:**

The USIS is a parent software which is used by Brac University to preserve the records of all students and courses. The software is used by students for their academic advising and

for viewing class schedules. It has a dynamic dashboard which allows the students to view the courses being offered and their seat status and enroll accordingly. The software also aids the university administration to retrieve resourceful data and utilize them for decision making, based on needs of the management.

- **TSR:**

The TSR is a server used by the faculties of Brac University to upload learning materials and make it accessible for students. The server however, was not accessible outside the Brac University campus.

- **LMS:**

The LMS, also known as the Learning Moodle System, is an enhanced version of the TSR, which allowed students to access the learning materials, shared by faculty members, from almost anywhere.

- **G-Suite:**

Brac University uses the G-Suite services for handling emails and cloud storage. All the students of Brac University are provided with a G-Suite account upon admission, which allows them to register in buX and gives them the access to university announcements and news.

- **buX:**

buX, also known as Brac University X, is a platform which was developed to aid online education for Brac University students. It is the first platform developed by any private university in Bangladesh to continue online education. The platform has a dynamic user interface which allows faculties to share recorded lectures and assessments, while providing students with the facility to learn online from the comfort of their homes.

Besides the aforementioned software and platforms, Brac University uses other essential software to enhance privacy of data and combat against cyber threats.

2.7 Industry and Competitive Analysis

As the economy of Bangladesh is developing quite rapidly, along with the improvement in the standard of living, need for higher education has been on the rise. This has led to the setting up of quite a number public and private higher educational institutes, making this sector quite competitive.

In this part of the report, Porter's Five Forces Model will be used to analyze the industry structure and the competitiveness of the higher education sector of Bangladesh. Moreover, a SWOT Analysis of Brac University will be carried out to assess the university's strengths, weaknesses, opportunities and threats.

2.7.1 Porter's Five Forces Model

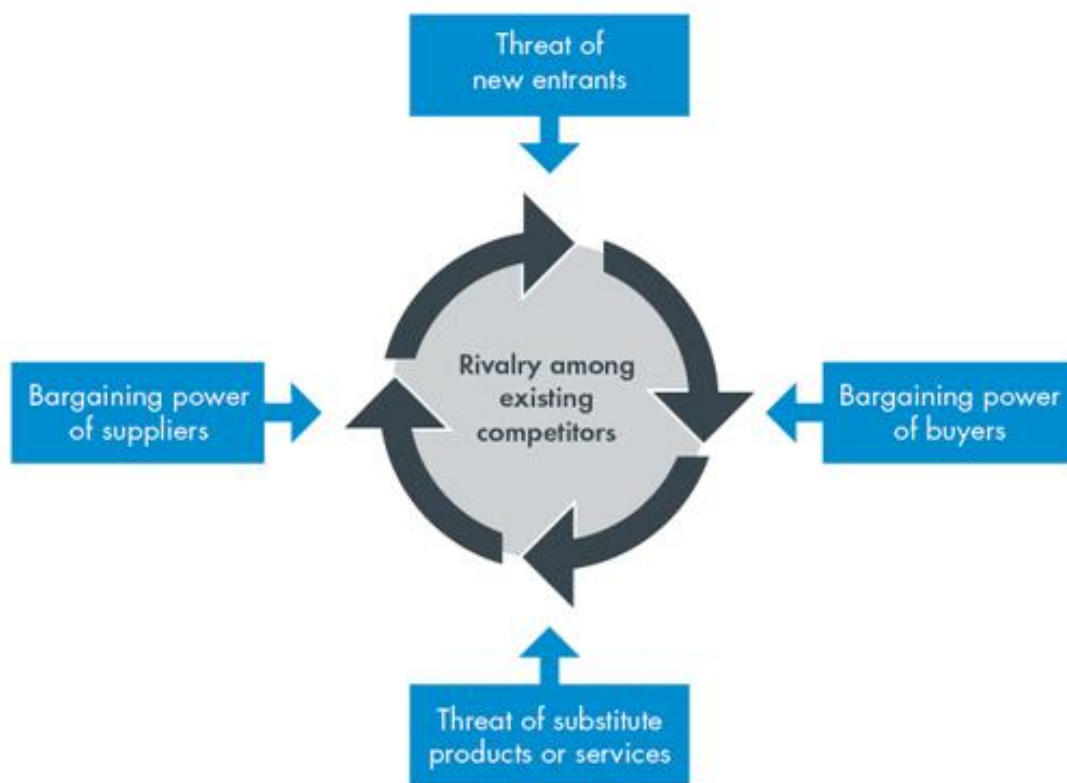


Figure 18: Porter's Five Forces Model

Threat of New Entrants:

In Bangladesh, setting up a university requires a lot of documentation and paperwork. Moreover, strict regulatory policies established and monitored by the Ministry of Education and UGC make it even harder for new universities to enter the sector. This means that the threat of new entrants, in the perspective of the Brac University, is quite low.

Threat of Substitute:

The higher education sector of Bangladesh currently consists of 103 private universities and more than 45 public universities. However, only a few of these institutions are reputed for their services. Considering the target market of Brac University and its reputation in the higher education sector, the threat of substitute is moderately high.

Bargaining Power of Buyers:

Parents and students are the buyers of services provided by Brac University. With so many universities operating in the higher education sector of Bangladesh, and with competitive tuition schemes and scholarships being provided, the bargaining power of buyers is quite high.

Bargaining Power of Suppliers:

Faculty members and administrators are the major suppliers of services provided by Brac University. Operating for almost two decades now, Brac University has earned a name and established itself as one of the finest higher educational institutes of Bangladesh. Trying to ensure a good working environment and proper HR practices, the university has been able to attract nationally and internationally renowned faculty members and administrators. However, the high number of universities, currently operating in the sector are also providing career opportunities for academicians and administrators. Considering these, we can state the bargaining power of suppliers of Brac University to be moderate.

Rivalry among existing competitors:

Being one of the finest higher educational institutes of the country, Brac University competes with the top private and public universities. The competition among these universities are fierce and can be portrayed as highly competitive.

After analyzing all the aspects of Porter's Five Forces Model, we can create the following radar diagram where 1 represents low competition, 3 represents moderate competition and 5 represents high competition.

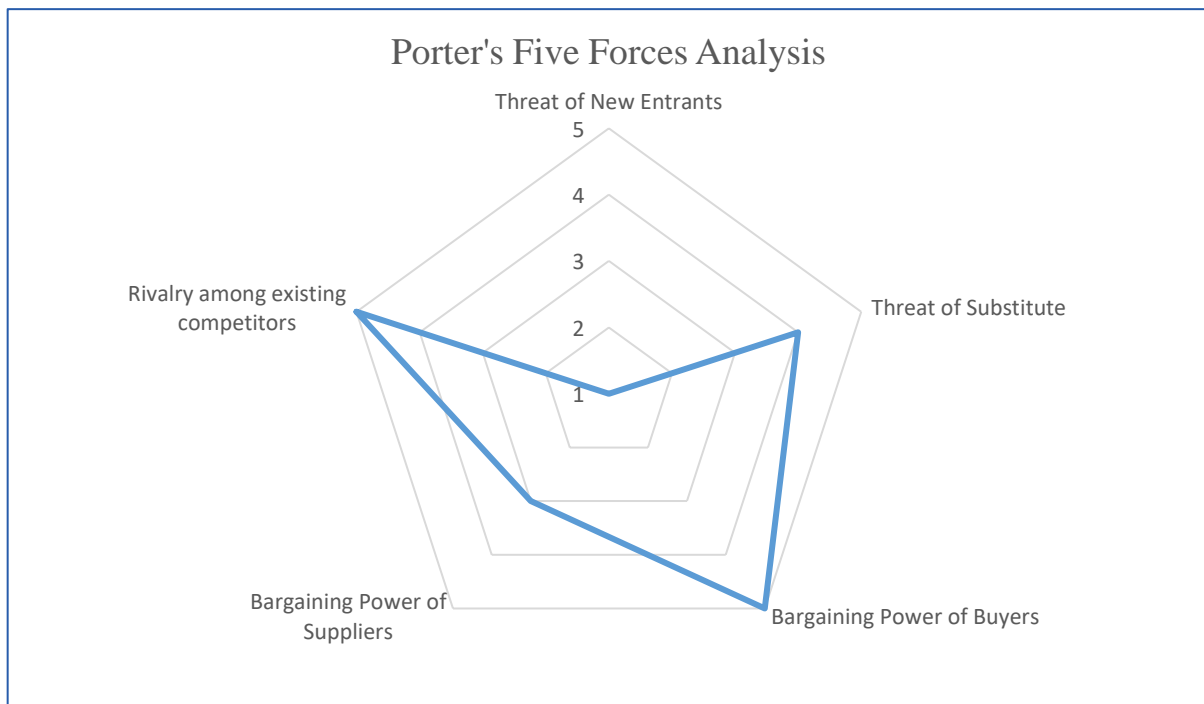


Figure 19: Porter's Five Forces Analysis

Based on our analysis and the afore-mentioned radar diagram, we can conclude that the higher education sector of Bangladesh is very competitive.

SWOT Analysis:

In order to assess the strengths, weaknesses, opportunities and threats, a SWOT Analysis of Brac University was carried out. The outcomes have been elaborated in the following page:


Strengths	Weaknesses
<ul style="list-style-type: none"> • Brand Name: BRAC is a well-known brand name in our country and BRAC University benefits from BRAC's proven brand name. • Capital: founding a university necessitates a large sum of money for the construction of its infrastructure. BRAC University's financial strength is one of its many assets. • Own campus: BRAC University is constructing its one-of-a-kind own campus which would attract a good number of students. 	<ul style="list-style-type: none"> • <u>Brac</u> University's current campus is insufficient to support its operations. A multistory building should not be the only structure on a university campus.
	
