INFLUENTIAL FACTORS AFFECTING TRANSIT-ORIENTED DEVELOPMENT RESIDENCES' USE OF BANGKOK MASS RAPID TRANSIT LINE: A CASE STUDY OF THE MRT CHALOEM RATCHAMONGKON LINE (MRT BLUE LINE)

BY

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AN INDEPENDENT STUDY SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE (REAL ESTATE BUSINESS)

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was approved as partial fulfillment of the requirements for
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ABSTRACT

This research study focuses on studying behavior and problems related to Transit-Oriented Development residences' use of Bangkok Mass Rapid Transit Blue Line (the MRT Blue Line). The objective is to increase the use of MRT Blue Line services by those who reside within 1 kilometer from each station of the MRT Blue Line. The study includes analyzing six factors, which are Density, Design, Distance, Diversity, Destination Accessibility, and Demand Management. Data was collected through online questionnaires from 400 residents who are living near the 38 stations of the MRT Blue Line, especially those who use less than 2 days per week or choose the other mode of transportation instead. The study analyzed factors using binary logistic regression analysis through SPSS software. The research found after conducting a One-way ANOVA analysis, in which it was found that occupation and marital status does not affect the use of MRT Blue Line by the Transit-Oriented Development residents. Meanwhile, those with a monthly income between 20,001 - 30,000 baht are more likely to use public transportation than those with a monthly income between 60,001 - 70,000, who walk the least. In addition to the tendency to use the MRT Blue Line, females,

those between 31-40 years old, and those with bachelor's degrees tend to use the MRT Blue Line. Apart from the demographic factors, two of the six Transit-Oriented factors, which are Design and Distance, also have an impact on the use of the MRT Blue Line by the residents nearby the 38 stations of the MRT Blue Line.

Keywords: Transit-Oriented Development, Built Environment, Transit Ridership Demand

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Siriwit Rojjuthakul

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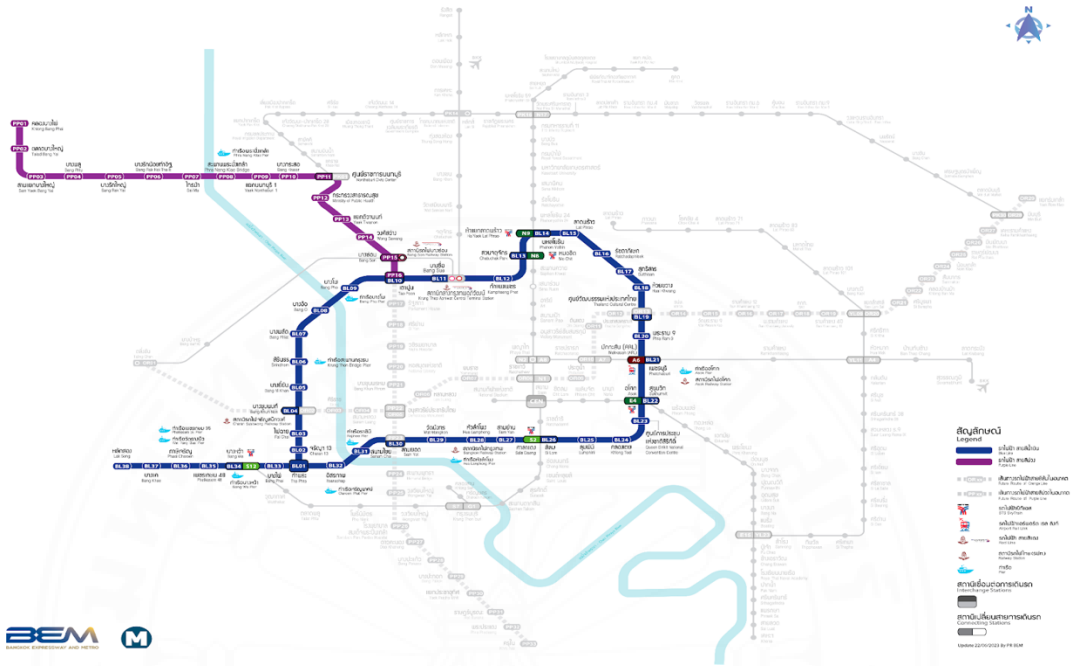
CHAPTER 1
INTRODUCTION

1.1 Introduction

In the modern landscape of urban development, the efficiency and sustainability of public transportation systems are pivotal in meeting the needs of the cities. Within the context of Bangkok, a metropolis renowned for its vibrant dynamism and bustling urban life, the Bangkok Metropolitan Rapid Transit (MRT) system stands as a critical pillar of the city's transportation infrastructure. Understanding the underlying factors that influence ridership demand on this rapid transit network is paramount for optimizing its functionality and ensuring its alignment with the evolving needs of the city's populace. The MRT Blue Line, officially known as the MRT Chaloem Ratchamongkhon Line, is an integral part of Bangkok's rapid transit system (See Figure 1.1), serving as the city's third mass rapid transit line (MRT System Line, n.d.). Although the MRT Blue Line has experienced significant expansion and increased ridership over time, certain stations along the line have struggled to generate sufficient demand and revenue, hindering further expansion efforts. Hence, this study aims to explore the correlation between Transit-Oriented Development (TOD) and the demand for ridership. It will delve into the Built Environment Factors and demographic profiles of TOD residents living within a 1-kilometer radius of each station with the goal to understand how these elements influence their choice to utilize the MRT Blue Line over other motorized transportation options.

Figure 1.1

The MRT Blue Line Network



Note. From "*MRT System Map" by BEM, n.d.*

(https://metro.bemplc.co.th/MRT-System-Map?lang=en)

1.2 Research Objectives

1.2.1 Influential Factor Identification

Explore the influential factors associated with mass transit use of TOD residences.

1.2.2 Demographic Attribute Identification

Identify demographic profiles by investigating the demographic characteristics of residents living within the proximity of MRT Blue Line stations, focusing on age, income levels, household size, and occupation to understand their influence on MRT usage.

1.2.3 Transit-Oriented Development Project Recommendations

Support TOD catchment area planning by proposing recommendations based on the findings, formulate recommendations and strategies for enhancing the utilization of the MRT Blue Line by TOD residents, considering aspects like infrastructure enhancements, community engagement, or policy revisions.

1.3 Scope of Study

1.3.1 Area Scope

Study factors and issues associated with TOD residences' use of Bangkok Mass Rapid Transit line or the MRT Blue line covering the area within a radius of 1,000 meters from each station.

1.3.2 Content Scope

Study related theories, research and issues with the influential factors affecting TOD residences' use of Bangkok Mass Rapid Transit line.

1.4 Expected Results (Benefits)

1.4.1 Advantages for Real Estate Developers

Exploring the advantages for real estate developers in Bangkok, Thailand by expanding insights into constructing walkable environments or the enhancement of transit accessibility.

1.4.2 Suggestions for Project Developments

Suggestions for public and private sectors in tailoring infrastructure to align with the preferences of MRT users, especially those residents who are living within the radius of 1 kilometer from the MRT Blue Line stations.

1.4.3 Insights for Policy Planners

Insights for urban policy planners to understand factors influencing TOD residences' Use Along Bangkok's MRT Blue Line.

1.5 Keyword Definitions

1.5.1 Transit-Oriented Development

The development of the surrounding area of any transit station by designing and developing those areas nearby the transit within 1,000 meters from the mass transit station.

1.5.2 Transit Ridership Demand

The quantity and frequency of individuals or passengers utilizing a transit system within a specified period, reflecting the need and preference for public transportation services.

1.5.3 Bangkok Metropolitan Rapid Transit Line

A comprehensive and interconnected system of rapid transit or metro lines within the urban landscape of Bangkok, providing subway or elevated rail services across the city and its adjoining areas.

1.5.4 Last-Mile Connectivity

The accessibility and ease of connecting from a transit station or stop to the destination, often considered a crucial factor influencing ridership decisions.

1.5.5 Non-motorized transport

Non-motorized transport (NMT) refers to modes of transportation that do not rely on motorized vehicles. These forms of transport include walking, cycling, skating, and the use of non-motorized vehicles like push scooters or wheelchairs. In the context of Transit-Oriented Development (TOD) and its influence on residences' utilization of Bangkok's MRT Blue Line, non-motorized transport plays a significant role in enhancing the accessibility and connectivity of individuals to transit stations.

1.5.6 Transit-Oriented Development Residents

Individuals or groups of people who live within a specific area designed with a focus on accessibility to public transportation. They are inhabitants of neighborhoods or communities that are strategically planned to offer convenient access to various modes of public transit, such as buses, trains, or subways.

1.5.7 Transit-Oriented Development Catchment Area

The geographic zone or area surrounding a Transit-Oriented Development (TOD), which is influenced or impacted by the transportation facilities and infrastructure within that development. It encompasses the region where people might be drawn to use or access the public transit services provided within the TOD.

1.5.8 Built Environment

The modified surroundings in which people live, work, and interact. It encompasses various physical structures, infrastructure, and spaces created by humans, such as buildings, roads, public transportation systems, parks, and other amenities based on transit-oriented development residences' use of the Bangkok Mass Rapid Transit Line (MRT Blue Line), the built environment would include the specific physical elements and urban design features surrounding the transit stations and along the transit corridor. This could involve analyzing factors such as station accessibility, land use patterns, density of development, pedestrian walkways, bike lanes, commercial establishments, and other elements that influence the relationship between the transit system and the surrounding community or residential areas.

CHAPTER 2
REVIEW OF LITERATURE

The review of literature's main topics is Transit-Oriented Development, transit ridership demand and built environment including density, design, distance, diversity, destination accessibility, and demand management.

2.1 Scope of Study

The growth and development brought by the MRT Blue Line (MRT Chaloem Ratchamongkon Line), Bangkok's third rapid transit line managed by Bangkok Expressway and Metro, have significantly impacted the vicinity of each station. Despite these advancements, various obstacles have hindered public uptake of the transit services, leading to a halt in the expansion project by Thailand's Department of Transportation. Consequently, this research seeks to delve into the influential factors contributing to the use of the MRT Blue Line by TOD residents, with the goal of formulating guidelines associated with transit-oriented development.

Upon analysis of the average monthly passenger counts, it was revealed that 10 stations reported fewer than 40,000 passengers per month, as outlined in table 2.1. These stations signify specific areas of interest warranting further investigation. Thus, the scope of study will be as follows:

2.1.1 The 38 stations with monthly number of MRT Blue Line Passengers

The Bangkok MRT Blue Line, with its 38 stations, is a vital transportation artery for the city. However, concerns have been raised regarding the ridership levels on some stations due to station locations, limited connectivity and competition from other modes of transportation. The table 2.1 below shows the number of passengers in each station of the MRT Blue Line.

Table 2.1

The MRT Blue Line's Stations with lower than 40,000 passengers a month.

Number	Station	Average Number of Passengers per Month (Trips per month)
1	Tha Phra	67,911
2	Charan 13	33,270
3	Fai Chai	30,699
4	Bang Khun Non	45,303
5	Bang Yi Khan	58,387
6	Sirindhorn	35,007
7	Bang Phlat	20,229
8	Bang O	35,906
9	Bang Pho	38,108
10	Tao Poon	91,686
11	Bang Sue	79,855
12	Kamphaeng Phet	48,528
13	Chatuchak Park	286,068
14	Phahon Yothin	176,720
15	Lat Phrao	157,494
16	Ratchadaphisek	65,465
17	Sutthisan	149,709
18	Huai Khwang	207,575
19	Thailand Cultural Centre	170,998
20	Phra Ram 9	285,651
21	Phetchaburi	282,981

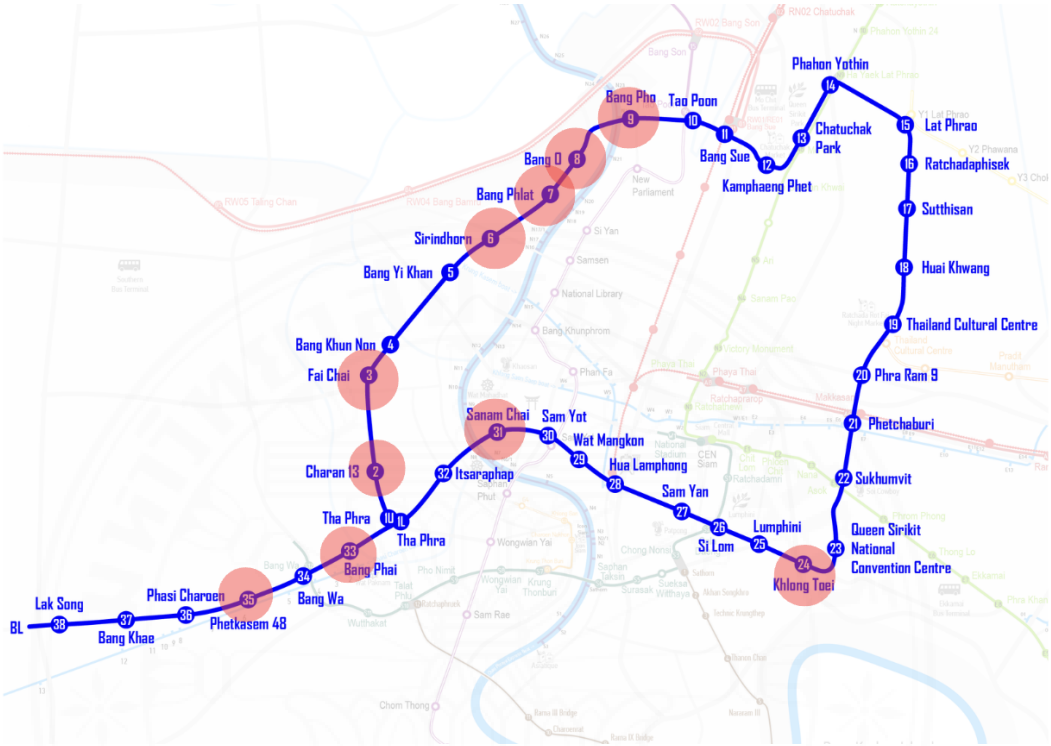
Table 2.1

The MRT Blue Line's Stations with lower than 40,000 passengers a month (Continued).

Number	Station	Average Number of Passengers per Month (Trips per month)
22	Sukhumvit	401,155
23	Queen Sirikit National Convention Centre	108,989
24	Klong Toei	31,873
25	Lumpini	112,583
26	Si Lom	222,245
27	Sam Yan	147,597
28	Hua Lamphong	80,588
29	Wat Mangkon	111,363
30	Sam Yot	73,287
31	Sanam Chai	36,578
33	Bang Phai	21,824
35	Phetkasem 48	30,181
36	Phasi Charoen	70,561
37	Bang Khae	52,285
38	Lak Song	166,237

Figure 2.1

The MRT Blue Line Network and the Stations with lower than 40,000 passengers a month.



Note. From "*MRT System Map" by BEM, n.d. (https://metro.bemplc.co.th/MRT-System-Map?lang=en)*

Therefore, the scope of study in this research will be mainly focused on the total of 38 stations of the MRT Blue line in order to explore problems and seek for proper solutions that could help increase the transit ridership demand or number of passengers in the future. Meanwhile, the rest of the transit network will be explored for those key success factors to construct a guideline for the future use of TOD catchment area planning.

2.2 Observation

2.2.1 Surrounding Environment of 10 Stations

Table 2.2

Current landscapes of The MRT Blue Line's Stations with lower than 40,000 passengers a month.

Station	Environment
Charan 13	
Fai Chai	
Sirindhorn	

Table 2.2

Current landscapes of The MRT Blue Line's Stations with lower than 40,000 passengers a month (Continued).

Station	Environment
Bang Phlat	
Bang O	
Bang Pho	

Table 2.2

Current landscapes of The MRT Blue Line's Stations with lower than 40,000 passengers a month (Continued).

Station	Environment
Klong Toei	
Sanam Chai	
Bang Phai	

Table 2.2

Current landscapes of The MRT Blue Line's Stations with lower than 40,000 passengers a month (Continued).

Station	Environment
Phetkasem 48	

Note. *From "Google Street Views" by Google Maps (https://www.google.com/maps)*

2.3 Concept

2.3.1 Transit-Oriented Development (TOD)

Transit-Oriented Development (TOD) refers to an urban planning concept, which is suitable for urban development and sustainability through creating the high-density, compact, and mixed land-use development near public transportation services (Pongprasert & Kubota, 2019). The primary objective of transit-oriented developments (TODs) is to stimulate active travel, transit ridership, and perhaps also to limit urban sprawl.

In addition to land-use planning concepts, they have created compact, walkable, pedestrian-oriented, mixed-use communities surrounding transit systems, which also increase citizen's house ownership, merge low-income households into one group, stabilize the workforce, and increase rail ridership (Pongprasert, 2020). Previous research also indicates that low-income households rely more on public transit compared to middle-income and high-income groups, often owning fewer cars. In Transit-Oriented Development (TOD) areas, these households tend to utilize rail

services even during off-peak hours, contributing to the efficiency of transit services. However, as the number of individuals using mass transit increases, congestion worsens. The presence of mixed-income residents in TODs emerges as a crucial factor, facilitating a higher percentage of transit ridership by offering diverse housing options within walking distance of transit facilities. Within the context of Bangkok's MRT Blue Line focuses on creating vibrant, accessible, and integrated communities centered around efficient public transit systems. The theory posits that the utilization of the MRT Blue Line by residents in TOD areas is influenced by a combination of influential factors, which can be categorized into several key dimensions as follows:

2.3.1.1 Proximity and Accessibility

The theory acknowledges the significance of proximity to MRT stations and the ease of access as fundamental factors influencing residents' decisions to utilize the transit system. Closer proximity and convenient access to stations are hypothesized to positively impact ridership (Nyunt & Wongchavalidkul, 2020).

2.3.1.2 Land Use Patterns and Design

TOD theory suggests that well-designed, mixed-use developments and pedestrian-friendly infrastructure in TOD areas contribute to increased transit ridership. The theory posits that the presence of diverse amenities, such as residential spaces, commercial establishments, and recreational facilities, within walking distance of stations encourages MRT usage (Jarritthai & Techpeeraparnich, 2017).

2.3.1.3 Community Demographics and Preferences

The theory recognizes that demographic profiles, including age, income levels, household size, and lifestyle preferences, play a significant role in determining residents' inclination towards using the MRT Blue Line. Understanding these demographic factors can provide insights into transit usage patterns (Iamtrakul & Zhang, 2014).

2.3.1.4 Last-Mile Connectivity and Non-Motorized Transport

The theory emphasizes the importance of last-mile connectivity and the provision of non-motorized transport options, such as walking and cycling infrastructure, in facilitating residents' access to MRT stations. It posits that

convenient and safe connectivity encourages transit usage (Nyunt & Wongchavalidkul, 2020).

2.3.1.5 Perceived Benefits and Barriers

TOD theory acknowledges residents' perceptions of the benefits and barriers associated with using the MRT Blue Line. Factors such as convenience, safety, reliability, and comfort are hypothesized to influence residents' choices regarding transit utilization (Iamtrakul, Raungratanaamporn, Klaylee, & Chayphong, 2021).

2.3.2 Built Environment Characteristics

The characteristics of the built environment act as a fundamental for comprehending how urban spaces shape transportation behaviors, especially in encouraging or discouraging the use of public transit systems. These factors provide valuable insights for urban planners, policymakers, and researchers seeking to optimize transit-oriented development and enhance sustainable transportation options within cities (Peng, Zhang, Li, Wang, & Yuan, 2023). The characteristics of built environment are as follows:

2.3.2.1 Density

Density refers to the concentration of people or activities within a given area. High population density often correlates with increased accessibility to public transportation and amenities. It can positively influence transit usage due to improved convenience and proximity to transit facilities (Anantsuksomsri & Tontisirin, 2015). The population density surrounding the MRT Blue Line stations significantly affects transit utilization among residents. Higher density areas tend to correlate with increased transit usage due to improved accessibility and proximity to transit facilities (Peng, Zhang, Li, Wang, & Yuan, 2023).

2.3.2.2 Design

This characteristic encompasses the physical layout, infrastructure, and aesthetics of an area. A well-designed environment with pedestrian-friendly features, efficient transit hubs, and mixed-use developments tends to encourage public transit use by fostering accessibility and convenience (Kamruzzaman,Shatu, Hine, Turrell, 2015). Thus, the design of the MRT stations plays a crucial role in shaping residents' transit behavior. Well-planned, pedestrian-friendly environments

encourage greater reliance on public transit and promote ease of access to transit facilities (Peng, Zhang, Li, Wang, & Yuan, 2023).

2.3.2.3 Distance

The distance relates to the proximity between residential areas, workplaces, amenities, and transit stations. Shorter distances and improved access to transit nodes often lead to higher transit usage as they reduce travel time and effort (Iamtrakul, Padon, & Klaylee, 2022). The research has also shown the relationship of walkability to the transit and the level of income, in which the lower-income passengers tend to accept longer walking time or distance (Pongprasert & Kubota, 2019). Proximity to MRT stations influences residents' choices in utilizing the transit system. Those residing closer to the stations are more likely to use public transit due to reduced travel distances and enhanced accessibility (Iamtrakul, Padon, & Klaylee, 2022).

