Design Considerations for a Major Terminal Facility in Metro Manila

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Abstract: One major terminal in Metro Manila is located in Parañaque city, which is the South West Integrated Provincial Transport System (SWIPTS), which includes the City Intermodal Terminal (CIT). The goal of the terminal is to serve several public utility vehicles (PUV's), which are going to the province of Cavite and the cities of Metro Manila. Having an integrated terminal would lessen the number of PUV's that stops at different points. Therefore, this paper outlined factors that could help improve the existing terminal. This research is guided through the use of survey questionnaires and volume counts, in order to produce the most appropriate design considerations for the major terminal. Results from the surveys and statistical analyses showed that accessibility and the number of public transport routes being served were important factors. This study recommends that the passengers should be prioritized in terms of having a more accessible and passenger-friendly terminal.

***Key words*:** Integrated Terminal, Public Utility Vehicles, Design Factors

1. INTRODUCTION

1.1 Background of the Study

Growth in urbanization and motorization in developing countries have led to an increase in traffic congestion on road networks. The rise of these occurrences leads to major traffic congestion problems. In the Philippines, particularly in the National Capital Region, private provincial bus operators have their terminals along major thoroughfares, i.e. EDSA, which causes congestion in the surrounding vicinities of the terminals and eventually along the entire stretch of the roadway. Furthermore, provincial buses plying through Metro Manila add up to the overwhelming volume of vehicles traversing through it which increases road congestion and reduces road-use efficiency.

The government has drafted plans and conducted studies to regulate and control the worsening traffic condition in Metro Manila, and part of this is the implementation of the Integrated Transport System (ITS). The ITS is a project under progress by the government established on

March 2012 under Executive Order no. 67. Three intermodal terminals are intended for the project. The purpose of these terminals generally lies on transferring passengers from provincial areas to urban areas within Metro Manila and vice versa. Currently, there are two intermodal terminals for the ITS project; the South Station at Alabang (Muntinlupa City) near South Luzon Expressway (SLEx) and the Southwest Integrated Provincial Transport System (SWIPTS) at Coastal Mall (Parañaque City) alongside Manila-Cavite Expressway (CAVITEx). SWIPTS also includes the City Intermodal Terminal (CIT) for city-bound vehicles. South Station and SWIPTS serve passengers going to and coming from Southern Luzon and Metro Manila. In line with the ITS project implementation, Administrative Order no. 40 was decreed on July 2013 to establish Interim Transport Terminals (ITT). It aims to provide temporary terminal services in preparation for the full implementation of the ITS project. The SWIPTS is an interim terminal for the upcoming South-West ITS terminal. Although temporary, SWIPTS manages almost 1000 buses and covers 72 routes according to MMDA. The ITS terminals handle other modes of intercity transport (Metro Manila-bound vehicles) for passenger convenience and mobility; other transport mode includes city buses, taxis, jeepneys, UV Express vans, and Multicabs.

1.1 Statement of the Problem

The rapid population growth results to problems associated with urban transportation, as well as environmental concerns. As Metro Manila is the center of commerce, it is apparent in urban areas that a reliable or efficient transportation system is needed for people to reach their respective destination with ease and comfort. In the case of SWIPTS, the roads surrounding it are affected by the traffic conditions in the Baclaran (EDSA), Parañaque (Airport Road), Cavite (CAVITEx), and Mall of Asia (Macapagal Avenue) areas. In addition, the ongoing construction of the NAIA Expressway adds to the severity of the traffic condition surrounding the terminal's vicinity. Determining the appropriate design standards for the ITS, specifically for SWIPTS, is a challenge. The design standard would not only reduce traffic, but would also relieve the commuter's overall transit experience.

2. RELATED LITERATURE

2.1 Integrated Transport System Terminal

The study conducted by Buzon, C. and Flores, S. (2013) on analyzing the appropriate location for a provincial bus terminal (Integrated Transport System Terminal) in Metro Manila, considered preferences from the project's three main stakeholders: passengers, bus operators, and administrators (government agencies) . From this study, two initial ITS locations were considered and evaluated based on the criteria they have developed. The locations are as follows: in North Triangle, Quezon city (northbound ITS) and in FTI Complex, Taguig city (southbound ITS). These locations were evaluated thoroughly considering the preferences of the major stakeholders; furthermore, the stakeholders preferences could influence the design standards used for the ITS terminals. For passenger preferences, the major concerns regarding the terminal's location are as follows: (1) location – the urban density surrounding the vicinity of the terminal, (2) availability of transport modes – the interoperability between transport modes within the terminal for efficient passenger mobility, (3) door-to-door public transport service – the convenience of passengers to disembark or embark on or near their desired destination, and (4) resistance to change – the passenger's hesitance to evade their 'usual' mode of transport system due to a new one which may cause inconvenience. For bus operator preferences, their main concern was where to garage their buses (including lease of lots for depot), assuming that ITS terminals wouldn't be able to handle each of the operator's bus fleet. The additional expense in operation due to the travel distance between depot and terminal was part of their minor concern. For government agency preferences, the following factors were considered in selecting an appropriate site for the terminal: (1) adjacency to mass transit networks – connectivity to other transport networks for efficient passenger mobility, (2) locations at the fringes of Metro Manila – considered location of terminals must not be heavily congested by urban traffic, (3) adjacency to government-owned properties – expansion of terminals by acquiring more space (land) would be easier through government-to-government transactions, and (4) accessibility to other modes of public transport – the terminal is intended to be multimodal to support efficient passenger mobility. The concerns from the stakeholders were deliberately considered to evaluate the government-proposed locations of the ITS terminals. It was found out that the North Triangle location in Quezon City is inadequate since its surrounding vicinity is heavily urbanized and traffic congested. However, the FTI Complex in Taguig city is an acceptable location for the south ITS terminal since it adheres to the stakeholder's preferences or concerns.