<ul style="list-style-type: none"> • Public universities have a limited number of seats available, and they are unable to accommodate all applicants who want to pursue higher education. This condition has opened the door for prestigious private universities such as BRAC University. • Session jots demotivate students to get enrolled in public universities. 	<ul style="list-style-type: none"> • If public universities expand student capacity, limit session length, and eliminate student politics, private universities like <u>Brac</u> University will face serious problems. • There are a few universities that are underperforming horribly. As a result, the image of private universities has been tarnished.
Opportunities	Threats

Table 2: SWOT Analysis

2.8 Summary and Conclusions

To summarize, Brac University has been making impact in the higher education arena of Bangladesh for the past two decades and now they are expanding their horizons by approaching internationalization. The employees of the various departments, both academic and administrative are working hard to achieve the objectives, set by the Senior Management, by 2024.

Moreover, Brac University, being one of the first universities in the country to adopt online education, amidst the pandemic, shows how adaptive the university is growing into to meet the needs of the ever-changing modern world.

Student centricity is certainly one of those traits, which allow universities to flourish and Brac University is surely on the right track, with its efforts to transform the higher education sector of Bangladesh and prepare the global citizens of tomorrow.

2.9 Recommendation

As an Intern in the Office of the Registrar at Brac University, I was privileged to have gotten the opportunity to directly work with some of the Senior Management official of the organization and contribute towards successful organizing of events. The wide range of responsibilities and projects which I was assigned with allowed me to learn more about the organization and attain skills, which will help me out throughout my lifetime.

However, while working as an Intern over the past few months, I have realized that there is still a lot of scope to analyze and utilize data and positively influence how the organization operates at the moment. Therefore, I would recommend Brac University to preserve and utilize educational data to optimize operations.

Lastly, I believe, Brac University has the potential and resources to become one of the finest universities in Asia, and with its adaptive trait, it can bring a massive transformation in the higher education sector of Bangladesh.

Chapter 3

Project Part: Importance of Educational Data Mining for Optimized Operations in Brac University

3.1 Introduction

Background

Every organization has its unique way of operating. Be it a full-fledged manufacturing organization, a non-governmental organization, a healthcare institute or an educational institute, the way in which each of these operate, varies from industry to industry, however, they all have one objective which coincide – to be sustainable in the long run by optimizing operations. By definition, optimized operations refer to the process, which ensures that an organization is running in the most efficient manner and attaining maximum profits by incurring the minimal amount of costs possible, under certain constraints (Fei, Li, & Sun, 2017).

However, in modern day, how an organization defines optimized operations and approaches sustainability is largely dictated by data. Data mining acts as the fuel that drives decision making in organizations, often leading towards optimization. By definition, data mining is the process of analyzing large sets of data to identify patterns and summarizing it into important information to aid decision making (Kumari, Nabi, & Priyanka, 2014). It has been years now since manufacturing organizations have started storing data and analyzing them to predict demand, understand changes in customer behavior, explore opportunities in new markets and lower cost alternatives to maximize profits, however, the higher educational institutes in Bangladesh are lagging behind in this area. The term ‘Big data’ is still a new concept in the higher education sector of Bangladesh and the importance and need for educational data mining

is somewhat being overlooked. Educational data mining (EDM) can be defined as a technique for retrieving valuable data, analyzing which can have impact on the decisions made by and educational institute (Algarni, 2016). Universities in Bangladesh need to understand the importance of data mining and realize the scopes that it offers for optimizing operations.

Moreover, with the COVID-19 pandemic playing its role and on-campus education being disrupted, leading to the education of hundreds and thousands of students being hindered, it is the prime time for universities to step up and utilize data as one of the primary resources for decision making and optimizing operations.

This research project is aimed towards providing an overview of the different types of data that universities can use for educational data mining and how they can be utilized to make decisions leading to optimized operations. In addition, it will analyze Leavitt's Model of Organizational Change, in the perspective of big data, to emphasize on how Brac University can cope with the challenges and grasp opportunities which complement data mining.

Objectives

The long-term goal of the research is to support, why a solid data mining unit is required to be established at Brac University, which will act as one of the crucial drivers behind decision making, leading the university towards optimized operations. Optimized operations here refer to the process of maximizing profits with the minimal amount of costs being incurred, under stated constraints. Furthermore, the objective of this study is to provide an extensive review of literature emphasizing the importance of data mining for Brac University; and propose solutions for the major problems leading to ineffective operations, with respect to data mining.

1. To identify the major problems leading to ineffective operations, which are being experienced due to the lack to data mining;

2. To propose a solution, with respect to data mining, to minimize these problems and ensure optimized operations bearing in mind the state and the needs of the stakeholders.

Significance

Being a higher educational institute, Brac University has access to plenty of data. This is because of the increased use of technology in educational environments, vast volumes of student data (i.e. demographic, geographic, academic) are being stored, making educational data mining an effective tool for improving teaching and learning processes.

Moreover, educational data mining can be used to recognize at-risk students, identify priority learning requirements for various classes of students, increase retention rates, target and filter potential students to maximize quality, accurately measure institutional success, maximize campus resources and minimize other problems which lead to inefficient operations. (Algarni, 2016)

The result of this research will be impactful as it will propose how the effective use of educational data mining can help minimize some major problems leading to optimized operations in Brac University and will be resourceful for similar higher educational institutions of Bangladesh, portraying the importance and the need for educational data mining in this industry.

Additionally, this study has allowed me to explore and understand the various ways in which educational data mining can be used to improve and optimize operations in higher educational institutions.

Formulation of the research question

During my internship period at Office of the Registrar, Brac University, I had the opportunity to directly work with various units such as Data and Systems, Student Wing and Student

Recruitment and Outreach. Effective communication with the representatives of these units allowed me to understand the challenges they face, specifically the ones, which lead to ineffective operations.

As per the Assistant Manager of Data and Systems, one of the major problems which lead to ineffective operations is the increasing number of students who are likely to take retakes. At Brac University, the standard time frame to complete any degree, except Architecture is 12 semesters (4 years). Retakes are usually taken by students who do not perform well in a course, due to various reasons, and as a result, they end up enrolling for the course again in the following semesters. This means that the student is taking an extra course in the following semester(s), which leads the student to take more semesters to complete his/her degree. The more time/semesters a student takes to complete his degree, the longer a seat/slot stays booked for that student, with campus resources being limited. Therefore, the university is unable to admit a new student after 12 semesters, because the students who were supposed to complete with their degree by now have been unable to do so and are still occupying the seats/slots, which were supposed to get vacant. Now visualize the effect of hundreds of students taking retakes. This rising problem directly impacts the number of students Brac University can allow to intake every semester during the admissions and as a result limits the increase in net revenue, leading towards inefficiency of resources.

Another problem which leads to ineffective operations and lowered net revenue is the inefficient enrollment management. In a developing country like Bangladesh, private universities are still going through the phase where they do not have to put much effort to maximize admission intakes, due to the presence of limited number of reputed private universities and very restricted number of intakes in public universities. Brac University is among the very few reputed higher educational institutes and is among the top 3-5 private university choices of parents and potential students. This surely provides Brac University with

the upper hand to attain a good number of intake during admissions, however, with Brac University's new vision of becoming a proud, global institution from Bangladesh and its new campus on the verge of getting ready, the current number of intakes will not prove to be satisfactory, in order to optimize operations. As a result, Brac University needs to boost its admission intakes by formulating student recruitment initiatives and outreach campaigns.

On the basis of the afore-mentioned problems, the following research question has been formulated:

Can the use of educational data mining help to reduce the number of students taking retakes and increase quality admission intakes in order to optimize operations?

3.2 Methodology

The research methodology for this study requires the analysis of both qualitative and quantitative data, which has been acquired through primary and secondary sources.

The primary data collected has been attained by going through the annual reports of Brac University of the last 5 years. Questionnaires were also distributed among the employees of the Office of the Registrar, in order to get access to crucial primary data. Additionally, the news releases of Brac University, published on their website were also analyzed to understand Brac University's current approach towards operations.

The secondary data included extensive review of research papers to understand the different types of data which needs to be considered for data mining in higher educational institutes to solve relevant problems leading to ineffective operations. Moreover, special emphasis was given to study the Leavitt's Model of Organizational Change to outline solutions against the identified problems and emphasize on how Brac University can cope with data mining, leading to optimized operations.

The primary goal to optimize operations is to improve financial health and to attain sustainability for an organization. The same is applicable for higher educational institutions. This is why the I decided to follow Robust Sustainability Framework suggested by the World Economic Forum (WEF) to which focuses on assessing sustainability of any organization. (O’Connell, et al., 2013) The framework consist of the following four elements:



Figure 20: Robust Sustainability Framework

Throughout the study, the four elements have been assessed thoroughly which has aided us to come to a conclusion, shared at the end of the report.

In order to assess the first element – Institutional Mechanism of Brac University, a hypothesis test was carried out on the outcomes of a weighted rating scale-based questionnaire, which was filled by 7 employees of the Office of the Registrar of Brac University. Further details about the hypothesis test have been shared in the ‘Methodology’ section of the report.

The second element – Data Analytics, has been prepared on the basis of the hypothesis test carried out in the first step. This part contains an in-depth analysis of the outcomes of the questionnaire and has been visualized through relevant graphs and charts for better understanding of some of the problems, which is leading to inefficient operations in Brac University. This part has been elaborated in the ‘Findings and Analysis’ section of the report.

The third element – Evaluation, will analyze the findings of the previous two elements and help prepare a holistic outcome, aiming towards reaching to a conclusion. This element can be found in details in the ‘Findings and Analysis’ section of the report.

Lastly, the fourth and the final element of the Robust Sustainability Framework – Feedback, consisting of the recommendations from the perspective of the researcher will be shared in details in the ‘Recommendations’ section of the report.

Institutional Mechanism

Primary data was very crucial in order to ensure that study is being carried out empirically. Therefore, with the help of my Supervisor at Office of the Registrar, at Brac University, I had distributed weighted rating scale-based questionnaire among the 7 employees of the Office of the Registrar. Each questionnaire consisted of 11 questions, related to the leading problems, which result in inefficient operations. The questionnaire was divided into 3 segments. The first segment, consisting of 5 questions, was aimed towards getting to know the perspective of the employees on the problems being faced. The second segment, consisting of 4 questions, was based on the predicting students’ academic performances. The students of Computer Science and Engineering (CSE) we considered sample in these segments, as the students of CSE add up to the highest number of retakes, in each semester. The third segment, consisting of 2 questions, was based on student recruitment and outreach. All 11 questions could be answered using likert scales with values of 1 to 5, making it easier for the employees to quantify the effects of the problems and their perspectives.