2.3.2.4 Diversity

The diversity refers to the variety and mix of amenities, services, and land uses within a locality. Diverse environments offering a range of options such as residential, commercial, recreational, and cultural facilities within walking distance can enhance the attractiveness of public transit (Nafi & Ouahrani, 2023). The diversity of MRT stations significantly impacts residents' decisions regarding transit usage. Offering a range of facilities within walking distance encourages greater reliance on the MRT Blue Line for various travel needs (Peng, Zhang, Li, Wang, & Yuan, 2023).

2.3.2.5 Destination Accessibility

The destination accessibility relates to the ease of reaching essential destinations like workplaces, schools, shopping centers, and recreational areas via public transportation. Improved access to key destinations via transit can significantly influence residents' choices in utilizing public transit. Accessibility to such destinations via the MRT Blue Line is a pivotal factor influencing residents' preference for using public transit for commuting and leisure purposes (Iamtrakul, Padon, & Klaylee, 2022).

2.3.2.6 Demand Management

Effective urban planning involves demand management, which is an integral aspect reflecting urban development and travel behaviors (Banister & Berechman, 2001). Travel patterns and expenditures are significantly influenced by parking fees during commuting (Jun, 2008). Challenges arise when the rail mass transit system lacks accessibility, failing to discourage car usage. Implementing strategies such as increased parking costs, limiting parking spaces or hours, and providing fewer free parking opportunities become essential administrative considerations (Viriyathanapat, 2022). Spatial analysis-driven Demand Management encompasses various elements, including determining bus station locations, land use planning, street parking allocations, and future development connections. These strategies aim to bridge the gap between initial and final destinations, optimizing travel efficiency (Jamaleddin & Ibrahim, 2022).

2.3.2.7 Demographics

Demographics encompass the characteristics of the population living within an area, including age, income, occupation, household composition, and cultural diversity. Demographic factors play a crucial role in determining transit usage patterns as different groups may have varying transit needs and preferences (Peng, Zhang, Li, Wang, & Yuan, 2023). The demographic composition of TOD residents plays a substantial role in shaping their transit usage patterns along the MRT Blue Line. Different demographic groups exhibit varying levels of reliance on public transit based on these factors (Kamruzzaman,Shatu, Hine, Turrell, 2015).

2.4 Literature Review

Table 2.3

Literature Review Summary

Reference	Paper Name	Variables	Methodology	Inference
Anantsuksomsri & Tontisirin, 2015	Evaluation of Relationships Between Ridership Demand and Transit-Oriented Development (TOD) Indicators Focused on Land Use Density, Diversity, and Accessibility: A Case Study of Existing Metro Stations in Bangkok	1.Density - Transit ridership - population density 2. Diversity - Entropy - Land use intensity - Vertical Mixture 3. Design - Access to municipal public service facilities - Access to opportunities - Public transport accessibility - Expressway accessibility - Transit interchanges - Public transport - Parking availability for cars/four- wheelers - Street network density - Street connectivity	- Correlation Analysis - Principal Component Analysis (PCA)	1.The vehicle trip generation rate in their comparative study areas was significantly lower at station parks with TOD than at those without TOD. 2. The level of comfort in using public transport services plays a significant role in rider choice. 3. The high-rise building area is significantly related to the volume of transit ridership. 4. Bus services have a stronger influence on transit ridership than railway stations and ferries (pier). 5. Interchange stations and park- and-ride buildings are found to be the main variables that correlate directly with transit ridership numbers.

Table 2.3

Literature Review Summary (Continued).

Reference	Paper Name	Variables	Methodology	Inference
Kamruzzaman, Shatu, Hine, Turrell, 2015	Commuting mode choice in Transit-Oriented development: disentangling the effects of competitive neighborhood, travel attitudes, self-selection	- Neighborhood type (ref: traditional suburb) - Built environment indicators - Travel attitudes and preferences - Reasons to choose current address - Travel time (ref: less than 15 minutes) - Socio-demographics Employment status: full-time (ref: part time) - Level of education (ref: up to year 12) - Current living arrangement (ref: living alone) - Household size - Health status	Binary Regression Model	1. Cities that implement transportation policies aligned with Transit-Oriented Development (TOD) principles effectively encourage the adoption of more sustainable transportation modes such as buses, trains, walking, and cycling. 2. Essential design considerations for TOD-related developments include facilitating convenient travel through the establishment of high-quality sidewalk networks. Adjacent amenities like shops, schools, and daycare centers further enhance the accessibility and attractiveness of these areas.

Table 2.3

Literature Review Summary (Continued).

Reference	Paper Name	Variables	Methodology	Inference
Pongprasert & Kubota, 2019	TOD residents' attitudes toward walking to transit station: a case study of transit-oriented developments (TODs) in Bangkok, Thailand	- Walking Acceptance - Feeling of walking: Comfortable, sense of freedom, fun, relaxing, enjoyable, fashionable, safe - Benefit of Walking: Healthy, Environment-friendly, saving travel cost	- Factor Analysis and Structural Modeling	Acceptable walking distance and walking time, middle-in- come households walk a shorter distance (505 m) than lower-income groups, 535 m. Meanwhile, middle-income households accept longer walking time (9.48 min) than the low-income group, 9.25 min. High-income group walks a shorter distance (438 m) and time (9.03 min) than others. Regarding the access modal share within 500-m distance.
Reference	**Paper Name**	**Variables**	**Methodology**	**Inference**
Pongprasert & Kubota, 2017	Factors affecting residents living near transit stations to use non-motorized access mode: case study about daily travel in Bangkok, Thailand.	- Socioeconomic Characteristics - Home, workplace, school, location characteristics - Travel Characteristics - Pedestrian Characteristics	Binary regression model	1. About 48% of pedestrians utilize public motorized-transportation. 2. Approximately 29% of train commuters opt for motorized mode. 3. 23% of individuals who rely on cars ,display a lower tendency to walk.

Table 2.3

Literature Review Summary (Continued).

Reference	Paper Name	Variables	Methodology	Inference
Pongprasert & Kubota, 2018	The influences of built environment factors on mode switching of TOD residents from car use to transit dependence: case study of Bangkok, Thailand	- Individual data - Attitude on six built environment factors (6ds): - destination (des) - distance (dis) - diversity (div) - density (den) - design (desi) - demand management (dm)	- Binary Logistic - Regression Model - SPSS Program - Online questionnaire survey - Likert scale ranging	1. Various factors influence car users' decision to opt for walking to access mass transit stations, notably the environment's proximity to the train station. 2. Poor sidewalk conditions that are unfriendly and unsupportive towards pedestrians often lead individuals to prefer cars for commuting. 3. The destination and distance play a crucial role in motivating individuals to walk and utilize mass transportation systems.
Reference	**Paper Name**	**Variables**	**Methodology**	**Inference**
Nafi & Ouahrani, 2023	Transit-oriented Development from the View of Traditional City Model	Evaluate LR on TOD key factors including: 1. TOD Model 2. Distinct types of TOD 3. The Presence of TOD features in traiditional cities. 4. The traditional city model 5. Connectivity and compact city 6. Public Realm 7. Diversity and Density	A meta-analysis was used to identify and analyze the various components of TOD and traditional city models	TOD is Transportation-centric Perspective, while Traditional Cities was made for a Human-centric Perspective

Table 2.3

Literature Review Summary (Continued).

Reference	Paper Name	Variables	Methodology	Inference
Iamtrakul, Padon, & Klaylee, 2022	The Study on Association between Urban Factors and Walkability of Transit Oriented Development (TOD)	Main Factors of TOD: 1. Density 2. Diversity 3. Design 4. Distance to transit 5. Destination Accessibility Factors influencing the Development of TOD: 1. The Physical Availability 2. The land and buildings are mixed-used 3. The liveliness of neighborhoods/neighborhoods 4. The sufficiently vacant land or undeveloped land for TOD development 5. The physical environment of the TOD area 6. The smaller block size	- Multiple Linear Regression Analysis to estimate the relationships between explanatory variables	The characterization of the transit stations in Bangkok can be classified into four station groups (Sub CBD, Urban Center, CBD, and Special District).
Reference	**Paper Name**	**Variables**	**Methodology**	**Inference**
Peng, Zhang, Li, Wang, & Yuan, 2023	Nonlinear, threshold and synergistic effects of first/last-mile facilities on metro ridership	Dependent Variable: Ridership Independent Variables: Built environment characteristic: 1.Density - Population density - Employment density - Rooftop density 2. Diversity - Land use mixture 3. Design - Road density - Intersection density 4. Destination	- DRMs to explore relationship between the built environment and metro ridership - Light GBM to estimate the nonlinear, threshold and synergistic effects of last-mile facilities on metro ridership in Shanghai, China.	Last-mile facilities collectively contribute 43.57% for predicting metro ridership, and the top-5 important variables are bike-sharing (14.16%), land use mixture (8.76%), park and ride (6.94%), number of bus lines (6.58%) and pedestrian shed ratio (6.26%).

Table 2.3

Literature Review Summary (Continued).

		- Accessibility - Distance to city center (straight) - Distance to city center (network) - Distance to city sub-center - Distance to viaduct 5. Demographics - Housing price 6. Metro network attributes - Transfer - Terminal - Number of metro lines 7. Last-mile facility variables - Park and Ride - Bike-sharing - Pedestrian shed ratio - Number of bus stops - Distance to the nearest bus stop - Number of bus lines	- Density was calculated as the ratio of employment POI points (e.g., business, commercial, industrial, manufacturing) to all POI points within 500 m buffer.	
Reference	**Paper Name**	**Variables**	**Methodology**	**Inference**
Pongprasert, 2020	Understanding the Choice of Residential Location Near Transit Stations and Urban Rail Commuting: A Case Study Of Transit-Oriented Development In Bangkok	- Socioeconomic - Travel behaviors - Distance between station and workplace - Proximity of residence to activities	A binary logistic regression model	Workplaces located near an urban rail station, proximity of one's residence to useful TOD activities affect both the residential location choice to live near a station and use the rail service. Low-and middle-income earners are the most likely groups choose to live near a rail station and use rail services.

Table 2.3

Literature Review Summary (Continued).

Reference	Paper Name	Variables	Methodology	Inference
lamtrakul & Raungratanaamporn, 2021	The walkability of transit-oriented development (TOD): a case study of Bangkok metropolitan, Thailand	- Street network - Natural environment - Traffic characteristics - Urban environment	- Site Observation - Site Analysis	1. The public's engagement with the transportation system significantly influences walking behavior of public transit users. 2. Technical attributes and physical elements of the environment play a pivotal role in understanding the walking habits of public transit users. 3. Common professions that heavily utilize public transportation include government officials (32.20%), students (32.0%), and office workers (22.80%). 4. Various factors hold significance in walking as a mode of transport, notably the influence of connectivity to the public transportation system. 5. Income levels serve as a crucial determinant affecting the decision to walk while using the mass transportation system.

Table 2.3

Literature Review Summary (Continued).

Reference	Paper Name	Variables	Methodology	Inference
lamtrakul & Raungratanaamporn, 2021	The walkability of transit-oriented development (TOD): a case study of Bangkok metropolitan, Thailand	- Street network - Natural environment - Traffic characteristics - Urban environment	- Site Observation - Site Analysis	1. The public's engagement with the transportation system significantly influences walking behavior of public transit users. 2. Technical attributes and physical elements of the environment play a pivotal role in understanding the walking habits of public transit users. 3. Common professions that heavily utilize public transportation include government officials (32.20%), students (32.0%), and office workers (22.80%). 4. Various factors hold significance in walking as a mode of transport, notably the influence of connectivity to the public transportation system. 5. Income levels serve as a crucial determinant affecting the decision to walk while using the mass transportation system.

Table 2.3

Literature Review Summary (Continued).

Reference	Paper Name	Variables	Methodology	Inference
Viriyathanapat, 2022	Factors affecting expanding transit oriented development (TOD) catchment area: case study of travel behavior of college students in Srinakharinwirot University Prasarnmit Campus	- Acceptable Walking Distance (AWD) - Destination - Distance - Density - Diversity - Design - Demand Management	Binary Logistic Regression Analysis	In areas with high pedestrian densities, fewer people will walk because of congestion in the area and high-temperature weather making it undesirable to walk.
Reference	**Paper Name**	**Variables**	**Methodology**	**Inference**
Taylor & Fink, 2003	The Factors Influencing Transit Ridership: A Review and Analysis of the Ridership Literature	- Transit Ridership - Population - Density - Economic Factors - Transit Network Size - Urban Development - Fare Structure and Policies - Demographic Factors	- A review and analysis of existing literature on transit ridership factors - Comprehensive examination, synthesis, and critical assessment of previously published studies	The research has measured service supply rather than service quality (variables such as on-time performance); those that have measured service quality have found that service quality is a more significant factor than both quantity and prices.

2.5 Research Hypothesis

2.5.1 Hypothesis 1 (Demographic Attributes)

Demographic factors, including gender, age, level of education, occupation, monthly income, and marital status, have different effects on the tendency to use the MRT Blue Line.

Hypothesis 1.1: Gender differences in demographic factors affect the tendency to use the MRT Blue Line differently.

Hypothesis 1.2: Age differences in demographic factors affect the tendency to use the MRT Blue Line differently.

Hypothesis 1.3: Differences in level of education among demographic factors affect the tendency to use the MRT Blue Line differently.

Hypothesis 1.4: Differences in occupation among demographic factors affect the tendency to use the MRT Blue Line differently.

Hypothesis 1.5: Differences in monthly income among demographic factors affect the MRT Blue Line differently.

Hypothesis 1.6: Differences in marital status among demographic factors affect the tendency to use the MRT Blue Line differently.

2.5.2 Hypothesis 2 (Built Environment Factors)

Built Environmental factors significantly affect the mass transit use of the Bangkok Mass Transit Train, MRT Chaloem Ratchamongkhon Line (MRT Blue Line among TOD residents

Hypothesis 2.1: Density significantly affects Mass transit use among TOD residents.

Hypothesis 2.2: Design significantly affects Mass transit use among TOD residents.

Hypothesis 2.3: Distance significantly affects Mass transit use among TOD residents.

Hypothesis 2.4: Diversity significantly affects Mass transit use among TOD residents.

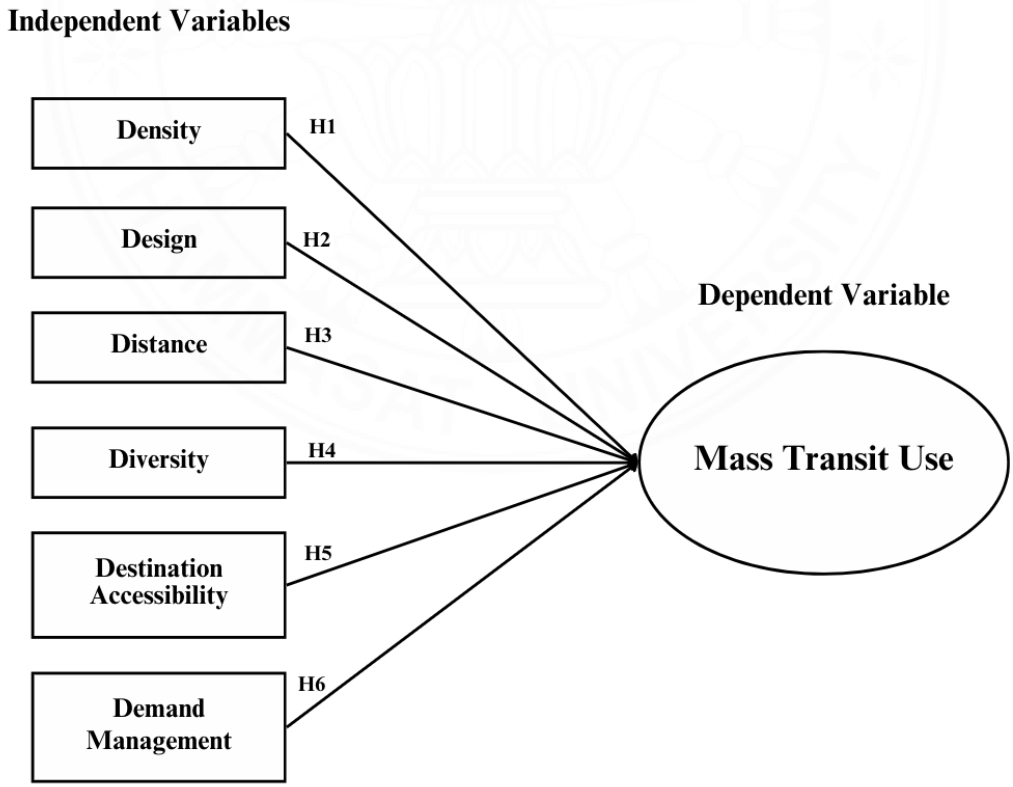
Hypothesis 2.5: Destination Accessibility significantly affects Mass transit use among TOD residents.

Hypothesis 2.6: Demand Management significantly affects Mass transit use among TOD residents.

2.6 Research Framework

Figure 2.2

Research Framework



Note. *From the literature reviews and analysis,* the researcher, 2023

CHAPTER 3
RESEARCH METHODOLOGY

The majority of TOD residents hesitate to use the Bangkok Mass Rapid Transit line due to several reasons such as the distance from their places, inconvenience and other accessibility concerns. This results in a barrier to expand the transit network. Therefore, this research aims to study and explore the factors or elements that help reduce these barriers for the residents to use the MRT Blue line by the purpose of a guideline for TOD catchment area planning. For the data collection, an online questionnaire will be used in order to construct a quantitative research.

3.1 Population and Sampling

TOD residents of the MRT Blue lines are identified as the focus group of this research, especially those in the 38 stations of the Blue Line.

3.1.1 Population

The primary population for this study comprises TOD Residents, which refer to individuals who live within the Transit-Oriented Development (TOD) areas adjacent to or in proximity to the MRT Chaloem Ratchamongkon Line (MRT Blue Line). This includes residents of mixed-use buildings, apartments, or residential complexes situated near selected MRT stations. Also, there must be the consideration of demographic diversity with an aim to capture a diverse representation of residents encompassing various age groups, income levels, household compositions, and occupations within these TOD areas.

3.1.2 Samplings

The guideline known as the "10 times number of variables" rule in logistic regression advises having a minimum of 10 occurrences of the outcome per independent variable for a dependable model (Chakpitak et al., 2018).

For this research scenario:

Independent variables = 6 Demographic Attributes

Independent variables = 24 Built Environment Factors

For 30 variables, the guideline recommends: 30 variables * 10 events = 300 events (or cases where the outcome occurs) to ensure a stable logistic regression model.

Thus, the investigation of the research should be targeting a sample size of at least 280 instances where mass transit use is observed and could bolster the reliability of the analysis, aligning with the number of predictor variables involved in the study. Finally, since the MRT Blue Line consists of 38 stations, this research will be a non-probability sampling method (Quota Samplings) that relies on the non-random selection of a predetermined number or proportion of units, in which the questionnaire will be distributed to 10 – 15 respondents for each station.

3.2 Data Collection

This research involves related theories from the literature review, which is applied in setting the framework for the quantitative research, and creating questionnaires for data collections with an aim to study the Influential Factors Affecting TOD Residences' Use of Bangkok Mass Rapid Transit Line: A Case Study of MRT Chaloem Ratchamongkon Line (MRT Blue Line) as follows:

3.2.1 Primary Data

The researcher collected data by distributing QR Codes for questionnaires when visiting the area, and online questionnaires which were collected by the researcher.

3.2.2 Secondary Data

The researcher studies and researches information from articles, documents, and related research in order to determine the conceptual framework for doing research and use it as a reference in writing research.

3.3 Research Instruments

This study adopts a quantitative research approach involving a data collection with a period spanning for two months (from January 2024 to February 2024)

by the researcher. To gather data, online questionnaires will be developed using Google Forms. These questionnaires will be distributed both on-site, stationed at each stop along the MRT Blue Line, and through various social media platforms, including but not limited to Facebook, Instagram, Line, and Line Group. The aim is to gather a minimum of 380 responses from the respondents. The questionnaire structure encompasses four sections, outlined as follows:

Section 1: Screening Questions targeting the respondents who currently reside in a Transit-Oriented Development (TOD) area along Bangkok's MRT Blue Line and have used Bangkok's MRT Blue Line at least once in the past month.

