Thesis Report
On
Designing a Sustainable University Transportation Model: A Case Study of Dhaka-based Institutions.

Submitted by:
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Program: MBA in Supply Chain Management
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Submitted to:
Faculty of Business
Department of Business Administration
Sonargaon University (SU)

Submitted for the partial fulfillment of the
degree of MBA in Supply Chain Management

Sonargaon University (SU)
147/I, Green Road, Panthapath, Tejgaon, Dhaka

Date of submission: January 03, 2026

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Submitted by
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Letter of Transmittal

January 03, 2026

Mst. Marium Akter
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Faculty of Business
Department of Business Administration
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Subject: Submission of thesis report on **"Designing a Sustainable University Transportation Model: A Case Study of Dhaka-based Institutions."**

Dear Madam,

With due respect, I am pleased to submit my thesis report entitled **"Designing a Sustainable University Transportation Model: A Case Study of Dhaka-based Institutions",** which has been prepared as a partial fulfillment of the requirements for the MBA in Supply Chain Management (MSCM) program. I have completed this thesis under your kind supervision and guidance. The purpose of this study is to analyze existing university transportation systems in Dhaka and to propose a sustainable, efficient, and safety-oriented transportation model suitable for higher education institutions. I have made my best effort to incorporate relevant academic concepts, practical observations, and real-world transportation challenges while keeping the report concise and structured.

I sincerely request you to kindly review and evaluate my thesis. Your valuable feedback and suggestions will be highly appreciated. Thank you very much for your continuous guidance, support, and encouragement throughout the preparation of this report.

Yours sincerely,

Mijan Hosen
Roll: MSCM2401031018
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Declaration of Student

I, **Mijan Hosen**, a student of the Master of Business Administration in Supply Chain Management (MSCM) program at Sonargaon University, bearing Roll No. MSCM2401031018, hereby declare that the thesis report entitled **"Designing a Sustainable University Transportation Model: A Case Study of Dhaka-based Institutions"** is an original work carried out by me. I affirm that this thesis has been prepared solely for the partial fulfillment of the requirements of the MBA in Supply Chain Management degree. During the preparation of this report, I have strictly followed academic ethics and ensured full compliance with copyright and referencing standards. I further declare that this report has not been submitted, either in whole or in part, to any other university or institution for the award of any degree, diploma, or professional qualification.

Yours sincerely,

_____

Mijan Hosen
Roll: MSCM2401031018
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Letter of Authorization

I hereby certify that the thesis report entitled **"Designing a Sustainable University Transportation Model: A Case Study of Dhaka-based Institutions"** has been prepared by **Mijan Hosen**, **Roll No**. **MSCM2401031018**, as a partial fulfillment of the requirements for the Master of Business Administration in Supply Chain Management (MSCM) program at Sonargaon University. This research work has been carried out under my direct supervision and guidance. To the best of my knowledge, the contents of this thesis are original and have not been submitted, either wholly or partially, to any other university or institution for the award of any degree or qualification. I therefore authorize the submission of this thesis report for academic evaluation.

Mst. Marium Akter
Lecturer
Department of Business Administration
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Acknowledgment

At the very outset, I would like to express my deepest gratitude to the Almighty Allah, whose infinite grace and mercy have guided me throughout this academic journey. It is only through His strength, patience, and wisdom that I was able to complete this research work. I remain deeply thankful for His unwavering support and the blessings He has bestowed upon me in every step of this endeavor.

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I would also like to extend my heartfelt appreciation to all the faculty members and administrative staff of Sonargaon University, who have supported me during my MBA program. Their professional cooperation, academic guidance, and constant encouragement have played an essential role in my growth and development. I feel privileged to have been a part of such a vibrant academic community that values learning and strives to support its students in achieving their goals.

Furthermore, my sincere thanks go to my fellow students for their companionship and support throughout this journey. The collaborative environment and shared experiences within the academic community have made this journey even more enriching, and I am grateful for the friendships and bonds forged along the way.

Finally, I would like to express my deepest gratitude to my family and friends. Their unwavering love, encouragement, and understanding have been a constant source of strength for me. The emotional support and belief they have shown in my abilities have been invaluable. It is because of their support that I was able to stay focused and motivated, even during the most challenging times. I dedicate this work to them, as their sacrifices and support have been instrumental in my success.

In conclusion, I would like to reiterate my heartfelt appreciation to everyone who has contributed to this research. This work would not have been possible without their support, and I will remain forever grateful for their role in my academic and personal growth.

Abstract

This thesis examines how university transportation systems in Dhaka can be designed and managed in a more sustainable manner by integrating three closely connected dimensions: operational efficiency, safety, and environmental sustainability. In a highly congested urban context like Dhaka, university-operated transport services play a crucial role in ensuring reliable mobility for students, faculty, and staff. However, these services often face challenges such as inefficient routing, uneven seat occupancy, rising fuel consumption, safety risks, and environmental concerns. The study adopts a mixed-methods research approach, combining a review of relevant literature and policy documents with survey data collected from transport users and operators, along with interviews with key stakeholders. The analysis identifies major operational bottlenecks, including peak-hour congestion, limited use of digital planning tools, and traditional scheduling practices that reduce service efficiency. Safety-related issues and environmental impacts associated with fuel use and emissions are also examined. The findings reveal that optimized route planning, demand-based scheduling, improved safety management practices, and the use of digital monitoring systems can significantly enhance transport performance. Based on these insights, the study proposes an integrated and practical university transportation model tailored to Dhaka-based institutions. The proposed framework aims to reduce operating costs, improve reliability and safety, and minimize environmental impact while remaining feasible within existing institutional and resource constraints.

LIST OF ACRONYMS

Acronym	Abbreviation
BRTA	**Bangladesh Road Transport Authority**
CO_2	**Carbon Dioxide**
KPI	**Key Performance Indicator**
KPL	**Kilometers Per Liter**
M^3	**Cubic Meter**
MT	**Metric Ton**
NOx	**Nitrogen Oxides**
PO	**Purchase Order**
RFP	**Request for Proposal**
SOP	**Standard Operating Procedure**

Table of Contents

Chapter: One

Introduction

1.1 Background of the study

In the complex urban landscape of Dhaka, university transportation is not just a student service; it is a critical logistics lifeline. From my decade-plus experience managing large-scale fleets, I have seen that institutional transport often faces the same "middle-mile" risks as industrial logistics: narrow urban links, congested highways, and mounting environmental pressures. For universities, these inefficiencies translate into lost academic hours and rising operational costs. This study moves beyond traditional bus scheduling to propose a model that integrates operational efficiency, safety, and environmental sustainability for Dhaka's unique academic corridors.

1.2 Scope of the study

This research focuses on the organized transport network connecting university campuses to the broader Dhaka metropolitan area. The scope is deliberately framed to:

- Infrastructure & Corridors: Examine how depot access, campus entry bottlenecks, and urban corridor constraints affect delivery times and safety.
- Operational Flows: Assess practices including route planning, vehicle utilization, and the specific challenges of faculty versus student transport services.
- Sustainability: Identify systemic waste, such as "empty runs" and high fuel consumption, and explore digital fleet management opportunities.

1.3 Objective of the study

Broad Objective

The broad objective of this study is to develop an optimized university transportation strategy that enhances safety and environmental sustainability while ensuring minimal disruption to daily academic operations of Dhaka-based higher education institutions.

Specific Objectives

To achieve the broad objective, the study seeks to:

- **Map the Existing Transport System**

  Document current university transport operations, including routes, vehicle types, schedules, and student passenger flow patterns across selected Dhaka-based institutions.

- **Assess and Quantify Safety Risks**

Evaluate existing safety practices, operational behaviors, and risk factors within student transport fleets in order to identify measures that can reduce the frequency and severity of transport-related incidents.

- **Model and Evaluate Operational Interventions**

  Analyze the potential impact of route optimization, load consolidation, and telematics based monitoring in reducing operational inefficiencies particularly the high proportion of empty or underutilized trips common in institutional transport systems.

1.4 Research Methodology

Primary Source of Data

- Data were collected through structured questionnaires/surveys.
- 34 respondents participated in the study.
- Respondents included Transport Managers, Depot Supervisors, and Safety Officers.
- Participants were selected using purposive sampling.
- Selection was based on respondents' direct involvement in university transport operations.
- The researcher's 11 years of professional experience in the transport sector supported appropriate respondent selection.

Secondary Source of Data

- Data were collected through a review of existing documents and literature.
- Sources included Bangladesh Road Transport Authority (BRTA) guidelines and safety standards.
- Relevant government policies and regulatory documents were reviewed.
- Academic journals, research papers, and studies on Green Supply Chain Management (Green SCM) were analyzed.
- International best practices related to campus and institutional transportation systems
- were used for benchmarking.

1.5 Significance of the study

This work provides actionable evidence for university administrators to update transport policies and vehicle standards. By adopting practical measures like digital routing and better staging area design, institutions can reduce "empty runs," shorten commute times, and cut operating costs. Ultimately, it builds the institutional capacity needed to monitor and scale sustainable transport in a high-density urban environment

1.6 Limitations of the Study

- Geographic Concentration: Data were collected mainly from major university transport hubs in Dhaka, which may not accurately represent transportation challenges faced by rural or semi- urban campuses.
- Limited Sample Size: The study was based on responses from a relatively small number of stakeholders, which may limit the generalizability of the findings.
- Purposive Sampling Bias: Respondents were selected using purposive sampling, which may introduce selection bias despite ensuring operational expertise.
- Self-Reported Data Bias: Survey responses relied on participants' personal experiences and perceptions, which may lead to underreporting of safety lapses or operational inefficiencies.
- Restricted Financial Disclosure: Institutional confidentiality policies limited access to detailed financial and cost data, affecting comprehensive economic cost–benefit analysis.
- Time Constraints: Data collection was conducted within a limited time frame, which may not capture seasonal variations in transport demand and safety issues.
- Operational Variability: Differences in fleet size, route structure, and operational policies across universities may affect result consistency.
- Policy Interpretation Differences: Variations in understanding and implementation of BRTA guidelines across institutions may influence response accuracy.
- Technological Disparity: Unequal adoption of transport management and safety technologies among universities may affect comparative analysis.
- Dynamic Regulatory Environment: Ongoing changes in transport regulations and sustainability standards may limit the long-term applicability of the study findings.

1.7 Structure of the thesis

The thesis is organized into eight strategic chapters:

- Chapter 1: Introduction, vision, and methodology.
- Chapter 2: Literature review of global trends vs. the Bangladesh context.
- Chapter 3: Conceptual framework linking infrastructure, human factors, and digital enablers.
- Chapter 4: Detailed methodology and operational modeling.
- Chapter 5: Data analysis identifying safety gaps and fuel waste.
- Chapter 6: Discussion on policy implications and stakeholder perspectives.
- Chapter 7: Conclusion and a phased implementation roadmap for sustainable transport.
- Chapter 8: Bibliography.

Chapter: Two

Literature Review

2.1 Fundamentals of Institutional Fleet Logistics

In my decade-plus career, I have learned that university transport is essentially a "Human Supply Chain." Unlike general freight, our "inventory" is the time and safety of students and faculty. Literature in this field emphasizes that an institutional model must prioritize Reliability and Predictability. The fundamentals of fleet management maintenance cycles, load factors, and driver dispatching—must be synchronized perfectly. In a city like Dhaka, the core challenge is managing "Fixed-Schedule Logistics" within a highly "Fluid Traffic Environment.

