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# ACCESSIBLE CIRCULATION AND MOVEMENT IN BUILDING: CASE STUDY OF STESEN SENTRAL KUALA LUMPUR

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ABSTRACT

This paper studies the building circulation system as a key organizing mechanism of layout and communication space as it links with the exterior and interior areas and mirrors the entire spatial layout of the building. This study approaches the principles of how movement occurs within the built environment, not based on the architecture which moves, but rather the movement of human form within architectural design. This work is primarily based on the literature reviews of the books and journals that have studied and discuss the issues. The main elements for circulation can be categories into five elements which consist of Building Approach, Building Entrance, and Configuration of the Path, Path-space Relationships, and Form of the Circulation Space. This study shows that the appropriate space design and building form affect the human movement and circulation pattern. Therefore, to enhance the effectiveness and efficiency of building circulation, the architects and building designers must ensure that the elements and approaches regarding the circulation are fully utilized during the initial design stages.



## 1. INTRODUCTION

In the field of architecture, the concept of circulation is common design consideration would take place in every building design; it often refers the way people, the blood of our buildings, and movement through space. Circulation has become part of the important element in designing a building; it is the way to enter, go through and go around a building or space. A better design in circulation helps people to perceive the architecture as they move through a building and its spaces. The circulation path can be referred to as a journey or the perceptual thread that links the spaces of a building, the interior and exterior spaces together that creating the movement in time over a sequence of spaces. To experience a space about where we have been and where we anticipate

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going.

In particular, circulation routes are the pathways that the building user will be passing through and go around the buildings or urban places. Circulation often refers to as 'space between the spaces', a connective function with the concept of taking the experience of moving ourselves go around a building, three-dimensionally and through time. This paper aims to analyse and reveal the principal components of a building's circulation system as positive elements that affect people perception of the forms and spaces of the building. The study will also focus on the numerous ways our bodies move within the built environment and investigates how architecture can accommodate freedom, or prescribe human movement.

Before passing into the interior of a building, people have to approach its entrance along a path, this is the first phase of the circulation system, when the people are ready to see, experience, and use the spaces in a building. The access and entrance can be different in duration from a few steps through a compacted space, to a protracted and crooked route. It can be perpendicular or oblique to the primary façade hence, the access might be in contrast with what is encountered at its termination, or it may be continued into the building's interior arrangement of spaces, obscuring the differences between inside and outside.

## 2. LITERATURE REVIEW

The circulation system refers to a "skeleton" that forms the supporting structure of the building (Jiang & Liu, 2010). To determine the effectiveness of the circulation system, it mainly depends on making the destination clearer and understandable to the user so that the users can be easily direct their movement towards their destination or targeted places. Thereby, circulation has demonstrated in a strong manner on how patterns of space and its composition can affect users through movements.

### 2.1 ARCHITECTURAL CONCEPTS: CIRCULATION

Hamer (2016) mentioned the four components of circulation which consist of the direction of movement, type of use, the frequency of use and time of use. The direction of movement often refers to horizontal or vertical, in public or private used, front or back of the house, while the number of uses can be divided into common or emergency and the time of use could be in the morning, day, evening or continuous. It requires different architectural consideration in each of these types of circulation. The movement and the pathways can be categorized as fast or slow, mechanical or manual, commence in the dark or bright, crowded or uncongested in movement while the pathways could be gentle and crooked, or narrow and direct. All the circulation pattern, direction, and usage are demanding to a building layout (Hamer, 2016).