Table 3.1

Section 1: Screening Questions

Screening Questions for Respondents	**Responds**
1. Do you reside within a transit-oriented development (within a 1 km radius from the mass transit station of the MRT Blue Line)?	• Yes • No (End of the Questionaire)
2. Do you use the MRT Blue Line everyday?	• Yes (Go to Section 2) • No
3. How frequently do you utilize mass transit rides? (Day or Days/Week)	(Short Answer)

Table 3.2

Section 2: Travel Behavior Questions

Travel Behavior Questions for Respondents	Responds
1. What type of residence do you live in?	• Detached House • Townhouse • Condominium • Dormitory • other
2. Does your residence have a parking space?	• Yes • No
3. How many people usually travel with you each day?	• 1 Person • 2 People • 3 People • 4 People • More than 5 People
4. Who made the decision to choose the travel mode for you?	• Myself • Family • Collegues • Other
5. Which MRT Blue line station is closest to you?	• Tha Phra (BL01) Station • Charan 13 (BL02) Station • Fai Chai (BL03) Station • Bang Khun Non (BL04) Station • Bang Yi Khan (BL05) Station • Sirindhorn (BL06) Station • Bang Phlat (BL07) Station • Bang O (BL08) Station • Bang Pho (BL09) Station • Tao Poon (BL10) Station • Bang Sue (BL11) Station • Kamphaeng Phet (BL12) Station • Chatuchak Park (BL13) Station • Phahon Yothin (BL14) Station • Lat Phrao (BL15) Station

Table 3.2

Section 2: Travel Behavior Questions (Continued)

	• Ratchadaphisek (BL16) Station • Sutthisan (BL17) Station • Huai Khwang (BL18) Station • Thailand Cultural Centre (BL19) Station • Phra Ram 9 (BL20) Station • Phetchaburi (BL21) Station • Sukhumvit (BL22) Station • Queen Sirikit National Convention Centre (BL23) Station • Khlong Toei (BL24) Station • Lumpini (BL25) Station • Si Lom (BL26) Station • Sam Yan (BL27) Station • Hua Lamphong (BL28) Station • Wat Mangkon (BL29) Station • Sam Yot (BL30) Station • Sanam Chai (BL31) Station • Itsaraphap (BL32) Station • Bang Phai (BL33) Station • Bang Wa (BL34) Station • Phetkasem 48 (BL35) Station • Phasi Charoen (BL36) Station • Bang Khae (BL37) Station • Lak Song (BL38) Station
6. What is the approximate walking time from your home to the nearest train station?	• Less than 5 minutes • 5-10 minutes • 11-15 minutes • 16 -20 minutes • More than 20 minutes
7. How do you access the MRT Blue Line station?	• Walk • Ride a motorcycle • Bus • Taxi • Private car

Table 3.2

Section 2: Travel Behavior Questions (Continued)

	• other
8. Acceptable cost of round-trip train travel:	(Short Answer in Numbers)
9. Do you have a private car? How many cars do you use regularly?	• No • 1 Car • 2 Cars • More than 2 Cars
10. Is the distance between your workplace and the nearest MRT Blue Line station greater than 1 kilometer?	• Yes (More than 1 kilometer) • No (Less than 1 kilometer)
11. What is your approximate daily commuting cost?	(Short Answer in Numbers)
12. Does your workplace have enough parking spaces?	• Sufficient • Insufficient
13. Do you need to pay for monthly parking fees at your workplace?	• Yes • No
14. If yes, how much do you pay per month for parking fees?	(Short Answer in Numbers)
15. (For the respondents who drive to the workplace) Daily commuting costs by car. Please calculate from the distance from home to work (kilometers) x car fuel consumption (liters/kilometer) x fuel price (baht/liter) approximately	(Short Answer in Numbers)

Section 3: Influential Factors Affecting TOD Residences' Use of Bangkok Mass Rapid Transit Line: A Case Study of MRT Chaloem Ratchamongkon Line (MRT Blue Line). The respondents will be asked to rate their level of agreement or disagreement using a specified scale (Five-point Likert Scale) The numerical values associated with each response are often coded for analysis purposes, for instance:

Strongly Agree:	5 Points
Agree:	4 Points
Neutral:	3 Points
Disagree:	2 Points
Strongly Disagree:	1 Point

Definitions:

Density refers to the concentration of residential or commercial spaces within the vicinity of MRT stations on the Blue Line.

Design encompasses the physical layout, infrastructure, and architectural features of the transit-oriented developments adjacent to the MRT stations.

Distance denotes the proximity of residential areas to the MRT Blue Line stations, influencing ease of access and potential usage patterns.

Diversity signifies the variety and mix of people, amenities, and services available in the areas surrounding the MRT stations, influencing usage by different demographic groups.

Destination Accessibility describes the ease with which residents can reach key destinations (like workplaces, commercial centers, educational institutions) using the MRT Blue Line.

Demand Management involves strategies and initiatives aimed at regulating and optimizing the usage of the MRT Blue Line, possibly through incentives, pricing, or service improvements to encourage ridership.

Table 3.3

Section 3: Built Environment Questions

Variables		Question for the Variable	Citation
Density (D)	D1	To what extent do you believe that increased population density around mass transit stations positively influences the usage of the stations?	Anantsuksomsri & Tontisirin, 2015
	D2	To what extent do you agree that greater residential building density near mass transit stations positively influences the utilization of the stations?	Anantsuksomsri & Tontisirin, 2015
	D3	To what degree do you agree that higher density of commercial buildings (including offices and retail spaces) around mass transit stations impacts the usage of such transit stations?	Iamtrakul, Padon, & Klaylee, 2022
	D4	To what degree do you agree that higher building density around mass transit stations correlates with increased utilization of the stations?	Iamtrakul, Padon, & Klaylee, 2022
Design (DS)	DS1	To what extent do you agree that enhanced design and improved pedestrian amenities near mass transit stations contribute to increased usage of these transit stations?	Anantsuksomsri & Tontisirin, 2015
	DS2	To what extent do you agree that an increased total length of the street network surrounding mass transit stations correlates with higher usage of these transit stations?	Anantsuksomsri & Tontisirin, 2015
	DS3	To what degree do you agree that a denser street network with more intersections around mass transit stations (within 1 km radius from the station) positively influences the usage of these transit stations?	Anantsuksomsri & Tontisirin, 2015
	DS4	To what degree do you agree that greater accessibility to bike lanes, routes, and signage around mass transit stations (within 1 km radius from the station) influences increased usage of these transit stations?	-
Distance	Dt1	To what extent do you agree that an easily walkable distance from home to the nearest station positively impacts the number of passengers using the mass transit station?	Pongprasert & Kubota, 2017

Table 3.3

Section 3: Built Environment Questions (Continued).

	Dt2	To what degree do you agree that a shorter distance from home to the main street influences increased usage of the mass transit station?	Pongprasert & Kubota, 2017
	Dt3	To what extent do you agree that a shorter distance between the station and workplace positively affects the number of people using the mass transit station?	Iamtrakul, Padon, & Klaylee, 2022
	Dt4	To what degree do you agree that a shorter distance between stations and commercial areas, particularly retail spaces, influences increased usage of the mass transit station?	Iamtrakul, Padon, & Klaylee, 2022
Diversity	Di1	To what extent do you agree that a greater diversity or mixed land use across various categories (Entropy) contributes to increased usage of the mass transit station?	Anantsuksomsri & Tontisirin, 2015
	Di2	To what degree do you agree that higher diversity or the presence of various developed areas for residential, commercial, office, industrial, parks, or recreational use (Land Use Intensity) influences increased usage of the mass transit station?	Anantsuksomsri & Tontisirin, 2015
	Di3	To what extent do you agree that a diverse mix of housing types catering to different income brackets (high, middle, low income) for economic diversity influences increased usage of the mass transit station?	-
	Di4	To what extent do you agree that a variety of shops and businesses (restaurants, cafes, grocery stores, entertainment venues, etc.) near the station influences your use of the mass transit station?	-
Destination Accessibility	DA1	To what extent do you agree that increased destination accessibility, particularly regarding access to work areas, correlates with higher usage of the mass transit station?	Iamtrakul, Padon, & Klaylee, 2022
	DA2	To what degree do you agree that enhanced destination accessibility, especially concerning access to residential areas, influences increased usage of the mass transit station?	Iamtrakul, Padon, & Klaylee, 2022

Table 3.3

Section 3: Built Environment Questions (Continued).

	DA3	To what extent do you agree that increased destination accessibility, particularly access to commercial or retail areas, affects higher usage of the mass transit station?	Iamtrakul, Padon, & Klaylee, 2022
	DA4	To what degree do you agree that improved destination accessibility, including access to other modes of public transportation like buses, taxis, and motorbikes, influences increased usage of the mass transit station?	Iamtrakul, Padon, & Klaylee, 2022
Demand Management	Dm1	To what extent do you agree that implementing demand management strategies, such as reducing the availability of parking spaces, influences increased usage of the mass transit station?	Viriyathanapat, 2022
	Dm2	To what degree do you agree that implementing demand management measures like increased parking fees influences increased usage of the mass transit station?	Viriyathanapat, 2022
	Dm3	To what extent do you agree that offering discounts for using the MRT Blue Line in combination with parking restrictions or increased parking fees would encourage you to use the MRT Blue Line more often?	-
	Dm4	To what extent do you agree that having reliable and convenient feeder bus services or ride-sharing options near the station influences your use of the mass transit station?	-

Section 3 (Continued): Would the occurrence of any built environment factor (density, design, distance, diversity, destination accessibility, demand management) around the mass transit station in your vicinity prompt you to use the station more often?

- Yes (Go to Section 4)
- No (Go to Section 4)

Section 4: Multiple Choice Questions (Choose only one answer for each question) for demographic attributes and general information of the respondents including.

Table 3.4

Section 4: Demographic Attributes Questions

Demographic Attributes	Type of Data
Age	Nominal Scale
Gender	Interval Scale
Level of Education	Ordinal Scale
Occupation	Nominal Scale
Level of Income	Interval Scale
Status (Marital or Single)	Nominal Scale

Section 4: Open-ended Questions that allow respondents to provide detailed and unrestricted responses, offering valuable qualitative insights into their thoughts, opinions, and experiences on influential factors affecting TOD residences' use of Bangkok's MRT Blue Line.

Independent variables are as follows:

1. Demographic including gender, age, occupation, level of education monthly income, and marital status.
2. Built Environment Factors including density, design, distance, diversity, destination accessibility, and demand management.

Dependent Variables: Use (1) / Do not Use (0)

3.4 Data Analysis

The methodology employed in this research involves the utilization of processing and statistical analysis tailored to align with the research objectives and informational needs. This research is structured into two distinct segments delineated as follows:

3.4.1 Descriptive Statistics

The methodology incorporates descriptive statistical analysis and personal factor data examination to scrutinize the overall sample data. This involves detailing and showcasing frequency, percentage, mean, standard deviation (SD), and variance in tabular format for comprehensive representation.

Assessing the spectrum of mean scores calculated, incorporating variations around the average. This section also encompasses opinions from diverse levels, detailed as:

Table 3.5

Mean Scoring and Meanings

Mean	Meaning
4.21 - 5.00	Strongly Agree
3.41 - 4.20	Agree
2.61 - 3.40	Neutral
1.81 - 2.60	Disagree
1.00 - 1.80	Strongly Disagree

3.4.2 Inferential Statistics

Inferential analysis, a vital component in testing research hypotheses, involves assessing data beyond the sample to draw conclusions about a larger population. This statistical approach employs probability theory encompassing estimation and hypothesis testing. The methodology integrates statistical techniques such as Binary Logistic Regression Analysis and One-way ANOVA to analyze and draw inferences from the data. These methods aid in summarizing results and testing hypotheses against a representative population.

3.4.2.1 Binary Logistic Regression Analysis

The research aims to investigate the correlation between various independent variables and a dependent variable. The independent factors

encompass Destination, Distance, Density, Diversity, Design, and Demand Management. Meanwhile, the focal dependent variable revolves around the escalation of transit ridership demand by the rise in Transit-Oriented Development (TOD) residents, particularly in response to amplified built environments around the station. This analysis utilizes the statistical software SPSS (Statistics Package for the Social Sciences) to examine data extracted from a meticulously scrutinized questionnaire, in which the questionnaire underwent thorough validation through Factor Analysis and Reliability Test to ensure accuracy.

In addition, Factor Analysis is employed to serve as a method to consolidate numerous variables, condensing the count by extracting underlying elements from the Correlation Matrix, in which the process involves a detailed analysis of these variables, including Factor Rotation—wherein the axes of components are adjusted—to reveal and extract interconnected variables by showing the inherent relationships.

To measure the confidence level of the questionnaire (Reliability Test), Cronbach's method will be used in which Cronbach's Alpha Coefficient will be between 0 and 1. There must be a coefficient of not less than 0.7 as a result in order to represent an unbiased set of questions (Tavakol & Dennick, 2011). In addition, the results will then be analyzed together with the variables that have been determined.

Table 3.6

A rule of thumb for interpreting alpha for dichotomous questions or Likert scale questions:

Cronbach's alpha	Internal Consistency
≥ 0.9	Excellent
0.9 ≥ α ≥ 0.8	Good
0.8 ≥ α ≥ 0.7	Acceptable
0.7 ≥ α ≥ 0.6	Questionable
0.6 ≥ α ≥ 0.5	Poor
0.5 ≥ α	Unacceptable

Note. From "*Cronbach's Alpha: Definition, Interpretation, SPSS" by Statisticshowto, n.d. (https://www.statisticshowto.com/probability-and-statistics/statistics-definitions/cronbachs-alpha-spss/)*

Based on the Reliability Test results aimed at demonstrating internal consistency and the questionnaire's accuracy, a higher R Squared value nearing 1 indicates a stronger positive outcome. A significant value of less than or equal to 0.05 signifies increased significance as it approaches 0 (Viriyathanapat, 2022). These results are subsequently analyzed alongside specified variables by scrutinizing each measurement question pertaining to individual variables.

3.4.2.2 One-way ANOVA Analysis

The instrument serves as a hypothesis test that examines variations among means across multiple population sets, evaluating differences between them. This research comprises of:

1. Factors influencing the use of mass transit (Demographic Attributes) among Transit-Oriented Development residents (MTU2).

2. Factors impacting the expansion of development (Built Environment) in the vicinity of MRT Blue Line Stations (MTU1).

Through the analysis of One-way variance, the study evaluates its statistical significance, particularly benefiting from larger sample sizes that offer a broader scope for participant selection, thereby reducing the occurrence of random outliers. Employing the Least Significance Difference (LSD) method for multiple comparisons, chosen for its randomization, allows for an effective analysis. Each set of samples operates independently, accommodating variations in sample sizes, making it fitting for this research. The statistical significance is assessed at or below a significance level of 0.05.

CHAPTER 4
RESULTS AND DISCUSSION

This research on the demand for the Metropolitan Rapid Transit Blue Line (MRT Blue Line) is a quantitative study. Questionnaires were used as the primary tool to collect data from a sample of 400 residents living in transit-oriented development areas. The research findings are presented in three sections:

1. Results Analyzed Using Descriptive Statistics
2. Results Analyzed Using Inferential Statistics
3. Summary of Hypothesis Testing Results

To ensure consistency in the interpretation, the following symbols are used for this study:

N = Population size
n = Sample size used in the study
X = Mean
S.D. = Standard Deviation
F = One - Way ANOVA Statisitcs
$*$ = Statistically significant at 0.05

4.1 Results Analyzed Using Descriptive Statistics

Descriptive statistics were used to analyze the demographic factors, travel behavior, factors influencing the demand for the MRT Blue Line, and trends in service usage. The following statistics were used: (1) Frequency (n) (2) Percentage (%) (3) Minimum value (Min) (4) Maximum value (Max) (5) Mean (Mean) (6) Standard deviation (S.D.).

4.1.1 Analysis of Demographic Factors

Table 4.1

Frequency and Percentage of Demographic Factors by Age

Age Group	n	%
31-40 yrs	105	26.30
41-50 yrs	104	26.00
51-60 yrs	73	18.20
21-30 yrs	59	14.80
> 60yrs	30	7.50
<=20 yrs	29	7.20
Total	400	100.00

Table 4.1 shows that the majority of respondents (26.30%) are between the ages of 31 and 40. The second largest group (26.00%) is between the ages of 41 and 50. The third largest group (18.20%) is between the ages of 51 and 60. The fourth largest group (14.80%) is between the ages of 21 and 30. The fifth largest group (7.50%) is over 60 years old. The smallest group (7.20%) is 20 years old or younger.

Table 4.2

Frequency and Percentage of Demographic Factors by Gender

Gender	n	%
Female	194	48.50
Male	117	29.30
LGBTQ (Lesbian, Gay, Bisexual, Transgender, Queer)	44	11.00
Unsure	30	7.40
Prefer not to say	30	7.40
Total	400	100.00

Table 4.2 shows that the majority of respondents (48.50%) are female. The second largest group (29.30%) is male. The third largest group (11.00%)

is LGBTQ (Lesbian, Gay, Bisexual, Transgender, Queer). The smallest groups (7.40%) are those who are unsure of their genders, and prefers not to identify their genders.

Table 4.3

Frequency and Percentage of Demographic Factors by Level of Education

Level of Education	**n**	**%**
Undergraduate	208	52.00
Pre-bachelor	105	26.20
Postgraduate	87	21.80
Total	400	100.00

Table 4.3 shows that the majority of respondents (52.00%) have a bachelor's degree (Undergraduate). The second largest group (26.20%) are pre-bachelors. The third largest group (21.80%) are postgraduates.

Table 4.4

Frequency and Percentage of Demographic Factors by Occupation

Occupation	**n**	**%**
Corporate Employee (Office Worker)	113	28.20
Government Official (Civil Servant)	113	28.20
Entrepreneur (Business Owner)	86	21.50
Student	77	19.30
Others	11	2.80
Total	400	100.00

Table 4.4 shows that the majority of respondents (28.20%) are government officials (Govern). The second largest group (28.20%) are private sector employees (employees). The third largest group (21.50%) are business owners. The fourth largest group (19.30%) are students. The smallest group (2.80%) are others, such as housewives and freelancers.

Table 4.5

Frequency and Percentage of Demographic Factors by Monthly Income

Monthly Income	n	%
20,001 - 30,000฿	102	25.50
10,001 - 20,000฿	94	23.50
Above 70,000฿	70	17.50
30,001 - 40,000฿	48	12.00
Below or 10,000฿	29	7.20
50,001 - 60,000฿	28	7.00
40,001 - 50,000฿	15	3.80
60,001 - 70,000฿	14	3.50
Total	**400**	**100.00**

Table 4.5 shows that the majority of respondents (25.50%) earn between 20,001 and 30,000 Baht per month. The second largest group (23.50%) earn between 10,001 and 20,000 Baht per month. The third largest group (17.50%) earn more than 70,000 Baht per month. The fourth largest group (12.00%) earn between 30,001 and 40,000 Baht per month. The fifth largest group (7.20%) earn less than or equal to 10,000 Baht per month. The sixth largest group (7.00%) earn between 50,001 and 60,000 Baht per month. The smallest group (3.50%) earn between 60,001 and 70,000 Baht per month.

Table 4.6

Frequency and Percentage of Demographic Factors by Marital Status

Marital Status	n	%
married	232	58.00
single	156	39.00
other	12	3.00
Total	400	100.00

Table 4.6 shows that the majority of respondents (58.00%) are married. The second largest group (39.00%) are single. The third largest group (3.00%) are in other marital statuses, such as widowed, divorced, or separated.

4.1.2 Travel Behavior Analysis

Table 4.7

Frequency and Percentage of Travel Behavior by Type of the Residence

Type of the Residence	n	%
Detached House	118	29.50
Condominium	106	26.50
Dormitory	89	22.20
Townhouse	73	18.30
Other	14	3.50
Total	400	100.00

Table 4.7 shows that from the 400 respondents, 118 (29.50%) live in detached houses. 106 (26.50%) live in condominiums. 89 (22.20%) live in dormitories. 73 (18.30%) live in townhouses. And 14 (3.50%) live in other types of residences, such as rental houses.

Table 4.8

Frequency and Percentage of Travel Behavior by Parking Availability at Residence

Parking Availability at Residence	n	%
Yes	386	96.50
No	14	3.50
Total	400	100.00

Table 4.8 shows that from the 400 respondents, 386 (96.50%) have parking available at their residence. 14 (3.50%) do not have parking available at their residence.

Table 4.9

Frequency and Percentage of Travel Behavior by Number of Daily Travelers

Number of Daily Travelers	n	%
1 Person	294	73.50
2 People	92	23.00
3 People	14	3.50
Total	400	100.00

Table 4.9 shows that from the 400 respondents, 294 (73.50%) travel alone each day. 92 (23.00%) travel with 1 other person each day. And 14 (3.50%) travel with 2 other people each day.

Table 4.10

Frequency and Percentage of Travel Behavior by Decision-Maker for Travel Choice

Decision-Maker for Travel Choice	n	%
Myself	324	81.00
Family Member	76	19.00
Total	400	100.00

Table 4.10 shows that from the 400 respondents, 324 (81.00%) make their own travel decisions. 76 (19.00%) have their travel decisions made by their family.