The following rating scale was used in order to formulate the weights assigned to all the 11 questions:

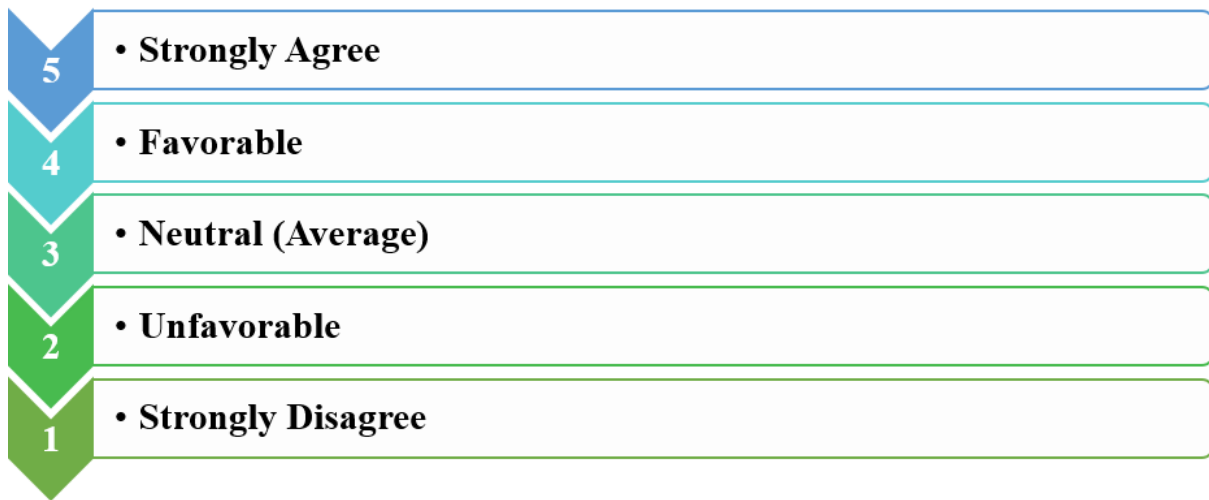


Figure 21: Rating Scale used for the survey

Upon receiving the completed questionnaires from all the 7 employees, a much more quantifiable perspective of the employees, regarding the problems leading to inefficient operations was available for a broader analysis. The weighted answers of the questionnaire will be used to calculate the average outcomes. These averages will be utilized as inputs carry out hypothesis testing in Microsoft Excel. Therefore, the null and alternate hypothesis of the research are as follows:

Null Hypothesis, H0: *'Educational data mining cannot help to reduce the number of students taking retakes and increase quality admission intakes in order to optimize operations'*.

Hence, $\mu \leq 3$

Alternate Hypothesis, H1: *'Educational data mining can help to reduce the number of students taking retakes and increase quality admission intakes in order to optimize operations'*.

Hence, $\mu > 3$

According to the above-mentioned weighted ranking scale, the assigned weight for neutral or normal is 3. As a result, the population mean μ is considered to be 3 in this case.

Hypothesis Test:

Step - 1: The average outcomes of all questions of the questionnaires are calculated.

	1. To what extent do you believe that 12 semesters are convenient for a CSE student to complete his/her degree?	2. To what extent do you believe that students of CSE are not completing their degree within 12 semesters?	3. To what extent do you believe that retaking courses is one of the main reasons behind students of CSE not completing their degree within 12 semesters?	4. To what extent do you believe that students taking more time is obstructing the university to enroll more students?	5. To what extent do you believe that data mining can help in enrollment management and result in increased net revenue?	6. To what extent do you believe that academic performance of CSE students are not predicted by the department?	7. To what extent do you believe that predicting the academic performance of CSE students can aid them to improve their performance and finish their degree on time?	8. To what extent do you believe that data mining can be used to predict the academic performance of CSE students?	9. To what extent do you believe that with the help of the students' academic performance, a separate specialized program can be created for those students to help them improve?	10. To what extent do you believe that data mining can help in other aspects such as student recruitment and outreach?	11. To what extent do you believe that data mining can help identify potential students for recruitment?
Employee 1	4	5	4	4	5	4	4	5	4	4	
Employee 2	4	5	5	5	5	3	5	5	4	5	
Employee 3	4	5	4	5	5	3	4	5	5	5	
Employee 4	4	3	4	3	4	4	4	4	5	5	
Employee 5	4	3	4	5	4	5	3	2	5	3	
Employee 6	4	3	4	3	3	4	5	3	4	4	
Employee 7	4	3	4	1	4	2	3	3	4	3	
Average Outcome	4.00	3.86	4.14	3.71	4.29	3.57	4.00	3.86	4.43	4.29	4.14

Figure 22: Average Outcome of all questions

Step - 2: The data is organized and a One Sample t-test is performed assuming significance level at 0.05.

Question	Average Outcomes
Question 1	4
Question 2	3.86
Question 3	4.14
Question 4	3.71
Question 5	4.29
Question 6	3.57
Question 7	4
Question 8	3.86
Question 9	4.43
Question 10	4.29
Question 11	4.14

t-Test: One-Sample Assuming Unequal Variances	
	<i>Average Outcomes</i>
Mean	4.026363636
Variance	0.069285455
Observations	11
Hypothesized Mean	3
df	10
t Stat	12.93232363
P(T<=t) one-tail	0.00000072
t Critical one-tail	1.812461123
P(T<=t) two-tail	0.000000144
t Critical two-tail	2.228138852

Figure 23: One sample t-test

From our output of the t-test, we can see that the *t Stat value (12.93)* is greater than the *t Critical one-tail value (1.81)*. Moreover, we can also notice that the *P(T<=t) one-tail value* is less than our significance level of 0.05. Therefore, we reject the Null Hypothesis, H₀, which means that the statement, '*Educational data mining can help to reduce the number of students taking retakes and increase quality admission intakes in order to optimize operations*', is true.

3.3 Findings and Analysis

While the first element – Institutional Mechanism, of the Robust Sustainability Framework allowed to collect the data required and carry out a hypothesis test successfully, the second element – Data and Analytics, would be used to dig deep into the data acquired, in this section of the report.

Moreover, after the findings have been stated, a range of solutions would be portrayed based on our review of the related literature. The third element of the framework – Evaluation will help us to suggest the best possible educational data mining techniques, which can be used to optimize operations.

3.3.1. Analysis of the data

The outcomes of the questionnaire are reviewed in details in this part of the report to understand the perspectives of the employees towards data mining and how it can affect to optimize operations. Data is reviewed and analyzed to detect findings of the study, following the Data and Analytics element of the Robust Sustainability Framework.

3.3.1.1 Data and Analytics

In this part of the report, all the 11 questions from our questionnaire would be analyzed thoroughly. Each question's response was weighted on a scale of 1 to 5, with 1 indicating strongly disagree, 3 indicating neutral/average and 5 indicating strongly agree.

The outcomes of each of the questions will be visualized using relevant graphs and charts in this part, followed by an in-depth analysis.

The graphical representation and analysis of the data are as follows:

Question 1: To what extent do you believe that 12 semesters are convenient for a CSE student to complete his/her degree?

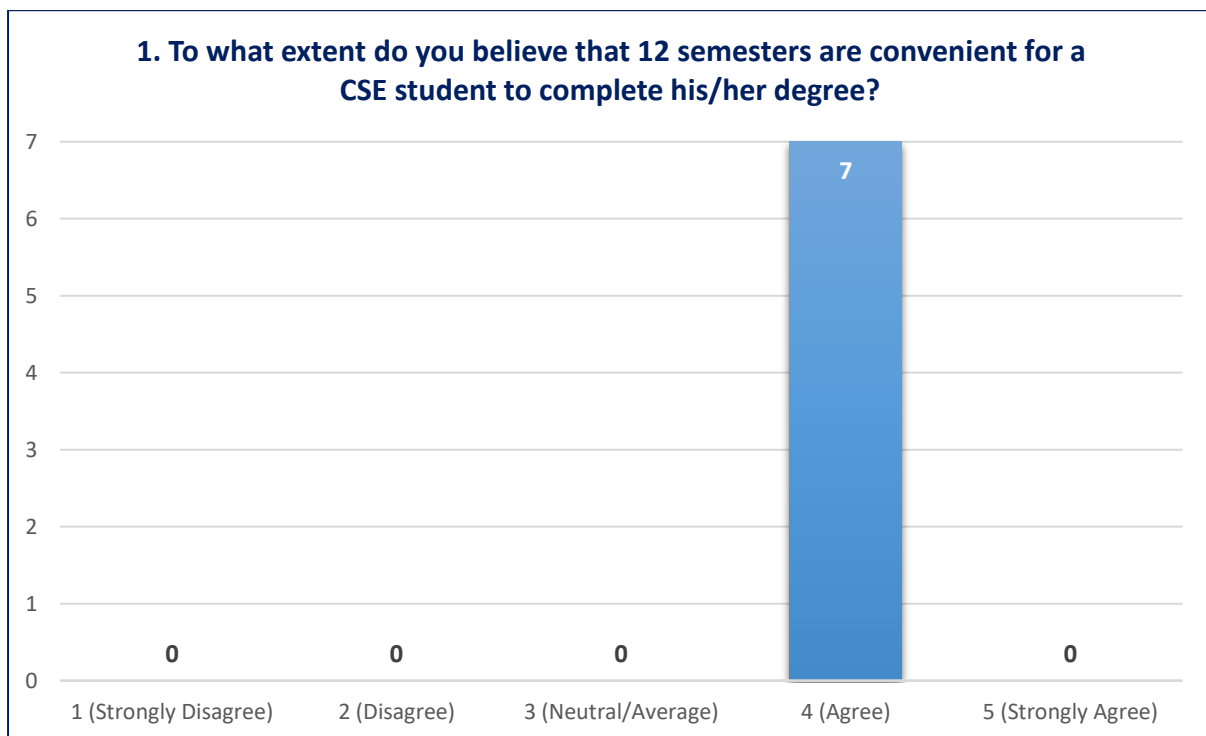


Figure 24: Survey outcome of Question 1

This chart represents the answers to the first question, which asks the employees about their perspectives on 12 semesters being the convenient numbers of semesters for a CSE student to complete his/her degree.