#### 2.1.1 DIRECTION

The horizontal circulation includes atria, paths, hallways, entries, and exits. It has an influence by the furniture layout as well as the placement of columns, plants, or topographic changes. For

instance, the design of the train station might be influenced by the ticketing electronic devices or rail track design. The design Architect will base on the requirements of the train station and produce with the spaces and form. This is the reason why in most of the Architects would like to incorporate the furniture arrangement as part of the concept design at the initial design stage because it severely links to the flow, function and feeling of the space. Other than that, the vertical circulation shows how the people move up and down within the building, it comprises of stairs, elevators, escalators, ramps and ladders which allow the building user to move from one level to another. (Hamer, 2016)

### 2.1.2 USE

Public circulation in a building is the common areas that are most widely and easily accessible, the main pathway connecting the spaces and functions such as the lobby, atrium, or gallery, and it requires a high level of architectural quality. The visibility of how the crowd's movement and the emergency escape route is critical however the private circulation requires more intimate movements within the building, for example, the back of the house of a building, services room, management office, storage zones which require a degree of privacy. (Hamer, 2016)

### 2.1.3 DESIGN CIRCULATION

In every building design, the planning of the circulation pathways should be clear and unobstructed as well as within the shortest distance between two spaces. The reason is, people do not like to get lost inside the building and prefer to move around the building with easy and readiness pathway. Sometimes the architects will purposely interrupt a smooth and straight circulation path with an object or furniture or a drops on the floor level to define a change in place, in order to make people slow down or provide focus points for some architectural reasons. Circulation is not necessarily to be the shortest distance between the two spaces but rather that it can be taken into the consideration of the sequence of spaces, thresholds, and atmospheres encountered through movement which bring the people for the transition from one space to another. Circulation can be choreographed, to add architectural interest. (Hamer, 2016)

For some people, circulation space is seen as useless space which by adding the needless area and increase the development and construction cost to a project. Therefore, the word "efficiency" often mentioned in between the developer and architect when designing the circulation. For instances, in residential apartments or commercial office buildings, architect and developer will try to minimize the amount of circulating space and include this space back to the tenancies or apartment interiors which are considered as sellable area, and thus, profit generating. In these cases, the design of the vertical circulation in most of the tall or high-rise buildings are located the core at the center of the building with the staircases and elevators build between each other and short corridors on each level that connecting the central core and leading to every individual unit of apartments or offices. (Hamer, 2016)

In contrast, where most of the circulation is located in the center of the building or sometimes hidden, the circulation externally becomes the façade of the building or within the building for

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architectural aesthetics purposes. For example, in designing a landed two-storey house, the circulation areas such as the staircase that connecting the ground floor to the first floor can also become an architectural feature of the house. It becomes the popular method that is used by the local architects or interior designer in Malaysia as one of the design elements to enhance the interior environments and feeling, and it mostly applied to the boutique hotel or café. A very good international example of this technique is the Pompidou Centre in Paris designed by Richard Rogers and Renzo Piano. The translucent escalators can be seen from the west façade of the building with the red painted on the undersides of the staircase. Across the exposed façade of the building, the movements of people making the building present and active in the square. (Hamer, 2016)

**Figure 1**: Pompidou Centre in Paris

## 2.2 New Evidence on Walking Distance to Transit Stop

El-Geneidy *et al.* (2014) mentioned that the fundamental system of performance measure is the percentage of the population served by a transit system in urban city. The performance measure depends on the circumscription of the services area which is around a transit station that the passengers or commuters are drawn. Most transit planners and engineers refer the standard method to determine the service areas around the transit stations in terms of walking distance which a 400m buffer for bus stops (O'Neill *et al.*, 1992; Zhao *et al.*, 2003) and 800m buffer for rail stations (Kuby *et al.*, 2004; Schlossberg *et al.*, 2007) since 1972. The distance is normal to the train and commuter users accessing to the stations by walking. However, some of the researchers think that this method is not complete enough and prefer to use a more comprehensive service area with 482m buffer for the bus station instead of 400m (Kimpel *et al.*, 2007).

