INFLUENCE OF TOD FACTORS ON STUDENTS' TRAVEL BEHAVIOUR IN KLANG VALLEY

STUDY

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DECLARATION

We hereby declare that:

(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

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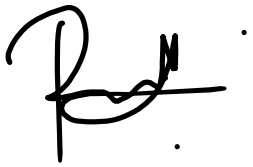
ROSEMARY WONG	2202048	

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LIST OF ABBREVIATIONS

BRT	Bus Rapid Transit
DV	Dependent Variable
IV	Independent Variable
KTM	Keretapi Tanah Melayu
LRT	Light Rail Transit
MRT	Mass Rapid Transit
N	Number of Respondents
RO	Research Objective
RQ	Research Question
SD	Standard Deviation
SPSS	Statistical Product and Service Solutions
TB	Travel Behaviour
TOD	Transit-Oriented Development
TPB	Theory of Planned Behaviour

PREFACE

This research was inspired by the authors' interest in the relationship between urban planning, public transportation, and students' travel behaviour in Malaysia's rapidly urbanising areas. In Klang Valley, increasing traffic congestion, rising transportation costs, and heavy dependence on private vehicles have created challenges for students who travel frequently between their accommodation, university, and other daily destinations. As Transit-Oriented Development (TOD) promotes better accessibility, connectivity, convenience, and safety around public transport nodes, it is important to examine how these factors influence students' travel choices. A review of literature revealed that while many studies have discussed TOD and public transport usage in urban areas, research focusing specifically on students' travel behaviour in Klang Valley remains limited. Therefore, this study adopts a quantitative approach to identify TOD factors and analyse their relationship with students' travel behaviour. The findings are expected to provide useful insights for urban planners, transport authorities, universities, and future researchers in promoting more sustainable and student-friendly mobility within Klang Valley.

ABSTRACT

Transit-Oriented Development (TOD) has become an important urban planning approach in improving public transportation usage and reducing dependency on private vehicles in urban areas. In Klang Valley, the expansion of MRT and LRT systems has encouraged the development of TOD environments to encourage the use of public transportation and promote sustainable travel behaviour. However, university students still face several transportation issues such as traffic congestion, long travel time, poor connectivity, and safety concerns when using public transport. Therefore, this research was conducted to identify the TOD factors that influence students' travel behaviour and to analyse the relationship between TOD factors and students' travel behaviour in Klang Valley. The TOD factors examined in this study include accessibility, connectivity, convenience, and safety. Questionnaires were distributed to university students in Klang Valley, and a total of 150 responses were collected. The collected data were analysed using regression analysis to examine the relationship between TOD factors and students' travel behaviour. The findings showed that all TOD factors significantly influence students' travel behaviour, with convenience identified as the strongest influencing factor. Therefore, improving TOD features may encourage greater public transport usage and support sustainable mobility among students in Klang Valley. However, this study is limited to university students in Klang Valley and relies only on questionnaire-based data collection. Future research is recommended to include a larger sample size, wider geographical coverage, and additional TOD-related variables to obtain more comprehensive findings.

Keywords: Transit-Oriented Development (TOD), Students' Travel Behaviour, Accessibility, Connectivity, Convenience, Safety, Klang Valley

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

Urban mobility has become a major issue due to environmental challenges, rising travel demand, and increasing traffic congestion. Therefore, one approach to addressing this issue is Transit-Oriented Development(TOD), which promotes compact, high-density, and mixed-use development around public transport nodes. TOD aims to reduce reliance on private vehicles, improve accessibility, and enhance the overall quality of urban living. It is also one of strategy that aims to generate compact, mixed-use developments around public transit stations, encouraging public transport use and reducing dependency on private vehicles (Saifful Nazmi et al., 2025).

This chapter presents an overview of the study on the influence of TOD factors to students' travel behaviour within Transit-Oriented Development (TOD) environments. The study focuses on Klang Valley, Malaysia which has developed transit systems Mass Rapid Transit (MRT) and Light Rapid Transit (LRT) for urban transportation. The study examines how transit-oriented environments support more sustainable and convenient travel behaviour among young urban commuters by studying students who use public transport.

1.1 Research Background

Transit-Oriented Development, also known as TOD, is an urban planning where high-density and mixed-use development is built within walking distance of public transportation as such as the LRT, MRT, Bus Rapid Transit (BRT), Keretapi Tanah Melayu (KTM), or even Electric Train Service (ETS). The major goal of TOD is to create a convenient environment where people can live, work, and travel without relying on private cars. In the Malaysian context, TOD has been increasingly emphasised as a key urban planning strategy, particularly in the Klang Valley. Large-scale rail infrastructure projects, including MRT and LRT expansions, have encouraged the development of high-density residential and commercial projects around transit stations. These initiatives aim to improve public transport ridership, alleviate traffic congestion, and promote sustainable urban development (Nasrudin et al., 2020).

Empirical studies in Malaysia suggest that TOD implementation has the potential to improve accessibility and mobility outcomes. Research conducted by Sidek et al. (2020) found that accessibility, connectivity, and service reliability significantly influence rail transit usage among urban residents in Klang Valley. Similarly, Abdullah et al. (2023) highlighted that pedestrian connectivity, safety, and comfort are critical TOD attributes affecting public perception and usage of rail-based transport systems in Malaysia.

Despite these advantages, TOD effectiveness varies across different population groups. University students form a substantial segment of public transport users in urban areas, particularly in cities with large higher-education institutions. However, students' travel behaviour differs from that of working adults due to irregular schedules, limited income, and lifestyle preferences. Studies in Malaysia indicate that younger adults and students are more sensitive to travel costs, waiting times,

and perceived convenience when choosing transportation modes (Yusoff et al., 2021).

Research on travel behaviour further shows that factors such as accessibility, safety, connectivity, travel time, and convenience play a significant role in influencing public transport usage (Kamruzzaman et al., 2014; Sidek et al., 2020). However, while these factors have been widely examined among general commuters, there is limited empirical evidence focusing specifically on students in TOD environments. This lack of focus is significant given that students may prioritise affordability and proximity to campus over other considerations.

Although TOD developments continue to expand in Klang Valley, existing Malaysian studies predominantly focus on households, office workers, or general commuters. Students, despite being a major group of transit users, remain underrepresented in TOD research (Abdullah et al., 2023). This gap highlights the need for focused investigation into how TOD features influence students' travel behaviour.

1.2 Problem statement

Transit-Oriented Development (TOD) serves as an effective urban planning method which increases public transportation use through its design of transit stations that connect to mixed-use areas and walkable spaces. TOD aims to reduce dependency on private vehicles while improving accessibility and enhancing urban transportation systems. However, the benefits of TOD infrastructure may not equally support all demographic groups, particularly university students.

In Malaysia, university students represent a major part of the population which depends on their daily travel needs to reach their campuses and dormitories and perform other activities. However, students who live in or near TOD zones still prefer to use private cars and e-hailing services instead of public transit. The situation demonstrates a problem because it shows whether TOD planning provides suitable assistance for student mobility requirements.

Several factors may contribute to this issue. One key factor is the perceived convenience and quality of public transportation. Students may view public transport as inconvenient due to long waiting times, overcrowding, safety concerns, and inadequate last-mile connectivity between transit stations and destinations. Previous research conducted in Malaysia showed that young people choose to use public transportation more often when they perceive the system as easy to use and accessible and safe to use (Sidek et al., 2020; Abdullah et al., 2023). In addition, students often evaluate travel cost and time differently from working adults due to limited income and flexible schedules, yet these differences have not been adequately examined in existing TOD research.

Despite the rapid expansion of TOD projects in Klang Valley, limited studies have specifically focused on university students as public transport users. Most existing studies examine general commuter behaviour rather than the specific mobility patterns and housing considerations of students (Nasrudin et al., 2020). This lack of targeted research creates uncertainty about how TOD features influence students' travel behaviour.

Therefore, this study investigates the influence of TOD Factors, namely accessibility, connectivity, convenience, and safety, on students' travel behaviour in Klang Valley. The findings of this study may contribute to improving TOD

planning and public transportation strategies that better support students' mobility needs.

1.3 Research Questions

1. What Transit-Oriented Development (TOD) factors influence students' travel behaviour in Klang Valley TOD environments?
2. How is the relationship between TOD factors and students' travel behaviour?

1.4 Research Objectives

This section will present the objective used to study the whole research.

1.4.1 General Objectives

To examine the factors influencing university students' travel behaviour within Transit-Oriented Development environments in the Klang Valley.

1.4.2 Specific Objectives

1. To identify TOD factors that influences students' travel behaviour.
2. To analyse the relationship between TOD factors and students' travel behaviour.

1.5 Scope of study

The study investigates Transit-Oriented Development (TOD) areas in the Klang Valley, which serve as the most developed public transportation systems for Malaysia. The research targets university students who form a major group that uses public transportation for both their daily travel and their housing choices. The research identifies key factors that influence students' decisions about where to live and how they will travel. The first part of the study examines TOD features, which include public transport accessibility and environmental safety and transport mode connections and location accessibility. The second part of the study examines students' travel behaviour, which includes their commuting patterns and their selected transportation methods and their travel frequency, which investigates how various TOD factors influence students' travel behaviour within TOD areas.

1.6 Significance of Study

The findings of this study contribute to both academic and practical contexts. Academically, the study adds to Malaysian TOD literature by providing student-focused insights into travel behaviour. Practically, the results may assist urban planners, policymakers, universities, and developers in improving TOD planning and housing strategies to better support students' mobility, affordability, and access to public transportation.

1.7 Chapter Layout

Chapter 1 introduces the study by providing the research background, problem statement, research questions, research objectives, significance of the study, and the overall structure of the research. This chapter establishes the context and rationale for the study.

Chapter 2 reviews literature related to Transit-Oriented Development factors and student transportation patterns. The chapter presents the TOD concept together with its association to travel patterns with components of accessibility , connectivity, convenience and safety. The study establishes its theoretical foundation through an examination of relevant theories together with prior research studies.

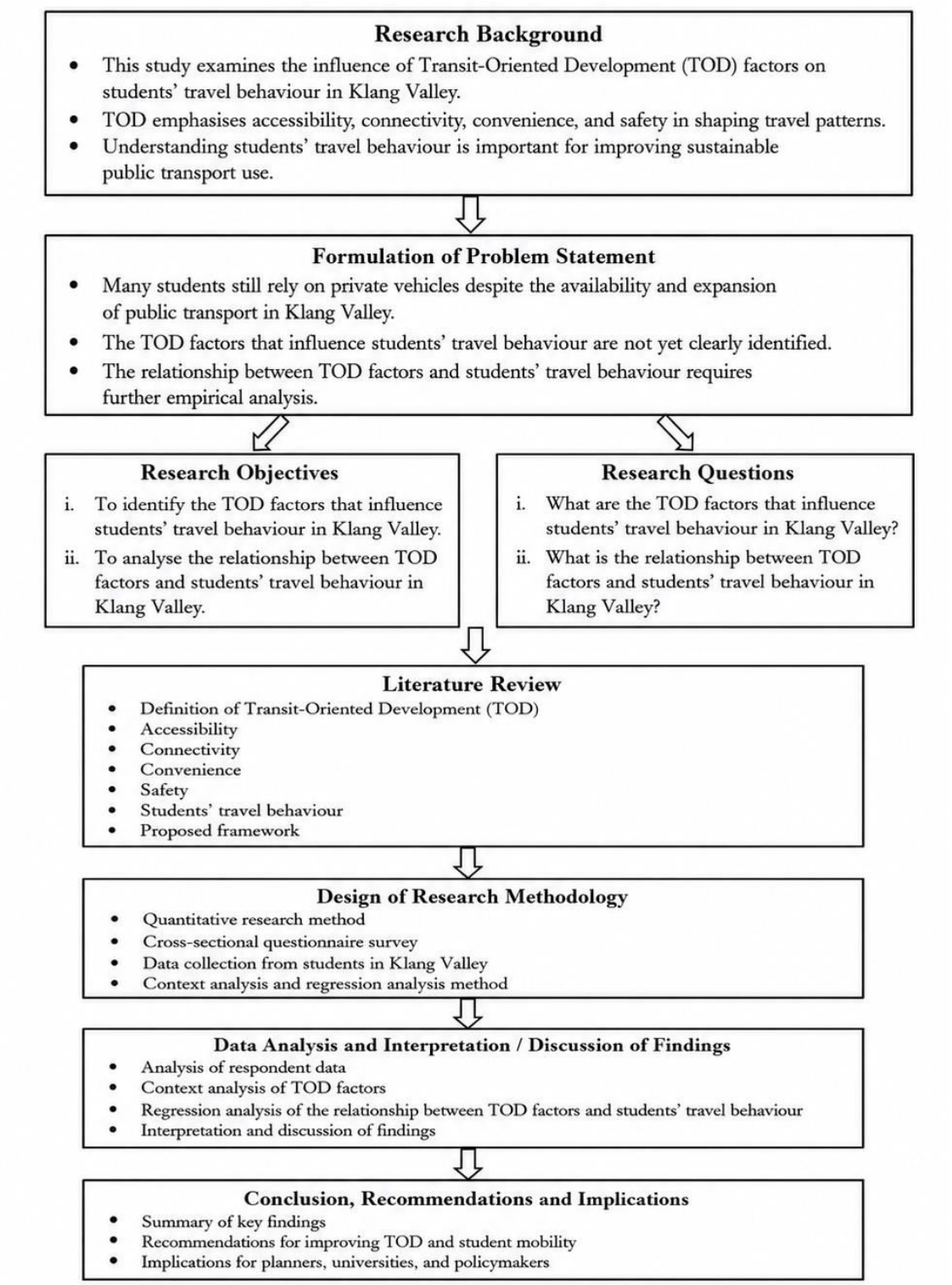
Chapter 3 explains the research methodology used in this study. The chapter describes all research elements which include research design, population, sampling method and sample size followed by data collection method by using questionnaire design and the data analysis techniques. The chapter demonstrates how to measure the independent variable (TOD factors) and the dependent variable (Students' Travel Behaviour). The methodology provides a systematic approach for achieving the research objectives.

Chapter 4 presents the data analysis and findings through Chapter 3. The data collected from respondents are analysed through descriptive analysis, reliability analysis and regression analysis which served as appropriate statistical methods to evaluate the data obtained from the respondents. The chapter provides demographic information about the study participants together with reliability assessment results, descriptive assessment results and regression analysis outcomes. The results are interpreted based on the research questions and research objectives.

Chapter 5 presents major findings through Chapter 4, to demonstrate how research connect to objectives and existing literature. The study explains how TOD factors affect student travel patterns in the Klang Valley according to the findings presented in chapter 4. It also presents its conclusions together with implications of study, limitations and recommendations for future research. The chapter presents complete study results while recommending better practices for TOD planning and student travel throughout the whole study area.

1.8 Research Flowchart

Figure 1.1: Research Flowchart



Source: Developed for the research

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

TOD is an urban planning approach widely adopted by cities worldwide to promote sustainable transportation and integrated land use. (Calthorpe 1993). The Klang Valley region of Malaysia experiences a major transformation of its urban transportation systems because of rapid development which includes Mass Rapid Transit (MRT) and Light Rail Transit (LRT) and KTM Komuter rail networks (Yap et al. 2021; Abdullah et al. 2023).

Despite these developments, the effectiveness of TOD cannot be evaluated solely based on infrastructure provision or urban design. Instead, it is essential to examine how individuals respond behaviourally to TOD environments. Among various population groups, students represent a unique segment due to their high reliance on public transportation, limited financial capacity, and sensitivity to travel-related factors such as cost, convenience, and safety (Ghani et al., 2020; Kalhoro et al., 2021).

This research examines four TOD features, which include accessibility and connectivity and convenience and safety, to measure their impact on student travel patterns. Travel behaviour exists as a complex construct, which consists of three components that include mode of transportation and travel frequency and commuting distance. The indicators show how students move in TOD environments according to their transportation patterns.

Furthermore, this chapter presents three theoretical frameworks which include Transit-Oriented Development theory and The Theory of Planned Behaviour and Von Thünen Theory. The theories explain how physical infrastructure and behavioural intentions and spatial factors work together to determine travel choices. The chapter uses a literature review to find essential research gaps while creating a conceptual framework that directs the scientific study which follows in later chapters.

2.1 Definition and Core Principles of TOD

Transit-Oriented Development (TOD) is urban planning and urban development practice which establishes pedestrian-friendly development zones that combine multiple land uses with public transportation systems throughout their service areas(Yap & Goh, 2017). The main objective of TOD Transit systems aims to reduce private vehicle usage by making public transportation and active travel routes more appealing while providing better access to employment centres educational institutions and municipal services(Suzuki 2015).

The literature in Malaysia describes the principles of TOD mainly through the "5Ds" concept: density, diversity, design, destination accessibility, and distance to transit (Yap et al., 2021). The density of people and activities establishes a specific area which transit users need to move through while better land use occurs(Abdullah & Mazlan 2016). People can complete their daily tasks because residential areas commercial spaces educational institutions and recreational facilities are located within walking distance of each other(Gomez et al. 2019).

Design establishes the essential elements which shape both pedestrian walking experiences and their assessments of safety. The first-mile and last-mile connection

system, which serves as a critical element for TOD operations, depends on walkable street designs and uninterrupted sidewalks with adequate lighting and protected pedestrian crossing areas (Pongprasert & Kubota, 2018). The distance to transit shows that very important point of having the location of development within an easy walking distance, commonly 400–800 meters from stations, while the accessibility of the destination shows how convenient public transportation services reach the main activity areas (Yap & Goh, 2017).

The research from Malaysia shows that transit-oriented development (TOD) projects achieve their planned density and mixed-use components but fail to meet pedestrian design standards which results in diminished TOD benefits (Ahmad et al., 2022; Abdullah et al., 2023).

2.1.1 TOD in the Malaysian Planning Context

The Malaysia government has promoted TOD through investments in rail transit systems and supportive planning policies. The Klang Valley area has witnessed the growing of the MRT and LRT systems and elevating the public transportation use along with planning policies which are favouring higher-density and mixed-usage development in the vicinity of the stations (Yap et al., 2021; Abdullah et al., 2023). The government has also promoted such initiatives in the northern states of the country and the island of Penang, usually alongside urban renewal and the development of transit corridors (Din et al., 2023).

The Malaysian TOD schemes have proved the results as they have improved public transport access and increased public transport usage and enhanced the quality of life for people who live in those regions (Abdullah & Mazlan, 2016; Din et al., 2023). Despite these positive outcomes, there are still some problems to be resolved,

such as the lack of good quality walkways, poor first-mile connections, and increase of housing prices near the transits (Ahmad et al., 2022; Dziauddin, 2021).

These problems are especially significant for students. Easy access to public transportation helps students move around; however high living expenses make it hard for them to secure housing in Transit Oriented Development (TOD) areas which should provide multiple access points to different communities.

2.1.2 Variations in TOD Outcomes across Malaysian Cities

The outcomes of TOD in Malaysia show different results between the urban areas of Klang Valley and Penang and smaller cities. The Klang Valley area operates TOD as the primary development strategy for both its MRT and LRT systems which use high-rise building developments to produce substantial property value increases (Dziauddin, 2021; Mentaza Khan et al., 2025).

However ,TOD remains an incomplete concept in Penang and northern Malaysia because rail systems lack proper pedestrian connections which are essential for its implementation (Din et al., 2023). The various environments require specific evaluations of TOD effects on students which should be assessed through their respective urban and institutional contexts rather than applying a uniform national standard.

2.2 Rail Transit Systems and Urban Accessibility in Malaysia

Malaysia's public transportation system relies heavily on rail-based networks as the backbone of TOD. The transit-oriented development (TOD) that influences travel behaviour has a close connection with the rail transit systems characteristics, coverage, and efficiency. The MRT, LRT, and KTM Komuter rail systems in Malaysia have transformed urban accessibility throughout the country, especially in densely populated regions. The students experience different accessibility levels to city destinations because system design elements and service quality standards and spatial integration features create different user experiences.

The relationship between rail transit systems and TOD environments functions as a crucial element that helps explain how rail transit systems influence students' daily commute patterns and their ability to afford transportation.