As per the outcomes, we can see that all the employees (100%) agree that the standard time frame, 12 semesters, to complete a degree in Brac University is convenient for the students of CSE to complete their degrees. This also indicates that only a few numbers of CSE students are being able to complete their degrees within the standard time frame.

Question 2: To what extent do you believe that students of CSE are not completing their degree within 12 semesters?

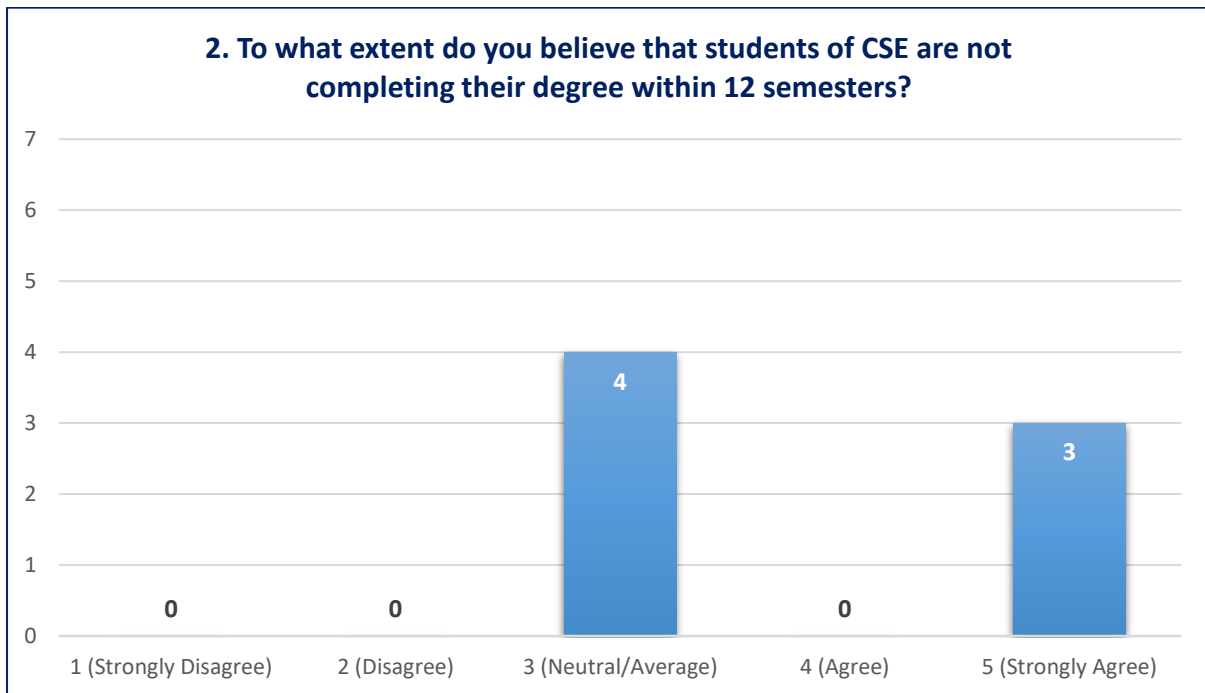


Figure 25: Survey Outcome of Question 2

This chart represents the answers to the second question, which asks the employees regarding the amount of CSE student to do not complete his/her degree within 12 semesters.

As per the outcomes, we can see that majority of the employees (4 out of 7) agree on a neutral perception. On the other hand, 3 employees strongly agree that the students of CSE are not

Employees' perception: CSE students are not completing their degree with 12 semesters

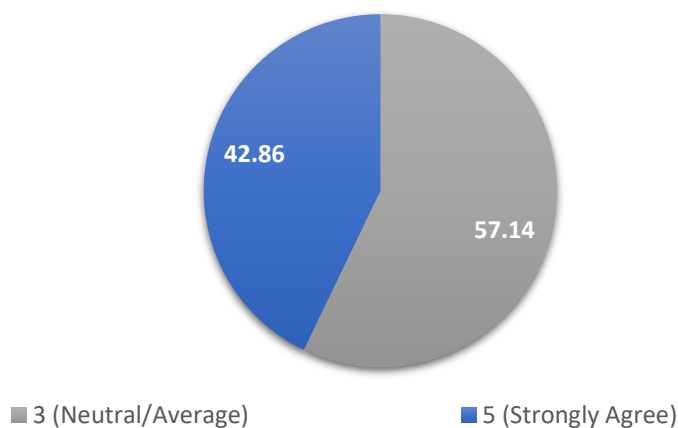


Figure 26: Survey Outcome of Question 2 (Percentage)

completing their degree on time. This clearly portrays that extra time is being taken by CSE students to complete their degree and the seats/slots are staying booked, which is impacting the number of admission intakes per semester.

Question 3: To what extent do you believe that retaking courses is one of the main reasons behind students of CSE not completing their degree within 12 semesters?

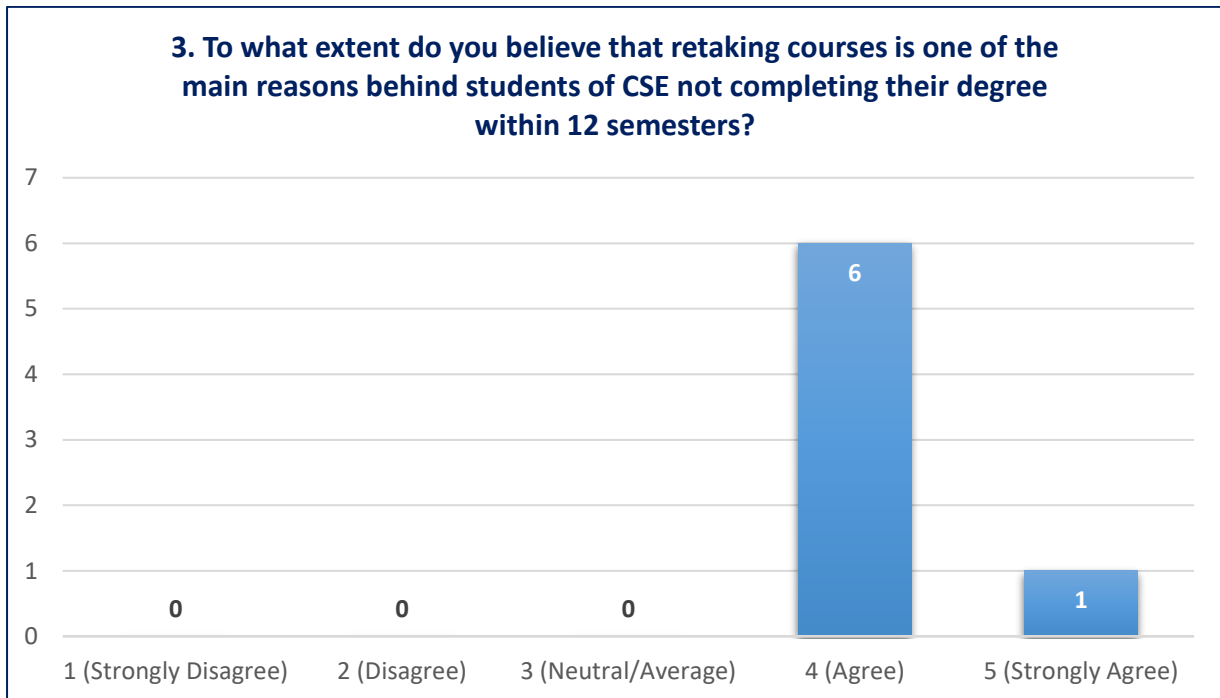


Figure 27: Survey outcome of Question 3

This chart represents the answers to the third question, which asks the employees of retaking courses in one of the main reasons behind CSE students to not complete his/her degree within 12 semesters.

As per the outcomes, we can see that majority of the employees (6 out of 7) agree that retaking courses is one of the main reasons behind CSE students to not being able to complete his/her degree within 12 semesters. In addition to that, 1 employee strongly agrees with the statement. This clearly portrays that CSE students take a lot retakes and it is one of the main reasons for them for not being able to complete their degree on time. It further indicates that a large number of seats/slots are staying booked, which is impacting the number of admission intakes per semester.

Employees' perception: Retake is one of the main reasons behind delay in degree completion of CSE students

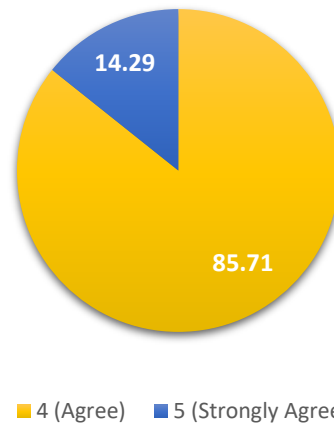


Figure 28: Survey outcome of Question 3 (Percentage)

Question 4: To what extent do you believe that students taking more time is obstructing the university to enroll more students?