3. RESEARCH METHODOLOGY AND DESIGN

3.1 Research Method
The study mainly utilized descriptive and analytic methods of research. It included both quantitative and qualitative forms of data coming from first-hand sources. The most important source of information came from the commuters. Quantifiable data were gathered from the projected survey, and then quantified through statistical analysis. This analytic approach answers as to what design standard is significant in the terminal.

3.2 Research Design
The research design provided the strategic process of the conduction of the study to determine the significant design standards in SWIPTS. The process is divided into four integral parts: initial study, actual study, data interpretation and recommendation.

3.2.1 Initial Study
Prior to gathering data inside the terminal, a letter of approval to conduct the research was submitted to MMDA, the governing agency of the terminal. Once a permit was obtained, an interview with the administration and management of SWIPTS was conducted for second hand sources. The initial data successfully collected were the following: (a) The Layout of the existing terminal, (b) Latest data of passenger and vehicle count, for verification with results coming from the actual study, (c) Operational scheme which contains the routes and destinations of public utility vehicles, and (d) Security procedures followed. First hand data of passenger and vehicle count was needed to be used as basis for the actual sampling size or representative distribution. Passenger and vehicle counting were conducted concurrently for both city-bound and provincial-bound public vehicles. This was performed during morning, afternoon and evening peak hours.
An initial survey was done to have an initial perspective on how the actual survey would be executed. It would be handed out to as many commuters present during the morning, afternoon and evening peak hours. The questionnaire meant to inspect all the modes and routes of the commuters arriving and departing from the terminal.

3.2.2 Actual Study
Based on the Initial Study, the sample size and the distribution strategy were determined. From then, the actual survey was similar to the conduction of the survey in the initial data gathering, where it was handed out during the survey period. A more specific approach of survey was handed out to the determined sample size. The actual survey would mean to identify their preferences regarding the design standards appropriate inside terminal.

3.2.3 Data Interpretation
The passenger and vehicle count were represented through charts and graphs for comparison between modes of vehicles. From the survey, the design standard which is mostly preferred by the commuters to be improved or changed was determined. For the initial questionnaire, both the general information and the rating of the current terminal were analyzed through basic statistical analysis. The general information was represented through graphs for comparison of the commuters. For the rating of the current terminal, the analysis obtained the mean and standard deviation of the commuters' responses. On the other hand, for the actual questionnaire, the rating of the design criteria was evaluated through factor analysis. The ranking of the design criteria was also analyzed through obtaining the mean and the standard deviation of the commuters' responses.

3.2.4 Recommendation

The last step of the process of this research will be the recommendation of an appropriate design for the terminal. The concrete output of this research will be an operation strategy and a layout consideration of the appropriate design acquired by the analytic processing of the survey then conduced. The operation strategy integrates the passenger and vehicle volume with the different design criteria. On the other hand, the layout consideration prioritizes the most important design criteria determined through the survey conducted. The operation strategy and layout consideration will be incorporated in the overall design.

4. DATA PRESENTATION AND ANALYSIS

4.1 Profile of Project Site

The profile of the interim terminal, including both SWIPTS and CIT, are pointed out in the following sections. The profile includes the Operational Scheme, and the Routes and Destinations franchised by each transportation mode.

4.1.1 Location of Public Transportation Vehicles

Generally, SWIPTS, which includes CIT, is located at Coastal Mall (Parañaque City) alongside Manila-Cavite Expressway (CAVITEx). SWIPTS mainly comprises of the provincial-bound buses. On the other hand, the CIT portion of SWIPTS comprises of city-bound vehicles, which include the City bus, Multicab and UV Express. The figure below shows the locations of each mode of vehicle inside the interim terminal. For the provincial buses, there are 14 bays. The unloading area for provincial buses is located at the CIT area. The city buses only have 2 lanes, where the buses can unload and load. There is also an entrance from the gas station along CAVITEx. UV Express Vans have only one lane, and multicabs have multiple lanes.