2.2.1 Types of Rail Transit Systems in Malaysia

The urban rail network in Malaysia mainly consists of three systems: Mass Rapid Transit (MRT), Light Rail Transit (LRT), and KTM Komuter, which is a commuter rail service. These systems differ in capacity, coverage, and operational characteristics, influencing TOD effectiveness. The MRT network functions as a complete high-capacity rail service which provides frequent train service for passengers traveling between different parts of the city. The MRT lines connect the densely populated residential areas with the employment, commercial, and educational hubs, thus, making them a pertinent aspect of the TOD strategies (Yap & Goh, 2017). The large size and expensive construction of MRT stations make them attractive locations for development projects that include residential and commercial spaces, which results in significant changes to land use patterns found near these stations (Mentaza Khan et al., 2025).

The LRT system is a medium-capacity rail network and usually uses more closely spaced stations in the same urban areas. LRT lines are instrumental in urban density areas and provide accessibility between different neighbourhoods and institutions, including universities, thus their location is such that they are in proximity to the already established neighbourhoods and institutional zones (Abdullah et al., 2023). LRT-based TOD developments are more intertwined with the urban fabric, and yet they also experience limitations as a result of the right-of-way issues and the older station designs.

The Malaysian commuter rail service operates through KTM Komuter which serves as a transit link connecting suburban and peri-urban areas with urban centres. Researchers recognize the potential of commuter rail systems to improve regional access but they consider the system's operational frequency and service reliability as primary drawbacks together with its station design which does not connect to adjacent areas (Bachok et al., 2013; Khalid et al., 2014). The deficiencies of the KTM Komuter system at its stations reduce their effectiveness as transit-oriented development centres which students use for their essential and timely transportation needs.

The different accessibility levels of various transit-oriented development environments between the two systems create a distinct difference between their operational effectiveness. Students who live close to MRT or LRT stations experience greater mobility advantages compared to students who depend on commuter train services.

2.2.2 Rail Transit Investment and Urban Land-Use Transformation

The development of a new rail transit system in Malaysia has resulted in urban changes that affect local land use patterns. The research demonstrates that station construction brings about two main effects which are development density increase and changes in land development patterns towards mixed-use development and rise in real estate activities (Dziauddin, 2021; Muhammad et al., 2024).

The resulting land transformation shows positive results for transit-oriented development because it produces higher population densities which enable shorter distances to reach multiple transit stations. The resulting effects from these modifications distribute themselves throughout the entire population area. The city gains better overall operational effectiveness through accessibility enhancements which result in increased land and rental costs for properties located near transit stations according to Sa'ari and Ahmad 2019 and Mentaza Khan et al 2025.

Take the students for example; the situation created by these dynamics works in an opposite direction for students. Transit investments create two benefits because they improve access to campuses and they connect people to urban amenities. Students will find it hard to rent apartments in the transit-oriented development areas because station-area rent increases will make housing costs unaffordable. The contradiction requires a dual approach that examines TOD effects through real land-use data while protecting the interests of low-income communities.

2.2.3 Station-Area Development and Spillover Effects

The development of the station area is a fundamental aspect of the TOD. The research by Yap and Goh from 2017 shows that Malaysian high-density residential

and commercial development occurs within a walking distance range of 400 to 800 meters from train stations.

The effects of transit-oriented development (TOD) spillover extend beyond the boundaries of station areas. The research by Dziauddin (2021) established that property values near metro stations experience a value increase which decreases with distance yet certain corridors maintained their substantial impact value even after reaching one kilometre distance. The specific type of spillover effects creates an impact which extends beyond the area surrounding the station to affect both rental markets and residential location choices.

The spillover effects create two different outcomes which affect students. The locations just a little further away from the station may be reasonably priced compared to the immediate area yet the improved accessibility is a common feature there. The success of such locations, though, is largely determined by the availability of pedestrian links and feeder transport services which can be very sporadic in Malaysian cities (Ahmad et al. 2022).

2.2.4 Transit Accessibility and Daily Travel Behaviour

Improved transit accessibility leads to changes in daily travel patterns because it decreases car use and encourages more people to use public transportation. Residents who live within walking distance of rail stations demonstrate higher public transportation usage and walking activities according to studies conducted in Malaysia (Yap et al. 2021).

The group of students who need public transportation shows high levels of sensitivity towards accessibility changes. Kalhoro et al. (2021) discovered that young people show greater interest in public transportation when they find the

service to be both dependable and economical while accessible throughout the day. Students at transit-oriented developments choose rail travel as their primary transportation option because train stations exist within close proximity.

However, public transport usage requires more than just accessibility to train stations. Students decide to use rail systems for their daily travel based on three factors which include service reliability and system comfort as well as their perceived safety of the system (Hizam et al. 2021).

2.2.5 Service Quality, Reliability, and Student Perceptions

The choice of transportation methods by students is mainly influenced by their service quality assessment which they conduct during their travel time. The main factors which determine commuter satisfaction and loyalty in Malaysia include three factors which are train arrival times and train frequency and passenger count and system cleanliness and safety measures (Khalid et al., 2014; Hizam et al., 2021).

Bachok et al. (2013) found that people avoid using trains because they complain about delays and overcrowded KTM Komuter services. Students who rely on unreliable transportation face three consequences which include arriving late to class and experiencing increased stress and losing chances to complete their academic work.

The evaluation of successful outcomes in TOD should include both distance measurements and ridership statistics as evaluation criteria. Service provision requires assessment of qualitative elements because they generate effects which particularly impact students.

2.2.6 Spatial Equity, Campus Location, and Student Accessibility

The Malaysian transit-oriented development research considers transit network connections to university campuses as an important topic which needs further research. Some university campuses are situated near major urban areas while other campuses experience low accessibility because of inadequate rail transit service (Yap & Goh, 2017).

Students attending campuses outside well-connected transit corridors may face longer travel times and higher transportation costs, even if TOD projects exist elsewhere in the city. The existing socio-economic gap between students exists because of this mismatch between their educational requirements and the existing transit system.

Students select their transportation methods through different factors which include how easily they can access public transit and their housing location and how much money they will spend each day. The subsequent section will examine student travel patterns and their housing selection process through the application of behavioural frameworks.

2.3 Students' Travel Behaviour

This part will be discussed on the definition of travel behaviour, the components of travel behaviour includes mode choice, travel frequency and commuting distance.

2.3.1 Definition of Travel Behaviour

Students' travel behaviour shows how university students move during their daily activities by studying their travel methods and travel frequency and their commuting distances between home and campus and other places they visit. Transportation researchers use various indicators to study travel behaviour which includes three main elements that define how people move within their particular surroundings (Ewing & Cervero, 2010; Limtanakool et al., 2006).

The research showed that students have a unique travelling pattern which distinguishes them from the general population. Unlike working adults, students face different financial challenges because they own fewer cars and rely more on public transportation services (Ghani et al., 2020; Kalhoro et al., 2021). The transport infrastructure quality and transport infrastructure availability become crucial because they determine how people move through Transit-Oriented Development (TOD) areas.

2.3.2 Mode Choice

The term mode choice describes how people decide which transportation methods they will use to travel throughout their daily activities. The travel behaviour aspect that matters most because it shows how people select their transportation methods based on their personal needs and the transportation options available in their area(Ben-Akiva & Lerman, 1985; Ewing & Cervero, 2010).

Student transportation decisions depend on three main factors which include their ability to pay and how easily they can reach their destinations. Research conducted in Malaysia demonstrates that students tend to use public transportation systems which include MRT and LRT and bus services when these systems provide easy

access and efficient operation(Yap et al., 2021). According to Hizam et al. (2021), students choose to use alternative transportation methods because they find public transit systems unreliable due to their excessive crowding and extended wait times.

TOD design elements directly influence transportation mode choice. The two elements which determine student transit station access are accessibility and transit station accessibility. User convenience determines safety which affects whether people will choose to walk or take public transportation. The selection of transportation methods shows how TOD elements determine student travel patterns.

2.3.4 Travel Frequency

The measurement of travel frequency tracks how many trips people take during established time intervals which include both daily and weekly periods. Students who need to travel between their homes and school throughout the academic year find themselves making multiple trips daily, which includes their daily school trips and their need to visit different locations for school activities and personal reasons (Limtanakool et al., 2006).

The frequency of travel in TOD environments depends on how easy and quick people can move around the area. People will choose to travel more often when they find it easier to reach their destinations because it reduces the time and effort they need for their daily trips. The presence of unproductive transportation networks leads to people traveling less frequently because they experience both difficult travel conditions and exhaustion from their journeys.

Students who travel more often to different locations show increased reaction to changes in transportation situations. Daily routines face major disruptions from unreliable services and unsafe environments, which create mobility problems that,

in turn, affect students' academic progress and ability to take part in school-related events (Ghani et al., 2020). The travel frequency measurement serves as an essential tool which helps assess how effectively TOD features enable students to move about for their daily activities.

2.3.5 Commuting Distance

Commuting distance refers to the distance between residence and main destinations such as universities. The distance between two points determines how people will travel because it impacts the time needed for travel and the expenses involved and the entire experience of commuting (Ewing & Cervero, 2010).

Commuting distance in Malaysia shows different results because students live in different places and their distance from public transportation systems varies. Students who live near MRT or LRT stations experience shorter commute times because they use public transportation more frequently (Yap et al., 2021). The distance students need to travel to reach transit nodes directly affects their transportation expenses and travel duration which affects their ability to move throughout the day.

Students who travel long distances to school demonstrate higher levels of stress and fatigue which result in decreased academic participation (Ghani et al., 2020). Effective TOD planning needs to decrease commuting distances because it helps students achieve better life quality and travel efficiency improvements.

From variable perspective people who use transportation systems need both accessibility and connectivity to control their commuting distance. People can reach transit services with shorter travel distances, which improves their ability to reach these services while better connectivity gives them optimal travel paths,

2.4 TOD Features

The TOD features involves components such as accessibility, connectivity, convenience and safety. This section will further review these components.

2.4.1 Accessibility

The primary element which defines Transit-Oriented Development stands as accessibility because it helps people reach vital locations which include transit stations and educational institutions and urban facilities (Geurs & van Wee, 2004). The Klang Valley area experiences better accessibility because the MRT and LRT networks have expanded their systems, which enables people to travel more efficiently between different locations.

However, distance measurement fails to capture the complete nature of accessibility. The system has three main components which include spatial accessibility that assesses how close people live to transit stations and temporal accessibility which measures both travel times and service operations and functional accessibility which evaluates how easily people can access different locations. Ahmad et al. (2022) argue that in Malaysia, many TOD developments achieve proximity to transit stations but fail to provide effective access due to poor pedestrian infrastructure and inadequate feeder services.

This issue is particularly important for students because students depend on public transport and walking to travel between their home and school which makes this problem urgent. Students cannot change their transport methods because they come from lower-income backgrounds. Students will experience major changes in their travel patterns because they face even the smallest accessibility obstacles which include unsafe walkways and lengthy transfer periods.

From a variable perspective, accessibility directly influences the dependent variable (travel behaviour) in the following ways:

- Mode of transportation: Higher accessibility increases likelihood of public transport usage
- Commuting distance: Better accessibility reduces distance to destinations
- Travel frequency: Improved access encourages more frequent travel

Ewing and Cervero (2010) also confirm that accessibility is one of the strongest predictors of travel behaviour, particularly in transit-oriented environments.

Thus, accessibility is not only a physical characteristic but also a behavioural driver, making it a critical independent variable in this study.

2.4.2 Connectivity

Connectivity describes how well transportation systems connect different locations which enables smooth travel across various transportation modes. The system includes three components which are route availability and network design and intermodal integration.

The transport systems in Malaysia show different levels of infrastructure connectivity which affects their performance. The MRT and LRT systems deliver better operational connectivity compared to KTM Komuter which struggles with network coverage and service reliability problems (Bachok et al. 2013). Users face problems with their travel times because of the network's uneven connectivity.

For students, they require good network access because it determines whether they can use public transport as their primary means of travel. Students use different transportation methods which include walking and taking buses and rail services. Travelers face extended travel durations because of two problems which include

poor transit links between transportation systems and actual travel time needed for different routes.

Hensher et al. (2008) argue that public transport performance depends mostly on how well various transit systems connect because passengers need to transfer between different transit systems. In Malaysia, Hizam et al. (2021) found that lack of integration between rail and bus systems significantly reduces commuter satisfaction.

From a variable perspective, connectivity influences students' travel behaviour by:

- Reducing travel time and transfer complexity
- Increasing reliability of travel routes
- Enhancing flexibility in commuting options

Therefore, connectivity strengthens the effectiveness of accessibility and directly contributes to improved travel behaviour outcomes.

2.4.3 Convenience

Convenience refers to the ease, comfort, and reliability of transportation systems, including factors such as waiting time, service frequency, and overall travel experience.

Public transport in Malaysia relies on convenience as its primary factor which determines passenger usage. Hizam et al. (2021) discovered that commuters show strong reactions towards service reliability because they consider delays and overcrowding as the main reasons for their discontent.

For students, they require easier access to their academic needs because they must complete their studies within specific timeframes. Students experience daily interruptions because they face long waiting periods and unreliable services and uncomfortable travel situations which lead to academic decline. Public transport usage depends on perceived convenience according to Beirão and Cabral (2007) who conducted their research. The Theory of Planned Behaviour establishes that attitudes determine how people will execute their actions.

From a variable perspective, convenience affects:

- Mode choice: Students prefer more convenient transport options
- Travel frequency: Higher convenience encourages regular use
- User satisfaction: Influences long-term behaviour

Thus, convenience acts as a psychological driver that translates TOD features into actual travel behaviour.

2.4.4 Proximity to Transit and Campus as Key Determinants

Proximity to educational institutions and public transport is ranked high among the factors that students consider when choosing their residence, according to empirical studies which never fail to confirm this fact. In their research, Kam et al. (2018) point out that in Malaysia, the youth have assigned the highest value to the accessibility and convenience of housing, even over the size of the dwelling or its attractive design.

The proximity to transit stations gives the students a number of benefits. Cutting down on commuting distances leads to a reduction of time spent travelling, highly minimised transportation costs and more participation in academic and social activities. On the other hand, Ghani et al. (2020) support the idea that students living closer to the campuses or the areas with good public transport have less daily stress and are more involved in their studies.

In the areas where the concept of TOD is applied, the combination of public transport and educational institutions enables the creation of prime locations. However, the increasing rents near the stations frequently take away the students' chances of enjoying these facilities. Consequently, the students have to settle for locations that are farther from the public transport corridors, which leads to longer travel time and increased transport expenses.

2.4.5 Safety

Safety stands as the main factor which determines how people travel throughout their journey. The system provides two types of safety elements which include physical safety measures for crime prevention and lighting as well as traffic safety functions through pedestrian infrastructure.

In the Malaysian context, Ahmad et al. (2022) study shows that Malaysian transit-oriented development environments lose their appealing qualities because of three factors which include inadequate lighting and unsafe crossings and poorly maintained pedestrian pathways. These issues are especially significant for students, who often travel during early morning or late evening hours.

Loukopoulos and Gärling (2005) study shows that people who need to use public transport according to their safety perceptions will use active travel methods which include walking. People tend to avoid using public transport systems when safety standards become deficient also when the systems provide easy access and travel convenience.

For students, safety concerns may lead to:

- Avoidance of walking to transit stations
- Reduced travel frequency
- Increased reliance on ride-hailing services

From a variable perspective, safety directly influences behavioural outcomes by affecting both physical mobility and psychological comfort.

Therefore, safety is not merely a supporting factor but a fundamental requirement for effective TOD implementation.

2.5 Influence of Built Environment on Travel Behaviour

The built environment serves as the main factor which determines how people travel in transit-oriented development areas. The built environment's 5Ds which include density and diversity and design and destination accessibility and distance to transit

systems according to Ewing and Cervero (2010) create a combined effect which determines how people travel.

In Malaysia, TOD developments often achieve high density and mixed land use, which theoretically support public transport usage. However, several studies show that existing design elements for pedestrian infrastructure and walkability continue to fall short of requirements (Ahmad et al., 2022).Students find walking to be the main way which they travel to school so the built environment becomes essential for their needs. The presence of transit stations nearby becomes ineffective for transit-oriented development because unsafe crossings and shelter shortages and poorly designed pedestrian pathways create dangerous conditions for people who want to walk to their destinations.

2.5.1 Interaction Between TOD Features and Behavioural Factors

An important insight from the literature is that TOD features do not operate independently but interact with behavioural factors to influence travel decisions.

For example, accessibility may increase the potential for public transport usage, but actual behaviour depends on perceived convenience and safety. This interaction is well explained by the Theory of Planned Behaviour, which emphasises the role of attitudes and perceived control in decision-making (Ajzen, 1991).

Hizam et al. (2021) found that commuters' satisfaction with rail services is strongly influenced by perceived reliability and comfort. Negative public transport perceptions decrease usage rates even when people have strong access to transit systems. The study shows that transit-oriented development success depends on both physical infrastructure and psychological and experiential elements.

2.6 Behavioural Perspectives on Travel Behaviour

Attitudes, Perceptions, and Habits

Behavioural travel theories emphasize theoretical concepts which explain travel behaviour through psychological and perceptual factors that fundamental guide travel behaviour patterns. The factors include public transportation attitudes together with perceived service quality and comfort and safety and habitual behaviour (Hizam et al., 2021).

People in Malaysia believe that public transport reliability and timely service delivery create the strongest link to their satisfaction which determines their future use of public transport (Khalid et al., 2014; Hizam et al., 2021). Students develop avoidance behaviours which lead them to choose ride-hailing services and informal transport methods because they want to avoid negative experiences that include delays and overcrowding.

Habit Formation and Early Adulthood

The process of habit development stands as a key part of student behaviour. The travel behaviour literature points out that the habits developed in early adulthood are often carried on to the later stages of life (Kalhoro et al., 2021). Students who benefit from efficient public transportation systems during their time at university will choose sustainable travel methods as their permanent travel preferences. Yap et al. (2021) present a case that the TOD (Transit Oriented Development) environments are habit forming as they incorporate public transport into the daily life routines. Students develop a new behaviour pattern when they start using train services to reach their educational institution because they complete their campus visits through train service. The student who receives inadequate service during their formative years will return to driving when they attain financial stability because they developed a preference for private vehicle use.

2.6.1 Role of Perception in Travel Behaviour

People's travel patterns depend more on their perception of accessibility than on actual accessibility measurements. For instance, two students living at the same distance from a transit station may exhibit different travel behaviours based on their perceptions of safety, reliability, and convenience. This aligns with the Theory of Planned Behaviour, which emphasises the importance of subjective factors in decision-making (Ajzen, 1991).

The people of Malaysia observe service quality which serves as the main factor that determines their usage of public transportation services. The study by Hizam and his colleagues in 2021 proved that commuters experience higher satisfaction levels when they perceive reliable services and comfortable transportation options. The analysis shows that TOD effectiveness needs both physical infrastructure improvements and better service quality and user experience enhancements.

2.6.2 Behavioural Adaptation in TOD Environments

An important but often overlooked aspect of TOD research is behavioural adaptation. People develop their response patterns to environmental situations instead of using infrastructure as their main response method.

Students demonstrate adaptive behaviour in response to TOD features. For example:

- When accessibility is high → increased public transport usage
- When convenience is low → shift to ride-hailing services
- When safety is poor → reduced walking

(Ghani et al., 2020; Hizam et al., 2021)

The adaptive behaviour demonstrates how TOD features interact with travel patterns in a constantly changing relationship. The process of people adapting their

behaviour depends on their established patterns of behaviour according to the research. The authors Kalhoro et al. 2021 found that students who use public transportation during their university studies will keep using it after graduation. The research shows that TOD environments create permanent changes in human behaviour.

2.6.3 Socio-Economic Context of Students

Students represent a unique socio-economic group with distinct travel behaviour characteristics.

Unlike working adults, students typically have:

- Limited income
- No private vehicle ownership
- Flexible but time-sensitive schedules

(Ghani et al., 2020)

These characteristics make students highly dependent on public transport and sensitive to TOD features.

2.7 Critical Discussion of TOD and Travel Behaviour

Although TOD has been widely promoted as an effective strategy to improve public transport usage, its effectiveness varies across different contexts. In Malaysia, TOD developments often achieve high density and mixed land use; however, issues such as poor pedestrian infrastructure, weak connectivity, and safety concerns limit their effectiveness. Furthermore, socio-economic factors such as affordability and accessibility create unequal benefits among users, particularly students. These limitations highlight the need for further investigation into how TOD features influence students' travel behaviour.