Table 4.11

Frequency and Percentage of Travel Behavior by Nearest MRT Station to the Residence

Nearest MRT Station to Residence	n	%
Tha Phra (BL01) Station	13	3.20
Charan 13 (BL02) Station	15	3.80
Fai Chai (BL03) Station	13	3.20
Bang Khun Non (BL04) Station	15	3.80
Bang Yi Khan (BL05) Station	10	2.50
Sirindhorn (BL06) Station	10	2.50
Bang Phlat (BL07) Station	11	2.80
Bang O (BL08) Station	10	2.50
Bang Pho (BL09) Station	10	2.50
Tao Poon (BL10) Station	10	2.50
Bang Sue (BL11) Station	10	2.50
Kamphaeng Phet (BL12) Station	10	2.50
Chatuchak Park (BL13) Station	10	2.50
Phahon Yothin (BL14) Station	11	2.80
Lat Phrao (BL15) Station	10	2.50
Ratchadaphisek (BL16) Station	10	2.50
Sutthisan (BL17) Station	10	2.50
Huai Khwang (BL18) Station	10	2.50
Thailand Cultural Centre (BL19) Station	10	2.50
Phra Ram 9 (BL20) Station	10	2.50
Phetchaburi (BL21) Station	10	2.50
Sukhumvit (BL22) Station	10	2.50
Queen Sirikit National Convention Centre (BL23) Station	10	2.50
Khlong Toei (BL24) Station	10	2.50
Lumpini (BL25) Station	10	2.50
Si Lom (BL26) Station	10	2.50
Sam Yan (BL27) Station	10	2.50
Hua Lamphong (BL28) Station	10	2.50
Wat Mangkon (BL29) Station	10	2.50

Table 4.11

Frequency and Percentage of Travel Behavior by Nearest MRT Station to the Residence (Conitnued).

Nearest MRT Station to Residence	n	%
Sam Yot (BL30) Station	10	2.50
Sanam Chai (BL31) Station	10	2.50
Itsaraphap (BL32) Station	10	2.50
Bang Phai (BL33) Station	10	2.50
Bang Wa (BL34) Station	11	2.80
Phetkasem 48 (BL35) Station	10	2.50
Phasi Charoen (BL36) Station	11	2.80
Bang Khae (BL37) Station	10	2.50
Lak Song (BL38) Station	10	2.50
Total	400	100.00

Table 4.11 shows that from the 400 respondents, 15 respondents (3.80%) live closest to the Charan 13 (BL02) and Bang Khun Non (BL04) stations. 13 respondents (3.20%) live closest to the Tha Phra (BL01) and Fai Chai (BL03) stations. 11 respondents (2.80%) live closest to the Bang Phlat (BL07), Phaholyothin (BL14), Bang Wa (BL34), and Phasi Charoen (BL36) stations. And the remaining 10 respondents (2.50%) live closest to all other stations.

Table 4.12

Frequency and Percentage of Travel Behavior by Walking Time from Home to MRT Station

Walking Time from Home to MRT Station	n	%
11-15 minutes	161	40.30
5-10 minutes	149	37.30
Less than 5 minutes	73	18.20
16 -20 minutes	17	4.20
Total	400	100.00

Table 4.12 shows that from the 400 respondents, 161 (40.30%) take 11-15 minutes to walk from home to their nearest MRT station. 149 (37.30%) takes 5-10 minutes. 73 (18.20%) take less than 5 minutes. And 17 (4.20%) take 16-20 minutes.

Table 4.13

Frequency and Percentage of Travel Behavior by Travel Mode of Access to MRT

Mode of Access to MRT	**n**	**%**
Walk	265	66.20
Motorcycle	45	11.20
Taxi	45	11.20
Bus	15	3.80
Private car	15	3.80
other	15	3.80
Total	400	100.00

Table 4.13 shows that from the 400 respondents, 265 (66.20%) walk to their nearest MRT station. 45 (11.20%) ride a motorcycle. 45 (11.20%) take a taxi. 15 (3.80%) take a bus. 15 (3.80%) drive a private car. And 15 (3.80%) use other methods, such as a motorbike taxi.

Table 4.14

Minimum, Maximum, Mean, and Standard Deviation of Travel Behavior by Acceptable Travel Cost (Round Trip)

Acceptable Travel Cost (Round Trip)	**Min**	**Max**	**Mean**	**S.D.**
Spending (Baht)	35.00	150.00	66.122	22.76

Table 4.14 shows that from the 400 respondents, the mean acceptable travel cost (round trip) is 66.122 baht (S.D. = 22.76). The minimum acceptable travel cost is 35.00 baht. And the maximum acceptable travel cost is 150.00 baht.

Table 4.15

Frequency and Percentage of Travel Behavior by Number of Private Cars Used Regularly

Number of Private Cars Used Regularly	n	%
1 Car	366	91.50
2 Cars	34	8.50
Total	400	100.00

Table 4.15 shows that from the 400 respondents, 366 (91.50%) use 1 private car regularly. 34 (8.50%) use 2 private cars regularly.

Table 4.16

Frequency and Percentage of Travel Behavior by Workplace Distance from MRT Station

Workplace Distance from MRT Station	n	%
More than 1 kilometer	234	58.50
Less than 1 kilometer	166	41.50
Total	400	100.00

Table 4.16 shows that from the 400 respondents, 234 people (58.50%) have a workplace that is more than 1 kilometer from their nearest MRT station, while 166 people (41.50%) have a workplace that is more than 1 kilometer away.

Table 4.17

Minimum, Maximum, Mean, and Standard Deviation of Travel Behavior by Daily Travel Cost to Workplace

Daily Travel Cost to Workplace	Min	Max	Mean	S.D.
Spending (Baht)	0.00	250	120.37	48.63

Table 4.17 shows that from the 400 respondents, the mean daily travel cost to work is 120.37 baht (S.D. = 48.63). The minimum daily travel cost is 0.00 baht. And the maximum daily travel cost is 250.00 baht.

Table 4.18

Frequency and Percentage of Travel Behavior by Parking Availability at the Workplace

Workplace Parking Availability	n	%
Sufficient	209	52.20
Insufficient	191	47.80
Total	400	100.00

Table 4.18 shows that from the 400 respondents, 209 people (52.20%) have a workplace with sufficient parking. 191 people (47.80%) have a workplace with insufficient parking.

Table 4.19

Frequency and Percentage of Travel Behavior by Need to Pay Monthly Parking Fee at the Workplace

Need to Pay Monthly Parking Fee at Workplaces	n	%
Yes	179	44.80
No	221	55.20
Total	400	100.00

Table 4.19 shows that from the 400 respondents, 221 people (55.20%) do not need to pay a monthly parking fee at work. 179 people (44.80%) do need to pay a monthly parking fee.

Table 4.20

Minimum, Maximum, Mean, and Standard Deviation of Travel Behavior by Parking Fees at Workplaces

Parking Fees at Work	Min	Max	Mean	S.D.
Monthly Fees (Baht)	0.00	4,500.00	1912.84	1111.28

Table 4.20 shows that from the 400 respondents, the mean monthly cost of parking at work is 1,912.84 baht (S.D. = 1,111.28). The minimum monthly cost of parking is 0.00 baht. And the maximum monthly cost of parking is 4,500 baht.

Table 4.21

Minimum, Maximum, Mean, and Standard Deviation of Travel Behavior by Daily Travel Cost by Car

Daily Travel Cost by Car	Min	Max	Mean	S.D.
Daily Travel Cost (Baht)	0.00	300	139.70	58.67

Table 4.21 shows that from the 400 respondents, the mean daily travel cost by car is 139.70 baht (S.D. = 58.67). The minimum daily travel cost by car is 0.00 baht. And the maximum daily travel cost by car is 300 baht.

4.1.3 Reliability Test of the Questionnaire

The results of a reliability test conducted in SPSS. The test statistic used is Cronbach's Alpha, which is a common measure of internal consistency reliability. The higher the Cronbach's Alpha score, the greater the reliability of the scale. All in all, testing the reliability of the research questionnaires, Cronbach's Alpha Coefficient considers a rule of thumb that the criterion of pilot questionnaires (22 variables) must be greater than 0.7 (Hulin et al., 2001). As a result, Cronbach's Alpha Coefficient of the total variables is 0.903 which infer to be very high.

Table 4.22

Cronbach's Alpha of Density

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.938	.939	24

In the specific results shown in Table 4.22, the Cronbach's Alpha score is .822, which indicates good reliability. A rule of thumb is that a score of .70 or higher is considered acceptable for most research purposes.

Table 4.23

Inter-Item Correlation Matrix of Density

Inter-Item Correlation Matrix				
	Density1	Density2	Density3	Density4
Density1	1.000	.562	.362	.487
Density2	.562	1.000	.710	.599
Density3	.362	.710	1.000	.476
Density4	.487	.599	.476	1.000

Table 4.23 shows the correlation coefficients between each pair of items in the scale. The correlation coefficients range from .379 to .725, which indicates that the items are moderately to strongly correlated.

Table 4.24

Scale Statistics of Density

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
16.493	5.492	2.343	4

Table 4.24 shows the mean, variance, and standard deviation of the scale scores. The mean score is 16.3333, the variance is 5.954, and the standard deviation is 2.44009.

Table 4.25

Cronbach's Alpha of Design

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.736	.737	4

In the specific results shown in Table 4.25, the Cronbach's Alpha score is .750, which indicates acceptable reliability, and the number of items in the scale (4).

Table 4.26

Inter-Item Correlation Matrix of Design

Inter-Item Correlation Matrix				
	Design1	Design2	Design3	Design4
Design1	1.000	.441	.205	.506
Design2	.441	1.000	.358	.342
Design3	.205	.358	1.000	.622
Design4	.506	.342	.622	1.000

Table 4.26 shows the correlation coefficients between each pair of items in the scale. The correlation coefficients range from .244 to .520, which indicates that the items are weakly to moderately correlated.

Table 4.27

Scale Statistics of Design

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
16.168	3.98	1.995	4

Table 4.27 shows the mean, variance, and standard deviation of the scale scores. The mean score is 15.9333, the variance is 4.133, and the standard deviation is 2.033.

Table 4.28

Cronbach's Alpha of Distance

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.740	.741	4

In the specific results shown in Table 4.28, the Cronbach's Alpha score is .755. This indicates acceptable reliability according to a rule of thumb that a

score of .70 or higher is considered acceptable for most research purposes, and the number of items in the scale (4).

Table 4.29

Inter-Item Correlation Matrix of Distance

Inter-Item Correlation Matrix				
	Distance1	Distance2	Distance3	Distance4
Distance1	1.000	.270	.219	.360
Distance2	.270	1.000	.599	.477
Distance3	.219	.599	1.000	.574
Distance4	.360	.477	.574	1.000

Table 4.29 shows the correlation coefficients between each pair of items in the scale. The correlation coefficients range from .269 to .580, which indicates that the items are weakly to moderately correlated.

Table 4.30

Scale Statistics of Distance

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
16.034	5.273	2.296	4

Table 4.30 shows the mean, variance, and standard deviation of the scale scores. The mean score is 15.8000, the variance is 5.614, and the standard deviation is 2.369.

Table 4.31

Cronbach's Alpha of Diversity

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.897	.896	4

In the specific results shown in Table 4.31, the Cronbach's Alpha score is .890. This indicates good reliability according to a rule of thumb that a score of .70 or higher is considered acceptable for most research purposes, and the number of items in the scale (3).

Table 4.32

Inter-Item Correlation Matrix of Diversity

Inter-Item Correlation Matrix				
	Diversity1	Diversity2	Diversity3	Diversity4
Diversity1	1.000	.691	.658	.456
Diversity2	.691	1.000	.847	.690
Diversity3	.658	.847	1.000	.751
Diversity4	.456	.690	.751	1.000

Table 4.32 shows the correlation coefficients between each pair of items in the scale. The correlation coefficients range from .658 to .695, which indicates that the items are moderately correlated.

Table 4.33

Scale Statistics of Diversity

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
15.760	6.840	2.615	4

Table 4.33 shows the mean, variance, and standard deviation of the scale scores. The mean score is 11.6000, the variance is 4.731, and the standard deviation is 2.175.

Table 4.34

Cronbach's Alpha of Destination Accessibility

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.837	.855	4

In the specific results shown in Table 4.34, the Cronbach's Alpha score is .838. This indicates good reliability according to a rule of thumb that a score of .70 or higher is considered acceptable for most research purposes, and the number of items in the scale (4).

Table 4.35

Inter-Item Correlation Matrix of Destination Accessibility

Inter-Item Correlation Matrix				
	Destination Accessibility1	Destination Accessibility2	Destination Accessibility3	Destination Accessibility4
Destination Accessibility1	1.000	.681	.569	.620
Destination Accessibility2	.681	1.000	.606	.633
Destination Accessibility3	.569	.606	1.000	.461
Destination Accessibility4	.620	.633	.461	1.000

Table 4.35 shows the correlation coefficients between each pair of items in the scale. The correlation coefficients range from .561 to .707, which indicates that the items are moderately correlated.

Table 4.36

Scale Statistics of Destination Accessibility

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
15.278	7.845	2.800	4

Table 4.36 shows the mean, variance, and standard deviation of the scale scores. The mean score is 14.9667, the variance is 8.033, and the standard deviation is 2.834.

Table 4.37

Cronbach's Alpha of Demand Management

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.724	.719	4

In the specific results shown in table 4.37, the Cronbach's Alpha score is .842. This indicates good reliability according to a rule of thumb that a score of .70 or higher is considered acceptable for most research purposes, and the number of items in the scale (3).

Table 4.38

Inter-Item Correlation Matrix of Demand Management

Inter-Item Correlation Matrix				
	Demand Management1	Demand Management2	Demand Management3	Demand Management4
Demand Management1	1.000	.180	.425	.396
Demand Management2	.180	1.000	.299	.488
Demand Management3	.425	.299	1.000	.555
Demand Management4	.396	.488	.555	1.000

Table 4.38 shows the correlation coefficients between each pair of items in the scale. The correlation coefficients range from .480 to .735, which indicates that the items are moderately correlated.

Table 4.39
Scale Statistics of Demand Management

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
15.265	5.364	2.3160	4

Scale Statistics: This table shows the mean, variance, and standard deviation of the scale scores. The mean score is 12.4667, the variance is 5.637, and the standard deviation is 2.374.

4.1.4 Analysis of Transit Oriented Development Environment Factors

Table 4.40
Mean, Standard Deviation, and Level of Agreement on the Opinions of Residents in Transit-Oriented Development Areas on Factors Affecting the Demand for the MRT Blue Line

Factors	**n = 400**		
	$\bar{X}$	**S.D.**	**Level**
1. Density	3.98	0.54	Agree
2. Design	3.99	0.55	Agree
3. Distance	3.91	0.68	Agree
4. Diversity	3.85	0.64	Agree
5. Destination Accessibility	3.77	0.65	Agree
6. Demand Management	4.07	0.56	Agree
Total	**3.93**	**0.48**	**Agree**

Based on Table 4.40, residents in transit-oriented development areas have a positive opinion of the factors affecting the demand for the MRT Blue Line ($\bar{X}$ = 3.93, S.D. = 0.48). When considering each factor individually, Demand Management

was ranked the highest, with residents expressing a strong agreement ($\bar{X}$ = 4.07, S.D. = 0.56). Design was ranked second, with residents expressing an agreement ($\bar{X}$ = 3.99, S.D. = 0.55) followed by Density ($\bar{X}$ = 3.98, S.D. = 0.54), Distance ($\bar{X}$ = 3.91, S.D. = 0.55), Diversity ($\bar{X}$= 3.85, S.D. = 0.64), and Destination Accessibility ($\bar{X}$ = 3.77, S.D. = 0.65) were ranked the lowest.

Table 4.41

Mean, Standard Deviation, and Level of Agreement on the Opinions of Residents in Transit-Oriented Development Areas on Factors Affecting the Demand for the MRT Blue Line in Terms of Density

Density	**n = 400**		
	$\bar{X}$	**S.D.**	**Level**
D1 - To what extent do you believe that increased population density around mass transit stations positively influences the usage of the stations?	4.29	0.68	Strongly Agree
D2 - To what extent do you agree that greater residential building density near mass transit stations positively influences the utilization of the stations?	4.13	0.67	Agree
D3 - To what degree do you agree that higher density of commercial buildings (including offices and retail spaces) around mass transit stations impacts the usage of such transit stations?	3.93	0.76	Agree
D4 - To what degree do you agree that higher building density around mass transit stations correlates with increased utilization of the stations?	4.03	0.74	Agree
Total	4.07	0.56	Agree

Based on Table 4.41, residents in transit-oriented development areas agree that Density has a positive effect on the demand for the MRT Blue Line ($\bar{X}$ = 4.07, standard deviation = 0.74). When considering each dimension individually, iIncreased population density around transit stations has a very strong positive effect on the use of the MRT Blue Line ($\bar{X}$ = 4.29, standard deviation = 0.68). The density of residential buildings near transit stations helps to increase the use of transit stations ($\bar{X}$ = 4.13, standard deviation = 0.67). The density of buildings around transit stations has a positive effect on the increased use of the MRT Blue Line ($\bar{X}$ = 4.03, standard

deviation = 0.74). The density of office buildings and retail space around MRT stations has an effect on the increased use of the MRT Blue Line ($\bar{X}$ = 3.93, standard deviation = 0.76).

Table 4.42

Mean, Standard Deviation, and Level of Agreement on the Opinions of Residents in Transit-Oriented Development Areas on Factors Affecting the Demand for the MRT Blue Line in Terms of Design

Design	n = 400		
	$\bar{X}$	S.D.	Level
DS1 - To what extent do you agree that enhanced design and improved pedestrian amenities near mass transit stations contribute to increased usage of these transit stations?	4.04	0.72	Agree
DS2 - To what extent do you agree that an increased total length of the street network surrounding mass transit stations correlates with higher usage of these transit stations?	4.15	0.73	Agree
DS3 - To what degree do you agree that a denser street network with more intersections around mass transit stations (within 1 km radius from the station) positively influences the usage of these transit stations?	3.82	0.79	Agree
DS4 - To what degree do you agree that greater accessibility to bike lanes, routes, and signage around mass transit stations (within 1 km radius from the station) influences increased usage of these transit stations?	3.92	0.70	Agree
Total	3.98	0.54	Agree

Based on Table 4.42, residents in transit-oriented development areas agree that Design has a positive effect on the demand for the MRT Blue Line ($\bar{X}$ = 3.98, standard deviation = 0.54). When considering each dimension individually, the improved connectivity of the road network around MRT stations has a very strong positive effect on the use of the MRT Blue Line ($\bar{X}$ = 4.15, standard deviation = 0.73). The design of high-quality sidewalks and bicycle lanes, such as adequate width, traffic lights, signs, safety features, and no obstructions to walking and cycling around MRT stations, has a positive effect on the increased use of the MRT Blue Line ($\bar{X}$ = 4.04, standard deviation = 0.72). The design of sidewalks, bicycle lanes, and signage around

the station to make it easy to access and convenient to use (within a radius of 1 kilometer from the station) has a positive effect on the increased use of the MRT Blue Line ($\bar{X}$ = 3.92, standard deviation = 0.70). Improved connectivity of the road network around MRT stations has a positive effect on the increased use of the MRT Blue Line ($\bar{X}$ = 3.82, standard deviation = 0.70).

Table 4.43

Mean, Standard Deviation, and Level of Agreement on the Opinions of Residents in Transit-Oriented Development Areas on Factors Affecting the Demand for the MRT Blue Line in Terms of Distance

Distance	**n = 400**		
	$\bar{X}$	**S.D.**	**Level**
Dt1 - To what extent do you agree that an easily walkable distance from home to the nearest station positively impacts the number of passengers using the mass transit station?	3.92	0.73	Agree
Dt2 - To what degree do you agree that a shorter distance from home to the main street influences increased usage of the mass transit station?	4.04	0.76	Agree
Dt3 - To what extent do you agree that a shorter distance between the station and workplace positively affects the number of people using the mass transit station?	4.00	0.73	Agree
Dt4 - To what degree do you agree that a shorter distance between stations and commercial areas, particularly retail spaces, influences increased usage of the mass transit station?	4.02	0.80	Agree
Total	3.99	0.55	Agree

Based on Table 4.43, it shows the opinions of residents living in transit-oriented development (TOD) areas on the factors that influence their demand for the MRT Blue Line. The factor of Distance was rated as "agree" ($\bar{X}$ = 3.99, S.D. = 0.55). When considering each dimension individually, shorter distance from home to main road: This factor had the highest rating, indicating that it has a strong influence on the use of the MRT Blue Line ($\bar{X}$ = 4.04, S.D. = 0.76). Closer proximity of commercial areas, such as shopping malls or stores, to MRT stations: This factor was

also rated highly, indicating that it has a significant influence on the use of the MRT Blue Line ($\bar{X}$ = 4.02, S.D. = 0.80). shorter distance between MRT stations and workplaces: This factor was rated slightly lower than the previous two factors, but it still had a positive influence on the use of the MRT Blue Line ($\bar{X}$ = 4.00, S.D. = 0.73). Walking distance between residential areas and MRT stations: This factor had the lowest rating, but it still had a positive influence on the use of the MRT Blue Line ($\bar{X}$ = 3.92, S.D. = 0.73).