2.2 Transport Operations in Emerging Economies: The Dhaka Crisis

Research into emerging economies like Bangladesh shows that urban mobility is often hampered by Mixed-Modal Traffic. Unlike developed nations with dedicated lanes, Dhaka's universities share narrow, high-density corridors with rickshaws, vans, and heavy trucks. Literature suggests that in such environments, "Agile Scheduling" and "Buffer-Time Management" are the only ways to maintain a sustainable service. My experience managing fleets confirms that without a strategic operational framework, even the newest buses will fail to provide an efficient service.

2.3 Safety Fundamentals & Institutional Duty of Care

Safety is the non-negotiable pillar of professional transport management. For a university, a single incident can cause irreparable human and reputational loss. This section reviews the Logistics Safety Management System (LSMS) framework:

- **Behavioral Safety:** The role of driver psychology and fatigue management in high-density traffic.
- **Active vs. Passive Safety**: Moving beyond basic vehicle fitness to proactive tech like speed governors and real-time GPS monitoring.
- **Safety Culture**: Why universities must adopt "Industrial-Grade" safety standards rather than basic commercial ones.

2.4 Sustainability & Strategies for Green Mobility

Sustainability in road transport is no longer just a trend; it is a survival strategy for urban institutions. Based on my professional background, I categorize sustainability into three operational pillars:

- Fuel Efficiency: Implementing "Eco-Driving" techniques and monitoring consumption per trip.

- Route Optimization: Using Supply Chain principles to eliminate "Empty Runs" (buses traveling without passengers), which current literature identifies as the largest source of waste in Dhaka's fleets.
- Digital Transformation: The role of Telematics in reducing idling time—a major contributor to carbon footprints in Dhaka's gridlock.

2.5 The Bangladesh Context: Challenges & Opportunities

Bangladesh presents a unique case. We have a massive concentration of universities within a small geographic radius in Dhaka.

- **The Gridlock Reality:** Literature highlights that "Peak-Hour Overlap" (office vs. university timing) is our biggest hurdle.
- **The Infrastructure Gap:** Lack of dedicated staging areas leads to roadside congestion.
- **The BRAC University Benchmark:** As a professional at BRAC University, I see the opportunity to move from "Individual Institutional Transport" to a "Shared Sustainable Model" where universities collaborate on corridors to reduce the total number of vehicles on the road.

Chapter: Three

Conceptual Framework

&

Hypothesis

3.1 Context and Rationale

After more than a decade of professional engagement in the transport sector, it has become evident that transportation systems fail not because of a single weak component, but because of fragmented thinking. Transport is often managed in silos—vehicles are considered separately from roads, drivers from schedules, fuel from finance, and safety from productivity. In reality, these elements are deeply interconnected. When road infrastructure is inadequate, vehicles are delayed and experience accelerated mechanical wear. When drivers are fatigued or insufficiently trained, safety risks increase and service reliability declines. When fuel consumption is inefficient, operational costs rise, undermining financial sustainability.

In the context of Dhaka-based universities, these interdependencies are even more pronounced. Dense traffic conditions, limited road space, inconsistent enforcement of traffic regulations, and high daily passenger volumes create a uniquely complex operating environment. University transport systems are not merely logistical services; they are essential support mechanisms that directly influence student safety, punctuality, institutional reputation, and environmental impact.

The rationale of this study is therefore rooted in the need to move away from traditional "Silo Management" toward an Integrated Transport Ecosystem. Sustainability, in this context, is not treated as a standalone objective or an environmental slogan. Rather, it is the natural outcome of aligning infrastructure, operational practices, human factors, regulatory compliance, and digital systems into a coherent and mutually reinforcing framework. For universities operating in Dhaka, sustainable transport is achieved not by isolated improvements, but by ensuring that every component of the system functions in harmony with the others.

3.2 Conceptual Framework

The conceptual framework of this study is grounded in a Total Systems Approach. This approach views university transportation as a living system composed of physical assets, human resources, institutional rules, and information flows. To make this holistic view intuitive, the framework is visualized metaphorically as a house.

In this model, the foundation represents the Regulatory and Institutional Environment, which provides legitimacy, safety standards, and compliance boundaries. Without a strong foundation, the entire system becomes unstable. The pillars of the house consist of Infrastructure and Human Factors—two structural elements that carry the operational load of the system. Infrastructure ensures physical feasibility, while human factors determine behavioral reliability and decision quality. The roof of the house symbolizes Sustainability Outcomes, protecting the system by ensuring long-term economic viability, social responsibility, and environmental stewardship.

This visualization emphasizes that sustainability cannot exist without structural balance. A strong roof cannot compensate for weak pillars, and advanced infrastructure cannot succeed without

competent and motivated human resources. The framework therefore rejects partial optimization and instead promotes systemic coherence.

3.3 Infrastructure: The Physical Foundation

Infrastructure forms the physical backbone of university transport operations. In Dhaka, infrastructural challenges extend beyond highway conditions and include access management, depot location, and staging capacity. One of the most persistent operational bottlenecks is the "last-mile" problem—the difficulty of moving vehicles efficiently from main corridors to campus entry points.

Depot design plays a critical role in determining operational efficiency. Inadequate staging areas force buses to idle on public roads, contributing to congestion even before trips formally begin. This not only disrupts city traffic but also increases fuel consumption and vehicle wear. Properly designed depots with sufficient queuing and maneuvering space can significantly reduce unnecessary idling and delays.

Another infrastructural concern is corridor constraint. Many university routes pass through narrow or deteriorated road segments that increase mechanical stress on vehicles. Identifying and mapping these bottleneck links allows transport managers to plan alternative routes, adjust maintenance schedules, and reduce long-term fleet degradation. Infrastructure, therefore, must be understood not only as static physical assets but as dynamic elements influencing cost, safety, and service reliability.

3.4 Operational Practices: The Engine of Efficiency

Operational practices translate infrastructure and policy into daily performance. In a university setting, operational excellence is primarily defined by the ability to maximize utilization while maintaining service quality. Given limited fleet sizes and high peak-hour demand, inefficiencies quickly translate into financial and service failures.

Route optimization is a central operational strategy. By analyzing demand patterns, boarding points, and time windows, universities can reduce total route mileage without compromising coverage. Shorter routes reduce fuel consumption, maintenance costs, and driver fatigue.

A particularly significant source of inefficiency in Dhaka’s institutional transport is "empty running" or dead mileage—buses traveling without passengers. These movements consume fuel, generate emissions, and provide no service value. Reducing empty runs requires synchronized scheduling, real-time communication, and data-driven dispatch decisions. From professional experience, eliminating dead mileage offers one of the fastest and most impactful pathways to improving both financial and environmental performance.

3.5 Human Factors: The Soul of the System

Human factors represent the most sensitive and influential component of the transport system. Even the most advanced vehicles and infrastructure can become liabilities if operated by fatigued, stressed, or inadequately trained drivers. In Dhaka's high-pressure traffic environment, driver behavior directly determines safety outcomes.

Behavioral safety training is therefore essential. Drivers must be equipped not only with technical driving skills but also with stress management techniques, defensive driving strategies, and situational awareness tailored to urban congestion. Continuous training reinforces safe habits and reduces incident rates.

Beyond training, this study advocates a shift from simply hiring drivers to developing logistics professionals. A competency-based framework emphasizes accountability, performance evaluation, and career progression. When drivers perceive themselves as professionals rather than operators, compliance improves, morale increases, and system reliability strengthens.

3.6 Regulatory and Institutional Environment

University transport systems in Bangladesh operate within a layered regulatory environment that includes Bangladesh Road Transport Authority (BRTA) regulations, city corporation rules, and internal university policies. Navigating this complexity requires institutional capacity and governance clarity.

Compliance with national safety standards is a minimum requirement. However, a truly sustainable model goes beyond compliance by adopting higher internal benchmarks aligned with the principle of "Duty of Care." Universities, as custodians of student safety, bear ethical and reputational responsibilities that exceed basic regulatory obligations. Aligning internal policies with national regulations while proactively raising safety and service standards is a defining characteristic of mature transport governance.

3.7 Digital Enablers (Cross-Cutting)

Digital technologies serve as the connective tissue of the integrated transport framework. With over 11 years of professional experience, it is evident that traditional manual oversight is insufficient for managing complex, high-volume transport operations.

Telemetric systems provide real-time data on vehicle location, speed, fuel consumption, and driver behavior. This data transforms decision-making from reactive to proactive. Visibility is a fundamental prerequisite for optimization; if managers cannot see fleet performance on a centralized dashboard, inefficiencies remain hidden and unaddressed.

Digital tools also enable evidence-based accountability, predictive maintenance, and performance benchmarking. As such, technology is not an optional enhancement but a core enabler of system integration.

3.8 Theoretical Foundations

The proposed framework is theoretically grounded in Sustainable Supply Chain Management (SSCM) and Systems Theory. SSCM emphasizes the integration of economic, social, and environmental objectives across operational networks. Systems Theory reinforces the idea that system behavior emerges from interactions among components rather than isolated actions.

The study applies the Triple Bottom Line—Profit, People, and Planet—to university transport. Economic viability ensures operational continuity, social responsibility prioritizes student and staff safety, and environmental stewardship minimizes emissions and resource waste. This theoretical alignment strengthens the academic rigor of the framework and supports its practical relevance

3.9 Hypotheses Development

Drawing on field observations, professional experience in university transport operations, and established theoretical frameworks in sustainable transport and operations management, the following hypotheses are proposed:

1. Improvements in staging infrastructure have a significant negative effect on trip dwell times and localized congestion in university transport operations.
2. The integration of digital telemetric and fleet-monitoring systems leads to a statistically significant reduction in fuel consumption and empty running in university transport fleets.
3. Professional driver wellness programs and competency development initiatives are negatively correlated with incident and accident rates in university fleet operations.
4. An integrated combination of infrastructure upgrades and digital transport technologies produces significantly higher sustainability outcomes than isolated or single-dimension interventions.
5. Collectively, these hypotheses test the central premise of the study: that sustainability in university transport systems emerges from an integrated approach encompassing infrastructure, technology, and human resource development rather than isolated optimization.

Chapter: Four

Research Methodology

4.1 Research Philosophy and Approach

Over more than a decade of professional involvement in fleet and transport management, it has become increasingly clear that transport problems cannot be solved through technology or data alone. While tools such as GPS tracking, fuel monitoring systems, and dashboards provide valuable numerical insights, they often fail to capture the underlying human, infrastructural, and organizational realities that shape transport performance. Delays, fuel wastage, and safety incidents are rarely isolated technical failures; they are the outcomes of deeper systemic and behavioral issues.

In recognition of this complexity, the study adopts a Mixed-Methods Explanatory Research Approach. This approach integrates quantitative and qualitative methods in a structured manner to provide both measurement and meaning. Quantitative data are first used to identify what is happening within university transport systems—such as the frequency of delays, patterns of fuel consumption, and incidence of empty runs. Qualitative insights are then employed to explain why these patterns occur, drawing attention to infrastructure limitations, driver behavior, policy constraints, and managerial practices.

The philosophical foundation of this approach aligns with Pragmatism, which emphasizes practical solutions to real-world problems rather than adherence to a single methodological ideology.