In the Malaysia, TOD has been applied because developers want to create high-density residential and commercial areas near public transportation hubs. Ahmad et al. (2022) argue that the success of Transit-Oriented Development (TOD) should not be evaluated through infrastructure assessment and property development results but through its impact on actual user behaviour. Public transit usage increases because of transit infrastructure presence, which makes this distinction essential. Hizam et al. (2021) show that users develop different habits because they have different views about service reliability and comfort and safety. People evaluate Transit-Oriented Development (TOD) success through their personal experiences rather than the public transit system's actual accessibility.

Furthermore, the existing research shows that transit-oriented development results in different outcomes for emerging nations because their systems operate differently than those of industrialized countries. The study conducted by Suzuki (2015) demonstrates that developed nations experience decreased car dependency and better pedestrian access through transit-oriented development implementation but developing nations encounter difficulties because of their governance systems and infrastructure limitations and social economic disparities. The Klang Valley area experiences its difficulties through its incomplete pedestrian pathways and irregular public transport connections and unbalanced access between different

transportation systems (Abdullah et al., 2023). The students at the school do not receive full advantages from transit-oriented development spaces because their rail systems have better access but they still lose some benefits.

2.7.1 Expanded Critical Evaluation of TOD in Malaysia

Despite significant investments in TOD, numerous operational obstacles remain in the Malaysian context for TOD projects. First, market forces establish the primary requirements for TOD implementation instead of directing it towards user needs. Developers concentrate their efforts on constructing high-density residential and commercial buildings, which fall short of providing proper solutions for connectivity and safety problems (Ahmad et al., 2022).

Second, the existing public transportation system lacks complete synchronization among various transportation methods. Rail systems enable better access to destinations, but their operational capabilities face limitations because of inadequate feeder services and unsafe pedestrian pathways (Abdullah et al., 2023).Third implementation of TOD programs encounters challenges because socio-economic differences between various groups determine their access to benefits. Students need to deal with two major obstacles that impede their travel which includes high costs and difficulties to reach their destination.

2.7.2 Strengths of Transit-Oriented Development

Transit-Oriented Development (TOD) is an urban planning strategy that city planners use to create sustainable transportation systems which enable efficient land development while decreasing the need for personal automobiles. The main

advantage of TOD enables its development of high-density buildings which combine multiple types of land use with public transportation systems that link to MRT and LRT stations (Calthorpe, 1993; Cervero & Kockelman, 1997). The system improves transportation options for people because it provides better access to public transit which displays enhanced walking and cycling possibilities.

The main advantage of TOD lies in its ability to create better access points which lead to improved mobility results. The TOD system enables people to reach their destinations faster while spending less money on travel because it places homes and businesses and public facilities close to transit stations (Ewing & Cervero, 2010). The Klang Valley area gained better access to public transportation after MRT and LRT system expansions which made it easier for people including students to navigate the complete territory (Yap et al., 2021). The system improves public transportation access points which makes the system more appealing to users and results in increased bus ridership and a decrease in road traffic.

The key advantage of Transit-Oriented Development (TOD) exists in its capacity to steer individuals toward choosing eco-friendly transportation methods. Research findings demonstrate that people residing in TOD regions exhibit higher public transit usage and decreased dependence on cars when compared to people living in non-TOD regions (Cervero & Murakami, 2009; Ewing & Cervero, 2010). The situation matters most for students because they need public transportation as their main transportation method due to their restricted access to private vehicles. transit-oriented development (TOD) enables students to develop environmentally-friendly travel patterns through its provision of easy-to-reach transportation services that include rail systems and pedestrian access to local places.

Transit-Oriented Development (TOD) establishes a system that effectively decreases traffic jams while promoting eco-friendly development practices. Transit-oriented development (TOD) decreases greenhouse gas output and fuel usage while enhancing air quality by moving people away from private cars toward public

transportation systems (Newman & Kenworthy, 1996; Litman, 2017). Transit-oriented development (TOD) provides urban areas such as Klang Valley with an effective approach to combat their ongoing traffic problems because it decreases vehicle traffic and enhances overall transportation performance.

The implementation of TOD enables cities to achieve effective land management and urban development solutions. The creation of high-density mixed-use developments enables cities to achieve compact urban environments through efficient land resource utilization which minimizes urban expansion (Cervero & Kockelman, 1997). The system enables cities to optimize their land resources because it creates better space allocation which maintains accessibility to essential public assets. The adoption of Transit-Oriented Development (TOD) in Malaysia has led to property value increases and economic growth in areas surrounding MRT and LRT stations which demonstrates the economic advantages of this transit-oriented development approach (Yap et al., 2021).

TOD provides a strong advantage because it improves social inclusion while enabling different population groups to access its services, including students and low-income people and individuals without personal vehicles. The public transportation system provides cost-effective and dependable transit solutions which enable residents to reach educational centres and job markets and various city attractions (Suzuki et al., 2013). Students benefit from TOD because it makes education more affordable through decreased transit expenses and better access to schools, which helps them succeed academically and maintain good health.

Furthermore, the development of transit-oriented development brings better urban quality of life and enhanced city living conditions. The combination of pedestrian-friendly streets and public spaces accessible to all people and transportation networks that operate effectively produces more active and liveable neighbourhoods (Gehl, 2010). People who can walk easily need less time for travel

which helps them spend their time on both work and socializing especially when they have to balance their student studies.

2.8 Relevant Theories

A strong theoretical foundation is essential in explaining how Transit-Oriented Development (TOD) influences students' travel behaviour, particularly within urban environments such as Klang Valley. This study uses the Theory of Planned Behaviour (TPB) and Von Thünen Theory to demonstrate how Transit-Oriented Development (TOD) elements impact student movement through real-world behavioural and geographic assessment. The theories explain how environmental factors and perception outcomes and spatial accessibility combine to impact travel decisions of people.

2.8.1 Transit-Oriented Development (TOD) Theory

Calthorpe (1993) introduced Transit-Oriented Development (TOD) theory which requires planners to combine land use and transportation design to construct areas which people can walk through and use public transit systems. The main goal of TOD aims to decrease private vehicle usage through better public transportation access and the promotion of environmentally friendly transportation methods.

In the Malaysian context, TOD has been implemented together with significant railway construction projects throughout Klang Valley. The expansion of MRT and LRT systems has improved public transport access which resulted in increased passenger usage (Yap et al., 2021; Abdullah et al., 2023). However, the effectiveness

of TOD depends not only on infrastructure availability and environment but also on how users perceive experience when they navigate the spaces.

Studies in Malaysia indicate that TOD developments often achieve high density and mixed-use characteristics but face challenges related to pedestrian infrastructure, connectivity, and safety (Ahmad et al., 2022). These limitations may reduce the behavioural impact of TOD among students who rely heavily on walking and public transport.

2.8.2 Travel Behaviour Theories Relevant to Students

Analysing students' travel patterns helps explain how people move in areas designed for transit-oriented development. Travel behaviour theories provide researchers with a fundamental framework to study how people respond to different transportation systems, their accessibility features, and the expenses and physical aspects of their surroundings. Students from different backgrounds choose their travel methods based on their financial limitations and their lack of access to vehicles and their need to travel at different times and their requirement for timely and accessible transportation (Ghani et al., 2020; Kalhoro et al., 2021).

Malaysian study of travel behaviour shows that building infrastructure will not lead to better mobility outcomes because people need to study how they travel. Users respond to systems. Their users develop their response through their system perception and user attitude and user behaviour and their socioeconomic background. Students select their travel methods based on both rational factors such as cost and travel time and safety aspects and service reliability and environmental aspects (Hizam et al., 2021).

The students' choice of transportation and their travel frequency and their long-term mobility patterns get affected by accessibility features that work with different behaviour factors in TOD environments. This section of the article reviews the fundamental travel behaviour theories which help explain how students travel in Malaysian transit-oriented development areas.

2.8.3 Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) which developed by Ajzen (1991), serves as a fundamental framework which explains human behaviour by demonstrating how beliefs and attitudes lead to actual behaviour. The theory explains that three components which include attitude, subjective norm and perceived behavioural control determine the behavioural intention which drives actual behaviour (Ajzen, 1991). Researchers have used Theory of Planned Behaviour to investigate how people choose their travel modes in urban areas with multiple transportation options because it provides an effective framework for this research (PBamberg et al. 2003 DE Vos et al. 2022).

In this study, TPB is used to examine students' travel behaviour because their travel choices depend on transportation infrastructure and their assessment of TOD elements which include accessibility and connectivity and convenience and safety. Students face challenges with their finances and mobility which makes them more aware of transport conditions than other groups do (Ghani et al. 2020). The psychological and behavioural factors drive their travel choices about transportation.

The first component of TPB is attitude, which refers to an individual's positive or negative evaluation of a behaviour (Ajzen, 1991). Students develop their attitude toward public transport through their actual experience with public transport systems. Students who see MRT or LRT services as reliable and comfortable and efficient services tend to develop positive attitudes toward public transport. Public transport usage decreases when people experience negative situations that include

service delays and overcrowded buses and low-quality services (Hizam et al., 2021). Higher convenience of TOD enables users to experience better service delivery because users perceive better service delivery through improved convenience.

The second component of subjective norm explains how social pressure from peers and family and societal expectations influence people (Ajzen, 1991). Students show a strong response to subjective norm because their travel behaviour follows the patterns established by their peers and their social surroundings. When most students at a university choose public transportation for their travel needs, this creates a social norm that encourages other students to do the same. Students choose other transportation options when they think private vehicle use provides them with better convenience and status. Studies have shown that subjective norms significantly influence travel intention, particularly among younger populations (Bamberg et al., 2003).

The third and most relevant component in this study is perceived behavioural control, which refers to the extent to which individuals believe they have the ability to perform a behaviour (Ajzen, 1991). The relationship exists between this element and the TOD features which exist in transportation systems. Students who study in areas with high accessibility find it easy to reach transit stations which increases their ability to control when they use public transport. The seamless transfer between different transport modes becomes easier because of strong connectivity which provides users with better control over their movements. Students choose public transport when they feel secure walking to stations and waiting at transit points because safety functions as a critical element in their decision-making process (Ahmad et al., 2022).

The factors of TOD which include accessibility together with connectivity and convenience and safety create an effect that determines how students perceive their ability to control their behaviour which subsequently leads to specific travel patterns. A student who lives close to an MRT station with safe walking routes and

dependable public transport services will find it easy to use public transport. People become less likely to use public transport when the infrastructure becomes insufficient and the situation becomes dangerous.

The independent variables of this research study impact the dependent variable through the variable approach of TPB. The two factors of accessibility and connectivity create better perceived behavioural control, while the two factors of convenience and safety impact both attitude and perceived control. The psychological mechanisms active in students determine their travel behaviour, which includes their transport mode selection and travel pattern and distance travelled for commuting. The theory of TPB presents two main drawbacks. People tend to behave according to their intentions, which the theory assumes, but actual behaviour gets affected by factors like infrastructure availability and service quality (De Vos et al., 2022). A student who wants to use public transport encounters obstacles through poor connectivity and unreliable services. The existence of this limitation shows that TPB needs spatial theory from Von Thünen Theory to explain how distance and accessibility mechanism's function.

2.8.4 Von Thünen Theory

The Von Thünen Theory which Johann Heinrich von Thünen established in 1826 demonstrates how economic activities and movement patterns are affected by spatial factors which include distance and transportation expenses. The theory which was first developed to study agricultural land use remains useful in urban and transport research through its main idea that people will change their behaviour according to different levels of accessibility (Rodrigue 2024).

Von Thünen Theory explains how people change their travel behaviour based on their distance from transit stations in the context of TOD. Transit stations in urban areas like Klang Valley function as accessibility points which help people reach

their destinations faster while saving them transportation expenses. Students who live closer to MRT or LRT stations experience shorter commuting distances and are more likely to use public transport (Yap et al., 2021).

The theory matters to students because their daily schedules depend on how far they need to travel for school. Students travel repeatedly between their home and their school and their other places of activity. Longer commuting distances lead to higher travel expenses which result in increased physical and mental exhaustion for students which negatively impacts their academic success (Ghani et al., 2020). Students who reside near transit nodes will choose to travel using more effective methods.

Von Thünen Theory shows that accessibility acts as a crucial factor for successful TOD development. The improved accessibility of an area decreases the travel expenses and necessary time for reaching destinations which makes public transportation systems more appealing. Research shows that people who reside near transit stations demonstrate higher public transport usage rates according to Ewing and Cervero 2010. The research shows that accessibility affects student commuting patterns by decreasing their travel distances while increasing their public transportation usage.

In addition, the theory beyond its current state shows potential for resolving connectivity issues. Modern urban transport research uses network accessibility as a measurement tool because Von Thünen developed his distance model. A location may be physically close to a station but poor connectivity through limited feeder services and inefficient route design causes actual travel time to increase. The process of spatial accessibility conversion into better travel patterns depends on the level of connectivity present.

Convenience can also be interpreted through the measurement of transportation expenses. The calculation of costs in this situation involves both monetary expenses and the time and physical work needed for completion. The combination of unreliable services with extended waiting periods and crowded conditions raises the travel expenses for public transport, which makes it less appealing to users. Students use convenience as their main criterion to assess how practical transit systems function.

Similarly, travel cost assessment includes safety as its component because unsafe environments heighten the danger assessment. Students may avoid walking or using public transport if they feel unsafe, even when distances are short. The research shows that safety conditions determine whether students will use the accessibility features available at TOD environments.

From a variable perspective, Von Thünen Theory establishes a connection between TOD elements and student commuting patterns through its explanation of spatial factors that determine travel behaviour. The study shows that accessibility and connectivity determine commuting distance and travel duration while convenience and safety elements create perceived travel expenses. The combination of these factors leads to students making decisions about their movements.

However, Von Thünen Theory has limitations when applied to modern urban environments. The original model assumes a simple and uniform spatial structure, which does not reflect the complexity of cities such as Klang Valley (Rodrigue, 2024). Multiple urban centres exist within cities, which feature various transportation networks and different levels of economic development. Travelers exhibit movement patterns that distance measurement alone cannot account for. The integration of behavioural theories with Von Thünen Theory needs to be conducted according to this limitation. This limitation reinforces the importance of integrating Von Thünen Theory with behavioural theories such as TPB.

2.8.5 Integration of TPB and Von Thünen Theory

The combined concepts of TPB and Von Thünen Theory creates a complete framework for understanding students' travel behaviour in TOD environments. TPB explains the psychological factors influencing behaviour, while Von Thünen Theory explains the spatial factors impact human activities.

In this study, TOD features influence both behavioural perception and spatial conditions. Accessibility and connectivity serve as spatial elements as they determine physical access to transport systems. Convenience and safety represent behavioural factors, as they influence perception and user experience.

Together, these combination shapes students' travel behaviour. For example, A student who lives close to a transit station which provides high accessibility and operates an efficient network system that connects multiple areas and offers dependable services and maintains safe walking paths will have a higher tendency to use public transportation. Conversely, public transportation usage decreases when transit-oriented development (TOD) lacks proper facilities because people do not want to use the existing infrastructure.

The combined theoretical framework of this research enables the study to measure travel behaviour through both objective and subjective methods which allows for an assessment of how transit-oriented development (TOD) elements affect student travel patterns in Klang Valley.

2.9 Conceptual Framework

The study creates conceptual framework to investigate how Transit-Oriented Development (TOD) elements affect student travel behaviour in Klang Valley. The framework combines transportation and behavioural theories through the Theory of Planned Behaviour (Ajzen, 1991) and the built environment–travel behaviour relationship (Ewing & Cervero, 2010) which show how physical and psychological factors shape mobility patterns.

2.9.1 Core Components of the Framework

The framework consists of two main components: Independent variables (IV) and the dependent variable (DV).

The independent variables (IV) represent the key TOD features, namely:

- Accessibility
- Connectivity
- Convenience
- Safety

The physical and perceived distance of travel is affected by these elements which researchers (Cervero & Kockelman, 1997; Ewing & Cervero, 2010) identify as essential components of mobility behaviour according to established transit-oriented development and transportation research.

The dependent variable (DV) is students' travel behaviour, which shows how students navigate through urban spaces. The construct of travel behaviour consists of multiple dimensions which show real travel behaviour patterns together with the processes people use to make travel decisions (Limtanakool et al. 2006).

Explanation of IV → DV Relationship

The conceptual framework proposes that TOD features directly influence students' travel behaviour. This relationship will determine how students travel between different locations. The relationship between built environments and travel patterns has been established through numerous studies which demonstrate how built environments control three travel components: mode selection, travel frequency, and distance of work-related travel (Ewing & Cervero, 2010).

Accessibility influences travel behaviour because it decreases both physical obstacles and time constraints which limit their ability to move freely. Students who live within walking distance of transit stations or who can reach public transport facilities without difficulty will use these services more frequently while their travel time will decrease (Yap et al., 2021). The system provides further advantages because its components work together to create better transport links which help students reach their destinations through different travel modes.

Convenience represents the dependable and efficient performance of transportation systems. Public transport usage increases when people perceive the system as convenient and efficient and comfortable according to Beirão and Cabral (2007). The academic commitments that students must follow make convenience a critical need for their daily activities.

Safety influences both physical mobility and psychological willingness to travel. Research shows that unsafe environments discourage walking and public transport usage, particularly among vulnerable groups such as students (Loukopoulos & Gärling, 2005). Students use travel behaviours based on safety assessment of their travel options.

Together, these TOD factors shape students' travel behaviour by influencing their mobility choices, travel patterns, and overall commuting experience.

2.9.2 Indicators of Travel Behaviour

In this study, students' travel behaviour is operationalised using indicators:

Mode of Transportation

Mode choice reflects the type of transport used by students, such as public transport, private vehicles, walking, or ride-hailing. It is one of the commonly used indicators in travel behaviour research as it directly represents individuals' response to the transport environment (Ben-Akiva & Lerman, 1985).

Travel Frequency

Travel frequency measures the total number of trips which people take during a given time frame. Students use this measure to show their travel patterns because it demonstrates their travel activities throughout the day. People tend to travel more frequently when they have better access to different transportation options and more ways to reach their destinations (Limtanakool et al., 2006).

Commuting Distance

Commuting distance shows how far people travel to reach their destinations. The distance between students' homes and their main destinations which include educational institutions gets measured through this method. Research demonstrates that the distance students need to travel to school affects their travel expenses and travel duration and their choice of transportation method (Ewing & Cervero, 2010)

Clarifications

It is important to clarify that mode of transportation, travel frequency, and commuting distance are not treated as mediating variables in this study. Instead, they are conceptualised as measurement indicators of the dependent variable, namely students' travel behaviour.

A mediator is typically used to explain the mechanism through which an independent variable influences a dependent variable. However, this study does not aim to test mediation effects statistically. Rather, it focuses on examining the direct relationship between TOD features and travel behaviour using regression analysis.

Therefore, the indicators serve to operationalise the dependent variable, allowing for a more comprehensive assessment of students' mobility patterns. This approach is consistent with previous studies, which treat travel behaviour as a multidimensional construct rather than a single observable variable (Ewing & Cervero, 2010; Limtanakool et al., 2006).

Theoretical Justification of the Framework

The conceptual framework is supported by both behavioural and spatial theories.

The Theory of Planned Behaviour (Ajzen, 1991) explains how individuals' perceptions of convenience, safety, and accessibility influence their behavioural intentions and actual travel decisions. At the same time, the built environment theory (Ewing & Cervero, 2010) explains how physical shows how physical elements that include accessibility and connectivity control people's travel behaviour.

By integrating these perspectives, the framework captures both:

- Objective factors (infrastructure, distance, connectivity)
- Subjective factors (perception, comfort, safety)

2.10 Hypotheses Development

Accessibility has been consistently identified as a key determinant of travel behaviour. Improved accessibility reduces travel barriers and increases public transport usage (Yap et al., 2021). Therefore:

- H1: Accessibility has a significant relationship with students' travel behaviour.
- H0 : Accessibility has no significant relationship with students travel behaviour.

Connectivity enhances mobility efficiency by improving network integration. Poor connectivity discourages public transport use (Bachok et al., 2013). Therefore:

- H2: Connectivity has a significant relationship with students' travel behaviour.
- H0: Connectivity has no significant relationship with students travel behaviour.