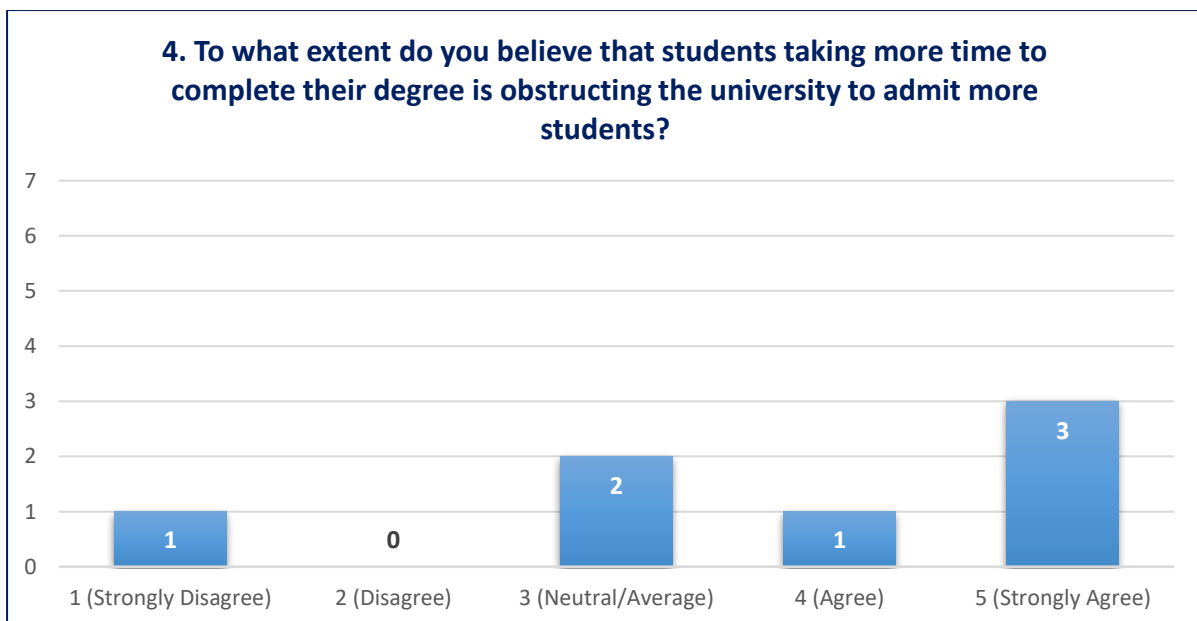


Figure 29: Survey outcome of Question 4

This chart represents the answers to the fourth question, which asks the employees if students taking more time to complete their degree, it obstructs the university to admit more students.

As per the outcomes, we can see that majority of the employees (3 out of 7) strongly agree that if students take more time to complete their degrees, it obstructs the university to admit more students. 2 employees quantified their perceptions as neutral and 1 employee quantified it as agree. On the other hand, 1 employ strongly disagreed to the statement.

This clearly portrays that if students take more time to complete their degrees, it obstructs the university to admit more student due to large number of seats/slots staying booked.

Employees' perception: If students taking more time to complete their degrees, it obstructs the university to admit more students

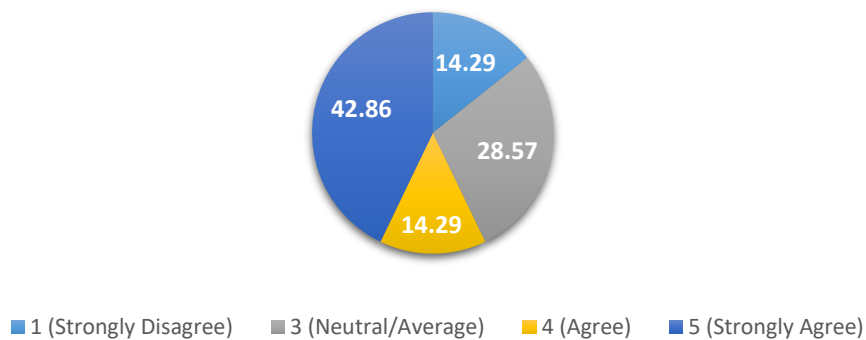


Figure 30: Survey outcome of Question 4 (Percentage)

Question 5: To what extent do you believe that data mining can help in enrollment management and result in increased net revenue?

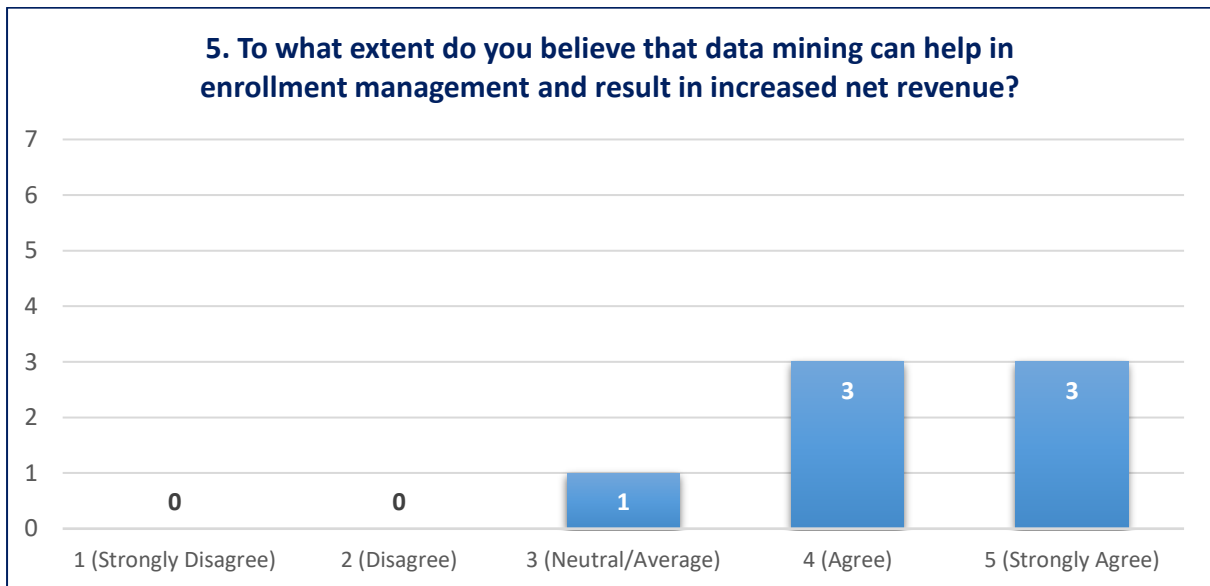


Figure 31: Survey Outcome of Question 5

This chart represents the answers to the fifth question, which asks the employees if they believe that data mining can help in enrollment management and result in increased net revenue.

As per the outcomes, we can see that majority of the employees (6 out of 7) agree to the statement with 3 employees among them strongly agreeing that data mining can help in enrollment management and result in increased net revenue. In addition to that, 1 employee quantified their perception as neutral. This clearly portrays that employees believe, with the

Employees' perception: Data mining can help in enrollment management and result in increased net revenue

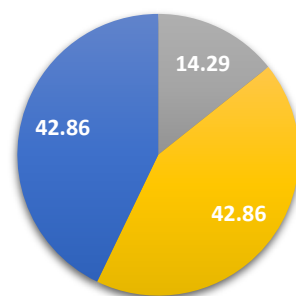


Figure 32: Survey outcome of Question 5 (Percentage)

data available at hand, if they start mining it, the university can clearly increase its net revenue by efficient enrollment management.

Question 6: To what extent do you believe that academic performance of CSE students are not predicted by the department?

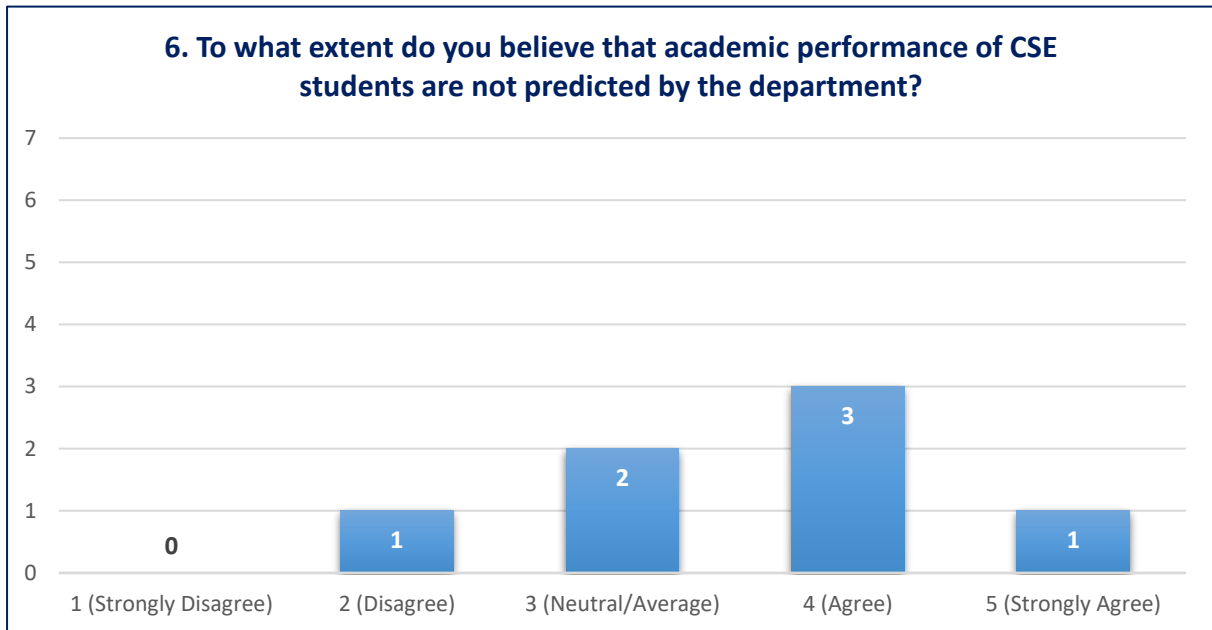


Figure 33: Survey outcome of Question 6

This chart represents the answers to the sixth question, which asks the employees if they believe whether academic performance of CSE students are not predicted by the department.

As per the outcomes, we can see that majority of the employees (4 out of 7) agree to the statement with 1 employee among them strongly agreeing that academic performance of CSE

Employees' perception: Academic performance of CSE students are not being predicted by the department

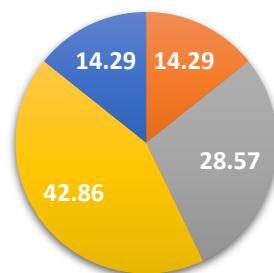


Figure 34: Survey outcome of Question 6 (Percentage)

■ 2 (Disagree) ■ 3 (Neutral/Average) ■ 4 (Agree) ■ 5 (Strongly Agree)

students are not predicted by the department. In addition to that, 2 employees quantified their perception as neutral. On the other hand, 1 employee disagreed to the statement.