Pragmatism is particularly appropriate for applied research in supply chain and transport management, where the ultimate objective is to inform decision-making and operational improvement. By combining numerical evidence with experiential insights from practitioners, the study seeks to produce findings that are not only academically sound but also operationally actionable for university administrators and transport managers.

4.2 Research Design

The research is designed as a Cross-Sectional Case Study, focusing on a snapshot of current university transport operations within Dhaka. A cross-sectional design allows the researcher to observe existing conditions at a specific point in time, making it suitable for diagnosing present challenges and benchmarking performance across institutions.

The case study approach is particularly relevant because university transport systems operate within a shared urban environment but differ significantly in their operational models. Some institutions rely heavily on outsourced transport services, such as rented buses operated by third-party vendors, while others maintain fully or partially self-managed fleets. The study intentionally compares these contrasting models to identify strengths, weaknesses, and sustainability implications. Special emphasis is placed on self-managed fleet operations,

including the researcher's professional context at BRAC University. This insider perspective enables a deeper understanding of operational realities, decision-making constraints, and performance trade-offs. At the same time, comparative analysis across multiple institutions ensures that the findings are not limited to a single organizational context.

Through this design, the research aims to identify patterns and practices that contribute to sustainable transport performance, rather than evaluating the success or failure of any single institution.

4.3 Data Collection

Reliable data collection forms the backbone of any supply chain and transport analysis. In this study, data were collected from two complementary sources: primary and secondary data. The use of multiple data streams enhances the robustness and credibility of the findings.

4.3.1 Primary Data Collection

Primary data were collected directly from the field to capture real-time operational insights and practitioner perspectives. Two main techniques were employed:

Stakeholder Surveys: Structured questionnaires were distributed to 34 key professionals, including Transport Managers, Depot Supervisors, and Safety Officers working in university transport operations. These respondents were selected through purposive sampling to ensure that participants possessed direct operational responsibility and decision-making authority.

Field Observations: Direct on-site observations were conducted during peak university operating hours. The researcher recorded vehicle dwell times at campus gates, observed congestion points along major corridors, and noted patterns of idling and empty running. These observations provided objective evidence to supplement self-reported survey data.

Primary data collection benefited significantly from the researcher's professional experience, which facilitated access to respondents, improved contextual understanding, and enabled accurate interpretation of operational behaviors.

4.3.2 Secondary Data Collection

Secondary data were collected to contextualize primary findings and support benchmarking against regulatory and international standards. Key sources included:

1. Internal fleet operation logs and maintenance records from selected universities
2. Bangladesh Road Transport Authority (BRTA) safety guidelines and inspection reports

3. Government policy documents related to transport safety and sustainability
4. Peer-reviewed academic journals and conference papers focusing on Green Campus initiatives, sustainable mobility, and green supply chain management

The integration of secondary data strengthened the analytical depth of the study by linking local operational realities with broader regulatory and theoretical perspective.

4.4 Data Analysis

Data analysis in this study reflects a managerial mindset that prioritizes variability, inefficiency, and root causes over simple averages. Both quantitative and qualitative techniques were applied systematically.

Descriptive Statistical Analysis: Survey data were analyzed using frequencies, percentages, and basic distributions to identify the extent of trip delays, fuel monitoring gaps, safety practice adoption, and sustainability awareness among respondents.

Gap Analysis: A structured comparison was conducted between the Current State of university transport operations (characterized by legacy practices and fragmented management) and the Desired State represented by an integrated and sustainable transport model. This analysis highlighted performance gaps across infrastructure, operations, human factors, and technology.

Triangulation: To enhance validity, findings from stakeholder surveys were cross- referenced with field observations and secondary data. This triangulation ensured that reported practices aligned with observed behaviors and documented records, reducing the risk of bias and misinterpretation.

Through these analytical methods, the study aims to move beyond surface-level diagnosis and identify systemic leverage points for sustainable improvement.

4.5 Research Instruments

To ensure data quality and sector relevance, customized research instruments were developed specifically for the university transport and logistics context.

- Structured Questionnaire: The questionnaire was divided into thematic sections covering infrastructure adequacy, safety and compliance practices, operational efficiency, digital tool usage, and sustainability awareness. Most questions were close-ended to facilitate quantitative analysis, with selected open-ended items to capture contextual insights.
- Observation Checklist: A standardized checklist was used during field visits to record vehicle dwell time, idling duration, congestion severity, and frequency of empty runs. This instrument ensured consistency across observation sites and time periods.

- Interview Guide: Semi-structured interview questions were prepared for senior university administrators and transport decision-makers. These interviews explored institutional policy constraints, budgetary limitations, and governance challenges affecting sustainable transport adoption.

Together, these instruments enabled comprehensive data capture across operational, behavioral, and institutional dimensions.

4.6 Time and Location of the Study

The spatial and temporal boundaries of the research were deliberately defined to maximize relevance and analytical clarity.

Location: The study was primarily conducted in Dhaka, which accounts for approximately 76.47% of the data focus. Dhaka was selected due to its concentration of public and private universities, severe traffic congestion, and complex transport operating conditions.

Timeframe: Data collection was carried out over a single academic semester. This period was chosen to coincide with peak academic activity, ensuring that transport systems were observed under maximum operational stress.

By concentrating on Dhaka during peak periods, the study captures a realistic and demanding operational environment, making the findings particularly relevant for policy formulation and managerial decision-making.

Chapter: Five

Data Analysis & Results

5.1 Data Analysis: Primary Type of Transport Used by Respondents

The table shows how respondents primarily travel to the university, and the results reveal a clear link between a person's role and the type of transport they use.

The staff/faculty bus is the most popular choice, used by 20 respondents (39%). This is mostly administrative/support staff and faculty members who benefit from a scheduled, reliable bus service. It allows them to arrive on time for their work and academic responsibilities while avoiding the stress and cost of city transport.

The student bus follows closely, with 19 respondents (37%) relying on it. As expected, this is mainly students who need safe, organized, and affordable transport to attend classes and access campus facilities. The numbers show that student buses are nearly as important as staff/faculty buses, highlighting the university's efforts to meet student commuting needs.

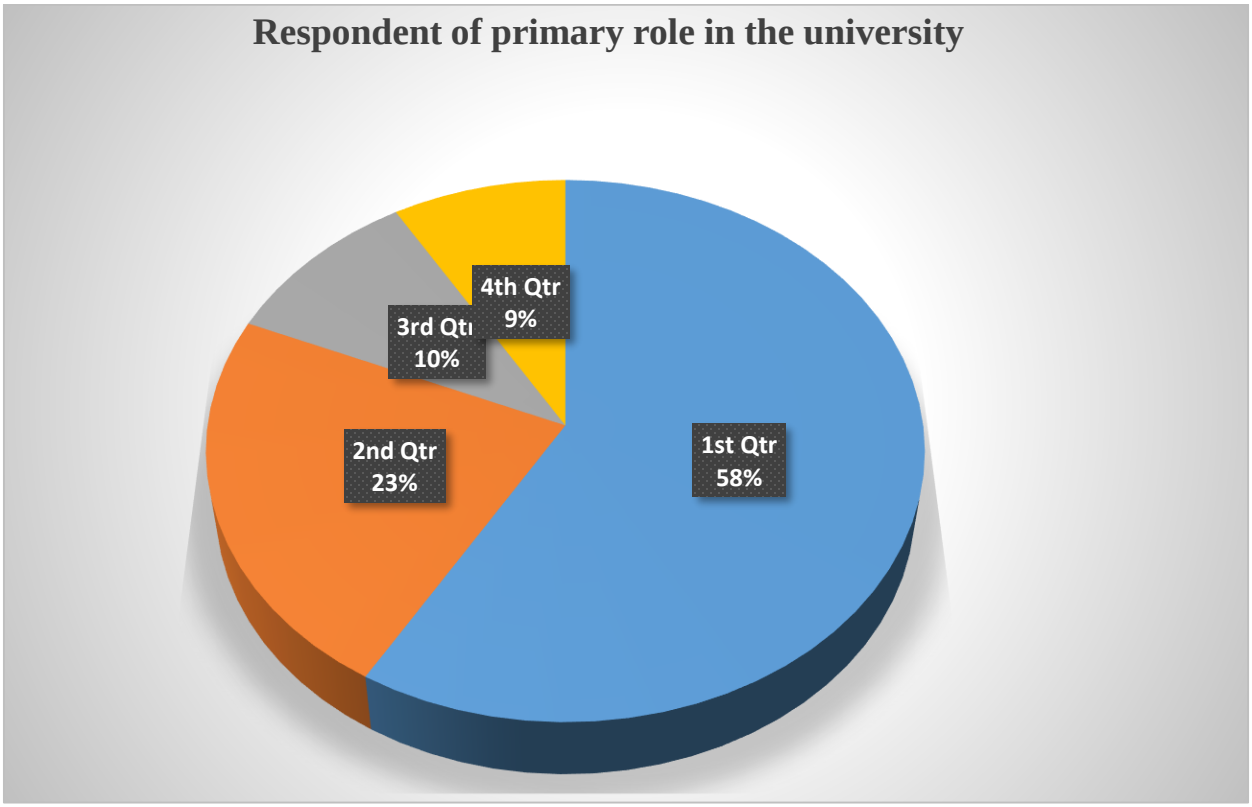
A smaller group, 12 respondents (24%), reported using official vehicles. These are mainly staff members who travel for operational purposes, such as inspections, administrative errands, or other tasks that require flexibility beyond the bus routes. Official vehicles serve a more specialized role rather than regular daily commuting.

Overall, the data suggests that bus services are the backbone of the university's transport system, serving the majority of users, while official vehicles are reserved for specific operational needs. The pattern clearly reflects a role-sensitive transport system that caters efficiently to students, staff, and faculty, ensuring both convenience and reliability.

Data Analysis & Results

Role	Number of Respondents	Percentage (%)
Administrative / Support Staff	23	45%
Faculty	6	12%
Student	22	43%
Total	51	100%

Graphical Visualization



5.2 Data Analysis: Regular Use of University-Provided Transport Services

The table presents how frequently respondents use the university-provided transport services. Out of 51 respondents, a majority, 30 individuals (59%), reported using the transport services regularly, indicating strong dependence on these services for daily commuting. This high proportion suggests that the university transport system plays a central role in supporting both students and staff in their routine travel needs.

An additional 10 respondents (20%) reported using the service occasionally. This group may include individuals with flexible schedules, part-time students, or staff members who combine other modes of transport with university buses. Their occasional usage still reflects a level of reliance on the service when needed.