Convenience influences user satisfaction and behavioural intention. Inconvenience reduces public transport usage (Hizam et al., 2021). Therefore:

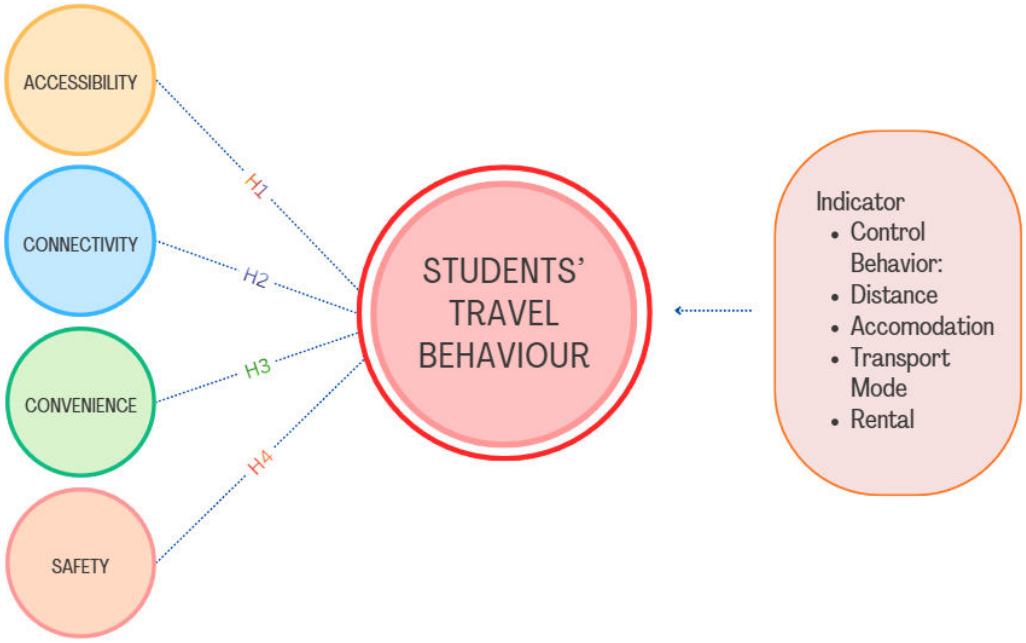
- H3: Convenience has a significant relationship with students' travel behaviour.
- H0: Convenience has no significant relationship with students travel behaviour.

Safety influences both physical mobility and psychological comfort. Unsafe environments discourage public transport use (Ahmad et al., 2022). Therefore:

- H4: Safety has a significant relationship with students' travel behaviour.
- H0: Safety has no significant relationship with students travel behaviour.

2.11 Proposed Framework

Figure 2.1: Proposed Framework



Source: Developed for the research

2.12 Chapter Conclusion

The chapter examined existing research about Transit-Oriented Development (TOD) which impacts student travel patterns specifically in the Klang Valley area. Urban planners use TOD as a planning method which combines land development and transportation systems to create better accessibility solutions and environmentally friendly transportation options and decreased private vehicle usage (Calthorpe, 1993; Cervero & Kockelman, 1997). The chapter evaluate four TOD features such as accessibility, connectivity, convenience, and safety. These features affects the mobility outcomes, although their effects are interrelated and influenced by user perceptions (Ewing & Cervero, 2010; Hizam et al., 2021).

The rail transit systems development in Malaysia which includes MRT LRT and KTM Komuter has created better urban access and transportation options for citizens. However, their effectiveness depends on multiple aspects which include service quality, connectivity, spatial integration. While the obstacles from insufficient walking paths and inadequate support services and safety concerns limit the full potential (Yap et al., 2021; Abdullah et al., 2023).Students were identified as socio-economic group with mobility patterns shaped by financial constraints and reliance on public transport (Ghani et al., 2020; Kalhoro et al., 2021). Their travel behaviour was conceptualised through mode of transportation, travel frequency, and commuting distance, which collectively represent daily mobility patterns.

The theoretical foundation integrated the Theory of Planned Behaviour (Ajzen, 1991) and Von Thünen Theory to explain all aspects of travel decisions through both behavioural and spatial factors. The review also identified gaps in Malaysian TOD research, particularly the limited focus on students and behavioural responses.

Based on these insights, a conceptual framework and hypotheses were developed to examine the direct relationship between TOD features and students' travel behaviour. The next chapter outlines the research methodology.

CHAPTER 3: RESEARCH METHODOLOGY

3.0 Introduction

This chapter presents the research methodology adopted for the study. This chapter describes the research methods used to gather data, process and analyse data in order to achieve the research objectives of this study (Creswell, 2018). Research methodology is important because it ensures the study is conducted systematically and maintains validity and reliability.

This study used a quantitative research method to study the relationship between Transit-Oriented Development (TOD) factors and students' travel behaviour using numerical data. Quantitative research is suitable when a researcher intends to examine relationships between variables through statistical analysis (Creswell & Creswell, 2018). In this study, TOD factors are treated as the independent variable, while students' travel behaviour is treated as the dependent variable.

Furthermore, this chapter discusses the research design, data collection method, sampling design, research instrument, construct measurement, data processing, and data analysis methods. It also explains the use of a pilot test, reliability test, descriptive analysis, content analysis, and regression analysis. These methods are selected to ensure that the study can identify TOD factors influencing students' travel behaviour and examine the extent to which TOD factors affect students' travel behaviour in Klang Valley.

3.1 Research Design

Research design refers to the overall framework used to answer the research questions and achieve the research objectives. It provides guidance on how data should be collected, measured, and analysed. In this study, a quantitative research design is adopted because the research aims to measure the influence of TOD factors on students' travel behaviour using numerical data and statistical techniques. Quantitative research is appropriate when the researcher intends to examine relationships between variables and test the strength of those relationships statistically (Creswell & Creswell, 2018).

The research design of this study adopts both is also descriptive and explanatory research design. It is descriptive because the study describes the demographic profile and travel background of the respondents, such as gender, age, university type, education level, accommodation type, distance to the nearest MRT/LRT/KTM station, primary transport mode, and public transport usage patterns. It is explanatory because the study examines whether TOD factors influence students' travel behaviour. Explanatory research is suitable when a study aims to explain the relationship between an independent variable and a dependent variable.

This study uses a cross-sectional survey design, where data is collected from respondents at one point in time. A cross-sectional design is appropriate because the research does not aim to study changes over a long period, but instead focuses on students' current travel behaviour and current perception of TOD features in Klang Valley.

The research study uses TOD factors as its independent variable which includes four elements that define accessibility, connectivity, convenience, and safety. The dependent variable is students' travel behaviour. Previous research in transport and urban planning studies shows that built environment characteristics which include density diversity design accessibility and pedestrian-oriented development create

an effect on travel demand and mode choice (Cervero & Kockelman, 1997; Ewing & Cervero, 2010). The selected research design serves the purpose of studying how TOD-related features affect students' daily travel patterns in Klang Valley.

3.2 Data Collection Method

Data collection describes the process of gathering necessary information for their research needs. For this study, both primary data and secondary data are used. The research benefits from using both data types because primary data delivers direct answers from target respondents and secondary data supplies theoretical and conceptual and empirical proof from past studies and official sources.

Primary data is collected through a structured questionnaire distributed to university students in Klang Valley. The questionnaire collects information on students' background, TOD features, and travel behaviour. Secondary data is collected from academic journals, books, government publications, official statistical reports, and relevant research articles related to TOD, public transport, travel behaviour, research methodology, sampling, and statistical analysis. Using both primary and secondary data enables the study to combine actual respondent data with established academic research.

3.2.1 Primary Data

Primary data refers to original data collected by the researcher for the specific purpose of the study. In this research, primary data was collected using a structured questionnaire. The questionnaire was distributed to university students in Klang Valley because they are the main target respondents of the study. Students were

selected because they regularly travel between their residence, campus, transit stations, and other daily destinations. Their travel decisions may be influenced by accessibility to transit stations, public transport connectivity, service convenience, and safety of the walking environment.

The use of a questionnaire is suitable for this study because it allows to collect standardised information from a relatively large number of respondents. Sekaran and Bougie (2016) stated that questionnaires are useful in quantitative research because they help researchers collect data in an organised and consistent manner. The research needs this because all participants must respond to identical questions which enables the researcher to evaluate answers through statistical methods.

The questionnaire used in this research was developed to collect data from university students in Klang Valley. The questionnaire consists of multiple sections where Section A collets respondents' demographic and travel background, Section B assesses TOD Features, and Section C evaluates students' travel patterns. The use of structured questionnaire allows to obtain uniform answer from respondents and provide data for research statistical software Statistical Product Service Solutions (SPSS) to analyse. Sekaran and Bougie (2016) stated that structured questionnaires are commonly used in quantitative research because they allow information to be collected consistently from a group of respondents.

The Likert-scale questions in Section B and Section C use a five-point scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. This scale allows students' perceptions to be converted into numerical values for statistical analysis. Likert scales are commonly used in social science and behavioural research because they allow respondents to express different levels of agreement towards a statement.

3.2.2 Secondary Data

Secondary data describes information which has been gathered and made available to the public through research conducted by other scientists and organizations and research institutions. In this study, secondary data was obtained from academic books, journal articles, and official government publications which contained information about TOD and public transport and travel behaviour and research methodology.

The study relies on secondary data sources which provide both theoretical frameworks and empirical evidence for its research. Transit-oriented development (TOD) represents an urban planning method which combines land use planning and transportation planning to promote public transportation and pedestrian movement while decreasing private vehicle use. Calthorpe (1993) is widely recognised for introducing TOD as a planning concept that promotes compact, walkable, and transit-supportive communities. Malaysian TOD literature describes TOD as a concept which combines transportation planning and land use planning to achieve public transportation and active transportation while reducing private vehicle use.

Secondary data was also used to support the sample size calculation. The population data used in this study was obtained from the Department of Statistics Malaysia (DOSM). The Department of Statistics Malaysia (DOSM) publishes official population estimates include age-group demographic data for Malaysia, which can be used as a reliable reference when exact target population data is unavailable.

3.3 Sampling Design

Sampling design refers to the involves choosing study participants from the target population to participate in the study. Sampling is necessary because it usually demands excessive time, financial resources, and time-consuming to collect data from the entire population. Therefore, a sample is selected to represent the target population and provide information for the study.

This research uses a sampling design which identifies the target population, sampling frame, sampling site, sampling element, sampling method and sampling size. The study targets university students who live in Klang Valley. The target population of this study is university students in Klang Valley. Klang Valley is selected because it is one of the most urbanised regions in Malaysia and has an extensive public transport network, including MRT, LRT, KTM, monorail, buses, and e-hailing services. The availability of rail-based public transport makes Klang Valley a suitable location for studying TOD factors and students' travel behaviour.

3.3.1 Target Population

The target population defines the exact group of people whom the researcher plans to examine. The research targets university students who attend universities located in the Klang Valley region. The student body includes individuals who attend either public or private universities and who reside in different housing types which include landed houses and condominiums and apartments and hostels and dormitories.

University students are selected as the target population because these students travel between locations throughout each day. Students require transportation to various places which include their campus and transit stations and commercial areas

and food outlets and libraries and their part-time workplaces and their other daily destinations. Their travel behaviour depends on three factors which include their home distance to the nearest transit station and the quality of walking paths and the access to public transit and the safety of transit stations.

The focus on Klang Valley is also justified because this region has a more developed public transport system compared with many other parts of Malaysia. Since TOD is closely related to transit accessibility, walkability, transport connectivity, and land use integration, Klang Valley provides a relevant urban context for the study.

Since the exact numbers of university students in Klang Valley was not available, the official population estimates data from the Department of Statistics Malaysia(DOSM) was used as proxy population for sample size estimation. The study used five age categories which included 15 to 19 years old 20 to 24 years old 25 to 29 years old 30 to 34 years old and 35 to 39 years old. The total population from these selected age groups was calculated as 15,374,309. The selected age groups match the age range found in foundation programs and undergraduate programs and postgraduate programs and mature student programs.

Table 3.1: Population age distribution

Age Group	**Population (people)**
15-19	2,786,272
20-24	3,134,489
25-29	3,167,066
30-34	3,172,849
35-39	3,113,633
	Total :15,374,309 people

Source: Department of Statistics Malaysia (DOSM, 2025)

3.3.2 Sampling Frame and Sampling Location

The sampling frame describes the list or source which researchers use to choose samples. The ideal sampling frame for this research required complete student records from all universities located in Klang Valley. The researcher could not access that complete student record list. The study used DOSM population data because it provided a wider basis for population size estimation.

The research takes place in the Klang Valley area. Klang Valley was chosen as a research site because it has multiple universities combined with residential areas and commercial areas and public transportation systems that use rail technology. The study examines students who either live or study or travel within Klang Valley because their travel behaviour gets influenced by TOD system elements which include accessibility and connectivity and convenience and safety.

3.3.3 Sampling Elements

Sampling elements refer to the individual units selected from the population to participate in the study. The research uses university students from Klang Valley as its sampling elements. The study establishes one unit of analysis for each respondent because it gathers data about students' perceptions and travel experiences and their responses to TOD features.

The respondents need to be current students who study at higher education institutions and who have experience traveling throughout the Klang Valley area. The students in this study can come from either public universities or private universities and they can be enrolled in foundation courses or undergraduate courses or postgraduate courses. The respondents need to provide answers about their

accommodation situation and their distance to the transit station and their travel method and their views about TOD features.

3.3.4 Sampling Technique

This study uses a non-probability sampling technique, specifically convenience sampling. Convenience sampling selects respondents based on their availability and accessibility and their willingness to participate in the study. This technique is suitable because the researcher does not have access to a complete list of all university students in Klang Valley.

Convenience sampling is commonly used in student research because it is practical, time-saving, and cost-effective. Sekaran and Bougie (2016) explained that non-probability sampling can be used when a complete sampling frame is not available and when respondents are selected based on accessibility. Since this study is conducted for academic purposes and involves questionnaire distribution among students, convenience sampling is appropriate.

3.3.5 Sampling Size

Sample size refers to the number of respondents required for the study. The study needs proper sample size determination because it directly impacts research result accuracy and reliability. The Taro Yamane formula was used to determine the sample size for this study. Yamane's formula is the standard method for calculating sample size when researchers know both the total population and their desired accuracy(Yamane 1967). The University of Florida sample size guide states that Yamane developed a basic formula which allows researchers to estimate sample size according to their total population and desired accuracy.

The Taro Yamane formula is shown below:

$$n = \frac{N}{1 + Ne^2}$$

Where:

n = required sample size
N = population size
e = margin of error

For this study:

N = 15,374,309
e = 0.0900 or 9.0%

Therefore:

$e^2 = (0.0900)^2 = 0.008100$

$1 + Ne^2 = 1 + (15,374,309 \times 0.008100) = 124532.902900$

$$n = \frac{15,374,309}{1 + 15,374,309(0.0900)^2}$$

$$n = \frac{15,374,309}{124532.902900} = 123.455799$$

Since the sample size must be a whole number, the value is rounded up to the nearest whole number. Therefore, the minimum required sample size is 124 respondents.

Although the minimum required sample size is 124 respondents, this study collected 150 responds. The dataset provides sufficient data for statistical analysis because the collected data exceeds the required minimum sample size. The population number used in the study came from selected age-group data from DOSM, which served as estimated population reference since researchers lacked exact numbers for university students in Klang Valley.

3.4 Research Instrument

A research instrument refers to the tool used to collect data from respondents. In this study, the research instrument is a structured questionnaire. The questionnaire was designed to collect quantitative data about respondents' demographic information and their travel patterns. Section A.

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The questionnaire is suitable for this study because it allows the researcher to collect consistent and comparable responses from all respondents. In this study, the study uses fixed-response questions and Likert-scale statements to measure its variables, which allows for statistical data analysis. The research instrument was designed based on the research objectives and conceptual framework of the study.

The questionnaire also includes a respondent information section and a Personal Data Protection Notice. This is important because respondents must be informed about the purpose of the research, confidentiality of their responses, and the academic use of the collected data. The questionnaire states that the information obtained is strictly confidential and will be used for statistical and academic purposes only.

3.4.1 Design of Questionnaire

The questionnaire was designed in a structured format to ensure that respondents could answer the questions easily and consistently. It begins with an introduction explaining the purpose of the study and the estimated time required to complete the questionnaire. It also includes a Personal Data Protection Notice to inform respondents about the collection, use, storage, and confidentiality of their personal data.

The questionnaire consists of three main sections relevant to this study. Section A focuses on personal information and background characteristics. This section includes questions on gender, age, university type, level of education, year of study, current type of accommodation, distance from residence to the nearest MRT/LRT/KTM station, primary mode of transport to campus, monthly rental, and main factor influencing accommodation choice. These questions are useful for describing the demographic profile of respondents and understanding their travel-related background.

Section B measures TOD features that may influence students' travel behaviour. It consists of four dimensions: accessibility, connectivity, convenience, and safety. Accessibility is measured through items related to ease of access to the rail transit station, comfortable walking distance, and clear/direct routes. Connectivity is measured through items related to public transport route connection, convenience of transfers, and ability to reach daily destinations. Convenience is measured through access to daily amenities, reasonable waiting time, and convenient public transport operating hours. Safety is measured through pedestrian walkway safety and students' feeling of safety when walking to the transit station during the day and at night.

Section C measures students' travel behaviour. The items focus on whether respondents frequently use public transport, prefer public transport over private vehicles, consider travel time when choosing transport mode, and adjust their travel schedule based on travel duration. These items are appropriate because travel behaviour is not only about the transport mode selected, but also about frequency of use, preference, time consideration, and travel adjustment.

Table 3.2: Section distribution of Questionnaire

Section	Description
A	Demographic Information
B	TOD Features
C	Students' Travel Behaviour

Source: Developed for the research

3.5 Construct Measurement (Scale and Operational Definitions)

The study establishes its measurement construct through the process of defining study variables which research team members will use to gather data for their analysis. The study defines its primary constructs through the examination of TOD factors together with students' travel behaviour patterns. Researchers use TOD factors as their independent variable whereas students' travel behaviour serves as their dependent variable.

The assessment of TOD factors uses four measurement dimensions which include accessibility, connectivity, convenience, and safety. The assessment of each dimension contains three distinct questionnaire items. Students' travel behaviour assessment requires four different measurement items. The use of multiple items for each construct is appropriate because a single item may not fully represent a complex concept. Cronbach's Alpha testing determines whether all items within each construct exhibit internal consistency. Researchers use Cronbach's Alpha to assess whether multiple Likert-scale items which make up a scale maintain internal consistency.

The study employs three fundamental measurement scales which include nominal scale, ordinal scale and Likert scale. Section A mainly utilizes nominal and ordinal scales whereas Section B and Section C employ the Likert scale. The scales enable researchers to obtain both categorical information and numerical data from the study participants. The illustration as at : Table 3.6.2: Data coding labels, values and measure.

3.5.1 Nominal Scale

A nominal scale is used to classify data into categories that lack any established ranking system. The researchers employed nominal scale items in Section A of their questionnaire of this research. The study identifies gender, university type, current accommodation type, primary mode of transport to campus, and main factor influencing accommodation choice as its examples. Gender categorization establishes two distinct categories which are male and female. Universities establish two distinct types which are public and private. Accommodation type has three distinct categories which are landed house condominium/apartment and hostel/dormitory. The categories exist as non-ranked classifications which separate respondents into distinct groups. The illustration as at : Table 3.6.2: Data coding labels, values and measure.

3.5.2 Ordinal Scale

An ordinal scale is applied to situations where response categories display a specific hierarchical order. The study employs ordinal scale items in Section A through its measurement instruments. The study measures participants through five demographic variables which include age group, educational attainment, study level, distance from their home to the nearest MRT/LRT/KTM station, and their monthly rent. The illustration as at : Table 3.6.2: Data coding labels, values and measure.

The age groups divide people into five categories which include people aged 18 to 22 and those aged 23 to 27 and 28 to 32 and 33 to 37 and those aged 38 or older. The educational attainment levels proceed from Foundation/Pre-U to Undergraduate and then to Postgraduate. The distance from the residence to the nearest station exists as three categories which include less than 200 metres and 200 metres to 800 metres and more than 800 metres. The monthly rental prices start at RM400 and end at RM1001 and above.

Ordinal data is useful because it allows to identify patterns based on ranking. For example, students living closer to a transit station may show different travel behaviour compared with students living farther away. This is relevant because TOD studies often emphasise walking distance and access to transit as important factors influencing public transport usage. The illustration as at : Table 3.6.2: Data coding labels, values and measure.

3.5.3 Likert Scale

A Likert scale is used to measure respondents' level of agreement with a series of statements. In this study, a five-point Likert scale is used in Section B and Section C.