Figure 1. Location of Public Transportation Vehicles in the Interim Terminal

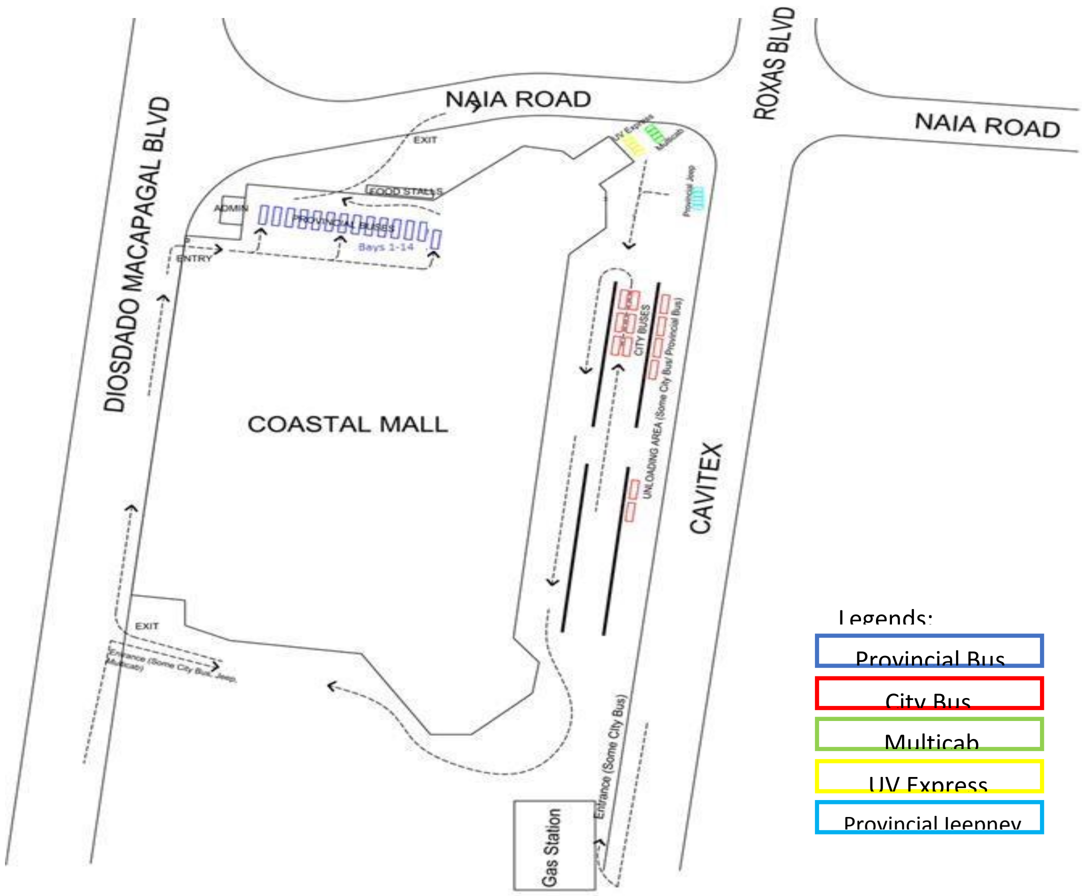

Figure 2. Current ITS Circulation

4.1.2 Provincial Bus

Provincial Buses register through the tagging area upon arrival. They follow the first come, first serve basis. The First vehicle to arrive is the first to serve its designated bay. Following buses are lined up. During peak hours, buses depart when it reaches its full capacity; otherwise, buses wait 15-20 minutes for departure. For provincial buses, there are no unloading passengers, only loading passengers. A provincial bus has an average maximum capacity of 60 people. Currently, there are 14 available bays where buses mainly traverse through the Cities of Cavite. The destinations of Bays 1 to 14, respectively, are Tagaytay, Dasmarñas, Mendez/Tagaytay, Trece Martires, Alfonso (w/o aircon), Alfonso, Balayan, Calatagan, Indang/Trece Martires, Cavite City, Cavity City, and Naic. The final stop of each bus are those indicated in the Bay, however, the provincial buses still stops at stations before its final destination.

4.1.3 City Bus

City Buses also register through the tagging area in the CIT area. Once they arrive, they would have to stop in order to get a tag for registration. Once permitted, they depart at once. For city buses, there are unloading passengers as well as loading passengers. City buses have an average maximum capacity of 60 people. For City-bound Buses, there are three types of buses are namely A, B and C, where they traverse mainly through EDSA in Metro Manila. For Bus A, it goes through the path passing Magallanes, Buendia, Guadalupe, Shaw Boulevard, SM Megamall, Boni Serrano, Cubao Farmers, Ermin Garcia (Q-Mart), Malanday, Fairview, and Navotas/Malabon, while Bus B passes through Ayala, Estrella, Pioneer/Boni Avenue, Main Avenue, Baliwag, Malanday, Fairview, Malinta, Navotas/Malabon. Lastly, Bus C passes through all the stops mentioned.

4.1.4 Multicab

Multicabs have to enter through two stalls. First is for Maynila Bay Corporation and second is for Coastal Mall. Each would have to pay Php 20 in order to pass through, since they are not under the jurisdiction of MMDA. Only one (1) Multicab is allowed to load passengers in a queue. The vehicle departs once it reaches its full capacity. For Multicabs, there are unloading passengers as well as loading passengers. There is an average maximum capacity of 18 people per multicab. Multicabs traverse through Macapagal Boulevard in order to reach their end point destination in the Mall of Asia Complex. Multicabs are allowed to stop at any destinations along Macapagal Boulevard. These destinations include the Entertainment City Complex, the extension office of the Department of Foreign Affairs, and other establishments and retail centers nearby the aforementioned places.

4.1.5 UV Express

Similar to Multicabs, UV express vehicles have to pay Php 20 pesos to Maynila Bay Corporation and Coastal Mall in order to enter. This mode of transportation is only available from 6 am - 12 noon. There is no definite time for arriving and departing UV Express vehicles. For these types of transportation, there are only loading passengers. For UV express, there is also an average maximum capacity of 18 people per vehicle. UV express vehicles traverse through Roxas Boulevard in order to reach Lawton and Divisoria.

4.1.6 Provincial Jeep

Although not included in the research, Provincial Jeeps are present beside the Multicabs and the UV Express Vehicles in the CIT Area. Also, similar to the Multicabs and UV express, they have to pay the same amount to Manila Bay Corporation and Coastal Mall. There are only loading passengers for this mode of transportation. Provincial Jeeps traverse through CAVITEx to reach Paliparan in Dasmarinas, Cavite.

4.2 Initial Study

The initial survey aimed to observe how the number of passengers varied on a given day inside the terminal. The researchers included the provincial buses, the city buses, multicabs, and the UV Express. Friday, Saturday and Sunday were the days that were considered as the days that most passengers are using the terminal as their mode of transportation going to their destinations and most vehicles are entering the terminal.

4.2.1 Interim Terminal

The figures below present the overall volume of passengers (Figure 5) and vehicles (Figure 6) in every type of mode that utilized the terminal. The observation period covered three-hour peak periods (i.e., Morning peak: 6AM to 9AM, Afternoon peak: 12NN to 3PM, and Evening peak periods: 5PM to 8PM) on a given day; observation days were done on a Friday, Saturday, and Sunday. Hourly intervals within the observation period (off-peak hours) were assumed to behave linearly or dependently on recorded periods (Pseudo Observation Days). From Figure 10, it can be generally observed that passenger volume arises during evening periods of all the three observation days. Emphasizing the Sunday observation, its passenger and vehicle volumes are significantly lesser as compared to Friday and Saturday observations. On Figure 11 on the other hand, it can be observed that vehicle volume generally declines as time period progresses towards midnight (2400 hours).