Other than that, a consequential body of research try to clarify the investigation of access to transit facilities. According to Murray and Wu (2003), the most essential factor in transit service planning is the accessibility to the transit service. In order to archive in greater the probability that the service will be used, the more people engaged around the transit stations is better. To estimate the walking distance to the transit facilities, it use the distance decay to define the service area (Hsiao *et al.*, 1997; Kimpel *et al.*, 2007; Lam & Morrall, 1982; O'Sullivan & Morrall, 1996; Zhao *et al.*, 2003). In the journal, the authors used the distance decay to explicit the distances in terms of proportions of the commuter who will walk not more than a certain distance.

Therefore, the service areas around the transit stations should be different according to the location in the city. There are few elements to be consider when analyzing the walking distance to the transit stations is that the pedestrians is always look to minimize both the distance and time of the walking distance of their trips. Besides of the minimum distance that require from the commuter, it also depends on the individual characteristics of the commuter and train user, the characteristics of the station and area, features of the transit route and the weather temperature will affect the commuter walking distance. According to Loutzenheiser (1997), individual characteristics are the most important factors that affecting the walking trips. For example, different kind of occupations and household incomes of the commuter will affect the walking distance such as blue or white-collar neighborhoods (Hsiao *et al.*, 1997; Kuby *et al.*, 2004; Loutzenheiser, 1997).

Furthermore, if the public transit system located within the walking distance from a population, the probability of using the transit system by the residents increases. The characteristics are based on the absence of any barriers or blocking items as well as the grid street design could be provided more pedestrian linkages, higher densities, less number of parking spaces at the transit station, more safety and an interesting and decisive transit service. Last but not least, another consideration of walking distance is the temperature. El-Geneidy *et al.* (2014) mentioned that the walking distances during the winter are slightly longer than summer in the four seasons' country. In a hot and humid country like Malaysia, the walking distances seek to be shorter due to the high temperature during daytime. Commuter and train user might suffer from the hot weather while walking from the bus stop or another train exchange and sweating could not be avoided. To enhance the walking distance in Malaysia, the solution might be introduced the elevated link-way/ link bridge that connected from the place to another with shelter or perhaps with air-conditioning.

## 2.3 INFLUENCES ON WALKING DISTANCE

Daniels and Mulley (2013) reviewed the influences on the walking as a mode and access to the public transport and to determine the possibility informative variables for use in the study consisting purpose of the trip, socio-demographic characteristics, build and natural environments and mode of public transport. According to Corpuz *et al.* (2005), women walk more than men, older and younger age groups walk more, and the people without car walk more. The researchers also found that the males were more likely access to the Mass Rapid Transit (MRT) stations in Singapore by walking compared to women while the walking distance was the most important aspect when access to MRT stations.

Besides, the elements of the built environment are affected on walking such as the ambience and aesthetics of the surrounding. The characteristics of the built environment including permeability, footpaths, lighting, security, density, and mixed land use can influence walking both as a transport mode, and as an access mode to public transport (Cervero *et al.* ,2009). The residents live in urbanized area leaned to walk more and the trading between the walk and car trips and mostly depends on the availability of public transport. Agrawal *et al.* (2008) found that the major consideration for commuters to walk to the transit station is the time and distance, the probability

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increase when the distance and time to be used is shorter. Safety from the traffic when the commuters walk along the roads rather than crime are the secondary factor in route choice, whereas the environmental appearance for instance the pleasant landscaping design and building along the journey to the transit station is also essential.

The natural environment elements such as the climate and topography are also the factors affecting the walking. The natural environmental conditions have the influence on the propensity of people to walk, such as the hilly road are unfavorable for the commuter for transportation walking because the transportation walking has more to do with reaching a certain place along the shortest route rather than the quality of the route, while recreational walking can be more flexible and people may choose certain routes based on route qualities (Lee and Moudon 2006, p. S95). Wibowo and Olszewski (2005) found that the consideration by walking to the transit station not only because of walking distance while also by the type and condition of the walking route such as number of road crossings, ascending steps and conflict points.