The Likert scale is suitable because it enables to convert student assessments of TOD attributes together with their travel habits into numerical values. The accessibility, connectivity, convenience, and safety, evaluation in Section B, uses the Likert scale, while Section C, evaluates students' traveling patterns through the same measurement system.

The use of Likert-scale items is appropriate for this study because the responses can be analysed using mean, standard deviation, reliability analysis, and regression

analysis. For example, the mean score for accessibility can be calculated by combining the three accessibility items. The mean score for travel behaviour can also be calculated by combining the four travel behaviour items. This allows the researcher to create composite variables for statistical analysis.

3.6 Data Processing

Data processing involves executing specific procedures which help to order and ready the gathered information for upcoming examination work. After the questionnaire responses were collected, the data underwent a complete process of checking and coding and SPSS entry and data cleaning and variable transformation for analysis. The processing of data holds critical value because it protects research findings from unreliable results that arise through improper coding and data loss.

The initial process for data processing involved verifying all filled questionnaires to confirm that the actual responses could be used. The second step involved converting the questionnaire answers into numerical codes. The third step required entering all coded information into the SPSS system. The fourth step consisted of verifying whether there were missing data points or wrong data entries or inconsistent data between responses. The final step involved calculating average scores for each primary research construct.

For Section B, the researcher computed mean scores for accessibility, connectivity, convenience, and safety. Accessibility mean was calculated from the three accessibility items. Connectivity mean was calculated from the three connectivity items. Convenience mean was calculated from the three convenience items. Safety mean was calculated from the three safety items. The overall TOD features mean was calculated by combining all TOD features related items. For Section C, the students' travel behaviour mean was calculated from the four travel behaviour items.

Computing mean scores is suitable because the constructs are measured using several Likert-scale items.

3.6.1 Pilot test

A pilot test was conducted before the main analysis to examine the suitability and reliability of the questionnaire. In this study, the pilot test involved 30 respondents. The purpose of the pilot test was to identify whether the questionnaire items were clear, understandable, and appropriate for measuring the intended constructs.

Pilot testing is important because it helps the researcher detect possible problems in the questionnaire before collecting the full set of data. Sekaran and Bougie (2016) explained that pilot testing helps improve the quality of the research instrument before it is used in the actual study.

In this study, the pilot test was also used to conduct a reliability test. The reliability test was conducted using Cronbach's Alpha to determine the internal consistency of the questionnaire items.

3.6.2 Data Coding

Data coding refers to the process of assigning numerical values to questionnaire responses. Coding is necessary because SPSS requires numerical data for statistical analysis. For Section A, nominal and ordinal variables were coded numerically as follow :

Table 3.3: Data coding label, values, and measure

Name	Label	Values	Measure
Gender	Gender	0 = Female 1 = Male	Nominal
Age	Age	1 = 18-22 2 = 23-27 3 = 28-32 4 = 33-37 5 = 38+	Ordinal
University	Uni	1 = Public 2 = Private	Nominal
Level of Education	Edu	1 = Foundation 2 =Undergraduate 3 = Postgraduate	Ordinal
Years of Study	Years	1 = Year 1 2 = Year 2 3 = Year 3 4 = Year 4	Ordinal
Current Types of Accommodation	Accommodation	1 = Landed 2 = Apartment / Condominium 3 = Hostel	Nominal
Distance from nearest MRT/LRT/KTM/BRT station	Distance	1 = < 200m 2 = 200m - 400m 3 = 401m - 801m 4 = > 800m	Ordinal
Primary mode of Transportation	Primary mode	1 = Rail Transit 2 = Bus 3 = Private vehicle 4 = E- hailing 5 = Waling / Cycling	Nominal

Table 3.3 (cont.): Data coding labels, values and measure

Name	Label	Values	Measure
Monthly Rental	Rental	1 = < RM 400 2 = RM 401 - RM 500 3 = RM 501 - RM 700 4 = RM 701 – RM900 5 = RM 901 – RM1000 6 = > RM1001	Ordinal
Factors influencing accommodation	Factors	1 = Rental 2 = Proximity to Transit 3 = Proximity to Campus 4 = Safety 5 = Facilities Provided	Nominal

Source: Developed for the research

For Section B and Section C, the Likert-scale responses were coded as follows:

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Slightly Agree
- 4 = Agree
- 5 = Strongly Agree

After coding, the researcher created composite variables by computing mean scores. The accessibility mean was computed from accessibility items, the connectivity mean was computed from connectivity items, the convenience mean was computed from convenience items, and the safety mean was computed from safety items. The overall TOD features mean was computed from all TOD feature items, while students' travel behaviour mean was computed from the four travel behaviour items.

This coding process allows the data to be analysed using descriptive analysis, reliability analysis, content analysis, and regression analysis. Proper coding is

important because any mistake during data coding may affect the accuracy of the statistical results.

3.7 Data Analysis

The term data analysis describes the process through which researchers study gathered information to find answers to their research inquiries. In this study, the data was analysed using SPSS. The study employs SPSS software study because it can conduct descriptive statistics, reliability analysis, and regression analysis for quantitative questionnaire data.

The main data analysis methods used in this study are descriptive analysis, reliability analysis, content analysis, and regression analysis. Descriptive analysis is used to summarise the respondents' demographic profile and background information. Reliability analysis is used to examine the internal consistency of the questionnaire items. Content analysis is used to identify and explain the TOD factors that influence students' travel behaviour. Regression analysis is used to examine whether TOD factors significantly influence students' travel behaviour.

3.7.1 Descriptive analysis

Descriptive analysis is used to describe and summarise the characteristics of the respondents. In this study, descriptive analysis is mainly used for Section A of the questionnaire. Section A includes gender, age, university type, level of education, year of study, current type of accommodation, distance from residence to the nearest MRT/LRT/KTM station, primary mode of transport to campus, monthly rental, and main factor influencing accommodation choice.

The purpose of descriptive analysis is to provide a clear profile of the respondents. Frequency and percentage are used to present categorical data. For example, the researcher can report the number and percentage of male and female respondents, public and private university students, different accommodation types, and different transport modes. This helps readers understand the background of the sample.

Although descriptive analysis is mainly used for Section A, mean and standard deviation may also be used to summarise Section B and Section C. Mean scores show the general level of agreement towards TOD factors and students' travel behaviour, while standard deviation shows the level of variation in respondents' answers. This supports the interpretation of students' perception before further analysis is conducted.

3.7.2 Reliability Test

Reliability analysis is conducted to determine whether the questionnaire items consistently measure the intended constructs. In this study, reliability is tested using Cronbach's Alpha. Reliability analysis was conducted using Cronbach's Alpha to determine the internal consistency of the measurement items. According to Pallant (2020), a Cronbach's Alpha value above 0.70 indicates acceptable reliability.

In general, a Cronbach's Alpha value of 0.70 and above is considered acceptable for reliability in social science research. Nunnally (1978) established that exploratory research requires a minimum reliability coefficient of 0.70 to achieve acceptable standards. Similarly, Hair et al. (2019) stated that internal consistency becomes acceptable when Cronbach's Alpha reaches 0.70 or greater. Therefore, this study considers all constructs with a Cronbach's Alpha score of 0.70 or higher to be dependable and usable in subsequent research.

The pilot test of 30 respondents served as the first reliability test for the research study. The purpose of this study was to assess the suitability of questionnaire items before conducting main data analysis. If the Cronbach's Alpha values were acceptable, the questionnaire items could be retained and used for the full study.

3.7.3 Content Analysis

Content analysis is used to interpret the TOD factors in relation to students' travel behaviour. The purpose of content analysis in this study is to support Research Objective 1: To identify TOD factors that influence students' travel behaviour. Based on the questionnaire, the TOD factors measured in this study are accessibility, connectivity, convenience, and safety.

Content analysis is therefore important because it explains the practical meaning of each TOD factor before regression analysis is conducted. It helps connect the questionnaire items with the research objective and provides a deeper understanding of how TOD factors may shape students' travel behaviour in Klang Valley.

3.7.4 Regression Analysis

Regression analysis is used to examine the influence of TOD factors on students' travel behaviour. The independent variable is TOD factors, while the dependent variable is students' travel behaviour. The overall TOD features mean is calculated from the items measuring accessibility, connectivity, convenience, and safety. The students' travel behaviour mean is calculated from the four items in Section C. Regression analysis is then used to examine whether TOD factors have a statistically significant influence on students' travel behaviour.

Table 3.4: Four kinds of simple regression analysis test with the variables.

Test	**Independent Variable**		**Dependent Variable**
1st Test	Accessibility mean (TOD1- TOD3)	vs	Students' Travel Behaviour Mean (TB1-TB4)
2nd Test	Connectivity mean (TOD4-TOD6)		
3rd Test	Convenience mean (TOD7-TOD9)		
4th Test	Safety Mean (TOD10-TOD12)		

Source: Developed for the research.

This study uses simple linear regression analysis for each relationship. The first regression tests the relationship between overall accessibility mean and students' travel behaviour mean. The second regression tests connectivity mean against students' travel behaviour mean. The third regression tests convenience mean against students' travel behaviour mean. The fourth regression tests safety mean against students' travel behaviour mean.

The regression output includes several important values. The R value shows how strongly the independent variable connects with the dependent variable. The R Square value indicates the percentage of variation in students' travel behaviour explained by the TOD factor. The ANOVA significance value indicates whether the

regression model is statistically significant. The coefficient value shows the direction and size of the influence.

In this study, the study uses 0.05 as significance level, which is commonly used in social science research as the threshold for determining statistical significance (Field, 2018; Pallant, 2020). Therefore, the relationship becomes statistically significant if the significance value which researchers also call p-value falls below 0.05. However, if the significance value is greater than 0.05, the relationship is not considered statistically significant (Field, 2018; Pallant, 2020).

3.7.5 Explanation of R Square in Psychological Social Economic

In regression analysis, the coefficient of determination (R-square) is used to explain how much variation in the dependent variable can be explained by the independent variable. A higher R Square value indicates that the independent variable explains a larger proportion of variation in the dependent variable. However, in behavioural and social science research, a lower or moderate R Square value does not automatically mean that the model is weak or unacceptable. This is because human behaviour patterns show complexity because various personal psychological social economic and environmental factors control human actions which regression models cannot capture.

This is especially relevant in studies involving perception, attitudes, travel preferences, safety perception, convenience, and behavioural decision-making. Human choices in social science research depend on multiple unpredictable factors which make outcomes less predictable than physical science studies. Therefore, regression models in social science may still be meaningful even when the R Square value is not very high, as long as the independent variable has a statistically significant effect and is supported by theoretical evidence.

According to Ozili (2023), a low R Square value is not necessarily unacceptable in social science research because many social science models aim to show which variables impact human behaviour instead of achieving complete prediction accuracy. Ozili (2023) further stated that an R Square value of at least 0.10 or 10% is valid for research standards when most explanatory variables show statistical significance.

Similarly, Cohen (1988) provided a standard method to interpret R Square. Based on Cohen's guideline, an R Square value below 0.01 is considered very weak, 0.02 to below 0.09 is considered moderate, 0.09 to 0.25 is considered substantial. Therefore, in behavioural studies, even an R Square value that appears numerically low may still represent a meaningful effect depending on the research context.

Table 3.5: Cohen's rough benchmarks for R square

R^2	Effect Size	Interpretation
0.01	Small	Weak relationships, indicating a noticeable but minor effect.
0.09	Medium	Moderate relationship, visible to an attentive observer.
0.25	Large	Strong relationships, indicate likely meaningful relationships in real life.

Source: Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2013). Applied multiple regression/correlation analysis for the behavioural sciences: Routledge

3.8 Conclusion

This chapter explained the methodology used to examine the influence of TOD factors on students' travel behaviour in Klang Valley. The study adopted a quantitative cross-sectional study which collected primary data through a structured survey that targeted university students. The questionnaire measured respondents' demographic background, TOD factors, and students' travel behaviour. The target population consisted of university students in Klang Valley. Using the Taro Yamane formula, the minimum sample size was 124 respondents, while 150 responses were successfully collected. The data was processed through coding, cleaning, and computation of mean scores.

Descriptive analysis, reliability analysis, content analysis, and regression analysis were used to analyse the data. Overall, this methodology provides a systematic basis for the findings presented in Chapter 4.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

The chapter presents both the analysis and all the outcomes which were obtained from the study's data collection process. The research analysis examines how TOD Factors affect student transportation patterns to achieve the research goals. The chapter is organized into five main sections. First, descriptive analysis is conducted to summarize respondent demographics in Section A from questionnaire and follow by the central tendencies of variables. Third, reliability analysis using Cronbach's Alpha is presented to assess the internal consistency of the measurement scales. Forth, the content analysis is presented findings based on Literature Review. Finally, inferential analysis using simple linear regression is conducted to determine the influence of TOD features and their dimensions (accessibility, connectivity, convenience, and safety) on students' travel behaviour.

4.1 Analysis for Respondent Demographic Profile

This subsection presents background characteristics of respondents which we derived through frequency analysis to create an overview that includes their gender their age group their university their education level their monthly rental expenses and their accommodation type and residence type and additional factors.

4.1.1 Gender

Table 4.1: Gender of respondents (N=150)

Gender	Frequency	Percentage(%)
Female	100	66.7
Male	50	33.3
Total	**150**	**100.0**

Source: Developed for the research

The gender distribution shows that female respondents form the majority at 66.7% (n = 100), while male respondents account for 33.3% (n = 50). The sample shows female dominance. The study includes both genders as participants but their results show a tendency to reflect female perspectives.

4.1.2 Age

Table 4.2: Age group of respondents (N=150)

Age	Frequency	Percentage(%)
≥38	2	1.3
18-22	68	45.3
23-27	75	50.0
28-32	5	3.3
Total	**150**	**100.0**

Source: Develop for the research

The age profile shows that most respondents belong to the young adult demographic. The largest group falls within the 23–27 age range (50.0%, n = 75), followed by those aged 18–22 (45.3%, n = 68).Only a small proportion of respondents are aged 28–32 (3.3%, n = 5) and above 38 years (1.3%, n = 2).This distribution demonstrates that university-aged students constitute the majority of participants, which makes the study suitable for investigating students' travel patterns.

4.1.3 University

Table 4.3: University of respondent (N=150)

University	Frequency	Percentage(%)
Private	136	90.7
Public	14	9.3
Total	**150**	**100.0**

Source: Developed for research

In terms of institution type, a substantial majority of respondents are from private universities (90.7%, n = 136), while only 9.3% (n = 14) are from public universities. The dataset shows the sample is largely influenced by private university students, which may reflect differences in accessibility, location, and transport options associated with different institutions.

4.1.4 Level of education

Table 4.4: Level of education of respondents (N=150)

Level of education	Frequency	Percentage(%)
Foundation / pre-U	50	33.3
Postgraduate	6	4.0
Undergraduate	94	62.7
Total	**150**	**100.0**

Source: Developed for the research

The study results show that undergraduate students made up 62.7% of the sample which included 94 participants while Foundation and Pre-University programs accounted for 33.3% of the sample. The group includes a minor category of postgraduate students who make up 4.0% of the total with 6 students. This shows that the sample mainly represents individuals in the early to mid-stages of higher education, which matches the requirements needed to study student travel behaviour.

4.1.5 Years of Study

Table 4.5: Years of study of respondents (N=150)

Years of study	Frequency	Percentage(%)
Year 1	34	22.7
Year 2	37	24.7
Year 3	62	41.3
Year 4	17	11.3
Total	**150**	**100.0**

Source: Developed for the research

The distribution by year of study shows that the largest group is Year 3 students (41.3%, n = 62), followed by Year 2 (24.7%, n = 37) and Year 1 (22.7%, n = 34). The smallest group is Year 4 students (11.3%, n = 17).

The study results show that most participants belong to the intermediate stage of their academic programs which leads to regularity in their travel patterns that researchers can use to study their behaviour.

4.1.6 Current type of accommodation

Table 4.6: Current type of accommodation (N=150)

Type of Accommodation	Frequency	Percentage(%)
Condominium /Apartment	82	54.7
Hostel / Dormitory	28	18.7
Landed House	40	26.7
Total	**150**	**100.0**

Source: Developed for the research

The survey results show that 54.7% of participants live in condominiums or apartments.(n=82). The second most common housing type among respondents is landed houses which 26.7% of participants (n=40). The least housing type among respondents is hostel or dormitories (18.7%, n = 28). The statement shows that many respondents reside in high-density housing areas which provide better access to urban transportation systems.

4.1.7 Distance from residence to nearest MRT/LRT/KTM/BRT station

Table 4.7: Distance from residence to nearest transit of respondents (N=150)

Distance	Frequency	Percentage(%)
Less than 200m (within 3-5 minutes' walk)	40	26.7
200m - 400m (5-10 minutes' walk)	55	36.7
401m - 800m (10-15 minutes' walk)	35	23.3
More than 800m (over 15 minutes' walk)	20	13.3
Total	**150**	**100.0**

Source: Developed for the research

The largest proportion of respondents live within 200–400 meters (36.7%, n = 55) of a transit station. This is followed by those within less than 200 meters (26.7%, n = 40) and 401–800 meters (23.3%, n = 35). A smaller group, 13.3% (n = 20), reside more than 800 meters away.

Overall, the majority of respondents live within 800 meters of transit facilities which demonstrates that public transportation remains easily accessible to them.

4.1.8 Primary mode of transport to campus (longest time spent)

Table 4.8: Primary mode of transport to campus of respondent (N=150)

Primary Transport	Frequency	Percentage(%)
Bus	15	10.0
E-hailing (Grab, etc)	1	0.7
Private vehicle	32	21.3
Rail Transit (MRT / LRT /KTM)	62	41.3
Walking / Cycling	40	26.7
Total	**150**	**100.0**

Source: Developed for the research

Rail transit emerges as the most commonly used mode, with 41.3% (n = 62) of respondents relying on MRT/LRT/KTM services. This is followed by walking or cycling (26.7%, n = 40) and private vehicles (21.3%, n = 32). A smaller proportion uses buses (10.0%, n = 15), while e-hailing services are minimally utilised (0.7%, n = 1).

This highlights a strong dependence on rail-based transport, supporting the importance of transit accessibility in shaping students' commuting patterns.

4.1.9 Monthly rental

Table 4.9: Monthly Rental of respondents (N=150)

Monthly Rental	Frequency	Percentage(%)
≤ RM400	7	4.7
≥ RM1001	7	4.7
RM401-RM500	28	18.7
RM501-RM700	39	26.0
RM701-RM900	33	22.0
RM901-RM1000	36	24.0
Total	**150**	**100.0**

Source: Developed for the research

The distribution of monthly rental shows that most respondents fall within the mid-range categories. The largest group pays RM501–RM700 (26.0%, n = 39), followed by RM901–RM1000 (24.0%, n = 36) and RM701–RM900 (22.0%, n = 33). Meanwhile, 18.7% (n = 28) pay between RM401–RM500, and only small proportions fall below RM400 (4.7%, n = 7) or above RM1001 (4.7%, n = 7).

This indicates that students generally choose accommodation within a moderate price range, balancing cost considerations with other factors such as location.

4.1.10 Main factor influencing choice of accommodation

Table 4.10: Main factor influencing choice of accommodation of respondents (N=150)

Main factor	Frequency	Percentage(%)
Affordable rent	53	35.3
Facilities provided	2	1.3
Proximity to campus	64	42.7
Proximity to transit	26	17.3
Safety	6	3.3
Total	**150**	**100.0**

Source: Developed for the research

The most influential factor in accommodation choice is proximity to campus (42.7%, n = 64), followed by affordable rent (35.3%, n = 53). Other factors such as proximity to transit (17.3%, n = 26), safety (3.3%, n = 6), and facilities provided (1.3%, n = 2) play a less significant role.

This suggests that convenience in terms of distance to the university is the primary concern among students, with affordability also being an important consideration. Proximity to transit, appears to be a secondary factor in comparison to direct campus proximity.

4.2 Scale Measurement

Reliability analysis was conducted by using Cronbach's Alpha to assess the internal consistency of the measurement scales. A pilot test involving 30 respondents was conducted and separated to the main data collection. All items used to measure perceptions of Transit-Oriented Development (TOD) features and students' travel behaviour were designed as multi-item constructs. These constructs were evaluated using a five-point Likert scale, where 1 =Strongly Disagree and 5 = Strongly Agree.

For each item, mean values and standard deviations were calculated to describe the central tendency and variability of responses. To enable further statistical analysis, individual items were aggregated into composite variables by computing the average score of their respective items.