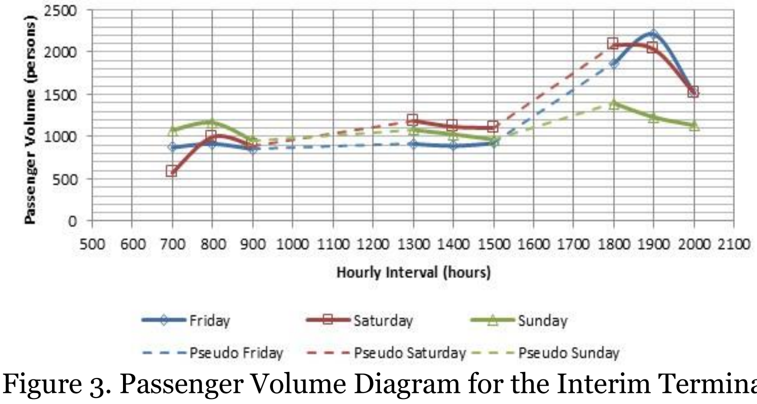

Figure 3. Passenger Volume Diagram for the Interim Terminal

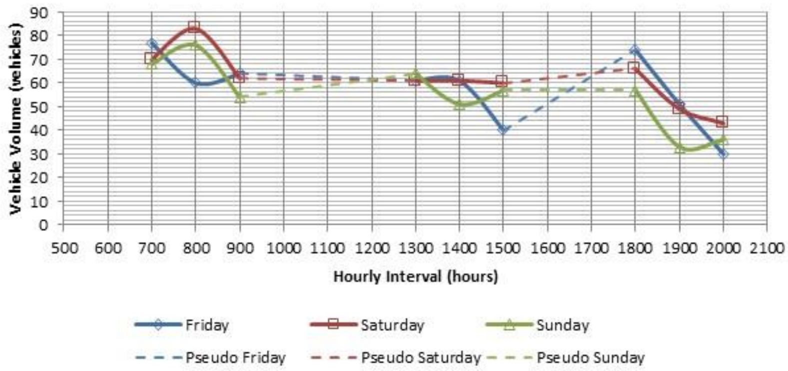

Figure 4. Vehicle Volume Diagram for the Interim Terminal

4.2.2 Initial Survey Comparison of Results

Figure 7 showed that 83% of the commuters travel to provinces using SWIPTS. On the other hand, only 17% use CIT to traverse around Metro Manila. However, Figure 8 showed that the total number of vehicles used for provincial operations are only 32%, while for city operations are 68% in total. For provincial-bound commuters, there were lesser vehicles to be used as compared to the number of vehicles used for city-bound commuters.

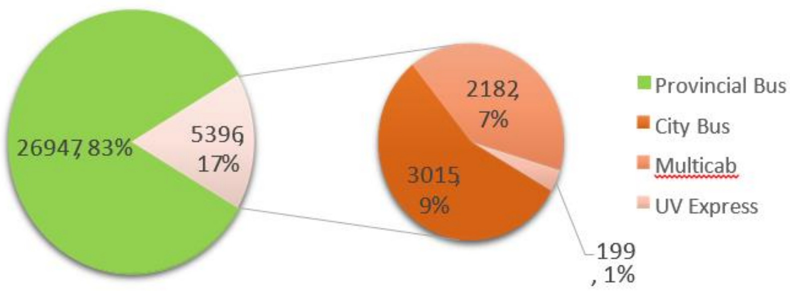

Figure 5. Passenger Count Comparison for Provincial and City Terminals

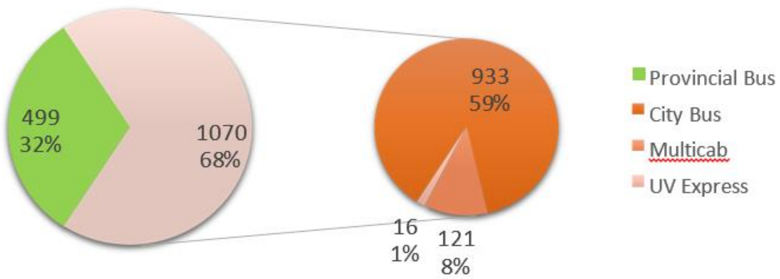

Figure 6. Vehicle Count Comparison for Provincial and City Terminals

4.3 Demand Characteristics

The demand characteristic features the relationship between average inter-arrival times and dwelling times of different transport modes with their respective demand (either passenger or vehicular volume). Inter-arrival time refers to the observable time interval between a departing vehicles until the arrival of the preceding loading vehicle. On the other hand, Dwelling time refers to the time duration that a vehicle will occupy a loading bay until its departure. The load factor refers to the ratio between the quantity of loaded passengers over the full seating capacity of each mode of vehicle. The relationships for each type of mode in this study (i.e., Provincial Bus, City Bus, Multicabs, and UV Express Vans) are presented as follows:

4.3.1 Provincial Bus
For morning and afternoon peak periods, the load factor showed that only 73% and 79% of the buses respectively were utilized by the commuters. Whereas for evening peak periods, the load factor of 110% showed that the number of passengers exceeded the full seating capacity of the provincial buses. There was an increase of 10% of users in the evening period. As for the users' waiting or dwelling time, for morning and peak periods, their average waiting time was 21 to 22 minutes. There was a decrease to 12 minutes of dwelling time in the evening, meaning that there is a shorter dwelling time in the evening compared to the morning and afternoon. The inter-arrival of buses did not vary much having an average value of 4 to 6 minutes. There were buses arriving every 4 to 6 minutes after the last bus departed for morning, afternoon and evening periods.