Table 4.44

Mean, Standard Deviation, and Level of Agreement on the Opinions of Residents in Transit-Oriented Development Areas on Factors Affecting the Demand for the MRT Blue Line in Terms of Diversity

Diversity	**n = 400**		
	$\bar{X}$	**S.D.**	**Level**
Di1 - To what extent do you agree that a greater diversity or mixed land use across various categories (Entropy) contributes to increased usage of the mass transit station?	3.99	0.79	Agree
Di2 - Do you think that if there is a diversity of projects (Project Diversity) around the station, such as housing, shops, offices, factories, parks or places of relaxation, will it have an effect on the increased use of the train?	3.85	0.87	Agree
Di3 - To what extent do you agree that a diverse mix of housing types catering to different income brackets (high, middle, low income) for economic diversity influences increased usage of the mass transit station?	3.89	0.84	Agree
Di4 - To what extent do you agree that a variety of shops and businesses (restaurants, cafes, grocery stores, entertainment venues, etc.) near the station influences your use of the MRT Blue Line?	3.92	0.78	Agree
Total	3.77	0.65	Agree

Based on Table 4.44, residents in transit-oriented development areas agree that Diversity has a positive effect on the demand for the MRT Blue Line ($\bar{X}$ = 3.77, S.D. = 0.65). When considering each dimension individually, If the land around

the MRT station is developed more diversely (Land Use Diversity), such as being developed into a market, green space or park, and Mixed Use buildings (residential and commercial buildings), it will have a positive effect on the increased use of the MRT Blue Line ($\bar{X}$ = 3.99, S.D. = 0.79). Secondly, a variety of shops and businesses near the station also have a positive effect on the increased use of the MRT Blue Line ($\bar{X}$ = 3.92, S.D. = 0.78). The diversity of housing types for different income groups, for economic diversity, has a positive effect on the increased use of the MRT Blue Line ($\bar{X}$ = 3.89, S.D. = 0.84). If there is a diversity of projects around the station (Project Diversity), such as housing, shops, offices, factories, parks or places of relaxation, it will have a positive effect on the increased use of the MRT Blue Line ($\bar{X}$ = 3.85, S.D. = 0.87).

Table 4.45

Mean, Standard Deviation, and Level of Agreement on the Opinions of Residents in Transit-Oriented Development Areas on Factors Affecting the Demand for the MRT Blue Line in Terms of Demand Management.

Demand Management	**n = 400**		
	$\bar{X}$	**S.D.**	**Level**
Dm1 - To what extent do you agree that implementing demand management strategies, such as reducing the availability of parking spaces, influences increased usage of the mass transit station?	3.88	0.78	Agree
Dm2 - To what degree do you agree that implementing demand management measures like increased parking fees influences increased usage of the mass transit station?	3.52	0.98	Agree
Dm3 - To what extent do you agree that providing discounts for car owners or drivers as a part of demand management would increase the usage of the mass transit station?	3.56	0.96	Agree
Dm4 - To what extent do you agree that having reliable and convenient feeder bus services or ride-sharing options near the station influences your use of the MRT Blue Line?	3.70	0.91	Agree
Total	3.65	0.74	Agree

Based on Table 4.45, residents in transit-oriented development areas agree that Demand Management has a positive effect on the demand for the MRT Blue Line ($\bar{X}$ = 3.65, standard deviation = 0.74). When considering each dimension individually, reducing the number of parking spaces in buildings around MRT stations will encourage people to use the MRT Blue Line more ($\bar{X}$ = 3.88, standard deviation = 0.78). Secondly, reliable and convenient feeder bus services or ride-sharing options near the station also influences the use of the MRT Blue Line ($\bar{X}$ = 3.70, standard deviation = 0.91). Providing rent discounts to tenants in office buildings near MRT stations that have measures to reduce the number of private cars of employees will encourage people to use the MRT Blue Line more ($\bar{X}$ = 3.56, standard deviation = 0.96). Increasing parking fees will encourage people to use the MRT Blue Line more ($\bar{X}$ = 3.52, standard deviation = 0.98).

Table 4.46

Mean, Standard Deviation, and Level of Agreement on the Opinions of Residents in Transit-Oriented Development Areas on Factors Affecting the Demand for the MRT Blue Line in Terms of Destination Accessibility

Destination Accessibility	**n = 400**		
	$\bar{X}$	**S.D.**	**Level**
DA1 - To what extent do you agree that increased destination accessibility, particularly regarding access to work areas, correlates with higher usage of the mass transit station?	3.86	0.82	Agree
DA2 - To what degree do you agree that enhanced destination accessibility, especially concerning access to residential areas, influences increased usage of the mass transit station?	3.82	0.77	Agree
DA3 - To what extent do you agree that increased destination accessibility, particularly access to commercial or retail areas, affects higher usage of the mass transit station?	3.96	0.79	Agree
DA4 - To what degree do you agree that improved destination accessibility, including access to other modes of public transportation like buses, taxis, and motorbikes, influences increased usage of the mass transit station?	3.77	0.86	Agree
Total	3.85	0.64	Agree

Based on Table 4.46, residents in transit-oriented development areas agree that Destination Accessibility has a positive effect on the demand for the MRT Blue Line ($\bar{X}$ = 3.85, S.D. = 0.855). When considering each dimension individually, increased convenience of access to destinations, especially commercial or retail areas, has a positive effect on increased use of the MRT Blue Line ($\bar{X}$ = 3.96, S.D. = 0.79). Increased convenience of access to destinations, especially work areas, has a positive effect on increased use of the MRT Blue Line ($\bar{X}$ = 3.86, S.D. = 0.82). Increased convenience of access to destinations ($\bar{X}$ = 3.82, S.D. = 0.77). Increased convenience of access to destinations, especially commercial or retail areas, has a positive effect on increased use of the MRT Blue Line ($\bar{X}$ = 3.77, S.D. = 0.86).

4.1.5 Service Usage Trend Analysis

Table 4.47

Frequency and Percentage of Service Usage

Service Usage Trend	n	%
Use	385	96.20
Do not Use	15	3.80
Total	400	100.00

From the 400 respondents, 385 people (96.20%) tend to use the service, while 15 people (3.80%) do not.

4.1.6 Factor Analysis

Table 4.48

Correlation Matrix of Density, Design, Distance and Diversity.

		Correlation Matrix															
		density1	density2	density3	density4	design1	design2	design3	design4	distance1	distance2	distance3	distance4	diversity1	diversity2	diversity3	diversity4
Correlation	density1	1.000	0.491	0.443	0.472	0.244	0.332	0.365	0.309	0.270	0.334	0.277	0.362	0.277	0.362	0.379	0.292
	density2	0.491	1.000	0.496	0.512	0.358	0.308	0.303	0.335	0.233	0.269	0.290	0.349	0.290	0.349	0.357	0.294
	density3	0.443	0.496	1.000	0.518	0.420	0.371	0.360	0.358	0.294	0.285	0.302	0.393	0.302	0.393	0.423	0.366
	density4	0.472	0.512	0.518	1.000	0.388	0.419	0.400	0.372	0.223	0.262	0.327	0.437	0.327	0.437	0.467	0.388
	design1	0.244	0.358	0.420	0.388	1.000	0.561	0.478	0.324	0.352	0.263	0.286	0.431	0.286	0.431	0.357	0.295
	design2	0.332	0.308	0.371	0.419	0.561	1.000	0.507	0.338	0.375	0.256	0.272	0.389	0.272	0.389	0.375	0.335
	design3	0.365	0.303	0.360	0.400	0.478	0.507	1.000	0.473	0.378	0.316	0.355	0.451	0.355	0.451	0.396	0.373
	design4	0.309	0.335	0.358	0.372	0.324	0.338	0.473	1.000	0.366	0.347	0.301	0.425	0.301	0.425	0.431	0.406
	distance1	0.270	0.233	0.294	0.223	0.352	0.375	0.378	0.366	1.000	0.398	0.352	0.380	0.352	0.380	0.322	0.237
	distance2	0.334	0.269	0.285	0.262	0.263	0.256	0.316	0.347	0.398	1.000	0.581	0.465	0.581	0.465	0.441	0.368
	distance3	0.277	0.290	0.302	0.327	0.286	0.272	0.355	0.301	0.352	0.581	1.000	0.631	1.000	0.631	0.531	0.433
	distance4	0.362	0.349	0.393	0.437	0.431	0.389	0.451	0.425	0.380	0.465	0.631	1.000	0.631	1.000	0.654	0.562
	diversity1	0.277	0.290	0.302	0.327	0.286	0.272	0.355	0.301	0.352	0.581	1.000	0.631	1.000	0.631	0.531	0.433
	diversity2	0.362	0.349	0.393	0.437	0.431	0.389	0.451	0.425	0.380	0.465	0.631	1.000	0.631	1.000	0.654	0.562
	diversity3	0.379	0.357	0.423	0.467	0.357	0.375	0.396	0.431	0.322	0.441	0.531	0.654	0.531	0.654	1.000	0.641
	diversity4	0.292	0.294	0.366	0.388	0.295	0.335	0.373	0.406	0.237	0.368	0.433	0.562	0.433	0.562	0.641	1.000
Sig. (1-tailed)	density1		<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
	density2	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	density3	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	density4	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	design1	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	design2	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	design3	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	design4	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	distance1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000
	distance2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
	distance3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
	distance4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
	diversity1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000
	diversity2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
	diversity3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
	diversity4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

A correlation matrix was used to analyze the relationships between the variables. It was found that all of the variables had a correlation coefficient of at least 0.3 and 0.9 with at least 1 other variable. Most of the correlations were statistically significant (p-value < 0.05). This suggests that all of the variables are related to each other in some way (correlation coefficient > 0.3 for at least 1 other variable) and that they are not all exactly the same (correlation coefficient < 0.9).

Table 4.49

Total Variance Explained of Density, Design, Distance and Diversity.

Total Variance Explained									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.124	44.524	44.524	7.124	44.524	44.524	2.993	18.709	18.709
2	1.677	10.483	55.008	1.677	10.483	55.008	2.687	16.795	35.504
3	1.096	6.848	61.855	1.096	6.848	61.855	2.625	16.409	51.913
4	.949	5.931	67.786	.949	5.931	67.786	2.540	15.874	67.786
5	.800	5.001	72.787						

Table 4.49

Total Variance Explained of Density, Design, Distance and Diversity (Continued).

6	.631	3.941	76.728						
7	.607	3.792	80.521						
8	.587	3.669	84.190						
9	.501	3.128	87.318						
10	.480	3.001	90.319						
11	.452	2.824	93.143						
12	.408	2.551	95.694						
13	.362	2.264	97.957						
14	.327	2.043	100.000						
15	5.689E-16	3.556E-15	100.000						
16	-6.073E-17	-3.796E-16	100.000						
Extraction Method: Principal Component Analysis.									

Table 4.49 shows that there are a total of 4 components with eigenvalues greater than 0.90. This means that the variables can be grouped into 4 components. These 4 components explain a total of 67.786% of the variance in the data. In other words, these 4 components can explain 67.786% of the variation among the sample group.

Table 4.50

Pattern Matrix of Rotated Component Matrix
of Density, Design, Distance and Diversity.

Rotated Component Matrix				
	Component			
	1	2	3	4
diversity2	.754			
distance4	.754			
diversity4	.749			
diversity3	.702			
diversity1	.400	.836		
distance3	.400	.836		
distance2		.724		
design2			.743	

Table 4.50

Pattern Matrix of Rotated Component Matrix

of Density, Design, Distance and Diversity (Continued).

design1			.719	
design3			.678	
distance1		.478	.622	
design4			.473	
density2				.786
density1				.741
density4				.674
density3				.668
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.				

Table 4.50 shows the factor loadings for each of the indicator questions. The factor loadings indicate which component each question has the highest loading on. This means that each question is assigned to the component that it has the strongest relationship with. After regrouping the indicator questions based on the highest factor loading for each question, the results were shown as follows:

Component 1 consists of 4 indicator questions from two factors including Diversity and Distance as follows:

1. diversity2: To what degree do you agree that higher diversity or the presence of various developed areas for residential, commercial, office, industrial, parks, or recreational use (Land Use Intensity) influences increased usage of the mass transit station?

2. diversity4: To what extent do you agree that a greater diversity or mixed land use across various categories (Entropy) contributes to increased usage of the mass transit station?

3. diversity3: To what extent do you agree that a diverse mix of housing types catering to different income brackets (high, middle, low income) for economic diversity influences increased usage of the mass transit station?

4. distance4: To what degree do you agree that a shorter distance between stations and commercial areas, particularly retail spaces, influences increased usage of the mass transit station?

Upon examining the aforementioned questions, it was discovered that they all convey the diversity of Built Environmental Factors. Consequently, the researcher has renamed Component 1 to Diversity.

Component 2 consists of 3 indicator questions from two factors including Diversity and Distance as follows:

1. diversity1: To what extent do you agree that a greater diversity or mixed land use across various categories (Entropy) contributes to increased usage of the mass transit station?

2. distance3: To what extent do you agree that a shorter distance between the station and workplace positively affects the number of people using the mass transit station?

3. distance2: To what degree do you agree that a shorter distance from home to the main street influences increased usage of the mass transit station?

Upon examining the aforementioned questions, it was discovered that they all convey the distance of Built Environmental Factors. Consequently, the researcher has renamed Component 2 to Distance.

Component 3 consists of 5 indicator questions from two factors including Design and Distance as follows:

1. design2: To what extent do you agree that an increased total length of the street network surrounding mass transit stations correlates with higher usage of these transit stations?

2. design1: To what extent do you agree that enhanced design and improved pedestrian amenities near mass transit stations contribute to increased usage of these transit stations?

3. design3: To what degree do you agree that a denser street network with more intersections around mass transit stations (within 1 km radius from the station) positively influences the usage of these transit stations?

4. distance1: To what extent do you agree that an easily walkable distance from home to the nearest station positively impacts the number of passengers using the mass transit station?

5. design4: To what degree do you agree that greater accessibility to bike lanes, routes, and signage around mass transit stations (within 1 km radius from the station) influences increased usage of these transit stations?

Upon examining the aforementioned questions, it was discovered that they all convey the design of Built Environmental Factors. Consequently, the researcher has renamed Component 3 to Design.

Component 4 consists of 4 indicator questions from one factor, which is Density as follows:

1. density2: To what extent do you agree that greater residential building density near mass transit stations positively influences the utilization of the stations?

2. density1: To what extent do you believe that increased population density around mass transit stations positively influences the usage of the stations?

3. density4: To what degree do you agree that higher building density around mass transit stations correlates with increased utilization of the stations?

4. density3: To what degree do you agree that higher density of commercial buildings (including offices and retail spaces) around mass transit stations impacts the usage of such transit stations?

Upon examining the aforementioned questions, it was discovered that they all convey the density of Built Environmental Factors. Consequently, the researcher has renamed Component 4 to Density.

Table 4.51

Correlation Matrix of Destination Accessibility and Demand Management.

		Correlation Matrix							
		destination accessibility1	destination accessibility2	destination accessibility3	destination accessibility4	demand management1	demand management4	demand management2	demand management3
Correlation	destination accessibility1	1.000	0.412	0.396	0.427	0.403	0.405	0.469	0.451
	destination accessibility2	0.412	1.000	0.426	0.412	0.390	0.452	0.313	0.404
	destination accessibility3	0.396	0.426	1.000	0.475	0.350	0.426	0.496	0.367
	destination accessibility4	0.427	0.412	0.475	1.000	0.416	0.400	0.527	0.472
	demand management1	0.403	0.390	0.350	0.416	1.000	0.437	0.444	0.486
	demand management4	0.405	0.452	0.426	0.400	0.437	1.000	0.365	0.406
	demand management2	0.469	0.313	0.496	0.527	0.444	0.365	1.000	0.573
	demand management3	0.451	0.404	0.367	0.472	0.486	0.406	0.573	1.000
Sig. (1-tailed)	destination accessibility1		<.001	<.001	<.001	<.001	<.001	<.001	<.001
	destination accessibility2	0.000		0.000	0.000	0.000	0.000	0.000	0.000
	destination accessibility3	0.000	0.000		0.000	0.000	0.000	0.000	0.000
	destination accessibility4	0.000	0.000	0.000		0.000	0.000	0.000	0.000
	demand management1	0.000	0.000	0.000	0.000		0.000	0.000	0.000
	demand management4	0.000	0.000	0.000	0.000	0.000		0.000	0.000
	demand management2	0.000	0.000	0.000	0.000	0.000	0.000		0.000
	demand management3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

A correlation matrix was used to analyze the relationships between the variables. It was found that all of the variables had a correlation coefficient of at least 0.3 and 0.9 with at least 1 other variable. Most of the correlations were statistically significant (p-value < 0.05). This suggests that all of the variables are related to each other in some way (correlation coefficient > 0.3 for at least 1 other variable) and that they are not all exactly the same (correlation coefficient < 0.9).

Table 4.52

Total Variance Explained of Destination Accessibility and Demand Management.

Total Variance Explained									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.005	50.067	50.067	4.005	50.067	50.067	2.720	34.002	34.002
2	.789	9.857	59.923	.789	9.857	59.923	2.074	25.921	59.923
3	.703	8.790	68.713						
4	.597	7.466	76.179						
5	.554	6.924	83.103						
6	.501	6.262	89.366						
7	.493	6.162	95.527						
8	.358	4.473	100.000						
Extraction Method: Principal Component Analysis.									

Table 4.52 shows that there are a total of 2 components with eigenvalues greater than 1.00. This means that the variables can be grouped into 2

components. These 2 components explain a total of 59.923% of the variance in the data. In other words, these 2 components can explain 59.923% of the variation among the sample group.

Table 4.53

Pattern Matrix of Rotated Component Matrix of Destination Accessibility and Demand Management

Rotated Component Matrix		
	Component	
	1	2
demand management2	.870	
demand management3	.757	
destination accessibility4	.667	
destination accessibility1	.559	.422
demand management1	.549	.422
destination accessibility2		.828
demand management4		.764
destination accessibility3	.480	.509
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.		

Table 4.53 shows the factor loadings for each of the indicator questions. The factor loadings indicate which component each question has the highest loading on. This means that each question is assigned to the component that it has the strongest relationship with. After regrouping the indicator questions based on the highest factor loading for each question, the results were shown as follows:

Component 5 consists of 5 indicator questions from 2 factors including Destination Accessibility and Demand Management as follows:

1. demand management2: To what degree do you agree that implementing demand management measures like increased parking fees influences increased usage of the mass transit station?

2. demand management3: To what extent do you agree that providing discounts for car owners or drivers as a part of demand management would increase the usage of the mass transit station?

3. destination accessibility4: To what degree do you agree that improved destination accessibility, including access to other modes of public transportation like buses, taxis, and motorbikes, influences increased usage of the mass transit station?

4. destination accessibility1: To what extent do you agree that increased destination accessibility, particularly regarding access to work areas, correlates with higher usage of the mass transit station?

5. demand management1: To what extent do you agree that implementing demand management strategies, such as reducing the availability of parking spaces, influences increased usage of the mass transit station?

Upon examining the aforementioned questions, it was discovered that they all convey the demand management of Built Environmental Factors. Consequently, the researcher has renamed Component 5 to Demand Management.

Component 6 consists of 3 indicator questions from 2 factors including Destination Accessibility and Demand Management as follows:

1. destination accessibility2: To what degree do you agree that enhanced destination accessibility, especially concerning access to residential areas, influences increased usage of the mass transit station?

2. demand management4: To what extent do you agree that providing discounts for car owners or drivers as a part of demand management would increase the usage of the mass transit station?

3. destination accessibility3: To what extent do you agree that increased destination accessibility, particularly access to commercial or retail areas, affects higher usage of the mass transit station?

Upon examining the aforementioned questions, it was discovered that they all convey the destination accessibility of Built Environmental Factors. Consequently, the researcher has renamed Component 6 to Destination Accessibility.

4.1.7 Reliability Test of the New Components

After identifying the new component groups, the researcher conducted reliability tests for each group. The details are as follows:

(1) Component 1: New Variable - Diversity

Table 4.54

Cronbach's Alpha of Diversity

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.896	.894	4

Table 4.55

Item-Total Statistics of Diversity

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
diversity2	11.6625	4.710	.863	.829
distance4	11.6625	4.710	.863	.829
diversity4	11.5900	5.731	.638	.910
diversity3	11.6225	5.258	.721	.883

The Cronbach's Alpha value for the Diversity component group was found to be 0.896, indicating excellent reliability. The removal of any variable from the component group did not result in that much higher Cronbach's Alpha value. Therefore, the researcher decided to retain all variables in the Diversity component group.

(2) Component 2: New Variable - Distance

Table 4.56

Cronbach's Alpha of Distance

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.885	.885	3

Table 4.57

Item-Total Statistics of Distance

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
diversity1	8.023	2.007	.887	.735
distance3	8.023	2.007	.887	.735
distance2	7.990	2.506	.581	1.000

The Cronbach's Alpha value for the Distance component group was found to be 0.885, indicating acceptable reliability. Since there are a few number of variables in the component group, removing any variable would not improve the Cronbach's Alpha value. Therefore, the researcher decided to retain all variables in the Distance component group.

(3) Component 3: New Variable - Design

Table 4.58

Cronbach's Alpha of Design

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.779	.780	5

Table 4.59

Item-Total Statistics of Design

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
design2	15.798	5.044	.604	.722
design1	15.890	4.835	.572	.732
design3	15.793	4.877	.625	.714
distance1	15.715	5.287	.481	.762
design4	15.675	5.152	.491	.759

The Cronbach's Alpha value for the Design component group was found to be 0.779, indicating excellent reliability. The removal of any variable from the component group did not result in a higher Cronbach's Alpha value. Therefore, the researcher decided to retain all variables in the Design component group.