The constructs in this study were structured as follows:

TOD Features (TOD 1 - TOD 12):

- Accessibility → TOD 1, TOD 2. TOD 3
- Connectivity → TOD 4, TOD 5, TOD 6
- Convenience → TOD 7, TOD 8, TOD 9
- Safety → TOD 10, TOD 11, TOD 12

Students' Travel Behaviour

- Travel Behaviour → TB 1, TB 2, TB 3, TB 4

SPSS software was used to compute the composite scores for each construct, which were used in both descriptive and inferential analyses. The internal consistency of each construct was assessed using Cronbach's Alpha (α) based on a pilot test of 30 respondents.

Since all constructs consist of multiple items, reliability analysis was appropriate and yielded acceptable alpha values, indicating that the measurement scales are consistent and reliable. These validated composite variables were then applied in

the regression analysis to examine the relationship between TOD features and students' travel behaviour.

4.2.1 Reliability of construct (Cronbach Alpha) (N=30)

Table 4.11: Reliability test result (N=30)

Construct	Item	No. of items	Cronbach's α
TOD Features (TOD 1 – TOD 12)			
Accessibility	TOD 1 – TOD 3	3	0.793
Connectivity	TOD 4 – TOD 6	3	0.867
Convenience	TOD 7 – TOD 9	3	0.812
Safety	TOD 10 – TOD 12	3	0.877
Travel Behaviour	TB 1 – TB 4	4	0.841

Source: Developed for the research

The reliability analysis using Cronbach's Alpha was conducted to assess the internal consistency of the measurement items for each construct in the study. Based on the results obtained from a sample of 30 respondents, all constructs demonstrate acceptable to strong reliability levels. The values of Cronbach's Alpha range from 0.793 to 0.877 for the independent variables (TOD features) and 0.841 for the dependent variable (travel behaviour). Since all values exceed 0.70, this indicates that the items used to measure each construct are consistent and reliable.

The safety dimension of TOD features showed most reliable results through its safety dimension which reached reliability coefficient 0.877 while connectivity dimension established its internal consistency through alpha value 0.867. The data results show that participants answered all questions about these attributes using stable response patterns. The convenience construct provides reliable results

through an alpha measurement of 0.812 which shows better reliability than the accessibility construct that measures 0.793. The accessibility dimension of TOD shows its weakest reliability score because it meets minimum standards which demonstrate measurement items maintain adequate consistency for further testing. The travel behaviour dependent variable shows strong reliability through a Cronbach's alpha value which reaches 0.841. The four items which assess travel behaviour show strong correlation because they measure the same construct. The study results show that all study constructs maintain proper internal consistency which allows researchers to use the measurement scales for future statistical tests which include descriptive statistics and regression analysis.

4.3 Content Analysis

This analysis is used to archive research objective 1.This section consist of 5 content analysis table as show as:

4.3.1 Content Analysis - Accessibility

Table 4.12: Content Analysis of Accessibility

Components	Content Analysis	Supporting Authors
Accessibility	Accessibility is one of the most fundamental TOD factors because it determines how easily individuals can reach transit stations, campuses, and urban facilities. In TOD environments, accessibility provides accessible transit systems through its design, which people can reach more easily.	Geurs & van Wee (2004); Ewing & Cervero (2010)
	In the Malaysian, accessibility improved through MRT and LRT expansion, especially in Klang Valley, where rail networks connect residential areas with employment centres, commercial zones, and educational institutions.	Yap et al. (2021); Abdullah et al. (2023)
	Accessibility extends beyond physical distance restrictions. The entire accessibility system also depends on first-mile connections and last-mile connections and pedestrian walkways and feeder bus services and station design elements to function properly. The presence of insufficient pedestrian infrastructure decreases the actual advantages of station proximity.	Ahmad et al. (2022); Pongprasert & Kubota (2018)
	Students need accessible spaces because their public transportation and walking needs make them dependent on public transport and walking. High accessibility leads to shorter commuting times and lower transportation expenses which enable people to travel to campus and their daily destinations more frequently.	Ghani et al. (2020); Yap et al. (2021)
	Students who have access to different locations will use public transportation more often while they travel shorter distances and they will create better travel patterns throughout their trips.	Ewing & Cervero (2010); Geurs & van Wee (2004)

Source: Developed for the research

4.3.2 Content Analysis - Connectivity

Table 4.13: Content Analysis of Connectivity

Components	Content Analysis	Supporting Authors
Connectivity	Connectivity measures the strength of links between different transportation networks and their respective routes and operational modes. The system includes intermodal integration and route continuity and transfer convenience and the ability to move between buses and rail lines and walking paths.	Hensher et al. (2008); Bachok et al. (2013)
	The connectivity of TOD environments becomes more valuable through enhanced connectivity which they provide. The public transport system becomes less effective when a station is situated close by but the connection between rail and bus and pedestrian routes remains poor.	Ewing & Cervero (2010); Hizam et al. (2021)
	The connectivity problems in Malaysia stem from three main issues which include inadequate feeder services and unreliable bus-rail integration and ineffective first-mile/last-mile systems. The system deficiencies lead to decreased commuter satisfaction which might result in lower public transport usage.	Bachok et al. (2013); Hizam et al. (2021); Ahmad et al. (2022)
	Students require reliable internet access because their daily travel requires using different transportation methods. The system enables easy movement between rail stations and bus stops and campus areas which helps users travel more efficiently and decreases their overall time spent commuting.	Ghani et al. (2020); Hensher et al. (2008)
	The connections impact their travel behaviour by elevating the route independence, enhanced travel efficiency, and also encouraging the travel frequency and reliability.	Hensher et al. (2008); Hizam et al. (2021)

Source: Developed for the research

4.3.3 Content Analysis - Convenience

Table 4.14: Content Analysis of Convenience

Components	Content Analysis	Authors
Convenience	Convenience describes how transportation services provide users with their most comfortable and dependable service at all times. The evaluation process examines multiple factors which include waiting time, service frequency, travel comfort, system reliability, cleanliness, and complete user experience.	Beirão & Cabral (2007); Hizam et al. (2021)
	Convenience serves as the primary factor which determines how people choose their travel options because commuters prefer transportation systems which provide them with reliable service that requires less time and delivers fewer operational problems.	Beirão & Cabral (2007); Ewing & Cervero (2010)
	In Malaysia, public transport complaints arise because of operational delays which create overcrowding problems and train services which have unpredictable reliability and deliver irregular service intervals.	Bachok et al. (2013); Khalid et al. (2014); Hizam et al. (2021)
	Students need easy access to their studies because their educational programs require them to attend classes at specific times. Students will less depend of public transport if face challenges.	Ghani et al. (2020); Hizam et al. (2021)
	Student travel patterns depend on convenience because it determines which transportation method, they choose and how often they travel and their satisfaction with public transportation systems. People who experience high convenience are more likely to use rail and bus systems on a regular basis.	Beirão & Cabral (2007); Hizam et al. (2021)

Source: Developed for the research

4.3.4 Content Analysis - Safety

Table 4.15: Content analysis of Safety

Components	Content Analysis	Authors
Safety	Safety refers to the level of protection from crime, accidents, and environmental hazards during the travel experience. The safety requirements in TOD areas include pedestrian protection, station security measures, street lighting systems, visibility requirements, and safe road crossing points.	Loukopoulos & Gärling (2005); Ahmad et al. (2022)
	Safety functions as an essential element in transit-oriented development because unsafe conditions create obstacles that prevent people from using transit systems despite their safe access and good system links.	Loukopoulos & Gärling (2005); Ajzen (1991)
	The safety problems of TOD areas in Malaysia arise from three factors which include inadequate street illumination and dangerous walking paths and insufficient pedestrian crossing solutions and neglected upkeep of public areas. The problems which exist in the system decrease its ability to attract people who walk or use public transportation.	Ahmad et al. (2022); Pongprasert & Kubota (2018)
	For students, safety is highly relevant because they may travel early in the morning, at night, or through unfamiliar routes. Students are therefore more sensitive to unsafe walking environments and insecure station areas.	Ghani et al. (2020); Ahmad et al. (2022)
	Safety affects students' transportation choices because it determines their willingness to walk to stations and use public transport and their frequency of travel. The need for secure transportation options leads people to depend more on ride-hailing services and their private vehicles.	Loukopoulos & Gärling (2005); Hizam et al. (2021)

Source: Developed for the research

4.3.5 Content Analysis – Students' Travel Behaviour

Table 4.16: Content Analysis of Students' Travel Behaviour

Components	Content Analysis	Authors
Students' Travel Behaviour	Students' travel behaviour describes the daily movement patterns of students which includes their travel methods, their travel frequencies, and their distance travelled between home, campus, and other locations.	Limtanakool et al. (2006); Ewing & Cervero (2010)
	Students are a unique group because their financial limitations and their low ownership of private vehicles and their strong need for public transportation create unique travel patterns. The travel choices of this group show greater sensitivity to TOD conditions than the travel choices of most working adults.	Ghani et al. (2020); Kalhoro et al. (2021)
	Mode choice reflects whether students use public transport, walking, private vehicles, or ride-hailing. This is strongly influenced by accessibility, convenience, and safety.	Ben-Akiva & Lerman (1985); Hizam et al. (2021)
	Travel frequency reflects how often students travel for academic, social, and daily purposes. TOD features that improve efficiency and reduce burden can encourage more regular travel.	Limtanakool et al. (2006); Ghani et al. (2020)
	Commuting distance affects travel time, cost, stress, and academic participation. Students who reside near both transit systems and university campuses experience better transportation efficiency.	Ewing & Cervero (2010); Yap et al. (2021); Ghani et al. (2020)
	The combination of TOD elements with student behaviour patterns determines how students navigate their transportation routes in Klang Valley. The positive TOD conditions lead students to prefer public transportation which helps them build environmentally friendly travel patterns.	Yap et al. (2021); Kalhoro et al. (2021); Hizam et al. (2021)

Source: Developed for the research

4.4 Regression analysis

This section of analysis is to achieve objective 2.The regression analysis is applied on Section B and Section C of the questionnaire.

The hypothesis develop in Chapter 2 focus on studying the relationship between TOD factors and students' travel behaviour:

- H1: Accessibility has significant relationship with students' travel behaviour.
- H2: Connectivity has significant relationship with students' travel behaviour.
- H3: Convenience has significant relationship with students' travel behaviour.
- H4: Safety has significant relationship with students' travel behaviour.

To analyse the hypothesis the variables are the composite construct as:

Table 4.17: Hypothesis variable construct

Code	**Items**	**Variables / Hypothesis**
Accessibility	TOD1-TOD3	Independent Variable / H1
Connectivity	TOD4-TOD6	Independent Variable / H2
Convenience	TOD7-TOD9	Independent Variable / H3
Safety	TOD10-TOD12	Independent Variable / H4
Travel Behaviour	TB1-TB4	Dependent Variable

Source: Developed for the research

The main inferential techniques which is Simple linear regression analysis are used to examine the influence of TOD features and its individual dimensions on students' travel behaviour.

4.4.1 Computation of Construct Means- Regression Analysis

In this study, each construct was measured using multiple items adapted from the questionnaire. To facilitate further analysis, the individual items under each construct were aggregated into a single composite score using the mean value.

Specifically, the constructs were computed as follows:

- Accessibility was calculated as the mean of TOD1, TOD2, and TOD3
- Connectivity was calculated as the mean of TOD4, TOD5, and TOD6
- Convenience was calculated as the mean of TOD7, TOD8, and TOD9
- Safety was calculated as the mean of TOD10, TOD11, and TOD12
- Travel Behaviour was calculated as the mean of TB1, TB2, TB3, and TB4

The computation of mean scores is expressed as:

- Accessibility Mean = (TOD1 + TOD2 + TOD3) / 3
- Connectivity Mean = (TOD4 + TOD5 + TOD6) / 3
- Convenience Mean = (TOD7 + TOD8 + TOD9) / 3
- Safety Mean = (TOD 10 + TOD 11 + TOD 12) / 3
- Travel Behaviour Mean = (TB1 + TB2 + TB3 + TB4) / 4

Table 4.18: Computation of variable mean score

Item code	Item	Mean	SD
Accessibility Mean	TOD 1+TOD 2+TOD 3	4.0667	0.81375
Connectivity Mean	TOD 4+ TOD 5 + TOD 6	3.8644	1.05062
Convenience Mean	TOD 7 + TOD 8 + TOD 9	3.7311	1.09823
Safety Mean	TOD 10 + TOD 11 + TOD 12	3.6511	1.17920
Travel Behaviour Mean	TB 1 + TB 2 +TB 3 +TB 4	3.8833	1.00279

Source: Developed for the research

This approach is widely used in quantitative research to represent a construct as a single variable, allowing for more efficient and meaningful statistical analysis. By aggregating the items, the study reduces complexity and ensures that each construct reflects the overall perception of respondents rather than relying on individual item responses.

4.4.2 Influence of Accessibility on Travel Behaviour (Results)

Regression model summary for influence of accessibility on travel behaviour.

Table 4.19: Regression model summary for H1

Statistic	Value
R^2	0.108
F-statistic	17.962
Sig.(F)	<0.001

Source: Developed for the research

Regression coefficients for predictors of accessibility (TOD1-TOD3), H1.

Table 4.20: Regression coefficient model for H1

Predictor	Unstandardized Coefficients Beta (β)	Sig.(p-value)
(Constant)	2.235	<0.001
Accessibility mean	0.405	<0.001

Source: Developed for the research

The regression analysis indicates that accessibility has a positive and statistically significant effect on travel behaviour. The model yields an R^2 value of 0.108, indicating that accessibility explains 10.8% of the variance in travel behaviour. The F-statistic ($F = 17.962$, $p < 0.001$) confirms that the model is statistically significant.

The regression coefficient for accessibility is $\beta = 0.405$ ($p < 0.001$), indicating a positive relationship between accessibility and travel behaviour. This suggests that higher levels of accessibility are associated with an increase in students' use of public transport.

4.4.3 Influence of Connectivity on Travel Behaviour (Results)

Regression model summary for influence of connectivity on travel behaviour

Table 4.21: Regression model summary for H2

Statistic	Value
R^2	0.253
F-statistic	50.129
Sig.(F)	<0.001

Source: Developed for the research

Regression coefficients for predictors of connectivity (TOD4-TOD6), H2.

Table 4.22: Regression coefficient model for H2

Predictor	Unstandardized Coefficients Beta (β)	Sig.(p-value)
(Constant)	2.028	<0.001
Connectivity mean	0.480	<0.001

Source: Developed for the research

The regression results show that connectivity has a positive and statistically significant relationship with travel behaviour. The model produces an R^2 value of 0.253, meaning that connectivity explains 25.3% of the variance in travel behaviour. The model is statistically significant, as indicated by the F-statistic ($F = 50.129$, $p < 0.001$).The regression coefficient for connectivity is $\beta = 0.480$ ($p < 0.001$), demonstrating a positive association between connectivity and travel behaviour. This indicates that improvements in connectivity correspond to higher levels of public transport usage among students.

4.4.4 Influence of Convenience on Travel Behaviour (Results)

Regression model summary for influence of convenience on travel behaviour

Table 4.23: Regression model summary for H3

Statistic	Value
R^2	0.301
F-statistic	63.766
Sig.(F)	<0.001

Source: Developed for the research

Regression coefficients for predictors of connectivity (TOD7-TOD9), H3.

Table 4.24: Regression coefficient model for H3

Predictor	Unstandardized Coefficients Beta (β)	Sig.(p-value)
(Constant)	2.014	<0.001
Convenience mean	0.501	<0.001

Source: Developed for the research

The analysis reveals that convenience has a positive and statistically significant influence on travel behaviour. The model explains 30.1% of the variance (R^2 = 0.301), which is the highest among all TOD features. The F-statistic (F = 63.766, $p < 0.001$) confirms that the model is statistically significant. The regression coefficient for convenience is $\beta = 0.501$ ($p < 0.001$), indicating a strong positive relationship. This shows that higher levels of perceived convenience are associated with increased use of public transport among respondents.

4.4.5 Influence of Safety on Travel Behaviour (Results)

Regression model summary for influence of safety on travel behaviour

Table 4.25: Regression coefficient model for H4

Statistic	Value
R^2	0.292
F-statistic	60.924
Sig.(F)	<0.001

Source: Developed for the research

Regression coefficients for predictors of connectivity (TOD10-TOD12), H4.

Table 4.26: Regression coefficient for H4

Predictor	Unstandardized Coefficients Beta (β)	Sig.(p-value)
(Constant)	2.207	<0.001
Safety mean	0.459	<0.001

Source: Developed for the research

The regression analysis shows that safety has a positive and statistically significant effect on travel behaviour. The model yields an R^2 value of 0.292, indicating that safety explains 29.2% of the variance in travel behaviour. The F-statistic ($F = 60.924$, $p < 0.001$) confirms the statistical significance of the model. The regression coefficient for safety is $\beta = 0.459$ ($p < 0.001$), suggesting a positive relationship between safety and travel behaviour. This indicates that higher levels of perceived safety are associated with increased public transport usage.

4.4.6 Summary of Regression Result

Table 4.27: Summary of regression result

Variable	R	R^2	Beta (β)	Significance	Result
Accessibility	0.329	0.108	0.405	Significant	Weak
Connectivity	0.503	0.253	0.480	Significant	Moderate
Convenience	0.549	0.301	0.501	Significant	Strong
Safety	0.540	0.292	0.459	Significant	Strong

Source: Developed for the research

The results indicate that all four TOD features, accessibility, connectivity, convenience, and safety have positive and statistically significant relationships with travel behaviour ($p < 0.001$).

Among the variables, convenience ($\beta = 0.501$, $R^2 = 0.301$) shows the highest explanatory power, followed by safety ($\beta = 0.459$, $R^2 = 0.292$) and connectivity ($\beta = 0.480$, $R^2 = 0.253$). In contrast, accessibility ($\beta = 0.405$, $R^2 = 0.108$) explains the lowest proportion of variance.

Overall, the results demonstrate that all independent variables significantly contribute to explaining variations in travel behaviour, with differing levels of explanatory strength as indicated by their respective R^2 and beta values.

4.5 Central Tendencies Measurement of Constructs

To support with the regression result, the Central Tendencies Measurement is constructed. Section B and Section C was use in the Central Tendencies Measurement. By using the SPSS, the mean and standard deviation of Section B were used to measure respondents' perceptions of TOD features and travel behaviour through analysis.

All items were measured on a five-point Likert scale, coded as:

1=Strongly Disagree

2=Disagree

3=Neutral

4=Agree

5=Strongly Agree

A mean value above 3.00 indicates a tendency towards agreement (more positive perception), while a mean below 3.00 indicates a tendency towards disagreement (more negative perception). Higher SD values indicate greater variability in responses among residents.

4.5.1 Descriptive Statistics for TOD Features items- Accessibility

Table 4.28: Descriptive Statistic for Accessibility (N=150)

Item code	Item	Mean	SD
Accessibility:			
TOD 1	A: The rail transit station is easily accessible from my accommodation.	4.31	1.181
TOD 2	A: My residence is within a comfortable walking distance of the transit station.	4.07	1.174
TOD 3	A: Access routes from my accommodation to the transit station are clear and direct.	3.83	0.896

Source: Developed for the research

For accessibility, all items recorded relatively high mean scores. The statement on ease of access to rail transit stations (TOD1, M = 4.31) achieved the highest mean within this dimension, suggesting that respondents perceive transit stations as highly reachable from their accommodation. The walking distance to stations (TOD2, M = 4.07) is also receive positive evaluation, while clarity and directness of access routes (TOD3, M = 3.83) show slightly lower approval, indicating there needs to be better design and navigation systems.

4.5.2 Descriptive Statistics for TOD Features items- Connectivity

Table 4.29: Descriptive Statistic for Connectivity (N=150)

Item code	Item	Mean	SD
Connectivity:			
TOD 4	B: Public transport routes connect well to my daily destinations.	3.95	1.244
TOD 5	B: Transfers between different public transport modes are convenient.	3.78	1.117
TOD 6	B: Public transport allows me to reach most of my daily destinations without difficulty.	3.86	1.259

Source: Developed for the research

In terms of connectivity, the mean values range from 3.78 to 3.95 which indicate moderate positive results. Respondents generally agree that public transport routes are well connected to their daily destinations (TOD4, M = 3.95). However, the convenience of transfers between transport modes (TOD5, M = 3.78) receives a rating that falls below actual performance, suggesting that interchange efficiency may not be fully optimised. The ability to reach most destinations without difficulty (TOD6, M = 3.86) further supports the view that connectivity is adequate but not exceptional.