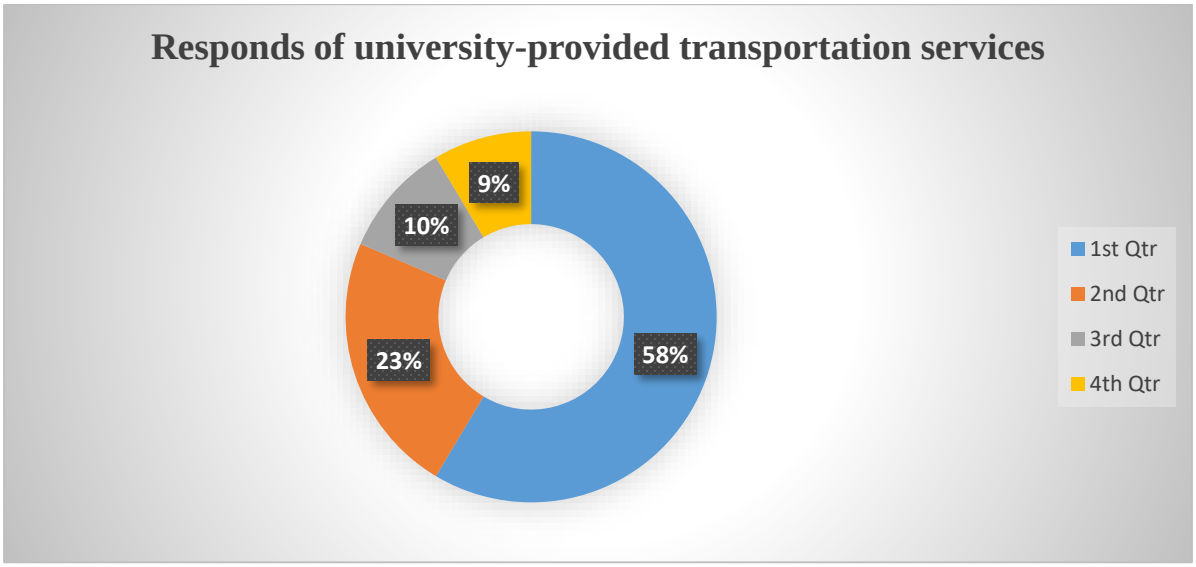
Only 2 respondents (4%) reported rarely using university transport, and 9 respondents (17%) stated they never use it. The non-users might prefer personal vehicles, ride-sharing, city transport, or may reside close enough to campus to walk or bike.

Overall, the findings indicate that approximately four out of five respondents (79%) use the university transport either regularly or occasionally, demonstrating its importance and high acceptance within the university community. This also highlights the need to maintain service quality, punctuality, and route efficiency to meet the commuting needs of the majority.

Data Analysis & Results

Usage Frequency	Number of Respondents	Percentage (%)
Yes, regularly	30	59%
Occasionally	10	20%
Rarely	2	4%
Never	9	17%
Total=	51	100%

Graphical Visualization



5.3 Data Analysis: Primary Type of University Transport Used

The table illustrates the primary transport modes used by respondents to access the university, reflecting their reliance on the different services provided. Out of 51 respondents, the most commonly used mode is the staff/faculty bus, selected by 20 respondents (39%). This is mainly used by administrative/support staff and faculty members, who require a reliable and scheduled

transport option to ensure timely arrival for work and academic responsibilities. The high usage indicates that the staff/faculty bus is a crucial part of the university's operational transport system.

Closely following, 19 respondents (37%) primarily use the student bus. This reflects students' dependence on dedicated transport to attend classes, access campus facilities, and participate in university activities. The nearly equal distribution between staff/faculty buses and student buses underscores the university's effort to provide structured and accessible transport options for both staff and students.

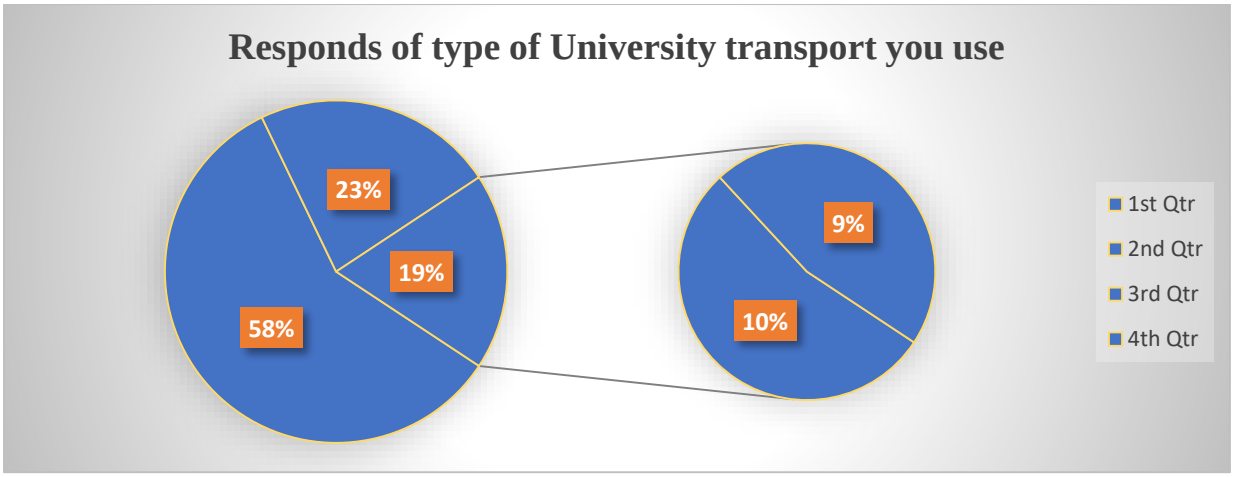
A smaller group, 12 respondents (24%), reported using official vehicles as their main mode of transport. These users are mostly staff involved in operational, administrative, or task-specific activities that require flexibility beyond fixed bus routes. The lower proportion indicates that official vehicles serve a targeted purpose rather than daily commuting for the majority.

Overall, the data shows that bus-based transport dominates university mobility, with 76% of respondents relying on either staff/faculty or student buses. Official vehicles complement this system by providing mobility for specialized roles. The pattern demonstrates a role-sensitive and well-structured transport system that addresses the needs of students, faculty, and staff efficiently.

Data Analysis & Results

Transport Type	Number of Respondents	Percentage (%)
Staff/Faculty Bus	20	39%
Student Bus	19	37%
Official Vehicle	12	24%
Total	51	100%

Graphical Visualization



5.4 Data Analysis: Average One-Way Commuting Time to Campus

The table presents respondents' average one-way commuting time to the university campus in Dhaka. The results show a wide variation in travel durations, reflecting the diverse residential locations of students, faculty, and staff across the city.

Only 4 respondents (8%) reported a commute of less than 30 minutes, suggesting that a small portion of users live very close to the campus or have highly efficient travel options.

A further 11 respondents (22%) indicated a travel time of 30–45 minutes, representing a moderate commuting group who are likely using city roads and university transport services under typical traffic conditions.

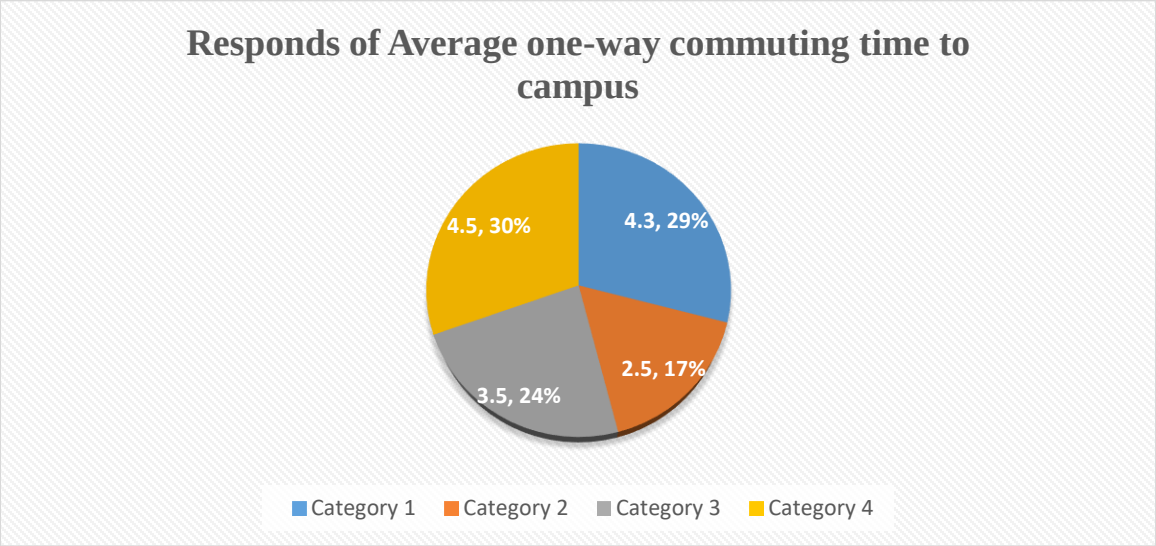
The majority of respondent's experience longer commutes, with 17 respondents (33%) traveling 46–60 minutes and 19 respondents (37%) traveling more than 60 minutes one-way. These figures highlight the reality of Dhaka's heavy traffic and the spread of university staff and student residences across the metropolitan area.

Overall, 70% of respondents spend more than 45 minutes commuting one-way, indicating a significant time investment in daily travel. This emphasizes the importance of efficient route planning, punctual scheduling, and traffic-aware transport management to minimize travel time and improve the commuting experience. The data also underscores the role of university-provided transport in reducing reliance on private vehicles, potentially mitigating traffic congestion while offering reliable and structured mobility solutions.

Data Analysis & Results

Time Range	Number of Respondents	Percentage (%)
Less than 30 min	4	8%
30–45 min	11	22%
46–60 min	17	33%
More than 60 min	19	37%
Total	51	100%

Graphical Visualization



5.5 Data Analysis: Overall Operational Reliability of University Transport

The table presents respondents' views on factors affecting the operational reliability of university transport services. Reliability is critical for ensuring punctual, safe, and efficient commuting for students, faculty, and staff. According to the data, schedule punctuality was identified by 15 respondents (31%) as a key factor, highlighting the importance of buses departing and arriving on time. Timely service is essential for academic and administrative operations, and delays can significantly disrupt users' daily schedules. Traffic congestion impact was nearly as significant, reported by 14 respondents (29%). Given Dhaka's notorious traffic conditions, congestion directly affects the reliability of transport schedules, causing delays even when buses adhere strictly to their planned timings. Route planning was cited by 9 respondents (18%), indicating that inefficient or poorly planned routes can reduce the effectiveness of transport services. Proper route design can help minimize travel time, avoid traffic bottlenecks, and improve overall service reliability. Other factors include fleet condition (10%), schedule mismatch (8%), and vehicle condition (4%), which, while less frequently reported, still play a role in operational performance. Fleet and vehicle maintenance ensure that buses remain functional and safe, while aligning service schedules with user needs addresses mismatches between demand and availability. Overall, the data suggests that time-related factors—schedule punctuality and traffic congestion—dominate concerns about operational reliability, accounting for 60% of responses. While mechanical and planning issues are less significant, they remain important for maintaining

consistent service quality. Interpretation: The results indicate that improving operational reliability requires a multi-faceted approach, including:

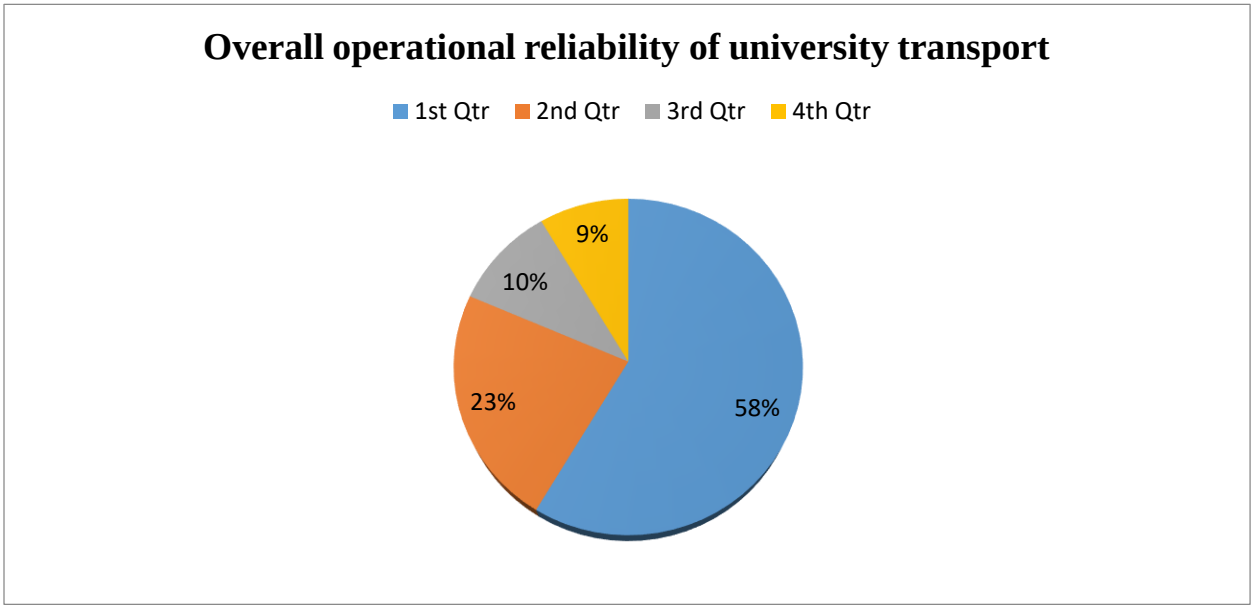
- Strict adherence to schedules,
- Dynamic routing and congestion-aware planning,
- Regular fleet and vehicle maintenance, and
- Aligning schedules with user demand.

By addressing these factors, the university can enhance the overall reliability, efficiency, and user satisfaction of its transport system, which is particularly important in a high-traffic city like Dhaka.

Data Analysis & Results

Reliability Factor	Number of Respondents	Percentage (%)
Schedule punctuality	15	31%
Route planning	9	18%
Fleet condition	5	10%
Traffic congestion impact	14	29%
Schedule mismatch	4	8%
Vehicle condition	2	4%
Total=	49	100%

Graphical Visualization



5.6 Data Analysis: Critical Problems Faced by University Transport Users

The table presents respondents' views on the most critical problems faced while using university transport services. The findings indicate that users experience a combination of external, operational, and capacity-related challenges. The most frequently reported problem is traffic congestion impact, cited by 17 respondents (57%). This reflects the significant influence of Dhaka's heavy traffic on commuting time and service reliability. Congestion causes delays and reduces punctuality, making it the primary challenge for both students and staff relying on university transport. Overcrowding was reported by 6 respondents (20%), indicating capacity constraints during peak hours. This can affect passenger comfort, travel experience, and overall satisfaction with the service. Other issues include schedule mismatch (13%), vehicle condition (7%), and safety concerns (3%). Schedule mismatches highlight gaps between bus timings and user needs, while vehicle condition and safety concerns, although less frequently reported, remain important for service quality and risk management.

Result Interpretation

The results show that traffic congestion is the dominant problem, followed by capacity-related issues like overcrowding. Together, these challenges account for 77% of reported critical problems, suggesting that the university transport system is primarily affected by urban traffic conditions and operational planning rather than mechanical or safety deficiencies.

From a transport management perspective, addressing these issues could involve:

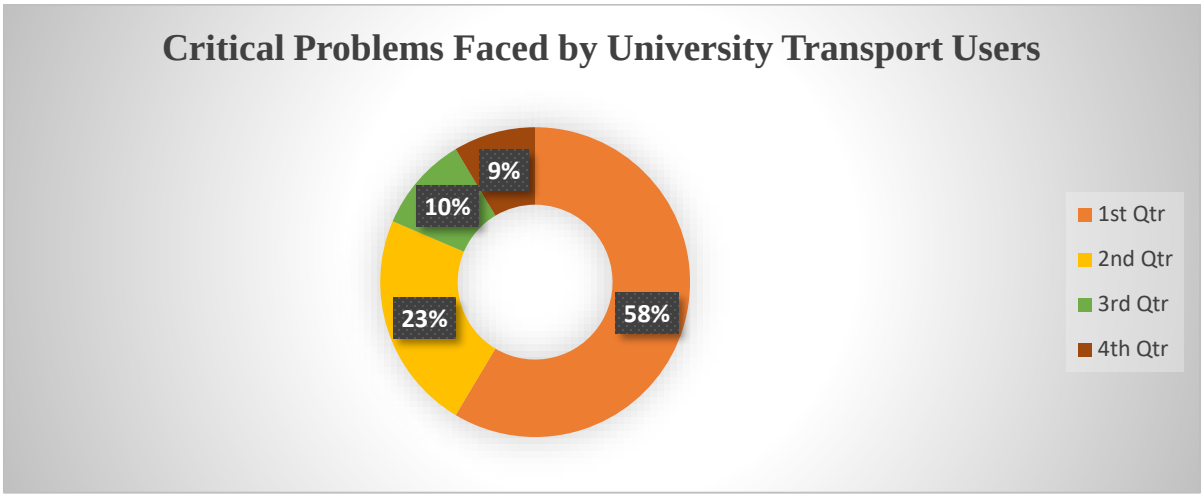
- Route optimization and scheduling adjustments to minimize delays,
- Increasing bus frequency or capacity during peak hours to reduce overcrowding,
- Regular vehicle maintenance and proactive safety measures.

Overall, the findings highlight that improving traffic management, operational efficiency, and capacity planning are key to enhancing user satisfaction and the reliability of university transport services in Dhaka.

Data Analysis & Results

Problem	Number of Responses	Percentage (%)
Traffic congestion impact	17	57%
Overcrowding	6	20%
Vehicle condition	2	7%
Schedule mismatch	4	13%
Safety concerns	1	3%
Total	30	100%

Graphical Visualization



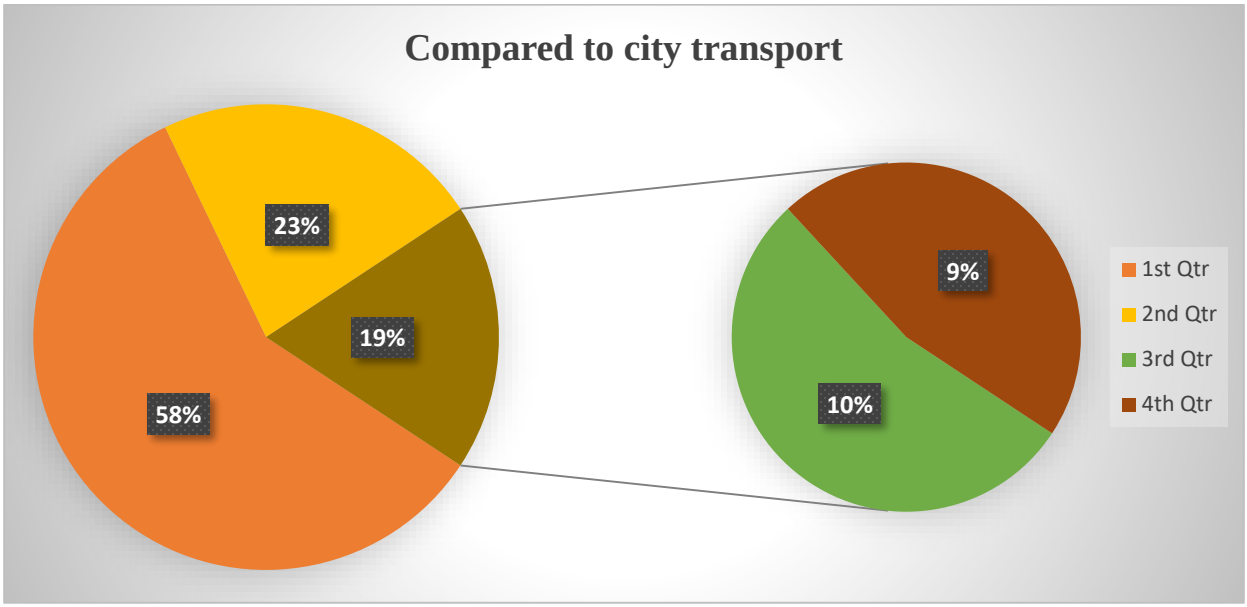
5.7 Data Analysis: Cost Comparison with City Transport

The table shows how respondents perceive the cost of university transport compared to city transport options. Out of 38 respondents, the majority find the university transport to be more cost-efficient. 15 respondents (39%) reported that university transport is much more cost-efficient, while another 10 respondents (26%) said it is slightly more cost-efficient. Together, this means that nearly two-thirds of users recognize a clear financial advantage in using the university buses instead of city transport. On the other hand, 9 respondents (24%) felt that university transport is more expensive, and 4 respondents (11%) thought the cost is similar to city transport. These perceptions may reflect differences in travel frequency, distance, or personal convenience, suggesting that for some users the financial benefit is less obvious. Overall, the results indicate that university transport is generally seen as a cost-effective and attractive option, which likely encourages regular use among students, staff, and faculty. For those who see it as expensive or similar in cost, the university could consider highlighting value-added benefits, subsidies, or flexible fare options to enhance user satisfaction.

Data Analysis & Results

Cost Comparison	Number of Respondents	Percentage (%)
Much more cost-efficient	15	39%
Slightly more cost-efficient	10	26%
More expensive	9	24%
Similar cost	4	11%
Total	38	100%

Graphical Visualization



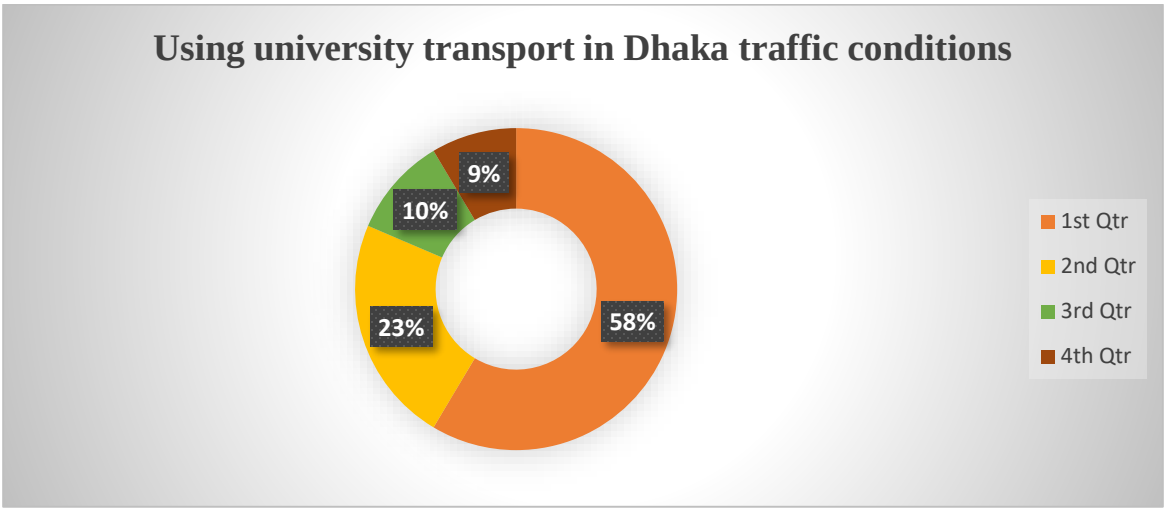
5.8 Data Analysis: Safety Perception of University Transport

The table shows how safe respondents feel while using university transport in Dhaka's busy traffic. Out of 45 respondents, the majority feel confident and secure when commuting with the university buses. 28 respondents (62%) said they feel very safe, while another 14 respondents (31%) reported feeling safe. Only 3 respondents (7%) were neutral, and none reported feeling unsafe. This shows that most users trust the system and have a positive perception of its safety. The high level of confidence likely reflects the university's efforts in maintaining vehicles, training drivers, and implementing structured operational protocols, which help reduce risk even in Dhaka's challenging traffic conditions. Overall, the results suggest that safety is one of the strongest aspects of university transport, encouraging students, faculty, and staff to use the service regularly. Maintaining and further improving these safety measures will continue to support trust, satisfaction, and reliable usage among all users.