This clearly portrays that employees believe data mining currently is not being used by the university to predict the academic performance of students.

Question 7: To what extent do you believe that predicting the academic performance of CSE students can aid them to improve their performance and finish their degree on time?

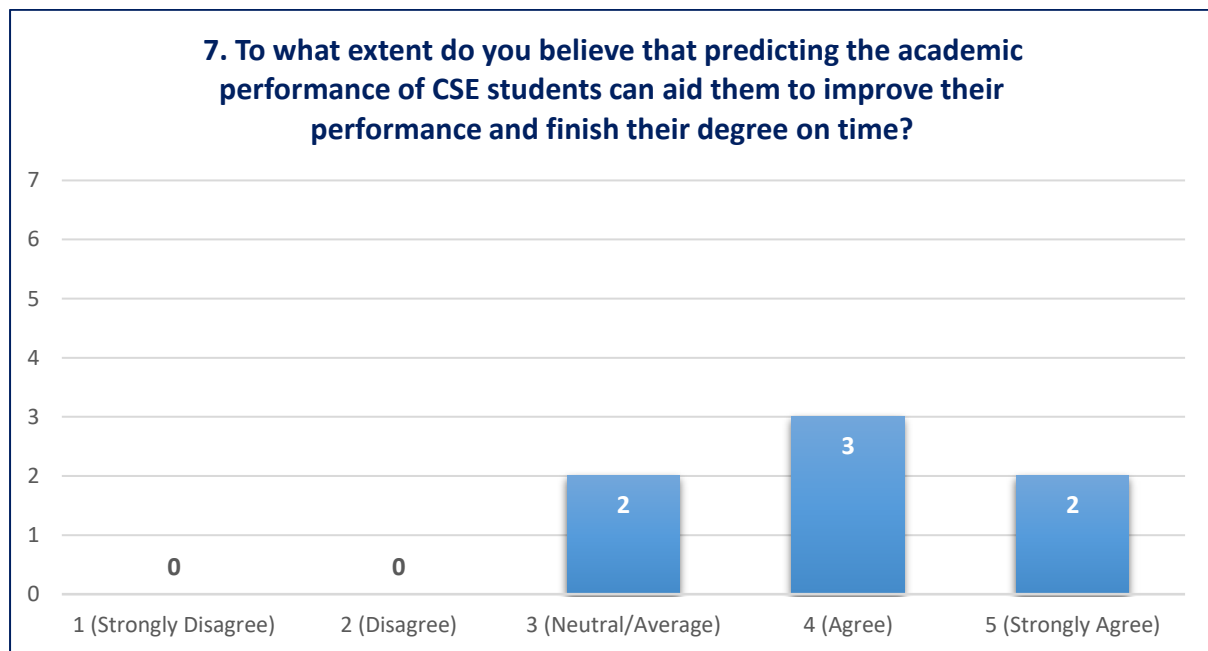


Figure 35: Survey outcome of Question 7

This chart represents the answers to the seventh question, which asks the employees if predicting the academic performance of CSE students can aid them to improve their performance and finish their degree on time.

As per the outcomes, we can see that majority of the employees (5 out of 7) agree to the statement with 2 employees among them strongly agreeing that predicting the academic performance of CSE students can aid them to improve their academic performance and finish their degree on time. In addition to that, 2 employees quantified their perception as neutral.

This clearly portrays that employees believe that predicting the academic performance of CSE students can aid them to improve their academic performance and finish their degree on time, which would help to optimize operations.

Employees' perception: Predicting the academic performance of CSE students can aid them to improve their performance and finish their degree on time

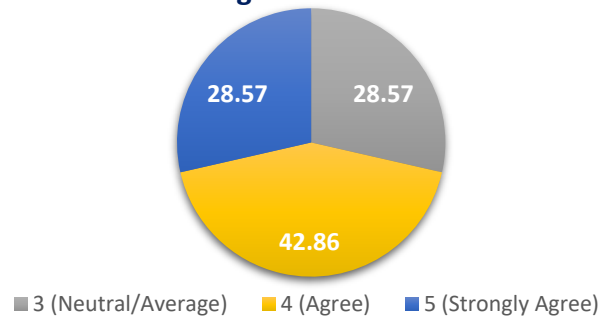


Figure 36: Survey outcome of Question 7 (Percentage)

Question 8: To what extent do you believe that data mining can be used to predict the academic performance of CSE students?

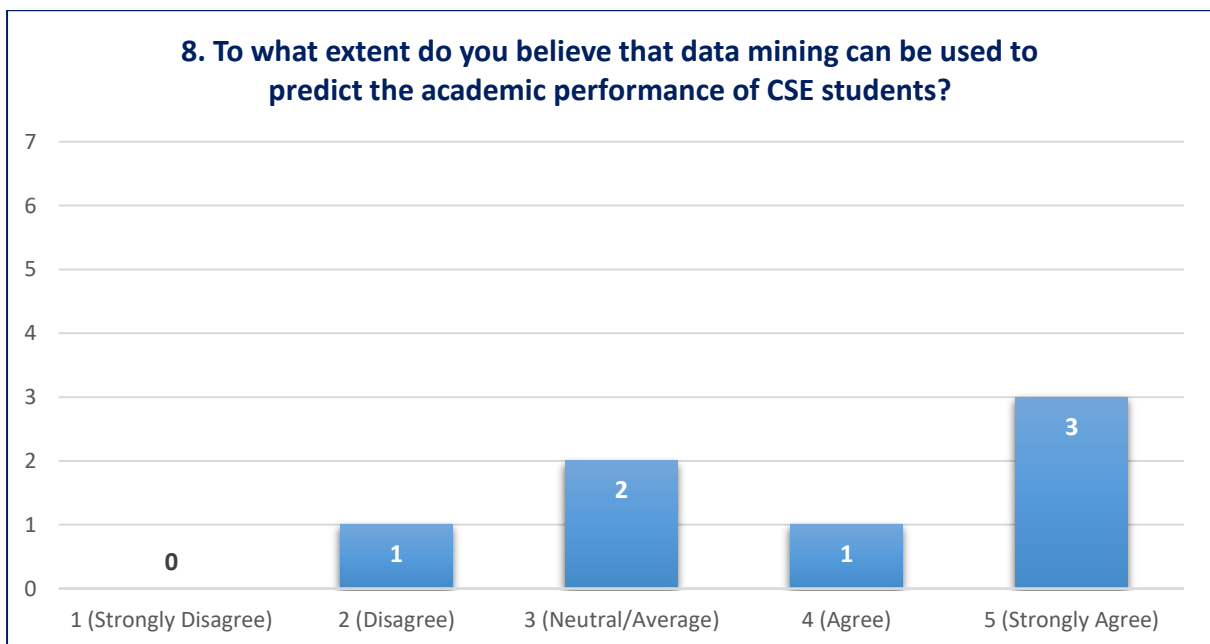


Figure 37: Survey outcome of Question 8

This chart represents the answers to the eighth question, which asks the employees if data mining can be used to predict the academic performance of CSE students.

As per the outcomes, we can see that majority of the employees (4 out of 7) agree to the statement with 3 employees among them strongly agreeing that data mining can be used to predict the academic performance of CSE students. 2 employees quantified their perception as neutral. On the other hand, 1 employee disagreed to the statement.

This clearly portrays that employees believe that data mining can be used to predict the academic performance of CSE students and improve them to finish their degree on time, which would help to optimize operations.

Employees' perception: Data mining can be used to predict the academic performance of CSE students

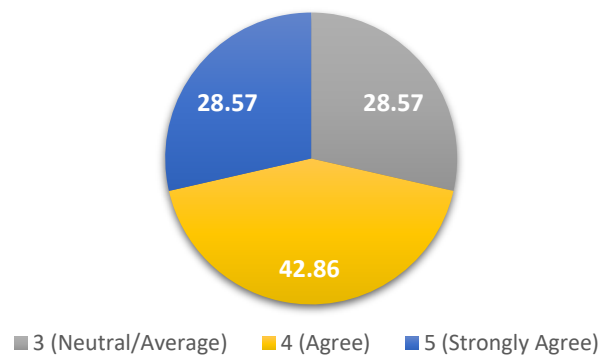


Figure 38: Survey outcome of Question 8 (Percentage)

Question 9: To what extent do you believe that with the help of the students' academic performance predictions, a separate specialized program can be created for those students to help them improve?

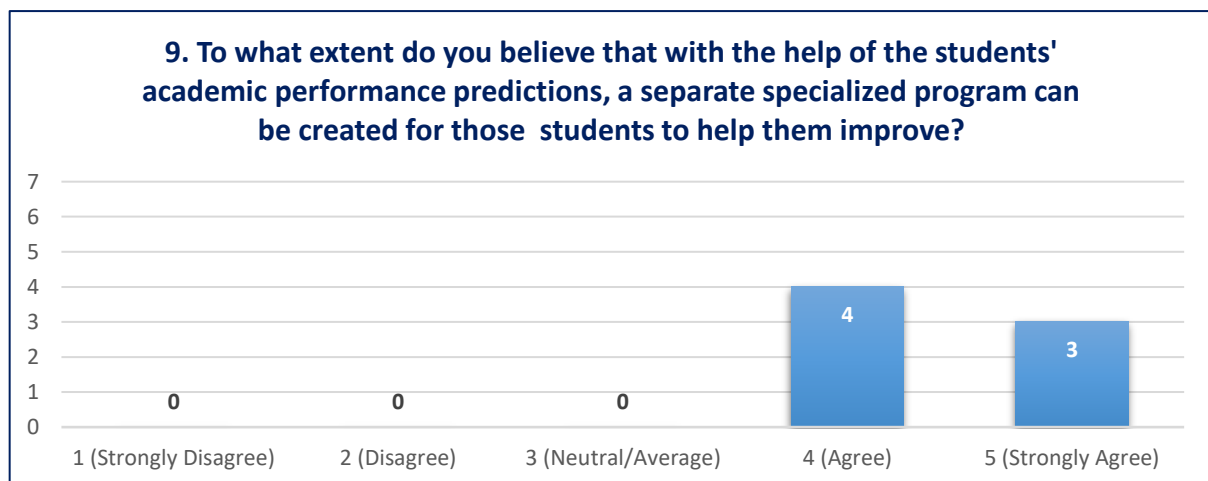
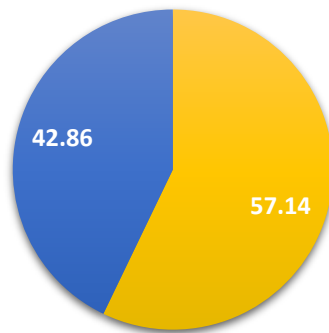


Figure 39: Survey outcome of Question 9

This chart represents the answers to the ninth question, which asks the employees whether with the help of the students' academic performance predictions, a separate specialized program can be created for those students, who fail to complete their degree on time, to help them improve.