4.5.3 Descriptive Statistics for TOD Features items- Convenience

Table 4.30: Descriptive Statistic for Convenience (N=150)

Item code	Item	Mean	SD
Convenience:			
TOD 7	C:The surrounding TOD environment provides convenient access to daily amenities.	3.77	1.308
TOD 8	C: Waiting time for trains is reasonable.	3.68	1.131
TOD 9	C: Public transport services operate at convenient times for my daily activities.	3.75	1.275

Source: Developed for the research

For the convenience dimension, the mean scores are slightly lower compared to accessibility and connectivity, ranging between 3.68 and 3.77. Respondents perceive the surrounding environment as providing reasonable access to amenities (TOD7, M = 3.77). However, aspects such as waiting time (TOD8, M = 3.68) and service timing (TOD9, M = 3.75) indicate moderate satisfaction, implying that service efficiency needs improvements.

4.5.4 Descriptive Statistics for TOD Features items- Safety

Table 4.31: Descriptive Statistic for Safety (N=150)

Item code	Item	Mean	SD
Safety:			
TOD 10	D: Pedestrian walkways to the transit station are safe and comfortable.	3.63	1.328
TOD 11	D: I feel safe walking to the transit station during the day.	3.74	1.190
TOD 12	D: I feel safe walking to the transit station at night.	3.56	1.392

Source: Developed for the research

Regarding safety, the mean values are the lowest among the TOD dimensions, ranging from 3.56 to 3.74. While respondents generally feel safe walking to transit stations during the day (TOD11, M = 3.74), perceptions of safety at night (TOD12, M = 3.56) are lower. Additionally, the condition of pedestrian walkways (TOD10, M = 3.63) reflects only moderate agreement.

4.5.5 Descriptive Statistics for Travel Behaviour items

Table 4.32: Descriptive Statistic for Travel Behaviour (N=150)

Item code	Item	Mean	SD
Travel Behaviour:			
TB 1	I frequently use public transport for daily travel.	4.04	1.279
TB 2	I prefer public transport over vehicles for my daily travel.	3.89	1.037
TB 3	Travel time influences my choice of transport mode.	3.81	1.197
TB 4	I adjust my travel schedule based on travel duration ?	3.79	1.276

Source: Developed for the research

The highest mean score is obtained for frequent use of public transport (TB1, M = 4.04), suggesting that respondents regularly rely on transit systems for their daily travel. People show a strong preference for public transportation because they like sustainable travel options which receive a score of 3.89 (TB 2).

Additionally, respondents acknowledge that travel time plays an important role in their decision-making with mean score of 3.81 (TB3), highlighting the of efficiency in transport choices. The observation which shows that people change their travel plans according to their expected travel times (TB4, M = 3.79) demonstrates how essential time factors are in determining travel patterns.

4.6 Conclusion

The chapter demonstrates data analysis through its results which include descriptive statistics and regression analysis that studies how Transit-Oriented Development (TOD) aspects affect student travel patterns. Content analysis is presented to identify TOD factors that influences students' travel behaviour. The demographic findings indicate that the respondents are predominantly young undergraduate students from private universities, with most residing in urban residential settings and having relatively good access to public transportation. The descriptive analysis further shows that respondents generally have positive perceptions toward TOD features, particularly in terms of accessibility and connectivity, while aspects such as safety and convenience received slightly lower but still moderate evaluations.

The regression analysis confirms that all four TOD features accessibility, connectivity, convenience, and safety have a positive and statistically significant relationship with travel behaviour. Among these variables, convenience demonstrates the highest explanatory power, followed by safety and connectivity, while accessibility shows the lowest contribution in explaining variations in travel behaviour. These findings indicate that although all TOD features are relevant, their levels of influence differ based on the strength of their statistical relationships.

Overall, the results provide empirical evidence that TOD features are significant predictors of students' travel behaviour. The findings of this chapter serve as the basis for further discussion and interpretation in the next chapter, where the results will be examined in relation to existing literature and theoretical perspectives.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS

5.0 Introduction

This chapter discusses the major findings of the study based on the data analysis presented in Chapter 4. The chapter discussion connects statistical results to research objectives and hypotheses and the literature from Chapter 2. In this chapter, it specifically describes how accessibility, connectivity, convenience and safety are combined to shape student travel behaviour in TOD environments.

The findings are discussed according to the two research objectives of the study. The first objective was to identify TOD factors that influence students' travel behaviour, which was addressed through the content analysis. The second objective was to analyse the relationship between TOD factors and students' travel behaviour, which was addressed through regression analysis. This chapter is consistent with the methodological structure explained in Chapter 3, where different analysis was used to support each different objective.

This chapter is organised into six main sections. Section 5.1 presents the summary of statistical analyses. Section 5.2 discusses the major findings according to the research objectives and hypotheses. Section 5.3 explains the implications of the study, including managerial implications. Section 5.4 discusses the limitations of the study. Section 5.5 provides recommendations for future research. Finally, Section 5.6 concludes the overall study.

5.1 Summary of Analysis

Chapter 4 presented the statistical analyses conducted in this study, including descriptive analysis, reliability analysis, content analysis, and regression analysis. In this chapter, the descriptive analysis was used to explain the demographic profile of respondents and the central tendency of the main constructs. The reliability analysis examined how well the questionnaire is understandable to the respondent. The content analysis identified which TOD factors impacted students' travel behaviour while regression analysis tested how these factors affected their travel behaviour.

The study involved 150 university students to participate the survey in Klang Valley. The majority of respondents were female, representing 66.7% of the sample, while male respondents represented 33.3%. The sample included mostly young adults who were university students because most respondents were between 18 and 27 years old. From the respond most of the respondents studied at private universities, only smaller group study in public universities. Most respondents were undergraduate students, which is appropriate for this study because undergraduate students is familiar with public transport while mostly are travelling between accommodation and campus or even other daily destinations.

The descriptive findings showed that many respondents lived in urban residential environments. More than half of the respondents lived in condominiums or apartments, followed by landed houses, hostels or dormitories. In terms of distance from residence to the nearest MRT, LRT, KTM, or BRT station, most respondents lived within 800 metres of a transit station. The TOD literature considers 400 to 800 metres as acceptable walking distance for transit-oriented. Therefore, the sample was suitable for examining TOD-related travel behaviour because many respondents had practical access to transit systems.

The result of travel mode showed that rail transit was the most commonly used mode of transport to campus, followed by walking or cycling, private vehicles, buses, and e-hailing. The results show that respondents consider public transport and active mobility as crucial components of their transportation needs. It also supports the relevance of studying TOD factors because TOD is designed to promotes public transport use while reducing dependence on private vehicles, and creates walkable city environments. In Malaysia, TOD has been promoted as a planning approach to support public transport viability and sustainable urban land-use planning, particularly in urban regions such as Klang Valley. Malaysian TOD literature also shows that TOD is increasingly linked with MRT and LRT development, especially around rail stations and high-density urban corridors.

The reliability analysis of 30 respondent showed that all constructs achieved acceptable Cronbach's Alpha values above 0.70. The accessibility dimension showed reliable score as $\alpha = 0.793$ while connectivity achieved $\alpha = 0.867$. Convenience recorded $\alpha = 0.812$, safety recorded as $\alpha = 0.877$, and travel behaviour recorded $\alpha = 0.841$. These results indicate that the questionnaire items maintained internal consistency and reliable for further analysis. Since all of the components reached reliable values standard of $\alpha > 0.7$, it can be further proceeded to the regression analysis.

The regression analysis showed that all four TOD factors positive results which reached statistical significance in their impact on students' travel behaviour. Accessibility recorded $R^2 = 0.108$ and $\beta = 0.405$. Connectivity recorded $R^2 = 0.253$ and $\beta = 0.480$. Convenience recorded $R^2 = 0.301$ and $\beta = 0.501$. Safety recorded $R^2 = 0.292$ and $\beta = 0.459$. All models were statistically significant at $p < 0.001$. These findings indicate that accessibility, connectivity, convenience, and safety are significant predictors of students' travel behaviour. Among the four variables, convenience had the highest explanatory power, followed by safety, connectivity, and accessibility.

Although the R^2 values were moderate rather than extremely high, they are still acceptable in behavioural and social science research. This is because travel behaviour is influenced by many dimensions such like personal preferences, psychological, social, economic, and environmental factors. In studies involving human behaviour, perception, a lower or moderate R^2 value does not automatically mean that the model is weak, especially when the relationship is statistically significant and supported by theory (Cohen, 1988; Ozili, 2023). Therefore, the regression findings hold meaningful because all TOD factors were significant and consistent with previous literature.

5.2 Discussion of Major Findings

This section presents major findings which result from the two research objectives and study hypotheses. The study results are linked to Malaysian TOD research, student travel behaviour studies, and two theoretical frameworks which include TOD theory and the Theory of Planned Behaviour.

5.2.1 Objective 1 : To Identify TOD Factors that influence students' Travel Behaviour

The first research objective was to identify the Transit-Oriented Development (TOD) factors which influence students' travel behaviour in Klang Valley. The content analysis proved that four accessible TOD factors which include accessibility, connectivity, convenience and safety should be used to assess transit-oriented development. The factors were chosen because they show how people experience transit-oriented development from both physical and human perspective. Accessibility and connectivity relate to the spatial characteristics of public transport, while convenience and safety reflect students' practical experience and perception when using public transport.

5.2.1.1 Accessibility

Accessibility was identified as an important TOD factor because it determines how easily students can reach transit stations from their accommodation, campus, and other daily destinations. The central tendencies measurement findings showed that accessibility recorded the highest mean score among the four TOD factors. This reflects that many respondents believed that rail transit stations could be reached effortless and easy to access. This finding matched with TOD principles, which emphasise compact and walkable development around public transport to encourage transit use and reduce reliance on private vehicles (Calthorpe, 1993; Cervero & Kockelman, 1997). It is also supported by Ewing and Cervero (2010), who stated that accessibility and distance to transit are important built-environment factors influencing travel behaviour.

However, accessibility should not be understood only as physical distance to the nearest station. A student may live close to an MRT, LRT, KTM, or BRT station, but actual accessibility also depends on pedestrian route quality, directness of access, walking comfort, wayfinding, and first-mile or last-mile connections. In Malaysia, accessibility of TOD environment faces difficulties because the pedestrian infrastructure remains weak and incomplete connection to surrounding areas from transit stations (Ahmad et al., 2022; Abdullah et al., 2023). Therefore, the finding establishes that accessibility is essential basic requirement of TOD, but proper pedestrian design and station-area planning must support this requirement.

5.2.1.2 Connectivity

Connectivity was also identified as a key TOD factor influencing students' travel behaviour. Connectivity refers to how well public transport routes, stations, and modes are linked to students' daily destinations, including campus, accommodation, commercial areas, and other activity centres. The results demonstrated that students

maintained a positive view of public transportation links because they found it easier to transfer between different routes that operated throughout the system. The result indicate that even the Klang Valley rail network offers beneficial transportation connections yet certain students encounter challenges when transferring between modes or completing their journey.

This finding is consistent with previous public transport studies which show that route integration, service quality, and network connection influence commuter satisfaction and continued public transport use. Hizam et al. (2021) found that public rail service quality in Kuala Lumpur affects commuters' satisfaction and loyalty behaviour. Similarly, Hensher et al. (2008) argued that public transport performance depends on the efficiency of service and route linkages to each other. For students, they require good connectivity because their daily journeys may involve walking, buses, rail transit and sometimes e-hailing. If transfers are inconvenient or routes are poorly connected, students may experience longer travel times and become less willing to depend on public transport.

5.2.1.3 Convenience

Convenience was identified as another important TOD factor because it reflects whether public transport is practical and suitable for students' daily routines. Convenience includes components such as waiting time, operating hours, service reliability, travel comfort, and access to daily amenities. Although convenience did not record the highest descriptive mean score, it remains important because students need public transport which operates effectively and provides them with essential services because they will determine its effectiveness through their estimation of its availability and their assessment of its accessibility and its dependable operation. This is supported by Beirão and Cabral (2007), who explained that user's perception of public transport comfort affects their decision to use the service because it

determines their views about system reliability and operational flexibility and user accessibility.

This finding is relevant to students because their travel decisions depends on their academic schedules and daily activities. If students experience long waiting times, unreliable services, or unsuitable operating hours, they may be less likely to pursue the use of public transport even when a station is nearby. Previous studies also show that service quality affects satisfaction and behavioural intention to continue using public transport (Hizam et al., 2021). Therefore, convenience plays an important role in determining whether students view public transport as a realistic option for daily commuting.

5.2.1.4 Safety

Safety was identified as one of a TOD factor influencing students' travel behaviour based on the result. The definition of safety extends to pedestrian walkway conditions, lightning, station security, road crossing and students' feeling when walking to transit stations during the day and at night. In the descriptive analysis, safety recorded the lowest mean score among the four TOD factors. This suggests that safety remains a concern in student-oriented TOD environments, particularly when students need to walk to or from transit stations at night.

Safety is important because students may avoid walking or using public transport if they feel unsafe, even when the station is accessible and the service is convenient. This finding is consistent with the Theory of Planned Behaviour, which explains that behaviour is influenced by attitudes and perceived behavioural control (Ajzen, 1991). If students perceive the walking environment as unsafe, their perceived control over using public transport may decrease, reducing their willingness to travel by transit. Malaysian TOD literature also highlights that poor lighting, unsafe

crossings, and weak pedestrian infrastructure can reduce the attractiveness of TOD environments (Ahmad et al., 2022; Abdullah et al., 2023).

Overall, Objective 1 was addressed because the study successfully identified the main factors which affect students' travel behaviour. When studying, accessibility, connectivity, convenience, and safety as the main TOD factors influencing students' travel behaviour. The result of this study confirm the findings of Chapter 2 literature review which establishes that TOD effectiveness relies on both rail infrastructure availability and the access quality, service convenience, route integration, and user safety. Therefore, students' travel behaviour in Klang Valley is shaped by the overall quality of the TOD environment, not by the presence of nearby transit stations.

5.2.2 Objective 2 : To analyse the relationship between TOD factors and students travel behaviour

The second research objective was to analyse the relationship between TOD factors and students' travel behaviour in Klang Valley. The analysis was conducted through simple linear regression analysis to test the impact of each TOD factors (Accessibility, Connectivity, Convenience, Safety) against students' travel behaviour separately. The regression results showed that all four TOD factors had positive and statistically significant relationships with students' travel behaviour. Therefore, all hypotheses from Chapter 2 were accepted as valid.

The research results support the existing literature with the built environment and travel behaviour. The study shows that travel behaviour is influenced by physical surroundings, built environment, service availability and personal perceptions towards travel behaviour. Ewing and Cervero (2010) found that built environment characteristics such as accessibility, distance to transit, land-use diversity, and street network design influence travel outcomes, including mode choice and travel distance. Similarly, Cervero and Kockelman (1997) explained that the "3Ds" of the

built environment, namely density, diversity, and design, can influence travel demand and reduce automobile dependency. In the TOD context, this means that students' travel behaviour is shaped not only by the availability of public transport, but also by how easily, safely, and conveniently they can use the transport system.

The research results support TOD theory which states that land use and transportation systems must work together to boost public transport usage while decreasing private vehicle dependence (Calthorpe, 1993; Cervero & Kockelman, 1997). In Malaysia, the government promotes TOD as an urban planning approach to help public transport systems function better and increases city mobility throughout rail transit stations. Recent Malaysian TOD literature also highlights that TOD implementation should not focus only on development density, but must also include accessibility, pedestrian infrastructure, service integration, public amenities, and user experience (Ramlan et al., 2021; Din et al., 2023; Abdullah et al., 2023).

5.2.2.1 Accessibility versus Students' Travel Behaviour

The first hypothesis stated that accessibility has a significant relationship with students' travel behaviour. The regression result showed that accessibility recorded $R^2 = 0.108$, $\beta = 0.405$, and $p < 0.001$. The regression result showed that accessibility recorded $R^2 = 0.108$, $\beta = 0.405$, and $p < 0.001$. The relationship shows statistical significance because the p-value falls below 0.05 threshold. The result supports H1.

The result shows that accessibility has a positive connection with students' travel behaviour. In other words, students who believe their accommodation allows them to reach transit stations without difficulty tend to use public transport more frequently. The finding is reasonable because accessibility serves as one of the major essential elements that define TOD. The design of TOD environments enables people to travel shorter distances between people, transit station and daily

destinations. When students can reach MRT, LRT, KTM, or BRT stations easily, public transport becomes a more practical option for daily commuting.

This finding is supported by Ewing and Cervero (2010), who found that accessibility to destinations is one of the built environment factors most strongly associated with travel behaviour. Their research showed that when people can easily access places through public transportation systems their travel patterns change. Similarly, Geurs and van Wee (2004) explained that accessibility refers to the extent to which land-use and transport systems allow individuals to reach activities and destinations. This supports the study because students' willingness to use public transport depends partly on whether they can easily access the transit system from their residence or campus.

The finding is also consistent with Malaysian TOD studies. Yap et al. (2021) showed that rail-based development in Klang Valley create better access to residential, commercial and institutional area through MRT and LRT networks. Ramlan et al. (2021) also noted that TOD implementation in Malaysia is closely linked to station-area accessibility and the integration of transport with surrounding land use. This supports the present result because students living within or near TOD environments may experience better access to public transport services.

However, although H1 is accepted, accessibility recorded the lowest explanatory power among the four TOD factors. The R^2 value of 0.108 means that accessibility explains only 10.8% of the variance in students' travel behaviour. The data indicates that accessibility functions as an important factor yet it remains less powerful than other elements which shape student travel behaviour. A possible explanation is that physical access to transit stations alone does not guarantee public transport usage. Students who live close to a station would still prefer private vehicles e-hailing or different transport options because of unreliable service and inconvenient transfer routes and unsafe walking areas.

This explanation is supported by Ahmad et al. (2022), who argued that Malaysian TOD environments may achieve proximity to transit stations, but still face weaknesses in pedestrian infrastructure, walkability, and first-mile or last-mile connectivity. Therefore, the result is accepted, but the influence of accessibility is considered weaker compared with convenience, safety, and connectivity. Accessibility creates the opportunity to use public transport, but other factors determine whether students actually choose to use it.

5.2.2.2 Connectivity versus Students' Travel Behaviour

The second hypothesis stated that connectivity has a significant relationship with students' travel behaviour. The regression result showed that connectivity recorded $R^2 = 0.253$, $\beta = 0.480$, and $p < 0.001$. Since the p-value is below 0.05, the relationship is statistically significant. Therefore, H2 is accepted.

The results demonstrate that connectivity positively affects students travel behaviour between different locations. Students who need to travel between their daily destinations will choose public transportation when they have better route connections or when they experience easier transfer between destination from rail transit to different destination. This is highly relevant to students because their daily trips often involve multiple destinations, such as accommodation, campus, food outlets, shopping areas, libraries, transit stations, and part-time workplaces.

This finding is supported by Hensher et al. (2008), who explained that public transport performance depends heavily on the integration of routes, services, and transfer systems. Public transport becomes more attractive when users can move smoothly across different modes and routes. Similarly, Bachok et al. (2013) discovered that public transport in Malaysia becomes less appealing when service reliability and transport networks are not properly integrated. This supports the present results because poor connectivity mat cause students to experience longer

travel time, greater transfer challenges which will reduce their reliance of public transport.

The result is also consistent with Hizam et al. (2021), who studied public rail quality of service in Kuala Lumpur and found that service quality is important in influencing commuter satisfaction and loyalty behaviour. Service quality includes factors such as reliability, route accessibility, comfort, and system performance. Since connectivity is part of the overall service experience, better connectivity can improve students' perception of public transport and encourage more consistent use.

The researchers in Abdullah et al. (2023) and Ahmad et al. (2022) demonstrate that TOD achieves its full potential when rail stations exist together with pedestrian walkways, feeder service and land development areas. This is important as students in Klang Valley may require multiple transportation method which include walking, rail transit, bus and e-hailing services to complete their journey. Public transportation systems become less attractive to people when different transportation options lack proper connections even though TOD facilities exist.

Therefore, H2 is accepted because the regression result confirms that connectivity determine students' travel behaviour. The R^2 value of 0.253 also shows that connectivity explains 25.3% of the variance in students' travel behaviour, which is higher than accessibility. This suggests that students are influenced based on two factors ; ability to access ; ability to use efficiently reach destinations.