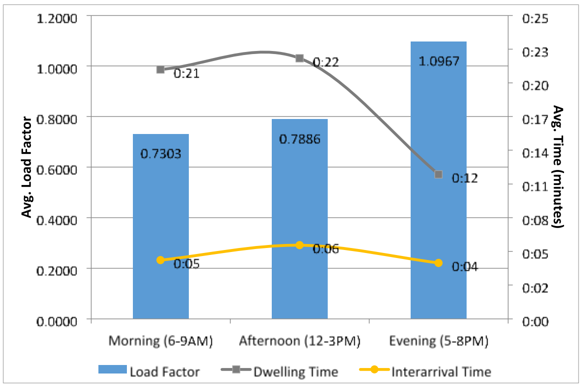

Figure 7. Inter-arrival and Dwelling Time Diagram for Provincial Bus

4.3.2 City Bus
City buses were not fully utilized as only 4.2%, 6.8% and 6.2% respectively for morning, afternoon and evening periods were used. There were more users using the city bus in the afternoon compared to the morning and evening periods. As for the dwelling time of passengers, it continued to decrease from an average of 5 minutes in the morning to 4 minutes in the afternoon and 3 minutes in the evening. Again for the inter-arrival time, the results showed that the average inter-arrival time ranged from 4 to 5 minutes, meaning there were buses arriving every 4 to 5 minutes.

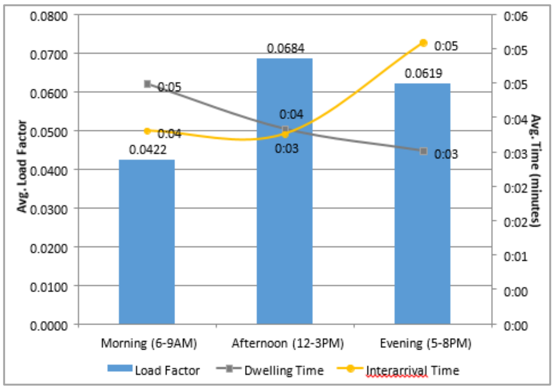

Figure 8. Inter-arrival and Dwelling Time Diagram for City Bus

4.3.3 Multicab
There is a high demand for using the multicab in the morning, as well as the afternoon. Having load factors of 102% and 102.2% for the morning and afternoon periods, it can be stated that there is an overcapacity in the multicabs by at least 2%. The passengers over the full seating capacity would be standing along the aisle in order to ride the bus. The dwelling time of passengers using the multicab averaged from 9 minutes in the morning, 13 minutes in the afternoon and 15 minutes in the evening. The dwelling time was increasing every time period. As for the inter-arrival time, it was increasing from 1 minute in the morning, 2 minutes in the afternoon and a longer inter-arrival time of 5 minutes in the evening. The results for the multicab

showed an ideal characteristic where if demand is high, there will be less dwelling time and inter-arrival time.

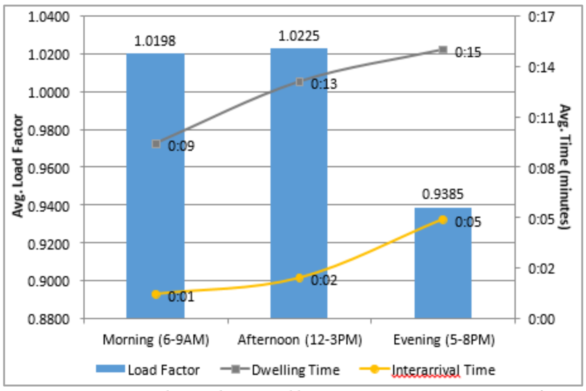

Figure 9. Inter-arrival and Dwelling Time Diagram for Multicab

4.3.4 UV Express

As there are only operations in the morning, and sometimes in the afternoon for the UV express, the load factor for the morning is higher compared to the afternoon period. The UV express is utilized by passengers by 80.3%, while for the afternoon period it is only 20.4% utilized. There are no operations in the evening for the UV express. The dwelling time in the morning is 10 mins, while it increased to 27 minutes in the afternoon. As for the inter-arrival the average time was 26 to 27 minutes. The standard deviation for the UV Express obtained were low enough to denote that the results do not vary much from the mean value.

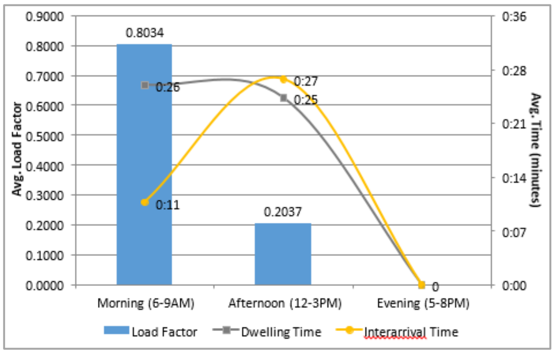

Figure 10. Inter-arrival and Dwelling Time Diagram for UV Express

4.4 Initial Questionnaire

The essence of the initial questionnaire is mainly to evaluate the current condition of the terminal. In addition, it also includes general information about the commuters using the interim terminal.