(4) Component 4: New Variable - Density

Table 4.60

Cronbach's Alpha of Density

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.791	.793	4

Table 4.61

Item-Total Statistics of Density

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
density2	12.180	3.160	.383	.732
density1	12.100	3.200	.329	.755
density4	12.270	2.970	.621	.729
density3	12.370	2.930	.598	.742

The Cronbach's Alpha value for the Density component group was found to be 0.791, indicating excellent reliability. The removal of any variable from the component group did not result in a higher Cronbach's Alpha value. Therefore, the researcher decided to retain all variables in the Density component group.

(5) Component 5: New Variable – Demand Management

Table 4.62

Cronbach's Alpha of Demand Management

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.814	.814	5

Table 4.63

Item-Total Statistics of Demand Management

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
demand management2	14.860	7.294	.663	.759
demand management3	14.818	7.478	.649	.764
destination accessibility4	14.590	7.897	.595	.780
destination accessibility1	14.760	8.258	.559	.791
demand management1	14.493	8.621	.558	.792

The Cronbach's Alpha value for the Demand Management component group was found to be 0.814, indicating excellent reliability. The removal of any variable from the component group did not result in a higher Cronbach's Alpha value. Therefore, the researcher decided to retain all variables in the Demand Management component group.

(6) Component 6: New Variable – Destination Accessibility

Table 4.64

Cronbach's Alpha of Destination Accessibility

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.700	.700	3

Table 4.65

Item-Total Statistics of Destination Accessibility

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
destination accessibility2	7.608	2.018	.518	.593
demand management4	7.673	2.080	.519	.595
destination accessibility3	8.045	1.823	.500	.623

The Cronbach's Alpha value for the Destination Accessibility component group was found to be 0.700, indicating excellent reliability. The removal of any variable from the component group did not result in a higher Cronbach's Alpha value. Therefore, the researcher decided to retain all variables in the Destination Accessibility component group.

4.2 Analysis Results Using Inferential Statistics

4.2.1 One-way ANOVA

Hypothesis 1: Demographic factors, including gender, age, level of education, occupation, monthly income, and marital status, have different effects on the tendency to use the MRT Blue Line differently.

Hypothesis 1.1: Gender differences in demographic factors affect the tendency to use the MRT Blue Line differently.

Hypothesis 1.2: Age differences in demographic factors affect the tendency to use the MRT Blue Line differently.

Hypothesis 1.3: Differences in levels of education among demographic factors affect the tendency to use MRT Blue Line differently.

Hypothesis 1.4: Differences in occupation among demographic factors affect the tendency to use the MRT Blue Line differently.

Hypothesis 1.5: Differences in monthly income among demographic factors affect the tendency to use the MRT Blue Line differently.

Hypothesis 1.6: Differences in marital status among demographic factors affect the tendency to use the MRT Blue Line differently.

Table 4.66

Results of the Comparison of the Tendency to use the MRT Blue Line by Gender

ANOVA					
Gender	**Sum of square**	**df**	**Mean**	**F**	**Sig**
Between Groups	0.471	4	0.118	3.327	0.011*
Within Groups	13.967	395	0.035		
Total	14.438	399			

*Significant 0.05

Table 4.66 shows the results of the hypothesis test for Hypothesis 1.1: There is a difference in the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) between genders.

Hypothesis:

H0: There is no difference in the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) between genders.

H1: There is a difference in the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) between genders.

The results of the hypothesis test using the One-Way ANOVA test show that there is a statistically significant difference in the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) between genders. The p-value is 0.011, which is less than the significance level of 0.05. This means that we can reject the null hypothesis H0 and accept the alternative hypothesis H1. In other words, gender is a statistically significant factor influencing the tendency to use the MRT Blue Line. Since there is a statistically significant difference between genders, we can proceed to pairwise comparisons using the LSD method. The results of the pairwise comparisons are shown in Table 4.31.

Table 4.67

Results of the pairwise comparisons of the tendency to use the MRT Blue Line by gender, using the LSD method

Gender	**Mean**	**Male**	**Female**	**LGBTQ**	**Unsure**	**Prefer not to say**
Male	1.0000	-				
Female	0.9278	**0.001***	-			
LGBTQ	0.9773	0.495	0.116	-		
Unsure	1.0000	1.000	0.153	0.686	-	
Prefer not to say	1.0000	1.000	0.051	1.000	1.000	-

*Significant 0.05

Table 4.67 shows the results of the pairwise comparisons of the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) by gender, using the LSD method at a significance level of 0.05. The results show that there is only one pair of genders that are significantly different, namely males and females. There is no significant difference between any other pairs of genders.

Table 4.68

Results of the comparison of the tendency to use the MRT Blue Line by age

ANOVA					
Age	**Sum of square**	**df**	**Mean**	**F**	**Sig**
Between Groups	1.580	5	0.316	3.327	**0.000***
Within Groups	12.857	394	0.033		
Total	14.438	399			

*Significant 0.05

From Table 4.68, we can see the results of the hypothesis test for Hypothesis 1.2: There is a difference in the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) between different age groups.

H0: There is no difference in the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) between different age groups.

H1: There is a difference in the tendency to use the MRT Blue Line between different age groups.

The results of the hypothesis test using the One-Way ANOVA test found that: There is a significant difference in the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) between different age groups. The Sig. value is 0.000, which is less than 0.05. This means that the null hypothesis (H0) can be rejected and the alternative hypothesis (H1) can be accepted. This means that: There is a statistically significant difference in the tendency

to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) between different age groups at the 0.05 level. Therefore, a pairwise comparison test was conducted using the LSD method, as shown in Table 4.33.

Table 4.69

Results of the pairwise comparison of the tendency to use the MRT Blue Line by age, using the LSD method

Age	Mean	Below or 20 years	21-30 years	31-40 years	41-50 years	51-60 years	Above 60 years
<=20 yrs	1.0000	-					
21-30 yrs	1.0000	1.000	-				
31-40 yrs	0.8571	**0.000***	**0.000***	-			
41-50 yrs	1.0000	1.000	1.000	**0.000***	-		
51-60 yrs	1.0000	1.000	1.000	**0.000***	1.000	-	
>60yrs	1.0000	1.000	1.000	**0.000***	1.000	1.000	-

*Significant 0.05

From Table 4.69, the results of the pairwise comparison of the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) by age, using the LSD method at the 0.05 significance level, found that there were 5 pairs of ages that were different:

(1) <=20 years old and 31-40 years old

(2) 21-30 years old and 31-40 years old

(3) 31-40 years old and 41-50 years old

(4) 31-40 years old and 51-60 years old

(5) 31-40 years old and >60 years old

No other pairs were found to be different.

Table 4.70

Results of the comparison of the tendency to use the MRT Blue Line by Level of Education

ANOVA					
Level of Education	**Sum of square**	**df**	**Mean**	**F**	**Sig**
Between Groups	0.519	2	0.260	7.405	**0.001***
Within Groups	13.918	397	0.035		
Total	14.438	399			

*Significant 0.05

From Table 4.70, we can test the hypothesis 1.3 that: Different educational levels affect the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line).

Hypothesis 1 (H0): There is no difference in the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) between people with different educational levels.

Hypothesis 2 (H1): People with different educational levels have different tendencies to use the MRT Blue Line.

Results of the hypothesis test using the One-Way ANOVA test found that demographic factors in terms of different educational levels cause different tendencies to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line). The Sig. value is 0.001, which is less than 0.05. Therefore, the null hypothesis H0 is rejected and the alternative hypothesis H1 is accepted, which means that demographic factors in terms of different educational levels cause different tendencies to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) with statistical significance at the 0.05 level. Therefore, the pairwise comparison test was conducted using the LSD method, as shown in Table 4.35.

Table 4.71

Results of the pairwise comparison of the tendency to use the MRT Blue Line by educational level, using the LSD method

Level of Education	Mean	Pre-Bachelor	Undergraduate	Postgraduate
Pre-Bachelor	1.0000	-		
Undergraduate	1.0000	**0.001***	-	
Postgraduate	0.8571	1.000	**0.003***	-

*Significant 0.05

From Table 4.71, the results of the pairwise comparison of the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) by educational level, using the LSD method at the statistical significance level of 0.05, found that there were 2 pairs of educational levels that were different:

(1) Pre-Bachelor (Below Bachelor's degree) and Undergraduate (Bachelor's degree)

(2) Undergraduate (Bachelor's degree) and Postgraduate (Above Bachelor's degree)

No other pairs were found to be different.

Table 4.72

Results of the comparison of the tendency to use the MRT Blue Line by Occupation

ANOVA					
Occuapation	**Sum of square**	**df**	**Mean**	**F**	**Sig**
Between Groups	0.051	4	0.013	0.349	0.845
Within Groups	14.387	395	0.036		
Total	14.438	399			

*Significant 0.05

From Table 4.72, we can see the results of the hypothesis test for H1.4 that People with different occupations have different tendencies to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line).

Hypothesis 1 (H0): There is no difference in the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) between people with different occupations.

Hypothesis 2 (H1): People with different occupations have different tendencies to use the MRT Blue Line.

Results of the hypothesis test using the One-Way ANOVA test found that demographic factors in terms of different occupations do not cause different tendencies to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line). The Sig. value is 0.845, which is greater than 0.05. Therefore, the null hypothesis H0 is accepted and the alternative hypothesis H1 is rejected, which means that demographic factors in terms of different occupations do not cause different tendencies to use the MRT Blue Line with statistical significance at the 0.05 level.

Table 4.73

Results of the comparison of the tendency to use the MRT Blue Line by Monthly Income

ANOVA					
Monthly Income	**Sum of square**	**df**	**Mean**	**F**	**Sig**
Between Groups	0.945	7	0.135	3.992	**0.001***
Within Groups	13.492	392	0.034		
Total	14.437	399			

*Significant 0.05

From Table 4.73, we can see the results of the hypothesis test for H1.5: People with different monthly incomes have different tendencies to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line). The results of the hypothesis test show that the p-value is 0.001, which is less than the

significance level of 0.05. Therefore, the null hypothesis H0 is rejected and the alternative hypothesis H1.5 is accepted.

Hypothesis 1 (H0): There is no difference in the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) between people with different monthly incomes.

Hypothesis 2 (H1): People with different monthly incomes have different tendencies to use the MRT Blue Line.

Results of the hypothesis test using the One-Way ANOVA test found that demographic factors in terms of different monthly incomes do cause different tendencies to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line). The Sig. value is 0.001, which is less than 0.05. Therefore, the null hypothesis H0 is rejected and the alternative hypothesis H1 is accepted, which means that demographic factors in terms of different monthly incomes do cause different tendencies to use the MRT Blue Line with statistical significance at the 0.05 level. Therefore, the next step is to conduct pairwise comparisons using the LSD method, as shown in Table 4.38.

Table 4.74

Results of the comparison of the tendency to use the MRT Blue Line by Monthly Income

Monthly Income	Mean	Below or 10,000฿	10,001-20,000 ฿	20,001-30,000 ฿	30,001 - 40,000฿	40,001 - 50,000฿	50,001 - 60,000฿	60,001 - 70,000฿	Above 70,000฿
Below or 10,000฿	1.0000	-							
10,001-20,000 ฿	1.0043	0.419	-						
20,001-30,000 ฿	0.9459	**0.003***	**0.001***	-					
30,001 - 40,000฿	1.0000	1.000	0.333	**0.000***	-				
40,001 - 50,000฿	1.0000	1.000	0.536	**0.002***	1.000	-			
50,001 - 60,000฿	1.0000	1.000	0.425	**0.003***	1.000	1.000	-		
60,001 - 70,000฿	1.0000	1.000	0.549	**0.027***	1.000	1.000	1.000	-	
Above 70,000฿	1.0000	1.000	0.277	**0.000***	1.000	1.000	1.000	1.000	-

*Significant 0.05

Table 4.74 shows the results of the pairwise comparison of the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) by monthly income using the LSD method at a statistical significance level of 0.05.

The results show that there are 7 pairs of monthly income levels that have significant differences in the tendency to use the MRT Blue Line:

(1) Below or 10,000฿ and 20,001-30,000฿

(2) 10,001-20,000฿ and 20,001-30,000฿

(3) 20,001-30,000฿ and 30,001-40,000฿

(4) 20,001-30,000฿ and 40,001-50,000฿

(5) 20,001-30,000฿ and 50,001-60,000฿

(6) 20,001-30,000฿ and 60,001-70,000฿

(7) 20,001-30,000฿ and above 70,000฿

There are no significant differences in the tendency to use the MRT Blue Line between any other pairs of monthly income levels.

Table 4.75

Results of the comparison of the tendency to use the MRT Blue Line by Marital Status

ANOVA					
Marital Status	**Sum of square**	**df**	**Mean**	**F**	**Sig**
Between Groups	0.054	2	0.027	0.751	0.472
Within Groups	14.383	397	0.036		
Total	14.438	399			

*Significant 0.05

Hypothesis 1.6: People with different marital statuses have different tendencies to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line).

Hypothesis 1 (H0): There is no difference in the tendency to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line) between people with different marital statuses.

Hypothesis 2 (H1): People with different marital statuses have different tendencies to use the MRT Blue Line.

Results of the hypothesis test using the One-Way ANOVA test found that demographic factors in terms of different marital statuses do not cause different tendencies to use the Bangkok Mass Rapid Transit (MRT) Chaloem Ratchamongkon Line (MRT Blue Line). The Sig. value is 0.472, which is greater than 0.05. Therefore, the null hypothesis H0 is accepted and the alternative hypothesis H1 is rejected, which means that demographic factors in terms of different marital statuses do not cause different tendencies to use the MRT Blue Line at a statistical significance level of 0.05.

4.2.2 Binary Logistic Regression Analysis

This section describes the process of testing hypotheses using binary logistic regression analysis to investigate the factors influencing the use of the MRT Blue Line by Transit-Oriented residents, in which SPSS software was used for the analysis. The six factors were identified through preliminary analysis including Density, Design, Distance, Diversity, Destination Accessibility and Demand Management.

Hypothesis 2: Environmental factors (Density, Design, Distance, Diversity, Destination Accessibility and Demand Management) influence the use of the MRT Blue Line by the Transit-Oriented residents.

Hypothesis 2.1: Density significantly affects Mass transit use among TOD residents.

Hypothesis 2.2: Design significantly affects Mass transit use among TOD residents.

Hypothesis 2.3: Distance significantly affects Mass transit use among TOD residents.

Hypothesis 2.4: Diversity significantly affects Mass transit use among TOD residents.

Hypothesis 2.5: Destination Accessibility significantly affects Mass transit use among TOD residents.

Hypothesis 2.6: Demand Management significantly affects Mass transit use among TOD residents.

Table 4.76

Regression Analysis Summary of Built Environment Factors Affecting the Use of Mass Transit Stations by TOD residents.

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	113.391[a]	.036	.130
a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.			

Table 4.77

Accuracy Analysis of Built Environment Factors Affecting the Use of Mass Transit Stations by TOD residents.

Classification Table[a]					
Observed			Predicted		
			Mass Transit Use		Percentage Correct
			No	Yes	
Step 0	Mass Transit Use	No	0	15	.0
		Yes	0	385	100.0
	Overall Percentage				96.3
a. Constant is included in the model.					
b. The cut value is .500					

Table 4.78

The Results of the test of Built Environment Factors affecting transit ridership demand of the MRT Blue Line by Transit-Oriented Development residents

Step 1[a]	B	S.E.	Wald	df	Sig	Exp(B)
DIVERSITY	.058	.301	.038	1	.846	1.060
DISTANCE	.576	.268	4.609	1	**.032***	1.779
DESIGN	-.758	.308	6.082	1	**.014***	.468
DENSITY	.152	.276	.304	1	.581	1.164
DEMAND MANAGEMENT	.216	.331	.425	1	.515	1.241
DESTINATION ACCESSIBILITY	-.072	.301	.057	1	.812	.931
Constant	3.681	.354	108.326	1	<.001	39.692
-2Log likelihood = 113.391[a]; Cox & Snell R Square = 0.036						

The Cox & Snell R Square value of 0.036 in Table 4.76 indicates that the model explains 3.6% of the variance in the dependent variable, which means that the model does not effectively capture the relationship between the independent variables and the dependent variable. However, Table 4.77 still shows that the model correctly predicts the dependent variable 96.3% of the time. This high accuracy rate suggests that the model is effective. From Table 4.78, the results of the test of the built

environmental factors that have an effect on the use of the MRT Blue Line include Distance and Design. By considering that the Exp (B) value or the Odd ratio value is greater than 1, it means that when the independent variable increases by 1 unit, it causes Y (the dependent variable: the use of mass transit) to increase by X times, with statistical significance. And if the Exp (B) value or the Odd ratio value is negative, it means that when the independent variable increases by 1 unit, it causes Y to decrease by X times, with statistical significance. When the P-Value is less than 0.05. Thus, the Exponential Coefficients value, Exp (B) or Odd Ratio of the Distance, is equal to 1.779. This means that if Distance increases by 1 unit, it will cause the demand to use the MRT Blue Line (Y) to increase by 1.779 with statistical significance at the 0.05 level. Meanwhile, the Exponential Coefficients value, Exp (B) or Odd Ratio of the Design side, is equal to -.468. This means that if Design increases by 1 unit, it will cause the demand to use the MRT Blue Line (Y) to decrease by .468 with statistical significance at the 0.05 level, while other factors remain unchanged. Therefore, the best predictor among these factors is Distance.

4.3 Summary of Hypothesis Testing Results

Table 4.79

Summary of the Hypothesis Testing Results

Hypothesis	Accept / Reject
Demographic Factors	
Age	Accept
Gender	Accept
Level of Education	Accept
Occupation	Reject
Monthly Income	Accept
Marital Status	Reject
Built Environment Factors (TOD)	
Diversity	Reject
Distance	Accept
Design	Accept
Density	Reject
Demand Management	Reject
Destination Accessibility	Reject

Table 4.80

Hypothesis and Directions of the Exponential Coefficients

Hypothesis	Independent Variable	B	Exp(B)	Sig	Direction
H1	DENSITY (D)	.152	1.164	.581 (α > 0.05)	+
H2	DESIGN (DS)	-.758	.468	.014 (α < 0.05)	-
H3	DISTANCE (Dt)	.576	1.779	.032 (α < 0.05)	+
H4	DIVERSITY (Di)	.058	1.060	.846 (α > 0.05)	+
H5	DESTINATION ACCESSIBILITY (DA)	-.072	.931	.812 (α > 0.05)	-
H6	DEMAND MANAGEMENT (Dm)	.216	1.241	.515 (α > 0.05)	+

The interpretations of the two coefficients are as follows:

Exp (B2) or Odd Ratio of Design = .468 means that if the level of the perception of the Design (Well-designed pedestrians, Road connectivity, and Last-mile connectivity) increases by 1 unit, the odds or chances that TOD residents use more of the MRT Blue Line service will be decreased by .468 times with statistically significant (p-value < 0.05).

Exp (B3) or Odd Ratio of Distance = 1.779 means that if the level of the perception of the Distance (Walkable, Shorter, and Closer to Retails) increases by 1 unit, the odds or chances that TOD residents use more of the MRT Blue Line service will be increased by 1.779 times with statistically significant (p-value < 0.05).

Hypothesis 1: Density significantly affects Mass transit use among TOD residents.

The Density of Built Environment factors (Density) has a significant value of 0.581, which is greater than the significance level at 0.05. Thus, the H1 (Alternative Hypothesis) is rejected, while the H0 (Null Hypothesis) is accepted.

In conclusion, based on the Significant Test, the results have shown that the Density of built environment factors has no statistically significant relationship with increasing Mass Transit Use by TOD residents.

Hypothesis 2: Design significantly affects Mass transit use among TOD residents.

The Design of Built Environment factors (Design) has a significant value of 0.014, which is less than the significance level at 0.05. Thus, the H0 (Null Hypothesis) is rejected, while H1 (Alternative Hypothesis) is accepted.

The Exponential Coefficient of Design equals to 0.468, in which the value is greater than 1, which means that if Design increases by 1 unit, the odds of increasing Mass Transit Use by TOD residents will decrease by 0.468 times.

In conclusion, based on the Significant Test and Exponential Coefficients, the results have shown that the Design of built environment factors has a statistically significant negative relationship with increasing Mass Transit Use by TOD residents.

Hypothesis 3: Distance significantly affects Mass transit use among TOD residents.

The Distance of Built Environment factors (Distance) has a significant value of 0.032, which is less than the significance level at 0.05. Thus, the H0 (Null Hypothesis) is rejected, while H1 (Alternative Hypothesis) is accepted.

The Exponential Coefficient of Distance equals to 1.779, in which the value is greater than 1, which means that if Design increases by 1 unit, the odds of increasing Mass Transit Use by TOD residents will increase by 1.779 times.

In conclusion, based on the Significant Test and Exponential Coefficients, the results have shown that the Distance of built environment factors has a statistically significant positive relationship with increasing Mass Transit Use by TOD residents.

Hypothesis 4: Diversity significantly affects Mass transit use among TOD residents.