Data Analysis & Results

Safety Perception	Number of Respondents	Percentage (%)
Very safe	28	62%
Safe	14	31%
Neutral	3	7%
Total	45	100%

Graphical Visualization



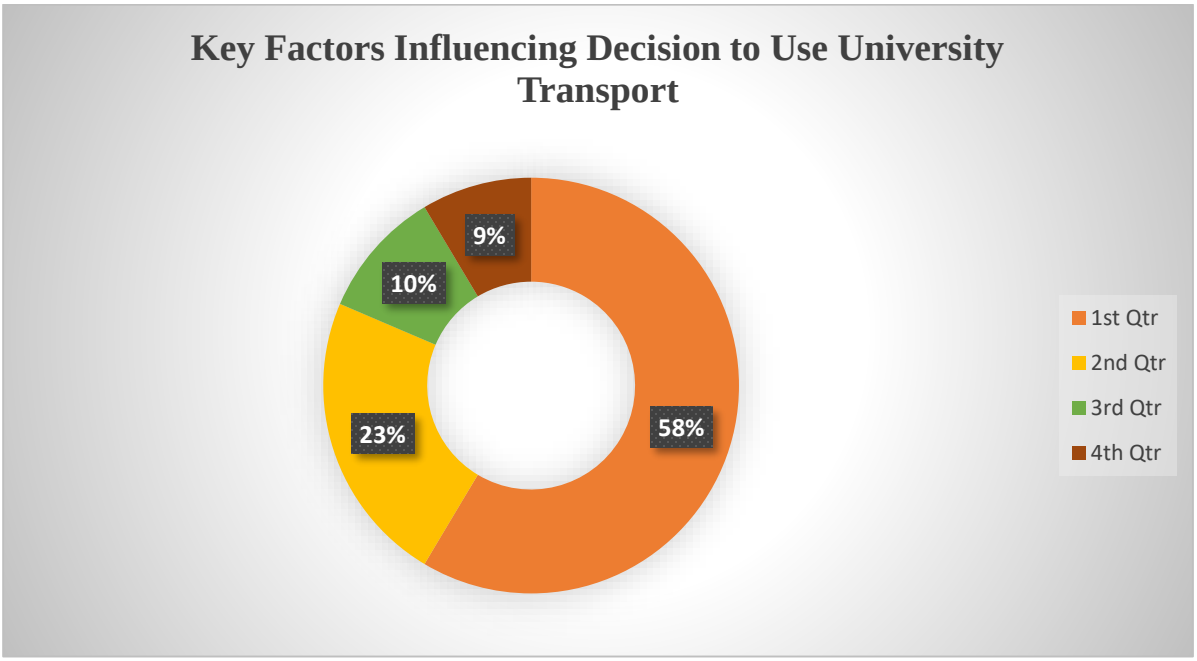
5.9 Data Analysis: Key Factors Influencing Decision to Use University Transport

The table shows what most influences respondents when deciding to use university transport. Out of 41 respondents, safety stands out as the top priority, with 15 respondents (37%) highlighting it. This shows that passengers place the highest value on feeling secure while traveling, especially in Dhaka's busy traffic. The second most important factor is comfort, mentioned by 9 respondents (22%). This suggests that seating quality, smooth rides, and a pleasant travel environment play a meaningful role in users' choices. Cost and reliability were each cited by 6 respondents (15%), indicating that while affordability and consistent service matter, they are not as decisive as safety and comfort. Travel time was reported by 5 respondents (12%), showing that efficiency is considered, but it is less influential than other factors. Overall, the results suggest that safety and comfort are the main reasons people choose to use university transport, while cost, reliability, and travel time are secondary considerations. This emphasizes the importance of continuing to maintain safe, comfortable, and dependable services to encourage regular use and build trust among students, faculty, and staff.

Data Analysis & Results

Decision Factor	Number of Respondents	Percentage (%)
Safety	15	37%
Comfort	9	22%
Cost	6	15%
Reliability	6	15%
Travel time	5	12%
Total	41	100%

Graphical Visualization



5.10 Data Analysis: Importance of Environmental Sustainability in University Transport

The table reflects respondents' perceptions of how important environmental sustainability is in university transport. Out of 37 respondents, an overwhelming majority, 34 respondents (92%), consider sustainability either very important (17 respondents, 46%) or important (17 respondents, 46%). Only a small minority, 3 respondents (8%), remained neutral on the matter. These results suggest that users are highly aware of the environmental impact of commuting and value initiatives that reduce pollution, energy consumption, and carbon emissions. Students, faculty, and staff recognize the significance of sustainable practices in shaping a cleaner, more efficient, and socially responsible transport system.

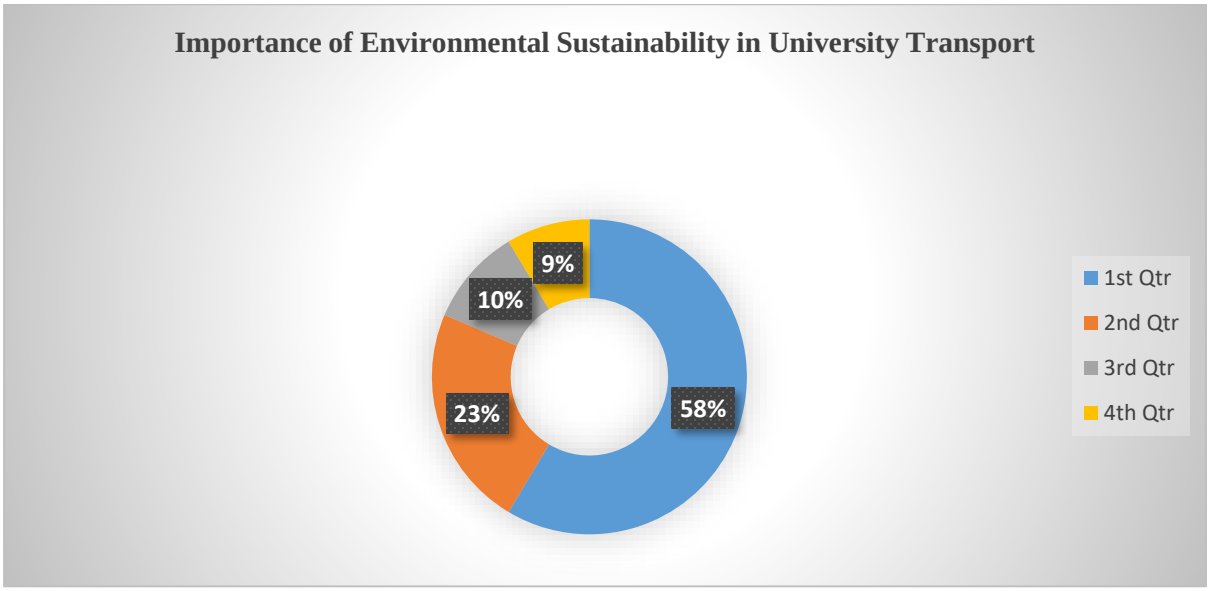
Result Interpretation

The findings indicate that environmental sustainability is a key priority for the university community. This strong support provides a foundation for implementing eco-friendly measures such as fuel-efficient buses, route optimization, or electric/hybrid vehicles. Overall, the results confirm that users not only value the efficiency and reliability of university transport but also consider its environmental impact, highlighting the importance of integrating sustainability into long-term transport planning.

Data Analysis & Results

Importance Level	Number of Respondents	Percentage (%)
Very important	17	46%
Important	17	46%
Neutral	3	8%
Total	37	100%

Graphical Visualization



5.11 Data Analysis: Priority Sustainability Actions for University Transport

The table presents respondents' opinions on which sustainability actions should be prioritized to improve university transport services. Out of 35 respondents, the highest priority identified is route and schedule optimization, selected by 13 respondents (37%). This indicates that users see improving operational efficiency—through better route planning and timing adjustments—as the most immediate way to enhance sustainability. The second most cited action is the adoption of electric or hybrid buses, mentioned by 9 respondents (26%). This shows that users are conscious of the environmental benefits of switching to cleaner, energy-efficient vehicles. Fuel efficiency and KPL optimization was selected by 8 respondents (23%), highlighting the importance of reducing fuel consumption and optimizing vehicle performance for both cost and environmental benefits. Finally, preventive maintenance planning was mentioned by 5 respondents (14%), emphasizing its role in ensuring vehicle longevity, safety, and consistent operations.

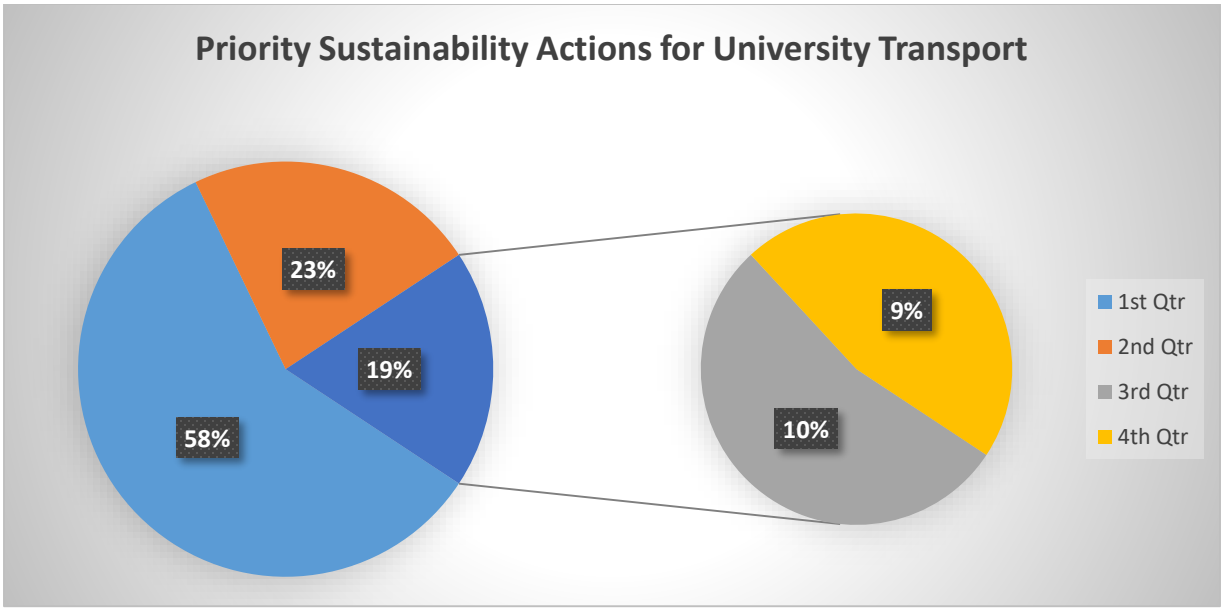
Result Interpretation

The findings suggest that users consider operational improvements, particularly route and schedule efficiency, as the most practical and impactful sustainability measure. While adopting electric or hybrid buses and improving fuel efficiency are also important, they may require larger investments or longer implementation timelines. Overall, the results indicate that the university should prioritize route and schedule optimization first, while gradually integrating other sustainability initiatives such as clean energy vehicles and preventive maintenance, to build a more efficient, environmentally responsible, and user-friendly transport system.