As per the outcomes, we can see that all the employees agree to the statement with 3 employees among them strongly agreeing that with the help of the students' academic performance predictions, a separate specialized program can be created for those students, who fail to complete their degree on time, to help them improve.

Employees' perception: With the help of the students' academic performance predictions, a separate specialized program can be created for those students, who fail to complete their degree on time, to help them improve



■ 4 (Agree) ■ 5 (Strongly Agree)

Figure 40: Survey outcome of Question 9 (Percentage)

Question 10: To what extent do you believe that data mining can help in other aspects such as student recruitment and outreach?

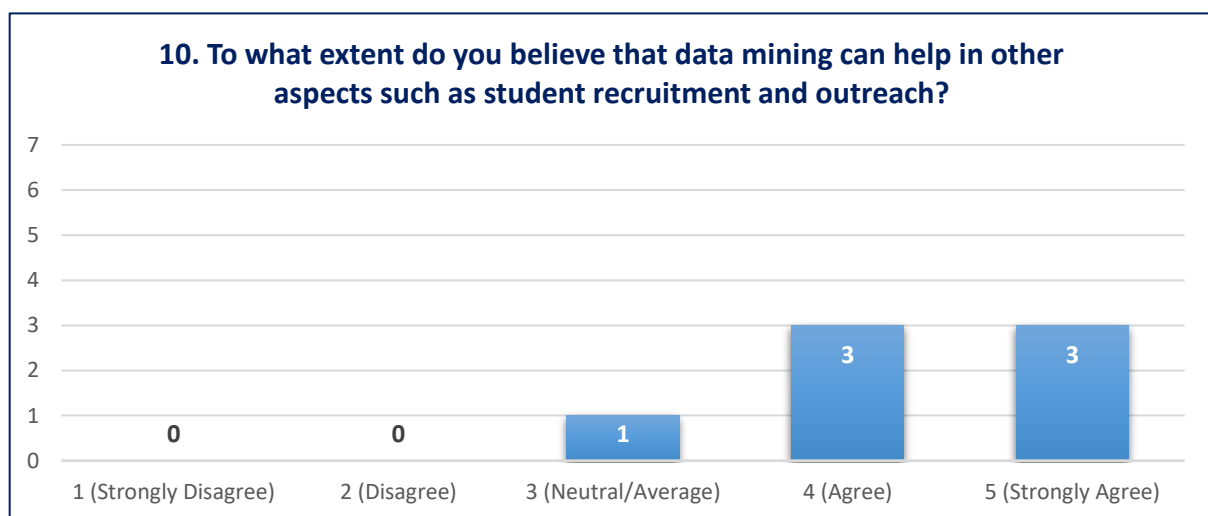


Figure 41: Survey outcome of Question 10

This chart represents the answers to the tenth question, which asks the employees if data mining can help in other aspects such as student recruitment and outreach.

As per the outcomes, we can see that majority of the employees (6 out of 7) agree to the statement with 3 employees among them strongly agreeing that data mining can help in other aspects such as student recruitment and outreach. However, 1 employee quantified their perception as neutral.

This clearly portrays that employees believe that data mining can help in other aspects such as student recruitment and outreach, which would help to optimize operations.

Employees' perception: Data mining can help in other aspects such as student recruitment and outreach

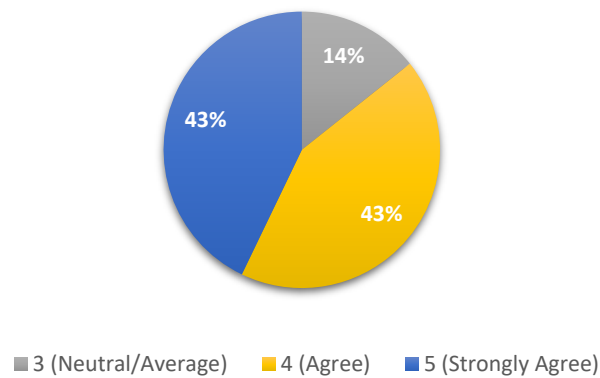


Figure 42: Survey outcome of Question 10 (Percentage)

Question 11: To what extent do you believe that data mining can help identify potential students for recruitment?

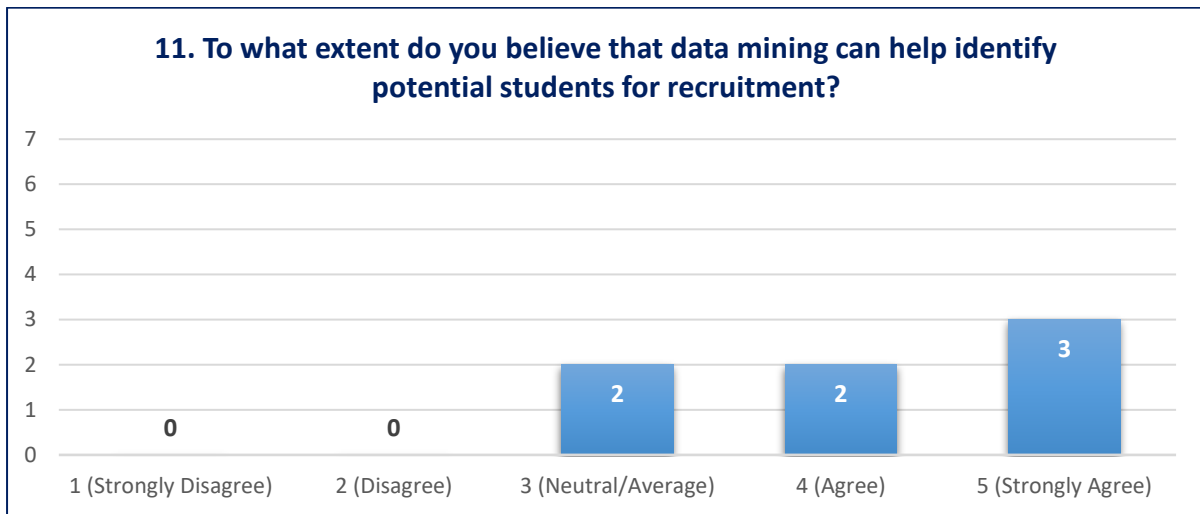


Figure 43: Survey outcome of Question 11

This chart represents the answers to the eleventh question, which asks the employees if data mining can help identify potential students for recruitment.

As per the outcomes, we can see that majority of the employees (5 out of 7) agree to the statement with 3 employees among them strongly agreeing that data mining can help identify potential students for recruitment. However, 2 employees quantified their perception as neutral.

Employees' perception: Data mining can help to identify potential students for recruitment

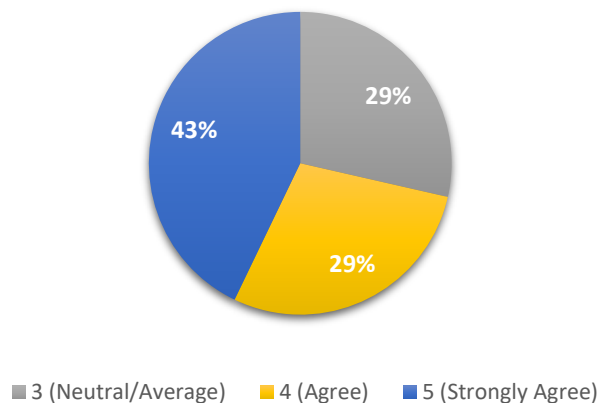


Figure 44: Survey outcome of Question 11 (Percentage)

This clearly portrays that employees believe that data mining can help identify potential students for recruitment, which would help to optimize operations by increasing the intake of good quality students and increasing net revenue.

3.3.2. Findings of the study

The main purpose of this research was to emphasize that educational data mining is important to optimize operations in Brac University. The result of the hypothesis test carried out in the primary phase of the study, elaborated in the ‘Methodology’ section of this report yielded that educational data mining can be used to help to reduce the number of students taking retakes and increase quality admission intakes, which would optimize operations.

Additionally, based on our analysis of the data in the form of questionnaire outcomes, we can clearly understand that the employees of Office of the Registrar, Brac University agree that these major problems, such as increasing number of students taking retakes and inefficient enrollment management, which are leading towards inefficient operations can be minimized using educational data mining.

A major limitation of this report is that, even though it focuses intensively on the importance of educational data mining to optimize operations in Brac University, it does not emphasize much on the data mining techniques which can be used to ensure maximum accuracy. However, after a holistic evaluation of the findings, a few techniques with the highest rating for accuracy will be mentioned.

3.3.2.1 Evaluation

Evaluation is the third element of the Robust Sustainability Framework suggested by the World Economic Forum and in our report, it will be used to generate a holistic overview of the findings.

The result of the hypothesis test and the overall outcome of the questionnaire assessed, combinedly reveal that educational data mining is actually quite important to ensure optimized operations. An average of the outcomes of each of the questions of the questionnaire was calculated to understand how many of the questions had average outcomes of above 3, indicating that employees’ perspectives that educational data mining will play an important role.