The Diversity of Built Environment factors (Diversity) has a significant value of 0.846, which is greater than the significance level at 0.05. Thus, the H1 (Alternative Hypothesis) is rejected, while the H0 (Null Hypothesis) is accepted.

In conclusion, based on the Significant Test, the results have shown that the Diversity of built environment factors has no statistically significant relationship with increasing Mass Transit Use by TOD residents.

Hypothesis 5: Destination Accessibility significantly affects Mass transit use among TOD residents.

The Destination Accessibility of Built Environment factors (Destination Accessibility) has a significant value of 0.812, which is greater than the significance level at 0.05. Thus, the H1 (Alternative Hypothesis) is rejected, while the H0 (Null Hypothesis) is accepted.

In conclusion, based on the Significant Test, the results have shown that the Destination Accessibility of built environment factors has no statistically significant relationship with increasing Mass Transit Use by TOD residents.

Hypothesis 6: Demand Management significantly affects Mass transit use among TOD residents.

The Demand Management of Built Environment factors (Demand Management) has a significant value of 0.515, which is greater than the significance level at 0.05. Thus, the H1 (Alternative Hypothesis) is rejected, while the H0 (Null Hypothesis) is accepted.

In conclusion, based on the Significant Test, the results have shown that the Demand Management of built environment factors has no statistically significant relationship with increasing Mass Transit Use by TOD residents.

By examining the coefficients of the six Built Environment factors, this study has gained insights into the relative influences on the increase of the use of the MRT Blue Line by TOD residents, in which the Distance of Built Environment factors exhibits the strongest positive influence on the use of the MRT Blue Line by TOD residents. The factor (Distance) suggests that easily walkable distance from home to the nearest station, a shorter distance from home to the main street, a shorter distance between the station and workplace, and a shorter distance between stations and commercial areas play a crucial role in encouraging TOD residents to use the MRT Blue Line. Secondly, the Design of Built Environment factors has a negative influence on the use of the MRT Blue Line by TOD residents. The factor (Design) suggests that enhanced design and improved pedestrian amenities near mass transit stations, increased total length of the street network surrounding mass transit stations, a denser street network with more intersections around mass transit stations (within 1 km radius from the station), and greater accessibility to bike lanes, routes, and signage around mass transit stations (within 1 km radius from the station) may have a slight negative effect on encouraging TOD residents to use the MRT Blue Line. Meanwhile, the Density, Diversity, Destination Accessibility, and Demand Management do not show statistically significant relationships with the use the MRT Blue Line by TOD residents, suggesting that they may not be as influential as the other factors considered in this analysis.

The regression equation can show the relationship as follows.

$$Y = \frac{e^{(\beta_0+\beta_1 x)}}{1 + e^{(\beta_0+\beta_1 x)}}$$

When β_0 and β_1 means Parameter Values
X means Independent Variables
E means Natural Logarithm (2.71828)

In case that the study has more than one independent variable, the equation will be as follow.

$$Y = \frac{e^{(\beta_0+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\beta_p x_p)}}{1 + e^{(\beta_0+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\beta_p x_p)}}$$

For an application of the study, the relationship can be expressed using the following equation, where each variable is represented by its corresponding beta coefficient.

$$Y = \frac{e^{(\beta_0+\beta_1 D+\beta_2 DS+\beta_3 Dt+\beta_4 Di+\beta_5 DA+\beta_6 Dm)}}{1 + e^{(\beta_0+\beta_1 D+\beta_2 DS+\beta_3 Dt+\beta_4 Di+\beta_5 DA+\beta_6 Dm)}}$$

However, there are four Built Environment factors that do not significantly influence Y, including Density (D), Diversity (Di), Demand Accessibility (DA), and Demand Management (Dm). Thus, the relationship can be illustrated by the following equation.

$$Y = \frac{e^{((0.152)(0)+(-0.758)DS+(0.576)Dt+(0.058)(0)+(-0.072)(0)+(0.216)(0))}}{1 + e^{((0.152)(0)+(-0.758)DS+(0.576)Dt+(0.058)(0)+(-0.072)(0)+(0.216)(0))}}$$

The equation below shows the significant relationship between independent variables with Y as a key factor or dependent factor.

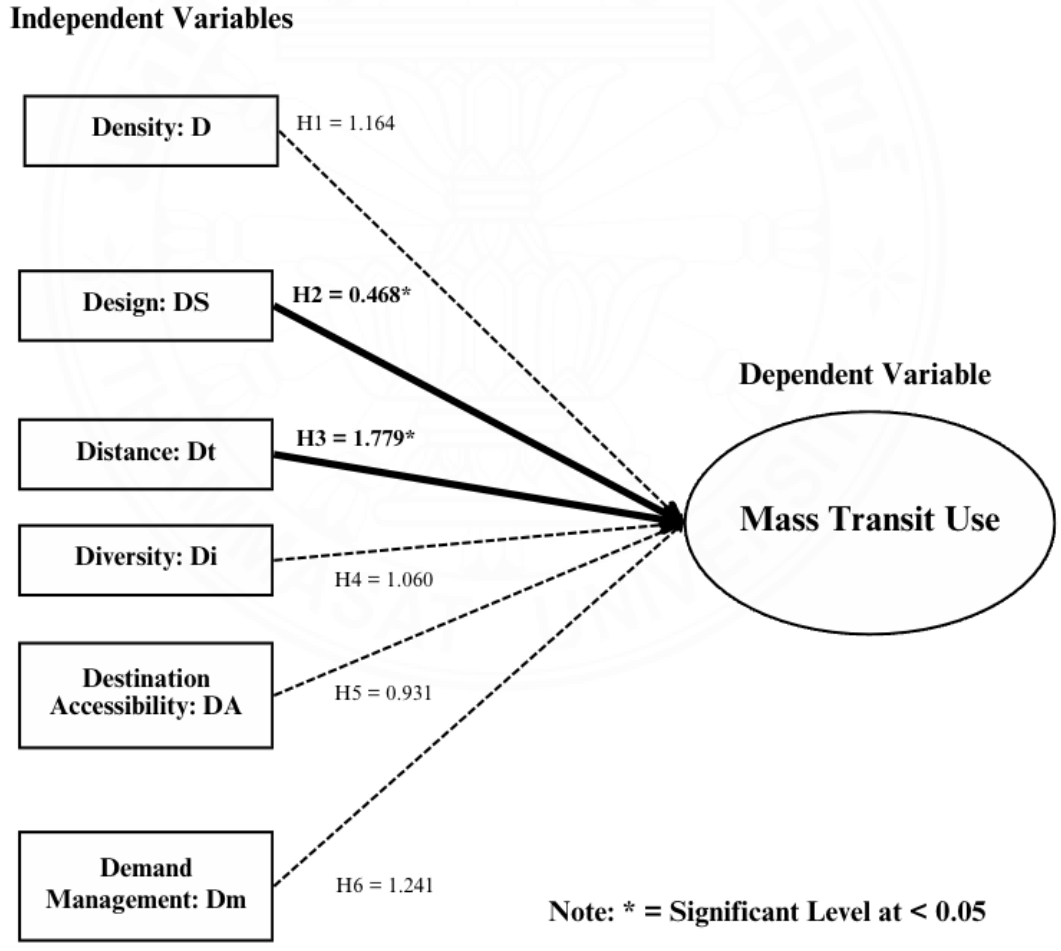
$$Y = \frac{e^{((-0.758)DS+(0.576)Dt)}}{1 + e^{((-0.758)DS+(0.576)Dt)}}$$

4.4 New Research Framework

By applying binary logistic regression, the framework was reestablished as a new conceptual framework, which is illustrated as follows.

Figure 4.1

New Research Framework



Note. *From the literature reviews and analysis,* the researcher, 2024

The new framework visually represents significant and non-significant relationships using solid and dashed lines, respectively. Exponential coefficients with asterisks further quantify the direction and strength of those relationships. A value greater than 1 suggests a positive influence, while a value less than 1 suggests a negative influence, both on the odds of the dependent variable occurring.

4.5 Summary of the Results

4.5.1 Summary of the Factors that encourage TOD residents to use the MRT Blue Line.

The two Built Environment factors that help increase the use of mass transit by those who reside within the radius of 1 kilometer from the MRT Blue Line stations include Distance and Design. In addition, these people are those who reside within walkable distance from their residents to the MRT Blue Line stations but refuse to use the MRT Blue Line that much due to their own reasons. However, they are the potential ones who can be encouraged to use more of the mass transit because of the problems in the Distance and Design of the current Built Environment factors near each mass transit station of the Blue Line.

4.5.2 Summary of the Demographic Attributes of TOD residents that can be encouraged to use the MRT Blue Line.

(1) Genders - There is a difference in the tendency to use the MRT Blue Line between genders of the respondents, especially between male and female that are significantly different.

(2) Age - There is a difference in the tendency to use the MRT Blue Line between age groups of the respondents, especially those who are 31 – 40 years that are significantly different from the other age groups.

(3) Level of Education – There is a difference in the tendency to use the MRT Blue Line between those who are pre-bachelor and undergraduate, and those who are undergraduate and postgraduate that are significantly different.

(4) Occupations - There is no difference in the tendency to use the MRT Blue Line among occupations.

(5) Monthly Income - There is a difference in the tendency to use the MRT Blue Line between the levels of monthly income of the respondents, especially those who are paid 20,001 – 30,000 baht per month that are significantly different from the other age groups.

(6) Marital Status - There is no difference in the tendency to use the MRT Blue Line between marital status.

4.5.3 The Developments of Design and Distance of the Built Environment Factors of the Transit-Oriented Development

(1) Design (DS) refers to the study of the Built Environment Design, including enhanced design and improved pedestrian amenities near mass transit stations, total length of the street network surrounding mass transit stations, a denser street network with more intersections around mass transit stations (within 1 km radius from the station), and a greater accessibility to bike lanes, routes, and signage around mass transit stations. In this case, a negative coefficient signifies an opposite relationship between the Design and the use of the MRT Blue Line by TOD residents, which indicates that even if there is no such improvement to the pedestrian, amenities, and facilities around the MRT Blue Line stations, the residents will still use the mass transit station. Furthermore, the denser and longer street network may discourage them to use the mass transit due to more complication or difficulty of the services. Thus, the design of the street network or amenities around the stations must be made for the ease of use to attract more residents to use the services.

(2) Distance (Dt) refers to the study of the Built Environment Distance, including a walkable distance from home to the nearest station, a shorter distance from home to the main street, a shorter distance between the station and workplace, and a shorter distance between stations and commercial areas. In this case, a positive coefficient signifies a positive relationship between the Distance and the use of the MRT Blue Line by TOD residents, which indicates that a shorter and more walkable distance from home to the stations, or from the stations to the workplaces may encourage them to use the mass transit due to the various aspects of walkability within the built environment, especially the convenience and ease of access to the stations.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

This study investigates the demand for the Bangkok Metropolitan Rapid Transit Line (the MRT Blue Line) through a quantitative approach. Data was collected via questionnaires administered to a sample of 400 residents residing within Transit-Oriented Development (TOD) areas served by the MRT Blue Line. A total of 400 sets of questionnaires were collected and analyzed using statistical methods, including factor analysis, correlation analysis, validity and reliability analysis, and binary logistic regression analysis. These analyses were conducted to achieve the research objectives.

The descriptive analysis of the respondents' demographic characteristics showed that the majority of respondents are between the ages of 31 and 40, female and male, have a bachelor's degree, government officials as their occupations, in which they earn between 20,001 and 30,000 Baht per month. Furthermore, the majority of them are married. Apart from the demographic information, there is also travel behavior analysis showing that the majority of these people live in a detached house (as known as single-family home) with parking available at their residences. They usually make a decision for the travel mode by themselves and travel alone. For the walking time from their residence to the nearest MRT Station, the majority of them take around 11 -15 minutes walking to the MRT stations For the spending, they accept the round-trip travel costs at 35 - 150 Baht. For the number of private cars used regularly, most respondents use 1 private car regularly. In addition, the workplace distance from MRT stations is more than 1 kilometer away from the station. When considering daily travel cost to the workplace, the results show that the average daily travel cost to work is 120.37 Baht. (Maximum at 250 Baht). Meanwhile, the workplace parking availability is sufficient and most people do not have to pay a monthly parking fee at work. However, those who need to pay the monthly parking fees will have to pay around 1,912.84 baht per month. For the daily travel cost by car, the mean is 139.70 Baht. Finally, these people agree with the six built environment factors including Density, Design, Distance, Diversity, Destination Accessibility, and Demand Management.

For the dependent variable, it is estimated that after considering the aforementioned factors, the number of TOD residents who will use the MRT Blue Line is 385, accounting for 96.20%. When examining the individual factors, it was found that in terms of gender, females are most likely to use the MRT Blue Line services (48.50%), while males are less likely to use them by about ten percent (29.30%). In terms of age, those who are 31 – 40 and 41 – 50 years old are most most likely to use the MRT Blue Line services, at 26.30% and 26.00% respectively. In terms of level of the education, undergraduates are most likely to use the service (52%). In terms of occupations, corporate employees and government officials are most likely to use the service at the same proportion (28.20%). For the monthly income level, those who receive 20,001 – 30,000 baht a month are most likely to use the service (25.50%). Finally, in terms of marital statuses, those who are married are most likely to use the service (58%).

Based on the literature review, six factors were identified that encourage the use of the MRT Blue Line by TOD residents including Density (D), Design (DS), Distance (Dt), Diversity (Di), Destination Accessibility (DA), and Demand Management (DM). These factors were analyzed using Factor Analysis, considering the Correlation Matrix, which explains the relationship between the 24 measured variables. These factors were analyzed using Factor Analysis, considering the Correlation Matrix, which explains the relationship between the 24 measured variables. Variables with a correlation coefficient of more than 0.3 and less than 0.9 with at least one other variable were included. Factor Rotation was then performed to regroup the 24 latent variables (measured questions) into six factors. The first component is called Diversity (Di) because it consists of four measured variables from Diversity and Distance including Di2, Di3, Di4, and Dt4. The second component is called Distance (Dt) because it consists of three measured variables from Diversity and Distance including Di1, Dt2 and Dt3. The third component is called Design (DS) because it consists of five measured variables from Design and Distance including DS1, DS2, DS3, DS4, and Dt1. The fourth component is called Density because it consists of four measured variables from Density including D1, D2, D3 and D4. The fifth component is called Demand Management because it consists of five measured variables from Destination Accessibility and Demand Management including DM1, DM2, DM3, DA1

and DA4. Finally, the sixth component is called Destination Accessibility because it consists of three measured variables from Destination Accessibility and Demand Management including DA2, DA3, and DM4.

For the analysis of the new components, the Reliability Test was used to assess the internal consistency and reliability of the questionnaire using Cronbach's Alpha. The Cronbach's Alpha coefficient for the questionnaires measuring Density (D) and Distance (Dt) was found to be above 0.80, which is considered reliable. The Cronbach's Alpha coefficient for the questionnaires measuring Design (DS), Diversity (Di), Destination Accessibility (DA), and Demand Management (DM) was found to be above and equal to 0.70, which is still considered reliable. Upon further examination, it was found that removing any variable will not affect the Cronbach's Alpha coefficient that significantly much. Thus, there is no variable that is removed in this test.

In addition to the analysis results, Binary Logistic Regression Analysis was conducted with a significance level of 0.05 to examine the factors influencing the encourage the demand for the MRT Blue Line services by the residents living nearby the MRT stations (within 1 kilometer radius from each station). The results revealed that Design (DS) and Distance (Dt) were all significantly associated with the demand for the MRT Blue Line services, in which Distance (Dt) emerged as the strongest predictor, with an exponential coefficient of 1.779, indicating a positive and substantial impact on the mass transit demand due to the shorter and walkable distance from the stations to the residents, commercials, and workplaces, which in turn could encourage TOD residents to use the services more frequently. Another key finding from the results is that the Design (DS) of the Built Environment factors within the area of the stations has a negative exponential coefficient, suggesting a negative association with mass transit usage demand, which could be explained by the fact that while negative coefficients usually suggest a negative association, it's possible that the true relationship isn't linear. There might be a tipping point. For example, a very dense street network could lead to traffic congestion and make walking or cycling less appealing, ultimately decreasing transit usage. Furthermore, the variables might have an indirect effect. Increased street network length or density could lead to more car traffic, making transit stations less attractive compared to driving. Similarly, extensive bike infrastructure could cater to a specific population who might not be regular transit users. In addition

to the design enhancement, a well-developed existing network (street network, bike lanes) might not significantly improve transit usage if other factors like station accessibility or service frequency are already good. Additional infrastructure might have diminishing returns. Another reason is the target population in this study, since the survey have captured responses from a population segment that doesn't rely heavily on mass transit but residing within the area of the mass transit stations. Increased street network or bike lanes might not significantly influence their choices.

All in all, the results show that Design and Distance of the Built Environment Factors are the ones influenced the use of the MRT Blue Line the most. Therefore, developers who are going to plan the projects within the area of the MRT Blue Line stations may focus mainly on these two aspects of the Built Environment factors.

5.2 Research Limitations

The data for this research was collected from a sample of residents living near stations on the MRT Blue Line only. Therefore, the results of the data analysis may be different from other mass transit lines. In addition, the research did not consider other factors that may influence the demand for the MRT Blue Line, such as the frequency of train services, safety, or the service satisfaction of the MRT system, or those facilities and amenities that are provided by such train stations. Furthermore, the limited time frame for data collection had restricted the ability to gather a more representative sample. The use of a single line of the mass transit as the sampling frame may limit the generalizability of the findings to other TOD populations or the broader population.

5.3 Future Research

To build upon this research, there should be an expansion for the scope by studying more on multi-line comparison for future studies, which can be achieved by conducting a comparative study across multiple lines in Bangkok. This would reveal if factors influencing MRT Blue Line usage differ from other lines with varying ridership

or characteristics. Also, including other TOD types by investigating if factors differ for residents living in different types of TODs such as high-density compared to low-density areas. As a result shown by the analysis, TOD residents, who are 31 – 40 years old (as known as Generation Y), are the ones who have different attitudes towards the use of the MRT Blue Line. Thus, there would be the future research studying to understand their motivation and attitude towards the use of the MRT Blue Line. Furthermore, since the research was conducted by a questionnaire piloting to the area around the station with limited time to interview the respondents, the future research may include interview session for a better understanding of the TOD residents of the mass transit lines. By addressing these future research areas, there will be a more comprehensive understanding of the factors influencing MRT usage in Bangkok's TODs. This knowledge can be used to develop strategies for promoting ridership and maximizing the potential of the MRT system as a sustainable transportation solution.

5.4 Recommendations and Applications

For the recommendations and applications, first of all, the policymakers should prioritize the development of TODs around existing and future MRT stations by focusing mainly on the Distance and Design of the Built Environment factors. To begin, since there is a positive exponential coefficient from the binary logistic regression analysis for the Distance, it suggests that proximity to key destinations plays a significant role in mass transit usage by the residents in the area. Thus, there should be a further analysis to identify the ideal walkable distance from residences, workplaces, and commercial areas to stations that in turn will maximize riderships. Altogether with the campaigns that highlight the benefits of living, working, and shopping close to transit stations. Emphasize the convenience and time savings associated with shorter walking distances as well as the promotion of policies and incentives that encourage mixed-use development near transit stations, which creates walkable communities where residents have easy access to daily needs and amenities. Finally, for the Distance, the accessibility assessments could also help identify areas with limited access to transit stations due to distance. Explore solutions like feeder bus routes or improved pedestrian infrastructure to bridge these gaps. To apply, the transit

network expansion to areas with high population density and potential ridership should be prioritized by focusing on connecting residential areas, workplaces, and commercial districts with frequent and reliable service. Furthermore, transit accessibility should be considered into urban planning and zoning regulations to encourage development patterns that promote a mix of land uses within walking distance of stations. In addition, there should be a support for the smart growth initiatives that promote compact, walkable communities centered around transit stations, which in turn will reduce reliance on private vehicles and improves overall sustainability. For the further real estate development, real estate developers need to consider the proximity to transit stations when developing new residential and commercial properties, which can create a competitive advantage and attract tenants or customers who value transit access.

Apart from the Distance of Built Environment factors, there is a negative exponential coefficient found in the binary logistic regression analysis for the Design, which suggest a counterintuitive relationship between the measured variables and mass transit usage. This indicates that there might a problem if the design is enhanced. For example, a very dense street network could lead to traffic congestion, making walking or cycling less appealing. For the recommendations, there might be the investment in in improvements (better design, amenities, bike lanes) near transit stations that are most likely to be used by a specific target population such as students or office workers who might be more receptive to use the mass transit. And rather than focusing on the design enhancement, the improvement for safety and security features around stations should be addressed for potential concerns about increased street network connectivity, especially for pedestrians and cyclists. To apply, there should be an investment in data collection and analysis tools to continuously monitor ridership patterns and the impact of infrastructure changes on travel behavior, which in turn will allow evidence-based adjustments for the future development plans. Next is to implement Transit-Oriented Development (TOD) in phases (Staged Development) by monitoring ridership changes and adapting strategies as needed to allow course corrections if increased street network density leads to unintended consequences. In addition to the development plans, the developers must avoid multi-modal integration in some specific areas around the mass transit stations. The focus on integrating various transportation modes (walking,

cycling, micro-mobility) with mass transit should be made with the considerations of traffic congestions of the areas.