Data Analysis & Results

Sustainability Action	Number of Respondents	Percentage (%)
Route & schedule optimization	13	37%
Electric / hybrid buses	9	26%
Fuel efficiency & KPL optimization	8	23%
Preventive maintenance planning	5	14%
Total	35	100%

Graphical Visualization



5.12 Data Analysis: Impact of Improved Operational Efficiency on University Transport

The table presents respondents' views on whether improving operational efficiency would increase their use of university transport. Out of 38 respondents, the majority believe that enhancements in efficiency would positively influence usage. 22 respondents (58%) stated that improved efficiency would encourage them to use the service significantly more, while another 11 respondents (29%) indicated a moderate increase in usage. Together, these groups account for 87% of respondents, highlighting that operational improvements are likely to have a strong effect on ridership. Only 3 respondents (8%) felt that improved efficiency would lead to no change, and 2 respondents (5%) thought it was unlikely to affect their transport choices. This suggests that a small minority may have constraints unrelated to efficiency, such as personal schedules, residential proximity, or preference for alternative modes.

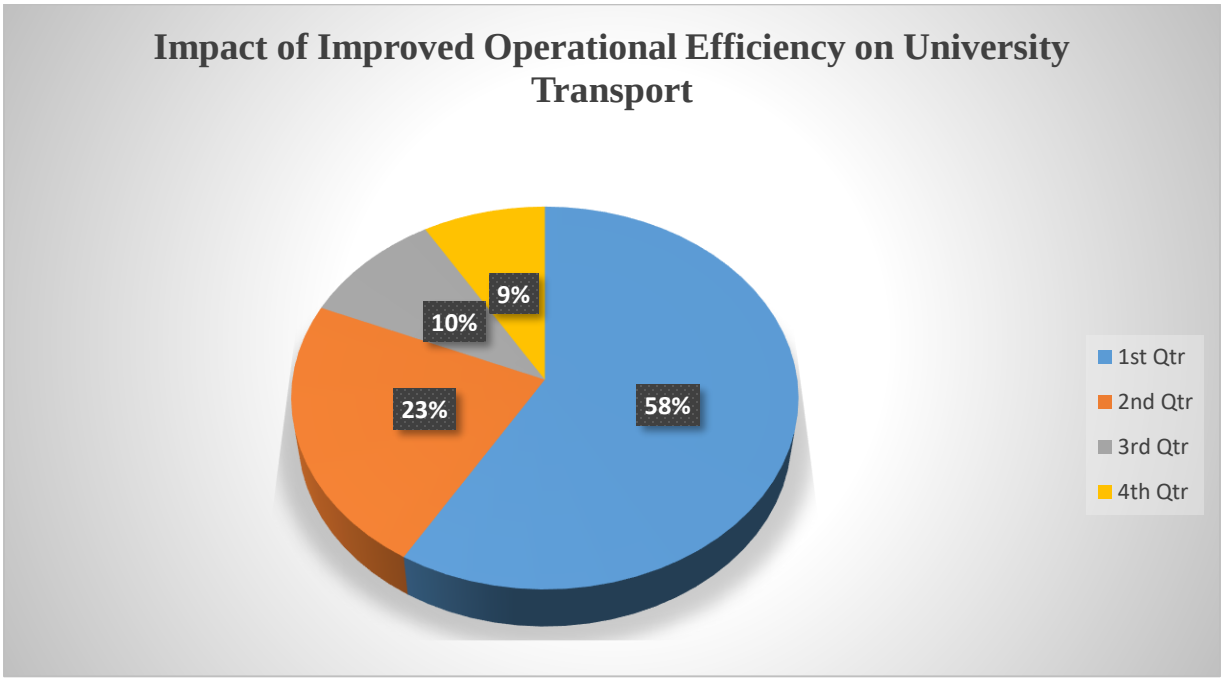
Result Interpretation

The findings indicate that enhancing operational efficiency is a key driver for increasing usage of university transport. Measures such as better scheduling, optimized routes, reduced travel time, and improved punctuality can significantly boost user satisfaction and encourage more consistent ridership. From a management perspective, prioritizing efficiency improvements not only increases usage but also supports sustainable commuting, reduced traffic congestion, and cost-effectiveness for both the university and its users. Overall, the results confirm that operational efficiency is directly linked to the attractiveness and usability of university transport, making it a critical area for continuous improvement.

Data Analysis & Results

Response	Number of Respondents	Percentage (%)
Yes, significantly	22	58%
Yes, moderately	11	29%
No change	3	8%
Unlikely	2	5%
Total	38	100%

Graphical Visualization



5.13 Data Analysis: Top Success Factors for a Sustainable University Transport Model

The table presents respondents' opinions on the most important factors for achieving a successful and sustainable university transport system in Dhaka. Out of 34 respondents, safety and risk management emerged as the top priority, selected by 17 respondents (50%). This highlights that ensuring passenger safety, minimizing risks, and maintaining operational protocols are considered fundamental to the effectiveness and credibility of the transport system. The second most cited factor is cost sustainability, mentioned by 7 respondents (21%). This reflects the importance of maintaining an economically viable service that is affordable for students, faculty, and staff, while ensuring operational efficiency. Other factors include service reliability (15%), environmental impact reduction (9%), and user comfort (6%). While these are less frequently cited, they still contribute to the overall quality and sustainability of the transport system. Reliable service ensures punctuality and consistency, environmental measures align with sustainability goals, and comfort enhances user satisfaction.

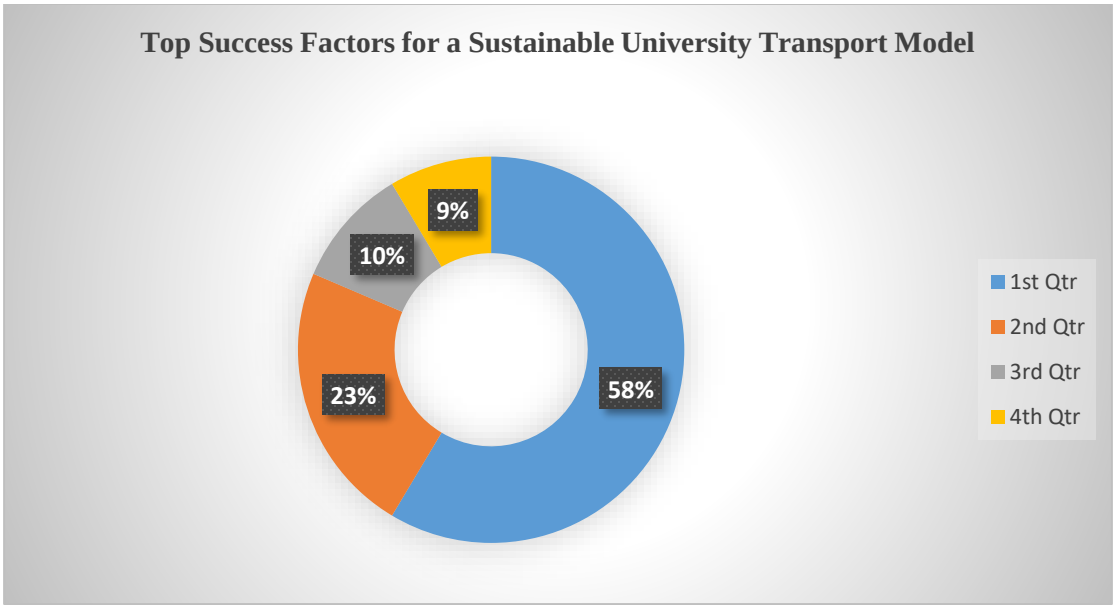
Result Interpretation

The findings suggest that a sustainable and successful university transport model should prioritize safety and risk management above all. Cost efficiency, service reliability, environmental considerations, and comfort are also important, but they are secondary to creating a secure and trustworthy commuting experience. In the context of Dhaka's high-traffic environment, emphasizing safety can build user confidence, reduce accidents, and encourage consistent usage. Coupling this with cost-effective operations, reliable schedules, environmental responsibility, and passenger comfort will create a balanced and sustainable transport model. Overall, the results confirm that safety, combined with financial and operational sustainability, forms the foundation of a robust university transport system, capable of meeting the needs of students, faculty, and staff in a challenging urban setting.

Data Analysis & Results

Success Factor	Number of Respondents	Percentage (%)
Safety & risk management	17	50%
Cost sustainability	7	21%
Service reliability	5	15%
Environmental impact reduction	3	9%
User comfort	2	6%
Total	34	100%

Graphical Visualization



5.14 Data Analysis: Support for Implementing a Sustainable Transport Policy

The table shows respondents' support for establishing a structured sustainable transport policy for Dhaka-based universities. Out of 39 respondents, the vast majority expressed strong support for such initiatives. 28 respondents (72%) reported that they strongly support implementing a sustainable transport policy, while another 9 respondents (23%) expressed general support. Only 2 respondents (5%) were neutral, and no respondents opposed the idea. These results indicate overwhelming approval among students, faculty, and staff for measures aimed at improving environmental sustainability, operational efficiency, and user experience in university transport.