4.4.1 Personal Information of Respondents

For the initial questionnaire, general information from the commuters were obtained. This includes their age, gender, monthly income/allowance, place of origin, place of destination, mode of vehicle going to the terminal, mode of vehicle going out of the terminal, frequency of travel, and trip purpose. The respondents interviewed were 44% male and 43% female. The rest did not specify their gender, which adds up to 13%. On the other hand, the commuters were mostly under the age group of 18-24 and 25-34, which are 35% and 34% of the respondents, respectively. As for the respondents' monthly income or allowance, 21% did not specify their income. However, 44% have their monthly income at the range of ten thousand to thirty thousand pesos (Php 10,000-Php 30,000). The commuters interviewed mostly originate from Metro Manila, specifically 48% and most coming from Makati City, in order to go to their place of destination. 28% originate from the province of Cavite, and 19% did not specify their place of origin. As for the commuters' place of destination, 41% travel to the province of Cavite, most coming from Silang, Cavite, and 27% to go around Metro Manila. Those who did not specify their place of destination increased to

29%. The most used mode of vehicle going to the interim terminal is the bus, which is answered by 69% percent of the respondents. The following most used modes of vehicle are the Jeep, UV Express, Taxi, Private Cars and other modes of vehicles. The trend is similar for the mode of vehicle going out of the terminal. The most used mode of vehicle is the bus, answered by 71% of the respondents. 27% of the respondents use the interim terminal daily, followed by using the terminal one time a month, then 5 times a week. 49% answered that their purpose of travel and using the terminal is because of work, followed by personal agendas. These include leisure/vacation trips, family trips, and church activities. The declared waiting time of the vehicles before departing is 15 minutes but there are still drivers who extend their time to be able to gain more passengers.

4.4.2 Rating of Current Terminal

For the second part of the initial questionnaire, the commuters were asked to rate the current facilities of the terminal. A Likert Scale was used to rate the following statements regarding the different design criteria which is incorporated in the terminal. According to the Statistical Analysis, the availability of transport routes has the highest average rating for the current design of the terminal which is equal to 3.5186. It also has the lowest standard deviation (.81965) this means that the respondents' ranking does not vary much compared to their rankings to other design aspects of SWIPTS. This also means that the higher the standard deviation, the least passenger concern occurs. Security and safety within the terminal facility on the other hand has the lowest average rating of 2.9943 which means that it is the factor that the passengers is most concerned about.

4.5 Actual Study

Whereas the initial questionnaire is to evaluate the current condition of the terminal, the actual questionnaire aims to determine the preferred design criteria of commuters to be assessed and to be incorporated into a new design. Based from the Initial Survey conducted, the sample size was determined through this equation:

$$n \geq \frac{N}{\left(\frac{e}{z}\right)^2 \frac{N-1}{P(1-P)} + 1} \tag{1}$$

Where n is the sample size, N is the population size (N = 26992 Persons), e is the margin of error (e = 5%), z is the critical value of the normal distribution (z = 1.96 for 95% confidence level), P is the percentage of picking a choice, expressed in decimal (For Normal Distribution, P = 50%). The sample size was calculated to be 380 for the overall size which includes both Provincial-Bound and City-Bound Passengers.

4.5.1 Assessment of Design Criteria

For the actual questionnaire, each design criteria were given variables for the commuters to assess. As a preliminary step to factor analysis, the intercorrelation between the variables had to be assessed. If the statements in the survey were measuring the same latent variables, then the variables are expected to have significant correlations. If there were any variables that do not correlate with each other, then those variables were removed and the correlation matrix was checked again. Although mild multicollinearity is not a problem with factor analysis, it is important to avoid extreme multicollinearity (variables having very high correlation with other variables: .9 and above) and singularity (variables having a perfect correlation with other variables: 1), thus variables having correlation of .9 and above should be removed.

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From Table 6, the correlations between the variables were significant and the values are less than 1 or 0.9. This implied that none of the variables should be removed.

SPSS had extracted four factors. The assumption for the factors to be included is considered when the sample size is greater than 250 and the average communality is greater than 0.6. However, since the average communality is not greater than 0.6, not all factors with eigenvalue greater than 1 were considered. Therefore, the scree plot was considered instead.
The Scree Plot showed that the point of inflection is at factor 2. Therefore, another run of Factor Analysis in SPSS was forced to have only two factors.
For the final run, the correlations between the variables were significant as well implying that none of the variables should be removed. It is seen, from the table below, that the first factor can explain 34.561% of the total variation making it the most important factor. On the other hand, the second factor formed can only explain 8.896% of the total variation.

Table 1. Total Variance Explained of Final Run

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	4.839	34.561	34.561	4.217	30.120	30.120	3.646
2	1.246	8.896	43.457	0.655	4.679	34.799	3.566
3	1.179	8.421	51.878				
4	1.068	7.625	59.504				
5	0.871	6.221	65.725				
6	0.815	5.819	71.544				
7	0.750	5.360	76.903				
8	0.631	4.508	81.411				
9	0.541	3.865	85.276				
10	0.496	3.544	88.820				
11	0.454	3.246	92.065				
12	0.427	3.051	95.116				
13	0.360	2.569	97.685				
14	0.324	2.315	100.000				

The pattern matrix showed which variables belong to which factors. In factor 1, the factor loading of TR2 (.742) suddenly drops down to .188 at AV1, meaning the variables AC1, AC2, TR1 and TR2 will be included in factor 1. On the other hand, it can be seen that there is a sudden increase from TR2 to AV1 (-.043 to 2.39), therefore variables from AV1 to OM2 will be included in factor 2.

Table 2. Pattern Matrix of Final Run

Variables	Factor	
	1	*2*
AC1	0.194	0.415
AC2	0.376	0.163
TR1	0.894	-0.218
TR2	0.742	-0.043
AV1	0.188	0.239
AV2	0.278	0.356
TF1	0.596	0.146
TF2	0.441	0.273
FA1	0.245	0.318
FA2	0.102	0.371
FA3	0.119	0.502
FA4	-0.107	0.547
OM1	-0.110	0.677
OM2	0.010	0.619

Factor 1 can explain most or 34.56% of the variations. They are the respondents who consider Accessibility and Transport Routes to be the most important. Although this is the case, notice that the loading for TR's is larger than those of AC, implying that they give more importance to Transport Routes than Accessibility. There are the few respondents who consider availability of modes, transferability, facilities and amenities, and operation & management to be the most important factor. Factor 2 can explain 8.89% of the variation which is less than that of factor 1.