5.2.2.3 Convenience versus Students' Travel Behaviour

The third hypothesis stated that convenience has a significant relationship with students' travel behaviour. The regression result showed that convenience achieved $R^2 = 0.301$ together with $\beta = 0.501$, and $p < 0.001$. Since the result is statistically significant, H3 is accepted. Among all four TOD factors convenience achieved the highest R^2 value together with the highest beta value. This study identified convenience as the main factor which determines students travel behaviour.

This result suggests that students develop their travel behaviour are strongly based on the ease of use of public transport. Convenience includes reasonable waiting time, operating hours, service reliability, comfort, and access to daily amenities. For students, they require convenient access to their daily activities because their time-sensitive obligations determine their daily schedules. They may need to attend classes, tutorials, examinations, group discussions, campus activities, and part-time work. If public transport is inconvenient, students may experience being late, stress, and uncertainty, causing them to shift to private vehicles or e-hailing services.

People form their attitudes about public transport based on these practical service factors which include comfort and reliability and flexibility and travel time and convenience according to (Beirão & Cabral, 2007). Their study showed that people compare public transport with private vehicles based on the overall travel experience. If public transport is perceived as inconvenient, users may prefer private cars even when public transport is available. This supports the present study finding because students may avoid public transport if it does not match their daily schedules or meet their expected travel expectations.

The result is also supported by Hizam et al. (2021), who found that public rail service quality in Kuala Lumpur influences commuter satisfaction and loyalty behaviour. Users will continue to use public transport services when they experience reliable and comfortable and timely and easy service according to

service quality standards. The research conducted by Khalid et al. (2014) and Bachok et al. (2013) discovered that public transportation problems in Malaysia which include delays and overcrowding and waiting time and unreliable service lead to decreased passenger satisfaction.

In the student context, this finding is also consistent with Ghani et al. (2020), who noted that students' make transportation decisions based on four factors which include travel expenses, travel duration and service accessibility to support their academic activities throughout the day. University students often have limited income and flexible but time-sensitive schedules. Therefore, convenience becomes a major factor because students need transport services that help them manage their daily movement efficiently.

The study demonstrates strong support for H3 because convenience shows the highest ability to explain based on study results. The R^2 value of 0.301 means that convenience explains 30.1% of the variance in students' travel behaviour. This suggests that students are more influenced by the quality and operational function of the public transport experience than by physical access alone. In other words, students do not use public transport simply because it is nearby; they use it when it is practical, reliable, time-saving, and suitable for their daily routine.

5.2.2.4 Safety versus Students' Travel Behaviour

The fourth hypothesis which is H4 stated that safety has a significant relationship with students' travel behaviour. The regression result of safety showed $R^2 = 0.292$, together with $\beta = 0.459$ and $p < 0.001$. Since the p-value is below 0.05, the relationship is statistically significant. Therefore, H4 is accepted.

This finding indicates that safety has a positive and significant relationship with students' travel behaviour. Students are more likely to use public transport when they feel safe walking to transit stations, waiting at stations, and moving through the TOD environment. Safety is important because public transport use usually involves walking before and after the transit trip. If students feel unsafe during this first-mile or last-mile journey, they may avoid public transport even when transit stations are accessible.

This result is supported by Loukopoulos and Gärling (2005), who explained that perceived safety can influence travel behaviour because users may avoid certain transport modes or routes if they perceive them as unsafe. Safety affects both physical mobility and psychological comfort. According to Ajzen's (1991) Theory of Planned Behaviour, behaviour is influenced by perceived behavioural control. When students feel unsafe, their perceived control over using public transport decreases, reducing their willingness to travel by public transport.

The finding is also consistent with Malaysian TOD literature. The authors Ahmad et al. (2022) discovered that TOD environments in Malaysia often face issues such as poor pedestrian infrastructure, dangerous crossings points, inadequate lighting, and weak pedestrian accessibility. The situation decreases the appeal of walking and using public transportation. Abdullah et al. (2023) demonstrated that pedestrian connectivity, comfort, and safety are important factors in determining public perception of transit-oriented environments in Malaysia.

Students require safety environments because they may need to travel during times when it is early in the morning or night for their class schedules or part-time employment. If the pedestrian paths are improper such as lack of lightning, it makes one feels insecure therefore resulting discomfort, they may even shift travel frequency to e-hailing or travel by private vehicles. This explains why safety recorded the second highest explanatory power in the regression analysis.

An important point is that safety recorded the lowest mean score in the descriptive analysis, but the second highest R^2 value in regression. This means that although students rated safety lower than other TOD factors, safety still strongly plays major role in their travel behaviour. This result suggests that safety is a critical weakness in student-oriented TOD environments. If safety improves, students may choose to walk to stations and use public transportation when they feel safe and secure. Therefore, H4 is accepted. Safety is represented as an essential element influencing students' travel behaviour.

5.2.3 Summary Result

5.2.3.1 Objective 1

Accessibility was identified as a key factor because students are more likely to use public transport when transit stations are easy to reach from their accommodation or campus. Connectivity was also important because students' daily travel often involves different destinations and transport modes. Good route connection and smooth transfers can make public transport more practical for students (Hensher et al., 2008; Hizam et al., 2021). Convenience influences students' travel behaviour because public transport must fit their daily academic routine. Reasonable waiting time, reliable service, and suitable operating hours can encourage regular public transport use (Beirão & Cabral, 2007; Hizam et al., 2021). Safety was identified as another important factor because students may avoid walking to transit stations or using public transport if they feel unsafe, especially at night. This is consistent with studies showing that safety affects willingness to use public transport (Loukopoulos & Gärling, 2005; Ahmad et al., 2022).

Overall, objective 1 established that accessibility, connectivity, convenience and safety exist as the primary factors which affect student travel patterns through their determination of transit-oriented development factors.

5.2.3.2 Objective 2

Overall, Objective 2 was achieved because the regression analysis confirmed that all four TOD factors have positive and statistically significant relationships with students' travel behaviour. The results support all four hypotheses, as shown below:

Table 5.1: Summary Table for hypothesis, regression result

Hypothesis	Relationship Tested	R^2	β	Result	Judgement
H1	Accessibility has a significant relationship with students' travel behaviour.	0.108	0.405	$p < 0.001$	Accepted
H2	Connectivity has a significant relationship with students' travel behaviour.	0.253	0.480	$p < 0.001$	Accepted
H3	Convenience has a significant relationship with students' travel behaviour.	0.301	0.501	$p < 0.001$	Accepted
H4	Safety has a significant relationship with students' travel behaviour.	0.292	0.459	$p < 0.001$	Accepted

Source: Developed for the research

In conclusion, this study confirmed that all four hypotheses are accepted. The results show that TOD factors significantly influence students' travel behaviour. The research findings demonstrate that convenience and safety have higher impact have greater impact on connectivity and accessibility.

Therefore, TOD planning for students in Klang Valley should prioritise reliable services, reasonable waiting times, suitable operating hours, safe pedestrian routes, efficient transfers, and better first-mile and last-mile connectivity.

5.3 Implications of the study

The findings of this study provide important implications for TOD planning, public transport improvement, university mobility planning, and student-oriented urban development in Malaysia. Since the study showed all four TOD factors had significant effects on students' travel behaviour, stakeholders should pay attention to accessibility, connectivity, convenience, and safety when planning transport systems and development around transit stations.

The study shows that TOD should not be understood only as building high-density developments near MRT, LRT, KTM, or BRT stations. From the findings, although station proximity is important, the findings show that convenience and safety have stronger explanatory power than accessibility. This explains that user experience determines whether TOD effectiveness.

Students are more likely to use public transport when services are reliable, routes are connected, waiting times remain reasonable, pedestrian pathways are safe, and the environment supports daily activities.

The findings also imply that student mobility should be considered as part of Malaysia's TOD planning process. Many TOD discussions focus on general commuters, working adults, or property development. However, students are also important user group because they often depend on public transport and active mobility. TOD environments will develop sustainable practices at an early stage of their adulthood. This is important because the development of travel behaviour might determine students' future transportation choices.

5.3.1 Managerial Implications

The research results offer practical implications to policymakers, urban planners, university administrators and real estate developers according to the research which is seen from a managerial viewpoint.

5.3.1.1 Policymakers

For policymakers and urban planners, the findings suggest that pedestrian safety, service convenience and first-mile and last-mile connectivity should be placed stronger emphasis. The current TOD planning process needs to extend beyond its current focus on density and station proximity. Instead, the TOD assessment should be evaluated based on the ease of movement from accommodation to stations or to daily amenities. Malaysian TOD studies shows that TOD development has become more important near MRT and LRT corridors but successful implementation still needs better public transport connections and pedestrian pathways and integration of land use planning. More than that, the findings show that convenience is the strongest predictor of students' travel behaviour. Policymakers should understand that student travel behaviour depends on the service frequency, reducing the waiting time and maintaining the service condition would will increase the usage of public transportation. This would help in shaping sustainable practice at the early stage of adulthood. Therefore, operators should improve service frequency, and maintain the rail transit vehicle in good state to ensure reliable schedules to support flexible student routines.

5.3.1.2 Universities administrators

For universities, the findings suggest that campus mobility planning should be integrated with nearby transit services. Universities can support student travel behaviour by providing shuttle buses between campus and nearby MRT, LRT, KTM, or BRT stations. The university can enhance pedestrian paths through its campus by improving their lighting and signage systems or even covered walkways between campus to transit stations. Since safety was found to be a strong predictor, universities should also work with local authorities to improve student safety around common walking routes.

5.3.1.3 Real Estate Developers

For property developers, the findings suggest that student housing near transit stations should focus not only on location, but also on safe and convenient access. A development may be marketed as being near transit, but if students need to walk through unsafe, or uncomfortable routes, the TOD advantage becomes weaker. Developers should therefore consider pedestrian-friendly design, direct walking routes, lighting, active frontages, mixed-use amenities, and secure environments when developing student accommodation or residential projects near transit stations.

5.3.1.4 Local Authorities

For local authorities, the findings suggest that safety enhancements as necessary components of TOD implementation. Better street lighting, safer crossings and wider pedestrian walkways with CCTV coverage would increase the students'

willingness to use public transport since they might travel at night therefore reduce dependence on private vehicles and traffic congestions.

The managerial implication shows that TOD planning in Malaysia needs to progress beyond station proximity to establish effective usable Transit-Oriented Development. A TOD environment is more effective to students when they can access it easily, connect to destinations efficiently, and feel safe throughout the journey.

5.4 Limitations of Study

Although this study achieved its research objectives, several limitations has been acknowledged. The research results maintain their importance yet the research limitations provide direction for future research.

5.4.1 Limitation 1

The research project selected participants through convenience sampling because the researcher did not have access to a complete list of all university students in Klang Valley. However, convenience sampling limits the generalisability of the findings because the sample may not fully represent all university students in the region. Some student groups, universities, or locations may be underrepresented.

5.4.2 Limitation 2

Most participants in this study came from private universities. The research results show that private university students experience higher travel patterns and TOD assessment results than their public university students. Students from public universities may have different accommodation patterns, transport access, financial backgrounds, and campus locations. Therefore, future studies should include a more balanced number of respondents from both public and private universities.

5.4.3 Limitation 3

Third, this study used a cross-sectional research design. Data were collected at one point in time, which means the findings represent students' travel behaviour during the survey period only. Travel behaviour may change depending on semester timetable, examination period, public transport service changes, weather, fuel prices, parking availability, or accommodation changes. Therefore, the study cannot explain long-term changes in students' travel behaviour.

5.4.4 Limitation 4

Fourth, the study focused only on four TOD factors which included accessibility, connectivity, convenience, and safety. Although these factors are important, students' travel behaviour may also be influenced by other factors such as : expenses of traveling, income of their families, their ownership of vehicles, existing weather conditions, their access to parking spaces. Not to mention peer influence and

personal attitude towards public transport. These factors were not evaluated as separate research variables in this study.

5.4.5 Limitation 5

Fifth, the study relied on self-reported questionnaire responses. Respondents answered based on their own perceptions and experiences. Therefore, the data may contain personal bias. For example, two students living in the same location may rate safety or convenience differently depending on their personal travel experience, time of travel, or level of confidence. However, this limitation is acceptable because the perception-based study needs this limitation to understand how students perceive TOD factors.

5.4.6 Limitation 6

The study examined each TOD factor through its respective analysis using simple linear regression. This method only established individual relationship between each TOD factor and students' travel behaviour. It does not reveal how all TOD factors interconnect within a single framework. A multiple regression model would allow future researchers to identify which factor remains most influential when all variables are tested together.

5.5 Recommendations for Future Research

5.5.1 Recommendation 1

Future research should expand the sample size and include a more balanced representation of students from public and private universities. A larger and more diverse sample would improve the generalisability from multiple backgrounds because their different backgrounds will help researchers compare their results with various student groups from different universities and campus locations.

5.5.2 Recommendation 2

Future studies should also include students from different urban regions in Malaysia, such as Penang, Johor Bahru, Ipoh, or Kota Kinabalu. This would allow comparison between Klang Valley, which operates advanced rail systems and other Malaysian cities where public transport systems are less extensive. Such comparison could help identify how transportation system development affects student travel behaviour through maturity of TOD factors.

5.5.3 Recommendation 3

Future research should also include additional variables such as transport cost, parking availability, income level, car ownership, travel time, weather conditions, and campus shuttle availability. These variables may provide a more complete explanation of students' travel behaviour. Since convenience and safety were found to be the strongest predictors in this study, future research could examine these

dimensions in greater detail by including items on train frequency, crowding, night lighting, CCTV, pedestrian crossings, and walking comfort.

5.5.4 Recommendation 4

Future research could also use multiple regression analysis to test all TOD factors together in one model. This would enable researchers to determine which factors most influence students' travel behaviour after all other factors have been eliminated. Future research could use structural equation modelling to study mediation effects through satisfaction and perceived behavioural control and intention to use public transport.

5.5.5 Recommendation 5

Future studies may also apply qualitative methods such as interviews or focus groups. Qualitative research can provide deeper understanding of why students choose or avoid public transport. For example, interviews may reveal that students avoid public transport because of fear of walking at night, unreliable feeder buses, overcrowding, long waiting time, or lack of direct connection to campus. This would provide richer explanation beyond numerical findings.

5.6 Conclusion

The study focused four TOD factors which included accessibility and connectivity and convenience and safety. Two objectives were used such as to identify TOD factors which affect student travel behaviour and to study how TOD factors affect student travel behaviour.

The findings results shows that accessibility, connectivity ,convenience and safety requirements function as primary TOD elements which determine student travel patterns. The content analysis confirmed that these factors shape students' ability, willingness, and comfort in using public transport. Students use transit stations because accessibility provides transit access, and connectivity enables them to travel to multiple locations, convenience decides their daily use of public transportation and safety determines their transit facility usage through walking. The regression analysis confirmed that all four TOD factors have positive and statistically significant relationships with students' travel behaviour. The strongest predictor of students' behaviour in this study was found to be convenience, while safety and connectivity and accessibility followed as additional predictors. Students decide how they travel based on two factors, which include the distance to transit stations and the practicalities of using public transportation, along with its safety features and system connectivity and daily life compatibility.

Overall, the study concludes that TOD factors play a significant role in shaping students' travel behaviour in Klang Valley. However, effective TOD planning requires more than just considering how close stations are to each other. A functional TOD system for students needs to establish secure walking paths and present reliable transportation service which operate throughout the day and enable access to daily amenities. By improving these elements, it will enable TOD systems to better support student mobility requirements while increasing public transportation utilization and decreasing private vehicle usage and contribute sustainable urban transportation patterns throughout Malaysia.

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APPENDIX

Appendix 3.1 : Survey Questionnaire

Influence of TOD Factors on students' Travel Behavior in Klang Valley

Dear Respondents,

I am Rosemary Wong, a final year student pursuing a Bachelor's Degree of Building and Property Management (Honours) at Universiti Tunku Abdul Rahman (UTAR). I am currently conducting a research project titled " **Transit, Choices, and Costs: Understanding Students' Travel Behaviour and Affordability in Transit-Oriented-Development Environments**." The purpose of this questionnaire is to examine the factors influencing university students' travel behaviour and residential decisions within transit-oriented development environments in the Klang Valley.

You are kindly invited to participate in this research by filling up this questionnaire, which will take approximately 10 minutes. The questionnaire consists of 5 sections: Section A, B, C, D, and E.

Information obtained is strictly confidential and will be used for statistical and academic purposes only.

If you have any doubts about this survey, kindly contact me at rosemary@1utar.my.

Thank you for your valuable time and participation.

Acknowledgment of Notice: I have been notified and that I hereby understood, consented and agreed per UTAR above notice.

- ◯ Yes - proceed to the questionnaire.
- ◯ No - thank you for your time.

Section A : Personal Information

Gender *

- ◯ Male
- ◯ Female

Age *

- ◯ 18-22
- ◯ 23-27
- ◯ 28-32
- ◯ 33-37
- ◯ ≥38

University *

- ◯ Private
- ◯ Public

Level of education *

- ◯ Foundation / Pre-U
- ◯ Undergraduate
- ◯ Postgraduate

Years of study *

- ◯ Year 1
- ◯ Year 2
- ◯ Year 3
- ◯ Year 4

Current Type of Accommodation *

- ◯ Landed house
- ◯ Condominium / Apartment
- ◯ Hostel / Domitory

Distance from Residence to nearest MRT / LRT / KTM / BRT station. *

- ◯ Less than 200m (within 3-5 minutes' walk)
- ◯ 200m-400m (5-10 minutes' walk)
- ◯ 401m-800m (10-15 minutes' walk)
- ◯ More than 800m (over 15 minutes' walk)

Primary mode of transport to campus (the most you spend longest time) *

- ◯ Rail transit (MRT / LRT / KTM)
- ◯ Bus
- ◯ Private vehicle
- ◯ E-hailing (Grab, etc)
- ◯ Walking / Cycling

Monthly rental (per person) *

- ◯ ≤ RM400
- ◯ RM401–RM500
- ◯ RM501–RM700
- ◯ RM701–RM900
- ◯ RM901-RM1000
- ◯ ≥ RM1001

Main factor influencing your choice of accommodation: *

- ◯ Affordable rent
- ◯ Proximity to transit
- ◯ Proximity to campus
- ◯ Safety
- ◯ Facilities provided

Back Next Clear form

Section B : TOD Features Influence Travel Behavior

Likert scale:
1 = Strongly Disagree | 2 = Disagree | 3 = Slightly Agree | 4 = Agree | 5 = Strongly Agree

A: Accessibility *

	Strongly Disagree	Disagree	Slightly Agree	Agree	Strongly Agree
The rail transit station is easily accessible from my accommodation	○	○	○	○	○
My residence is within a comfortable walking distance of the transit station.	○	○	○	○	○
Access routes from my accommodation to the transit station are clear and direct.	○	○	○	○	○

B: Connectivity *

	Strongly Disagree	Disagree	Slightly Agree	Agree	Strongly Agree
Public transport routes connect well to my daily destinations.	○	○	○	○	○
Transfers between different public transport modes are convenient.	○	○	○	○	○
Public transport allows me to reach most of my daily destinations without difficultiy.	○	○	○	○	○

C: Convenience *

	Strongly Disagree	Disagree	Slightly Agree	Agree	Strongly Agree
Public transport routes connect well to my daily deestinations.	○	○	○	○	○
Transfers between different public transport modes are convenient.	○	○	○	○	○
Public transport allows me to reach most of my daily destinations without difficulty	○	○	○	○	○

D: Safety *

	Strongly Disagree	Disagree	Slightly Agree	Agree	Strongly Agree
Pedestrian walkways to the transit station are safe and comfortable.	○	○	○	○	○
I feel safe walking to the transit station during the day.	○	○	○	○	○
I feel safe walking to the transit station at night.	○	○	○	○	○

Section C : Students' Travel Behavior

Likert scale:
1 = Strongly Disagree | 2 = Disagree | 3 = Slightly Agree | 4 = Agree | 5 = Strongly Agree

Travel Behavior *

	Strongly Disagree	Disagree	Slightly Agree	Agree	Strongly Agree
I frequently use public transport for my daily travel.	◯	◯	◯	◯	◯
I prefer public transport over vehicles for my daily travel.	◯	◯	◯	◯	◯
Travel time influences my choice of transport mode.	◯	◯	◯	◯	◯
I adjust my travel schedule based on travel duration.	◯	◯	◯	◯	◯