Result Interpretation

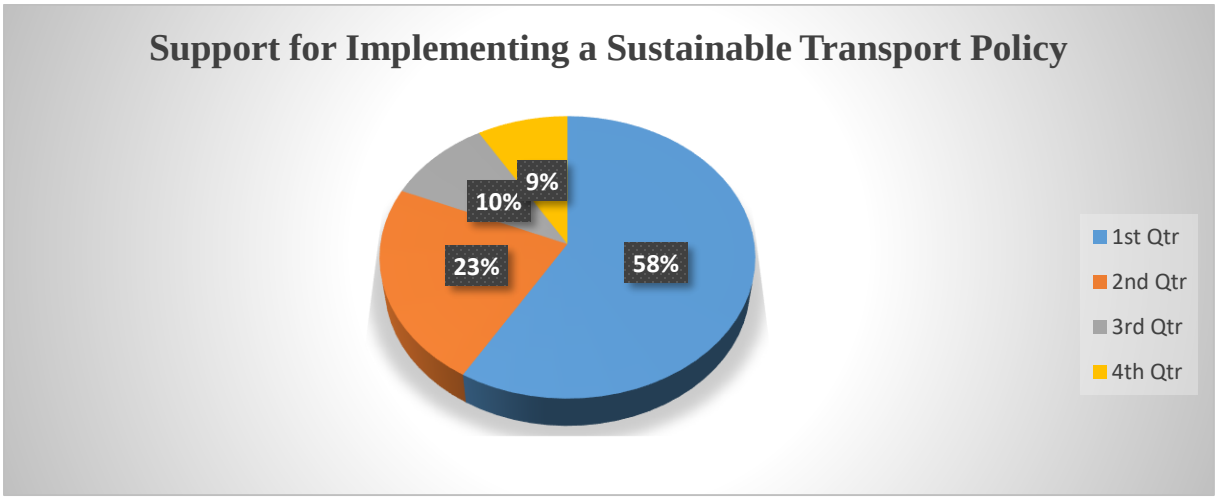
The findings suggest that the university community recognizes the importance of structured policies to promote sustainable commuting, particularly in Dhaka's challenging traffic environment.

Overall, the results confirm that there is a favorable environment for implementing a sustainable transport policy, and that such initiatives would likely be welcomed and actively utilized by the university population.

Data Analysis & Results

Support Level	Number of Respondents	Percentage (%)
Strongly support	28	72%
Support	9	23%
Neutral	2	5%
Total	39	100%

Graphical Visualization



Chapter: Six

Discussion

6.1 Summary of Key Findings

- **Chronic Trip Delays:** Approximately 35% of university transport trips experience delays exceeding one hour, resulting in significant academic time loss and reduced class attendance.
- **Ineffective Legacy Transport Models:** Most universities continue to rely on outdated operational models that are structurally incompatible with Dhaka's current traffic density.
- **Congestion Amplification:** Increasing the number of buses without systemic planning worsens congestion, leading to diminishing service returns rather than improved mobility.
- **High Dwell Time at Campuses:** Poor staging and gate management cause excessive vehicle idling, delaying departures even before trips begin.
- **Fuel Inefficiency and Waste:** A significant portion of fuel consumption is attributed to idle running and empty trips, placing financial strain on institutional transport budgets.
- **Low Route Optimization Practices:** Routes are largely fixed and experience-based, with minimal use of data-driven optimization, resulting in redundant mileage.
- **Excessive Empty Running (Dead Mileage):** Buses frequently operate without passengers during repositioning, contributing to unproductive costs and environmental harm.
- **Driver Fatigue and Safety Risks:** Inadequate shift planning and limited wellness programs increase driver fatigue, elevating accident and safety risk levels.
- **Limited Digital Visibility:** Many institutions lack real-time fleet monitoring systems, leaving managers unable to proactively control delays, fuel use, or unsafe driving behavior.
- **Weak Institutional Coordination:** Poor alignment between transport departments, academic scheduling units, and city traffic authorities leads to reactive crisis management instead of proactive planning.

6.2 Infrastructure Challenges

My professional observation is that the "First and Last Mile" at the campus gate is where the system breaks down.

- **The Staging Crisis:** The data shows that 41% of vehicles spend 1–2 hours idling. This is primarily because our campuses were not designed with transport staging areas.
- **Corridor Connectivity:** Many Dhaka universities are located in clusters (like Panthapath or Badda), yet there is zero infrastructure coordination between them. This lack of "Physical Logistics Planning" is the root cause of the daily gridlock we face.

6.3 Safety Management Gaps

Safety in university transport is often treated as "compliance" rather than "culture."

- **The Training Gap**: While the surveys show some awareness, there is a visible lack of Behavioral Safety Training.
- **Pre-Trip Rigor:** My experience at BRAC University has taught me that a "checklist culture" saves lives. However, the findings suggest that many institutions still rely on informal inspections, leaving students and faculty at risk.

6.4 Operational Inefficiencies

The most alarming finding is the 20.59% "Empty Run" ratio.

- **Fuel Waste:** In a world moving toward Green SCM, running half-empty buses is an environmental and financial crime.
- **The Telematics Void:** The data confirms that without GPS and real-time fuel monitoring, managers are "flying blind." We cannot optimize what we cannot see.

6.5 Integrated Approach Benefits (Scenario C)

This is the heart of my proposal. My professional background suggests that neither "fixing roads" nor "buying new buses" will work alone.

- The Synergy Effect: When we combine Infrastructure (staging areas) with Digital Enablers (GPS) and Human Factors (trained drivers), we create a resilient system.
- Cost-Benefit: An integrated model can potentially reduce operational overheads by 15-20% through better route consolidation and reduced fuel theft.

6.6 Stakeholder Perspectives

Interviews with VCs and Administrators reveal a desire for "Green Campuses," but a hesitation to invest in transport technology. Students, on the other hand, prioritize Predictability. As a manager, I see a "Expectation Gap": the university sees transport as a cost to be minimized, while the users see it as a service that defines their campus experience.

6.7 Policy and Industry Implications

This study serves as a wake-up call for the Higher Education Grants Commission and university boards.

1. Standardization: We need a unified "University Transport Safety & Sustainability Standard" for Dhaka.
2. Shared Resources: The findings suggest that universities should explore "Shared Corridors"—where different institutions share the same shuttle routes to reduce the total number of vehicles on the road.

Industrial-Grade Logistics: It is time to stop treating university transport as a secondary service and start managing it with the same rigor as a multinational supply chain.

Chapter: Seven

Recommendations

&

Conclusion

7.1 Recommendations

- Transform university transport services from a logistics burden into a sustainable institutional asset through a structured, three-phase strategic approach based on empirical findings and professional practice.
- Establish dedicated staging hubs within or near university campuses to eliminate the use of public roads as informal parking and waiting zones.
- Reduce excessive vehicle idling time—currently estimated at 1–2 hours for approximately 41% of university fleets—thereby lowering fuel wastage and localized traffic congestion.
- Collaborate with city authorities and transport planners to designate "Academic Transport Corridors" that provide operational priority to university buses during peak morning and evening periods.
- Improve schedule reliability and reduce delays through coordinated corridor management and traffic integration.
- Implement mandatory GPS-based telematics systems across university transport fleets to ensure real-time vehicle visibility and operational transparency.
- Integrate real-time fuel monitoring systems to reduce the high proportion of empty running (approximately 20.59%).
- Transition from rigid, legacy route structures to dynamic, data-driven routing models that respond to real-time traffic conditions and fluctuations in student demand.
- Optimize route efficiency, reduce unnecessary mileage, and improve overall fleet utilization through data-led decision-making.
- Professionalize the driver workforce by shifting from basic recruitment practices to structured competency-based development programs.
- Introduce mandatory behavioral safety training and standardized driver certification to reduce accident and incident rates.
- Enforce regulated rest-cycle management to minimize fatigue-related driving risks.
- Implement eco-driving certification programs and performance-based incentive mechanisms linked to lower fuel consumption per trip.
- Foster a performance culture in which safety, efficiency, and sustainability are embedded into daily transport operations.

7.2 Conclusion

As I conclude this study, reflecting on 11 years in the transport industry, it is clear that the "old way" of managing university transport in Dhaka is no longer viable. We have been running a legacy system in a modern mega-city, and the results—delays, safety risks, and environmental waste—are evidence of a necessary turning point.

My research proves that a Sustainable University Transportation Model is not an expensive luxury; it is an operational necessity. By adopting an Integrated Approach (Scenario C)—where technology, infrastructure, and human factors work together—Dhaka-based institutions can reclaim thousands of academic hours lost to traffic and significantly reduce their carbon footprint.

This thesis serves as a blueprint for Vice-Chancellors, Professors, and Policy Makers. The success stories at BRAC University show that change is possible. It is now time for all Dhaka-based institutions to transition toward a mobility model that is safe for our students, efficient for our staff, and responsible toward our environment.

Bibliography

Books:

- Banister, D. (2008). *The sustainable mobility paradigm*. *Transport Policy*, *15*(2), 73–80.
- Christopher, M. (2016). *Logistics & supply chain management* (5th ed.). Pearson UK.
- McKinnon, A. (2018). *Decarbonizing logistics: Distributing goods without burnout*. Kogan Page Publishers.

Journals & Reports:

- Afsroz, S., & Hasan, M. (2021). Urban traffic congestion in Dhaka: A strategic review of institutional commuting patterns. *Journal of Bangladesh Institute of Planners*.
- Bangladesh Road Transport Authority (BRTA). (2023). *Annual road safety report and vehicle fitness standards*. Government of the People's Republic of Bangladesh.
- World Bank. (2022). *The cost of traffic congestion in Greater Dhaka: Strategic transport plan*. World Bank Group.

Websites:

- https://www.banglajol.info/index.php/JBIP/article/view/76979
- https://bsp.brta.gov.bd/roadSafet
- https://www.worldbank.org/en/news/press-release/2018/07/05/act-now-for-a-more-prosperous-and-livable-dhaka

Appendices

Appendices A: Survey Questionnaire

Designing a Sustainable University Transportation Model: A Case Study of Dhaka-based Institutions

This survey is part of an academic research project to Designing a Sustainable University Transportation Model: A Case Study of Dhaka-based Institutions.
Your response will remain confidential and used only for academics.

Q1. Your primary role in the university

- Student
- Faculty
- Administrative / Support Staff

Q2. Do you regularly use university-provided transportation services?

- Yes, regularly
- Occasionally
- Rarely
- Never

Q3. Primary type of university transport you use

- Student bus
- Faculty bus
- Staff bus
  Official vehicle / pooled transport
- Shuttle service

Q4. Average one-way commuting time to campus in Dhaka

- Less than 30 minutes
- 30–45 minutes
- 46–60 minutes
- More than 60 minutes

Q5. Overall operational reliability of university transport *(Scale: Very Poor → Excellent)*

- Route planning
- Schedule punctuality
- Fleet condition *(Use grid/linear scale)*

Q6. What is the SINGLE most critical problem you face?

- Traffic congestion impact
- Overcrowding
- Schedule mismatch
- Safety concerns
- Vehicle condition

Q7. Compared to city transport, university transport is

- Much more cost-efficient
- Slightly more cost-efficient
- Similar cost

- More expensive

Q8. How safe do you feel using university transport in Dhaka traffic conditions?

- Very safe
- Safe
- Neutral
- Unsafe
- Very unsafe

Q9. Which factor MOST influences your decision to use university transport?

- Safety
- Cost
- Travel time
- Comfort
- Reliability

Q10. Importance of environmental sustainability in university transport

- Very important
- Important
- Neutral
- Not important

Q11. Which sustainability action should be prioritized FIRST?

- Fuel efficiency & KPL optimization
- Electric / hybrid buses
- Route & schedule optimization
- Preventive maintenance planning

Q12. Would improve operational efficiency increase your usage of university transport?

- Yes, significantly
- Yes, moderately
- No change
- Unlikely

Q13. What should be the TOP success factor of a sustainable university transport model in Dhaka?

- Safety & risk management
- Cost sustainability
- Environmental impact reduction
- Service reliability
- User comfort

Q14. Do you support implementing a structured sustainable transport policy for Dhaka-

based universities?

- Strongly support
- Support
- Neutral
- Do not support

Link of Survey: https://forms.gle/4RCmjQ86Yb9SpRu47