4.5.2 Ranking of Design Criteria

The passengers were asked to rank six different criteria whether it is the most important for them or it is the least important factor that they want to consider while inside the terminal.
Accessibility between different modes of transportation where in the pedestrians would have an established facility was deemed by the respondents as the most important design criteria for the terminal facility. It has an average ranking of 2.882 and a standard deviation of 1.7310. This was followed by Transport Routes, Operation and Management and Availability of Modes with 3.503, 3.516 and 3.634 average ranks respectively. The fifth most important design criterion is Facilities and Amenities which has 3.721 average rank. This means that the respondents' rank for Facilities and Amenities does not vary as much as the ranks for other design criteria. Lastly, Transferability that emphasis the ways on how the pedestrians could go inside the terminal was reckoned least important among the design criteria with an average rank of 3. 739.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Six design criteria were deliberated for a major terminal in Metro Manila, namely the South-West Integrated Provincial Transport System (SWIPTS) which includes City Intermodal Terminal (CIT). The study was set forth to assess Accessibility, Availability of PUV's, Operation & Management, Transferability and Transport Routes in the said terminal in order to evaluate each design criteria's current condition, and to know in which aspect to improve on. The key findings for the average rating for the current terminal shows that the design criteria, transport routes, were deemed to have enough routes and destinations offered by the terminal. On the other hand, security and safety, under operation and management, were a concern to the commuters. Contrary to these averages based from basic statistical analysis, factor analysis was done to know which design criteria is the most important. The results showed that accessibility and transport routes can explain 34.56% of the variations, wherein transport routes (0.894 and 0.742) had higher loadings than that of accessibility (0.194 and 0.376). It was suggested that having more routes and destinations to and from Metro Manila or the province were important to add based on the loadings from the factor analysis results. Although averages from the ranking showed that accessibility was the most important design criteria, and transport routes as second, for consistency, the researchers have chosen Transport Routes as the most important design factor in a major terminal facility.

5.2 Recommendations

Initially, from reviews of related literature, six elements were identified as design components for a major terminal facility; viz., accessibility, transport routes, transferability, operation and management, facilities and amenities, and availability of transport vehicles. From the six predetermined design factors, two factors, as identified by passengers of the Interim terminal, were deemed important: Transport Routes, as a result from a rigorous factor analysis and Accessibility, as a result from general ranking. For consistency between results, the researchers have chosen Transport Routes, as a result from factor analysis, as the most important design factor in a major terminal facility.

5.2.1 Operational Strategy

Operational strategy is a big factor that needs to be considered in improving the terminal. Having an operation that can comply with all the demand of the passengers and the vehicles is significant. There is a need to relate the volume of passengers and vehicles to achieve the operations and to be able to achieve this, the peak hours of Provincial Buses, City Buses, UV Express and Multicabs will be considered.

The peak hour of the provincial buses is every Friday night, meaning there is an enormous number of passengers every Friday night therefore, the operations will be based according to the peak hour. The bays that are unused should be considered as an additional bay to increase the number of provincial buses that could enter the terminal and the departing time of the vehicles should be followed. If this rule would be followed by the provincial bus drivers, the number of passengers that are waiting would be lessened. For the City buses, the partition of the classification of City Buses should be considered and the number of tagging area should increase and improve to lessen the time of waiting of every passengers every time the driver needs to go down to pay.

The Area for the UV Express should be lessened because the time of the UV Express Vehicle is limited. There should also be signage that this vehicle would only run from a specific time and the operators should also provide the time table or the time schedule of the UV Express. Since the UV Express would not run all throughout the day, the number of Multi Cabs should increase because the number of passengers for Multicabs is higher than the UV Express. There should also be signage around the area that there are available multi Cabs and UV Express inside the terminal, this would help the passengers identify the vehicles that are appropriate for their travel schedules.

5.2.2 Layout Consideration

Figure 15 illustrates the provincial vehicle flow from ingress to egress in the terminal complex. Provincial vehicles may only come from the south of the terminal using Diosdado Macapagal Boulevard. Unloading bays are adjacent to terminal access; loading bays on the other hand are adjacent to the terminal egress which directly leads to the expressway. This traffic flow scheme restricts the interaction or integration between provincial and city vehicles.

Figure 16 illustrates the vehicular flow of city vehicles from ingress to egress of the terminal complex. City vehicles mostly come from north of the terminal, by either traversing Diosdado Macapagal boulevard or Roxas Boulevard. Entree is made using the terminal access road which cuts through the ground floor of the terminal building. The same concept of loading and unloading for provincial vehicles applies for city vehicles; loading bays are adjacent to terminal egress as well, which leads the vehicles back to Diosdado Macapagal Boulevard.

Furthermore, Figure 17 illustrates the traffic flow for private vehicles. Private vehicles may either come from the north or south side of the terminal; nevertheless, ingress and egress points are the same. The terminal access road is heavily utilized by private vehicles. Passenger drop-off, pick-up points and taxi stands are located on this road (on both north and south edges) to effectively cater passengers that require private transport services.

A more extensive study may be done by knowing which design factor is preferred by different age groups, income, or gender as the present research is concerned only about the general population of the commuters. It would also have been interesting if the take of the operators or management were considered as part of the survey. A 24-hour survey may be conducted in order to be more accurate for the volume diagrams. For future studies regarding the terminal, researchers may consider other design factors such as the cost of travel using the public transportation system.