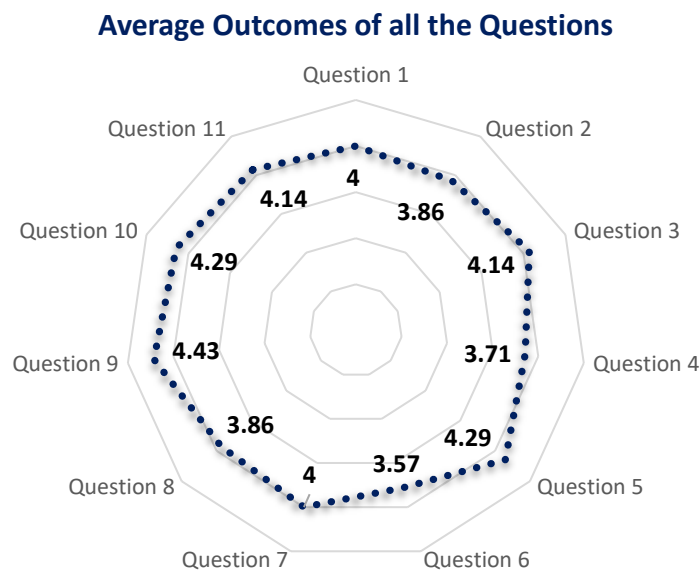


Figure 45: Average outcomes of all the Questions

This above chart shows that all the 11 questions of the questionnaire had an average outcome of more than 3, which indicates that majority of the employees believe that educational data mining is important to optimize operations.

Besides these primary findings, our review of relevant literature provides a few other findings, which needs to be considered:

- Educational data mining has its own sets of components, which include – Stakeholders; Methods, Tools & Techniques, Data and Environment. All these components are interconnected with one another and varies how an organization approaches data

mining. Therefore, these components need to be studied and observed by any organization/institution which is considering to approach data mining. (Dahiya, 2018)

- Predicting student results, identifying undesirable student activities, grouping students, and student modeling are some of the most popular applications of educational data mining. These applications are designed to assist institutional decision-makers in better understanding student conditions, improving student success, identifying learning goals for various classes of students, and developing learning processes. (Alshareef, Alhakami, Alsubait, & Baz, 2020)
- The accuracy of estimation is chosen as the criterion for evaluating the usefulness of educational data mining techniques. (Alshareef, Alhakami, Alsubait, & Baz, 2020)
Therefore, multiple data mining techniques should be reviewed and studied to selected the best suited one for an organization/institution, depending on its applications.
- According to studies, the most efficient educational data mining techniques for predicting students' academic performances are Bayesian Network and Random Forest; whereas Social Network Analysis is the best strategy for identifying unhealthy student habits. Moreover, Clustering and Social Network Analysis are the most effective educational data mining techniques for grouping students and student modeling, respectively. (Alshareef, Alhakami, Alsubait, & Baz, 2020)

3.4 Summary and Conclusions

Brac University is one of the most reputed and fastest growing private universities in Bangladesh. With its new vision being aligned, it is now focusing on attaining international exposure and being the proud, global institution from Bangladesh. Even though the last financial year has been impressive for Brac University, in terms of improved profitability and financial health, a lot of efforts still need to be put to attain sustainability in this highly

competitive sector, and this can be done by optimizing operations through proper utilization of educational data mining.

To conclude, the aim of this research paper was to examine and emphasize the significance of educational data mining for optimized operations at Brac University, which has been successfully portrayed. With the revolutionary advancements in technology and the fourth industrial revolution slowly taking over, I believe, the need for educational data mining at Brac University may potentially represent the larger picture of Bangladesh's higher educational institutions and their requirement for educational data mining to achieve optimization and grow sustainably.

3.5 Recommendations

Based on the analysis of the research data and the findings of the study, I have proposed a few recommendations after consulting with my organizational supervisor at Brac University. The recommendations are depicted as the fourth element of the Robust Sustainability Framework, suggested by WEF.

3.5.1 Feedback

The primary feedback would be to strengthen and solidify the Data Unit at the Office of the Registrar, Brac University. This can be done in the following ways:

- Employing data scientists
- Training the existing employees to learn educational data mining techniques and making them compatible to interpret and analyze data
- Continuous recording and preserving of relevant data
- Studying past data to detect patterns and forecast future scenarios
- Expand operations of the unit with involvement with all other departments

Despite these recommendations, the fact cannot be overlooked that establishing a solid data unit would have an impact on how the organization operates and its strategies. Therefore, I would recommend Brac University to consider Leavitt's Diamond model in order to understand the crucial connections between each of the organization's components, required to drive a successful integrated change. (Leavitt's Diamond: Understanding the Factors Involved in Change, n.d.) The four components are as follows:

- Task – With the emergence of a solid Data Unit, it will have an impact on how certain tasks are being carried out. Brac University needs to outline the changes in tasks to its employees properly, in order for them to feel connected with the changes and motivated to adapt with them.
- People – With certain tasks being changed and new ways of carrying those out, it will be crucial for the university to facilitate relevant and required training for its employees, so that they understand and value the tasks which need to be accomplished to attain success.
- Structure – With changes in tasks and the roles of people, it is necessary that the structure which the organization follows, would get impacted as well. New roles might be required to fill in.
- Technology – Technology will have the most effect on this rest of the three components. It needs to be ensured that the technology being used/introduced is user friendly and sustainable in the long run, as it has cost-factors associated with it.

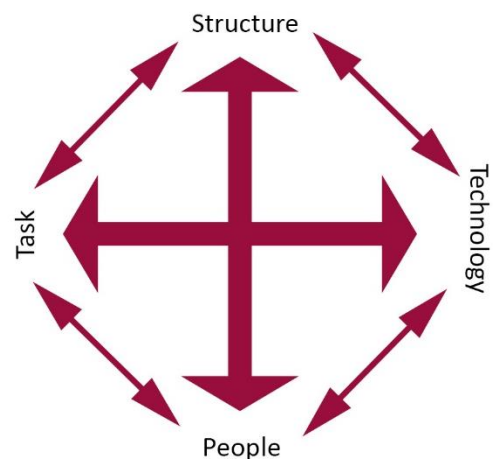


Figure 46: Leavitt's Diamond Model

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Appendix A.

1.1 Financial information collected from the Annual Report of Brac University for the calculation of Financial Ratios

Particulars	2015	2016	2017	2018	2019
Current Assets	1,885,604,875	2,060,166,635	1,498,733,655	2,798,453,140	2,755,059,854
Current Liabilities	750,375,578	826,949,272	1,088,616,096	1,640,018,136	1,948,871,077
Non-Current Assets	3,546,166,920	3,925,693,239	5,431,461,315	5,868,283,173	7,727,118,745
Total Assets	5,431,771,795	5,985,859,874	6,930,194,970	8,666,736,313	10,482,178,599
Total Debts	293,562,919	378,741,558	507,272,139	781,860,129	1,642,988,652
Total Equity	4,387,833,299	4,780,169,044	5,334,306,736	6,244,858,048	6,890,318,870
Total Revenue	1,238,872,817	1,330,797,860	1,550,534,473	1,811,703,357	2,102,182,967
EBIT	171,361,038	225,483,051	391,062,436	437,051,184	473,538,629
Net Profit	236,103,870	291,801,277	402,468,022	442,792,575	502,858,305

1.2 Outcomes of Ratio Analysis

Financial Ratios	2015	2016	2017	2018	2019
<i>Liquidity Ratios</i>					
Current Ratio	2.51	2.49	1.38	1.71	1.41
<i>Asset Management Ratios</i>					
Total Asset Turnover	0.23	0.22	0.22	0.21	0.20
<i>Debt Management Ratios</i>					
Debt Ratio	5.40	6.33	7.32	9.02	15.67
<i>Profitability Ratios</i>					
Operating Profit Margin	13.83	16.94	25.22	24.12	22.53
Net Profit Margin	19.06	21.93	25.96	24.44	23.92
Return on Assets (ROA)	4.35	4.87	5.81	5.11	4.80
Return on Equity (ROE)	5.38	6.10	7.54	7.09	7.30

2.1 Survey Questionnaire



Utilization of Data to Optimize Operations in Brac University

This study is being undertaken to understand how higher educational institutes can help students to improve their academic performance by analyzing and utilizing their data. Moreover, the study will also help to understand how data mining can aid in enrollment management, leading towards optimized operations.

The results of this survey will solely be used for educational purpose.

This questionnaire is distributed among the employees of Office of the Registrar, Brac University.

* Required

1. To what extent do you believe that 12 semesters are convenient for a CSE student to complete his/her degree? *

1 2 3 4 5

Strongly Unfavorable Strongly Favorable

2. To what extent do you believe that students of CSE are not completing their degree within 12 semesters? *

1 2 3 4 5

Strongly Unfavorable Strongly Favorable

3. To what extent do you believe that retaking courses is one of the main reason behind students of CSE not completing their degree within 12 semesters? *

1 2 3 4 5

Strongly Unfavorable Strongly Favorable

4. To what extent do you believe that students taking more time is obstructing the university to enroll more students? *

1 2 3 4 5

Strongly Unfavorable Strongly Favorable

5. To what extent do you believe that data mining can help in enrollment management and result in increased net revenue? *

1 2 3 4 5

Strongly Unfavorable Strongly Favorable

Predicting Student Performance

6. To what extent do you believe that academic performance of CSE students are not predicted by the department? *

1 2 3 4 5

Strongly Unfavorable Strongly Favorable

7. To what extent do you believe that predicting the academic performance of CSE students can aid them to improve their performance and finish their degree on time? *

1 2 3 4 5

Strongly Unfavorable Strongly Favorable

8. To what extent do you believe that data mining can be used to predict the academic performance of CSE students? *

1 2 3 4 5

Strongly Unfavorable Strongly Favorable

9. To what extent do you believe that with the help of the students' academic performance predictions, a separate specialized program can be created for those students to help them improve? *

1 2 3 4 5

Strongly Unfavorable Strongly Favorable

Student Recruitment and Outreach

10. To what extent do you believe that data mining can help in other aspects such as student recruitment and outreach? *

1 2 3 4 5

Strongly Unfavorable Strongly Favorable

11. To what extent do you believe that data mining can help identify potential students for recruitment? *

1 2 3 4 5

Strongly Unfavorable Strongly Favorable