Lastly, for marketing and promotional campaigns, developers can target residents within the Transit-Oriented Development (TOD) project. This could include both men and women with bachelor's degrees, earning a monthly income between 20,001 and 30,000 baht, who are professionals working in corporate or government positions near the MRT Blue Line Stations.

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APPENDICE

APPENDIX A

Questionaire

MRT Blue Line Usage Assessment Questionnaire

Instructions: This questionnaire is part of a research project for the Real Estate Business Department, Faculty of Commerce and Accountancy, Thammasat University.

Purpose of the Study: To investigate the relationship between the following factors and the usage of the MRT Blue Line by residents in Transit-Oriented Development (TOD) areas:

1. Density
2. Design
3. Distance
4. Diversity
5. Destination Accessibility
6. Demand Management

For Confidentiality: The information obtained from this questionnaire will be kept confidential and used solely for the purpose of this research. The data will be presented in the form of an aggregated summary, and no personal information will be disclosed. We kindly request your cooperation in answering the questionnaire truthfully to benefit the research.

Questionnaire Structure: The questionnaire is divided into 4 parts:

Part 1: Respondent Screening (2 questions)

Part 2: Travel Behavior (15 questions)

Part 3: Factors Influencing Blue Line MRT Usage by Residents in TOD Areas (25 questions)

Part 4: Other Information (6 questions)

For questions or feedback, please contact: siriwit-roj65@tbs.tu.ac.th or call 099-979-4195

Part 1: Screening Questions

ส่วนที่ 1 : คัดกรองผู้ตอบแบบสอบถาม

กรุณาใส่เครื่องหมาย √ ลงในช่อง □ หน้าข้อความที่เป็นจริงเพียงอย่างเดียว

1. ท่านอาศัยอยู่ในพื้นที่ที่เข้าถึงสถานีขนส่งมวลชนของรถไฟฟ้าสายสีน้ำเงินได้ (ภายในระยะทาง 1 กิโลเมตรหรือไม่) *

- ◯ ใช่
- ◯ ไม่ใช่

2. ท่านใช้บริการรถไฟฟ้าทุกวันใช่หรือไม่ *

- ◯ ใช่
- ◯ ไม่ใช่

3. ความถี่ในการใช้บริการรถไฟฟ้าของท่าน (วัน / สัปดาห์) *

Your answer

Part 2: Travel Behavior

ส่วนที่ 2: พฤติกรรมการเดินทาง

คำชี้แจง กรุณาใส่เครื่องหมาย √ ลงในช่อง □ หน้าข้อความที่เป็นจริงเพียงอย่างเดียว

2.1 ท่านพักที่อยู่อาศัยประเภทใด? *

- ◯ บ้านเดี่ยว
- ◯ ทาวน์เฮ้าส์
- ◯ คอนโดมิเนียม
- ◯ หอพัก
- ◯ Other: _____

2.2 ที่อยู่อาศัยของท่านมีที่จอดรถหรือไม่? *

- ◯ มี
- ◯ ไม่มี

2.3 ปกติท่านเดินทางในแต่ละวันกี่คน? *

- ◯ 1 คน
- ◯ 2 คน
- ◯ 3 คน
- ◯ 4 คน
- ◯ 5 คนขึ้นไป

2.4 ใครมีอำนาจตัดสินใจในการเลือกวิธีเดินทางแต่ละวัน? *

- ◯ ตัวท่านเอง
- ◯ สมาชิกในครอบครัว
- ◯ เพื่อนร่วมงาน
- ◯ Other: _____

2.5 (การเดินทางด้วยรถไฟฟ้า) สถานีรถไฟฟ้าที่ใกล้ที่สุดของท่านคือสถานีใด? *

Choose

2.6 (การเดินทางด้วยรถไฟฟ้า) ระยะเวลาในการเดินเท้าจากบ้านเข้าถึงสถานีรถไฟที่ใกล้ที่สุดโดยประมาณ? *

- ◯ น้อยกว่า 5 นาที
- ◯ 5-10 นาที
- ◯ 11-15 นาที
- ◯ 16-20 นาที
- ◯ มากกว่า 20 นาที

2.7 (การเดินทางด้วยรถไฟฟ้า) ท่านเข้าถึงสถานีรถไฟฟ้าได้อย่างไร? *

- ◯ เดินเท้า
- ◯ ขี่รถจักรยาน
- ◯ ขี่รถมอเตอร์ไซค์
- ◯ รถเมล์
- ◯ แท็กซี่
- ◯ รถส่วนตัว
- ◯ Other: _____

2.8 (การเดินทางด้วยรถไฟฟ้า) ค่าใช้จ่ายในการเดินทางด้วยรถไฟที่ยอมรับได้ (ไปกลับ) ใส่เพียงตัวเลข *

Your answer

2.9 (การเดินทางด้วยรถยนต์ส่วนตัว) ท่านมีรถยนต์ส่วนตัวหรือไม่ กี่คัน ที่ใช้ประจำ? *

- ◯ 1 คัน
- ◯ 2 คัน
- ◯ 3 คันขึ้นไป
- ◯ ไม่มี
- ◯ Other: _____

2.10 (การเดินทางไปสถานที่ทำงาน) ที่ทำงานของท่านอยู่ห่างจากสถานีรถไฟฟ้าเกิน 1 กิโลเมตรใช่หรือไม่ *

- ◯ ใช่
- ◯ ไม่ใช่

2.11 (การเดินทางไปสถานที่ทำงาน) ค่าใช้จ่ายในการเดินทางไปทำงานในแต่ละวันโดยประมาณ? (ใส่แค่ตัวเลข) *

Your answer _____

2.12 (การเดินทางไปสถานที่ทำงาน) สถานที่ทำงานของท่านมีที่จอดรถเพียงพอหรือไม่ *

- ◯ เพียงพอ
- ◯ ไม่เพียงพอ

2.13 (การเดินทางไปสถานที่ทำงาน) ท่านจำเป็นต้องจ่ายค่าจอดรถรายเดือนที่สถานที่ทำงานหรือไม่ *

- ◯ ใช่
- ◯ ไม่

2.14 (การเดินทางไปสถานที่ทำงาน) หากใช่ ท่านต้องจ่ายเงินเพื่อจอดรถเป็นเงินกี่บาทต่อเดือน (ใส่เพียงตัวเลข)

Your answer

2.15 (กรณีขับรถยนต์ไปทำงาน) ค่าใช้จ่ายในการเดินทาง "ต่อวัน" ด้วยรถยนต์ ขอให้ท่านคิดจาก ระยะทางจากบ้านไปที่ทำงาน (กิโลเมตร) x อัตราการกินน้ำมันของรถ (ลิตร/กิโลเมตร) x ราคาน้ำมัน (บาท/ลิตร) โดยประมาณ

Your answer

Part 3: Built Environment Factors that Influence the Use of The MRT Blueline by the TOD residents.

ส่วนที่ 3 ปัจจัยที่มีอิทธิพลต่อการใช้รถไฟฟ้าสายสีน้ำเงินของผู้อาศัยในพื้นที่พัฒนาเพื่อการขนส่ง: กรณีศึกษาเส้นทางรถไฟฟ้ามหานครสายสีน้ำเงิน

ในส่วนนี้ ผู้ตอบแบบสอบถามจะต้องประเมินระดับความเห็นด้วยหรือไม่เห็นด้วยโดยใช้มาตราส่วนที่กำหนดไว้ ค่าตัวเลขที่สัมพันธ์กับแต่ละคำตอบมักถูกเข้ารหัสเพื่อใช้ในการวิเคราะห์ เช่น:

Strongly disagree (ไม่เห็นด้วยอย่างยิ่ง):	1
Disagree (ไม่เห็นด้วย):	2
Neutral (เฉยๆ):	3
Agree (เห็นด้วย):	4
Strongly agree (เห็นด้วยอย่างยิ่ง):	5

1. ความหนาแน่น (Density)

คำอธิบาย: ความหนาแน่น (Density): หมายถึง จำนวนประชากร และระดับการกระจุกตัวของพื้นที่อยู่อาศัยหรือเชิงพาณิชย์บริเวณรอบสถานี MRT สายสีน้ำเงิน ความหนาแน่นส่งผลต่อปริมาณผู้ใช้บริการรถไฟฟ้าและรูปแบบการเดินทาง

ท่านเห็นด้วยมากน้อยเพียงใดที่ ... *

	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	เฉยๆ	เห็นด้วย	เห็นด้วยอย่างยิ่ง
1.1 ความหนาแน่นของประชากรที่เพิ่มขึ้นบริเวณรอบสถานีขนส่งมีผลเชิงบวกต่อการใช้งานรถไฟฟ้ามากขึ้น	○	○	○	○	○
1.2 ความหนาแน่นของอาคารที่อยู่อาศัยใกล้สถานีขนส่งมวลชนมีส่วนช่วยเพิ่มการใช้สถานีขนส่งมวลชน	○	○	○	○	○
1.3 ความหนาแน่นของพื้นที่อาคารสำนักงานและพื้นที่ค้าปลีกบริเวณรอบสถานีรถไฟฟ้ามีผลต่อการใช้งานรถไฟฟ้าเพิ่มขึ้น	○	○	○	○	○
1.4 ความหนาแน่นของอาคารรอบสถานีขนส่งมีผลเชิงบวกต่อการใช้งานรถไฟฟ้ามากขึ้น	○	○	○	○	○

2. การออกแบบ (Design)

คำอธิบาย: การออกแบบ (Design): ครอบคลุมถึงรูปแบบผังเมือง โครงสร้างพื้นฐาน และลักษณะสถาปัตยกรรมของพื้นที่พัฒนาที่เน้นการขนส่งรอบสถานี MRT การออกแบบที่ดีส่งผลต่อความสะดวกสบาย ความปลอดภัย และความน่าใช้งาน

ท่านเห็นด้วยมากน้อยเพียงใดที่ ... *

	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	เฉยๆ	เห็นด้วย	เห็นด้วยอย่างยิ่ง
2.1 การออกแบบทางเท้าและทางจักรยานที่ดีมีคุณภาพ เช่น มีความกว้างที่เหมาะสม มีป้ายสัญญาณไฟ มีป้ายบอกทาง มีระบบความปลอดภัย และไม่มีสิ่งกีดขวางต่อการเดินและขี่จักรยานบริเวณรอบสถานีรถไฟฟ้ามีผลต่อการใช้รถไฟฟ้ามากขึ้น	○	○	○	○	○
2.2 ถ้าโครงข่ายถนนมีการเชื่อมต่อมากขึ้นบริเวณรอบสถานีรถไฟฟ้ามีผลต่อการใช้รถไฟฟ้ามากขึ้น	○	○	○	○	○
2.3 ถ้าความหนาแน่นของโครงข่ายถนนและทางแยกมากขึ้นรอบสถานีขนส่ง (ภายในรัศมี 1 กิโลเมตรจากสถานี) มีผลต่อการใช้รถไฟฟ้ามากขึ้น	○	○	○	○	○
2.4 การออกแบบทางเท้า ทางจักรยาน และการมีป้ายบอกทางรอบสถานีให้ง่ายต่อการเข้าถึงและสะดวกต่อการใช้งาน (ภายในรัศมี 1 กิโลเมตรจากสถานี) มีผลต่อการใช้รถไฟฟ้ามากขึ้น	○	○	○	○	○

3. ระยะทาง (Distance)

คำอธิบาย: ระยะทาง (Distance): หมายถึงความใกล้เคียงของเขตที่อยู่อาศัยกับสถานี MRT สายสีน้ำเงิน ระยะทางส่งผลต่อความสะดวกในการเข้าถึงรถไฟฟ้าและรูปแบบการเดินทาง

ท่านเห็นด้วยมากน้อยเพียงใดที่ ... *

	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	เฉยๆ	เห็นด้วย	เห็นด้วยอย่างยิ่ง
3.1 ถ้าที่พักอาศัยและสถานีรถไฟฟ้าอยู่ในระยะทางที่เดินได้ จะมีผลต่อการใช้รถไฟฟ้าที่มากขึ้น	○	○	○	○	○
3.2 ระยะทางที่สั้นลงจากบ้านไปยังถนนหลักมีผลต่อการใช้รถไฟฟ้ามากขึ้น	○	○	○	○	○
3.3 ระยะทางระหว่างสถานีรถไฟฟ้าและที่ทำงานที่สั้นลง มีผลต่อการใช้รถไฟฟ้ามากขึ้น	○	○	○	○	○
3.4 ถ้าพื้นที่เชิงพาณิชย์ เช่น ศูนย์การค้า หรือร้านค้าต่างๆ อยู่ใกล้กับสถานีรถไฟฟ้ามากขึ้น จะมีผลต่อการใช้รถไฟฟ้ามากขึ้น	○	○	○	○	○

4. ความหลากหลาย (Diversity)

คำอธิบาย: ความหลากหลาย (Diversity): หมายถึงชนิดและความผสมผสานของผู้คน สิ่งอำนวยความสะดวก และบริการต่างๆ ในบริเวณโดยรอบสถานี MRT ความหลากหลายส่งผลต่อการใช้บริการรถไฟฟ้าของกลุ่มประชากรต่างๆ

ท่านเห็นด้วยมากน้อยเพียงใดที่ ... *

	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	เฉยๆ	เห็นด้วย	เห็นด้วยอย่างยิ่ง
4.1 ถ้าที่ดินรอบสถานีรถไฟฟ้าถูกพัฒนาอย่างหลากหลาย (Land Use Diversity) มากขึ้น เช่น ถูกพัฒนาเป็นตลาด พื้นที่สีเขียวหรือสวนสาธารณะ และอาคาร Mixed Use (อาคารเพื่อการอยู่อาศัยและพาณิชยกรรม) จะมีผลทำให้การใช้รถไฟฟ้ามากขึ้น	○	○	○	○	○
4.2 ถ้ารอบสถานีมีความหลากหลายของโครงการ (Project Diversity) เช่น ที่อยู่อาศัย ร้านค้า สำนักงาน โรงงาน สวนสาธารณะ หรือสถานที่พักผ่อนหย่อนใจจะมีผลต่อการใช้รถไฟฟ้าที่มากขึ้น	○	○	○	○	○
4.3 ความหลากหลายของประเภทที่อยู่อาศัย เพื่อกลุ่มรายได้ที่แตกต่างกัน เพื่อความหลากหลายทางเศรษฐกิจ มีผลต่อการใช้รถไฟฟ้าที่มากขึ้น	○	○	○	○	○
4.4 การมีร้านค้าและธุรกิจที่หลากหลาย (เช่น ร้านอาหาร คาเฟ่ ร้านขายของชำ สถานบันเทิง ฯลฯ) ใกล้สถานี มีผลต่อการใช้บริการรถไฟฟ้าที่เพิ่มขึ้น	○	○	○	○	○

5. ความสะดวกในการเข้าถึงจุดหมายปลายทาง (Destination Accessibility)

คำอธิบาย: ความสะดวกในการเข้าถึงจุดหมายปลายทาง (Destination Accessibility): หมายถึงความง่ายดายในการเดินทางไปยังจุดหมายปลายทางสำคัญ (เช่น ที่ทำงาน ศูนย์การค้า สถานศึกษา) โดยใช้ MRT สายสีน้ำเงิน ความสะดวกในการเข้าถึงจุดหมายปลายทางส่งผลต่อความนิยมในการใช้บริการรถไฟฟ้า

ท่านเห็นด้วยมากน้อยเพียงใดที่ ... *

	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	เฉยๆ	เห็นด้วย	เห็นด้วยอย่างยิ่ง
5.1 ความสะดวกที่เพิ่มขึ้นในการเข้าถึงจุดหมายปลายทางโดยเฉพาะการเข้าถึงพื้นที่ทำงานมีผลต่อการใช้รถไฟฟ้าที่มากขึ้น	○	○	○	○	○
5.2 ความสะดวกในการเข้าถึงจุดหมายปลายทางที่เพิ่มขึ้นโดยเฉพาะการเข้าถึงพื้นที่ที่อยู่อาศัยมีผลต่อการใช้รถไฟฟ้าที่มากขึ้น	○	○	○	○	○
5.3 ความสะดวกในการเข้าถึงจุดหมายปลายทางที่เพิ่มขึ้นโดยเฉพาะอย่างยิ่งการเข้าถึงพื้นที่เชิงพาณิชย์หรือพื้นที่ค้าปลีกมีผลต่อการใช้รถไฟฟ้าที่มากขึ้น	○	○	○	○	○
5.4 ความสะดวกในการเข้าถึงจุดหมายปลายทางที่เพิ่มขึ้นจากรูปแบบการขนส่งสาธารณะอื่นๆ เช่น รถบัส รถแท็กซี่ และรถจักรยานยนต์ มีผลต่อการใช้รถไฟฟ้าที่มากขึ้น	○	○	○	○	○

6. การจัดการความต้องการ (Demand Management)

คำอธิบาย: การจัดการความต้องการ (Demand Management): หมายถึงกลยุทธ์และโครงการต่างๆ ที่มีเป้าหมายในการควบคุมและปรับปรุงการใช้บริการรถไฟฟ้า MRT สายสีน้ำเงิน อาจทำได้ผ่านระบบให้รางวัล กำหนดราคา หรือปรับปรุงคุณภาพบริการ

ท่านเห็นด้วยมากน้อยเพียงใดที่ ... *

	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	เฉยๆ	เห็นด้วย	เห็นด้วยอย่างยิ่ง
6.1 การลดจำนวนที่จอดรถในอาคารรอบสถานีรถไฟฟ้าจะช่วยให้คนใช้รถไฟฟ้ามากขึ้น	○	○	○	○	○
6.2 การเรียกเก็บค่าจอดรถที่เพิ่มขึ้นจะช่วยให้คนใช้รถไฟฟ้ามากขึ้น	○	○	○	○	○
6.3 การให้ส่วนลดค่าเช่ากับผู้เช่าในอาคารสำนักงานใกล้สถานีรถไฟฟ้าที่มีมาตรการช่วยลดจำนวนรถยนต์ส่วนตัวของพนักงาน จะช่วยทำให้เกิดการใช้รถไฟฟ้ามากขึ้น	○	○	○	○	○
6.4 การมีบริการรถโดยสารรับ-ส่ง หรือ บริการรถโดยสารใกล้สถานี มีผลต่อการใช้บริการรถไฟฟ้าที่เพิ่มขึ้น	○	○	○	○	○

ส่วนที่ 3 (ต่อ)

การมีปัจจัยด้านสภาพแวดล้อมรอบสถานีรถไฟฟ้าใต้ดินในละแวกบ้านของคุณ เช่น ความหนาแน่น การออกแบบ ระยะทาง ความหลากหลาย การเข้าถึงปลายทาง และการบริหารจัดการความต้องการ ที่ดี ส่งผลให้คุณใช้สถานีบ่อยๆ บ่อยมากขึ้นหรือไม่? *

- ◯ ใช่
- ◯ ไม่ใช่

Part 4: Demographic Information of the Respondent

ส่วนที่ 4: ข้อมูลอื่นๆ

เลือกคำตอบเพียงข้อเดียวสำหรับแต่ละข้อ เพื่อเก็บข้อมูลด้านประชากรและข้อมูลทั่วไปของผู้ตอบแบบสำรวจ

3.1 อายุ *

- ○ ต่ำกว่า 18 ปี
- ○ 18 - 22 ปี
- ◉ 22 - 30 ปี
- ○ 30 - 40 ปี
- ○ 40 - 50 ปี
- ○ 50 - 60 ปี
- ○ มากกว่า 60 ปี

3.2 เพศ *

- ○ ชาย
- ○ หญิง
- ○ เพศทางเลือก /ชายข้ามเพศ / หญิงข้ามเพศ
- ○ เพศวิถีไม่ตรงกับเพศกำเนิด
- ○ ไม่แน่ใจ
- ○ ไม่ประสงค์จะระบุ
- ○ Other: _____

3.3 ระดับการศึกษาสูงสุด *

- ◯ ต่ำกว่า ปริญญาตรี
- ◯ ปริญญาตรี
- ◯ ตั้งแต่ปริญญาโทขึ้นไป

3.4 อาชีพ *

- ◯ นักเรียน / นักศึกษา
- ◯ ข้าราชการ / รัฐวิสาหกิจ
- ◯ เจ้าของกิจการ / ธุรกิจส่วนตัว
- ◯ พนักงานบริษัทเอกชน
- ◯ อื่นๆ

3.5 ระดับรายได้ *

- ◯ ต่ำกว่า 10,000 บาท
- ◯ 10,001 - 20,000 บาท
- ◯ 20,001 - 30,000 บาท
- ◯ 30,001 - 40,000 บาท
- ◯ 40,001 - 50,000 บาท
- ◯ 50,001 - 60,000 บาท
- ◯ 60,001 - 70,000 บาท
- ◯ มากกว่า 70,000 บาท

3.6 สถานภาพ *

- ◯ โสด
- ◯ แต่งงาน
- ◯ อื่นๆ

BIOGRAPHY

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