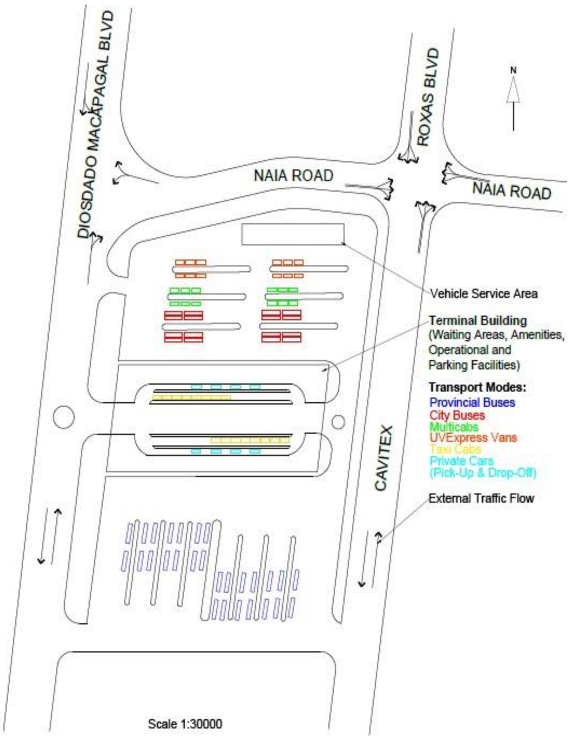

Figure 11. Recommended Layout for the ITS

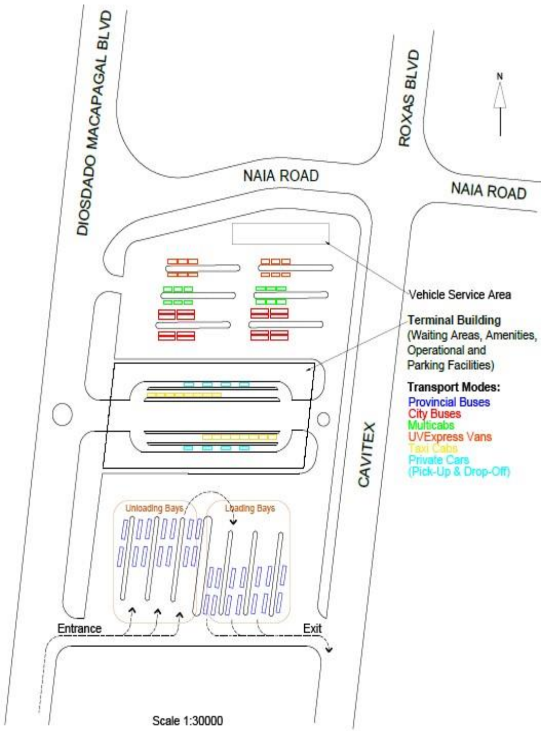

Figure 12. Provincial Vehicle Flow Diagram

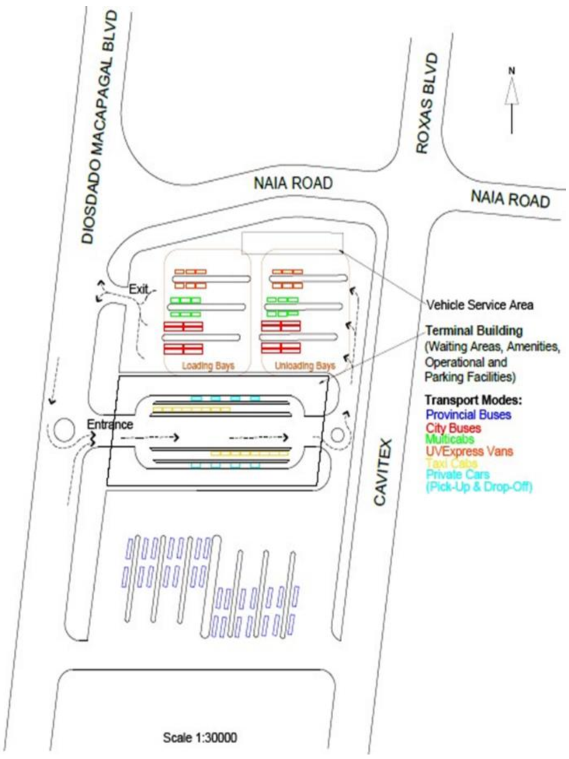

Figure 13. City Vehicle Flow Diagram

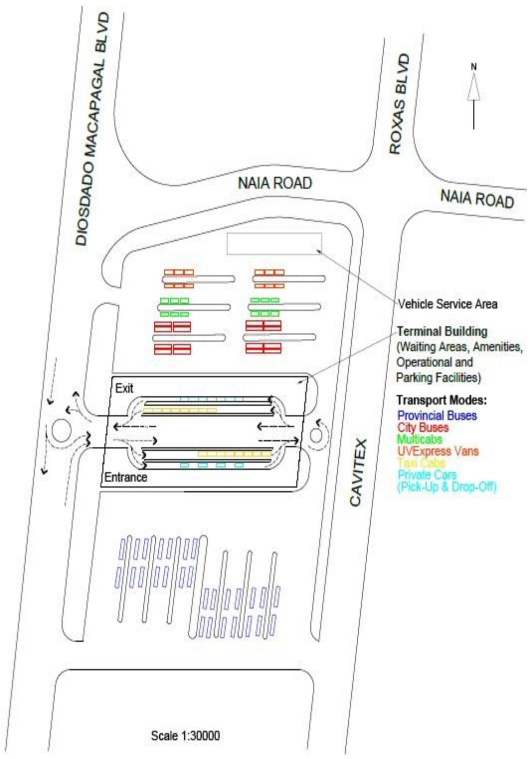

Figure 14. Private Vehicle Flow Diagram

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