## 3. METHODOLOGY

This paper seeks for how effectiveness of the building circulation by examine the space planning and design in the building as well as analyze the walking distance and behavior towards the commuter. A case study on the buildings based on the similar typology will be chosen for this survey. Through the online case study, the data will be analyzed by using the comparative approach whereby the raw data are based on the analysis and info gathering are compared with the data from the literature reviews and the background study. According to Carpi and Egger (2008), comparative approach consists of reflection studies that refer back at the events that already happened and the eventual studies which review on the variables from the present forward.

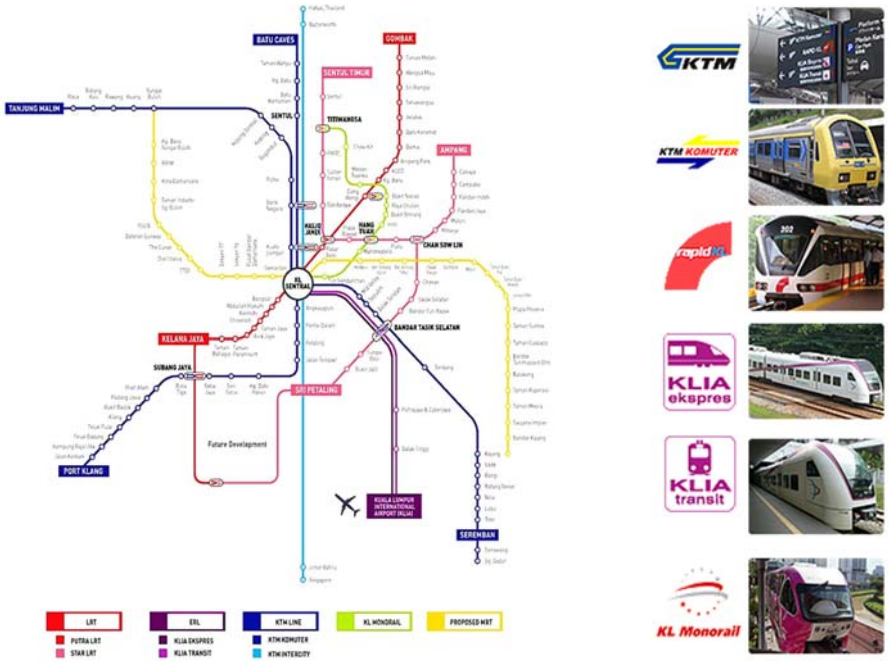


**Figure 2**: Overall Transit Map and the Six Rail Networks in Kuala Lumpur.

The case study building is Stesen Sentral Kuala Lumpur (KL Sentral), located at the southwest

of Kuala Lumpur City and only 1.5km from the central business district. Stesen Sentral also known as Malaysia's largest and world-class transportation hub which integrated with rail transportation center, offering global connectivity and seamlessly linking all urban and suburban residential, commercial and industrial areas. There are six rail networks in the Stensen Sentral which are KLIA Express Rail Link, KLIA Transit, RAPID KL (Putra), KTM Komuter, KTM Intercity and KL Monorail Services that direct to the Kuala Lumpur International Airport (KLIA), Putrajaya the Federal Government Administrative Office and major highways. (A World-Class Transportation Hub, 2009).

As an international and global transportation hub, Stesen Sentral encourage the residents and tourists to use of public transportation in order to reduce the carbon footprint and traffic congestion within Kuala Lumpur. The growing of visiting population and insufficient of car-parking spaces have noticed the management of Stesen Sentral to enhance the parking facilities in the next 3-5 years for better convenience and easement of large amount of travelers. Nonetheless, due to involving of multiple trains line in Stesen Sentral as well as the security issues, the planning of internal spaces, vehicle and commuter circulation inside the building is crucial.

## 3.1 CIRCULATION

The variables of the architectural elements that mentioned in the literature reviews were determined and analyzed based on the selected case study. The circulation in Stesen Sentral were analyzed by study on its floor layout and according to the author's experience and personal perception towards Stesen Sentral when visited to the building. Circulation in Stesen Sentral have been categories into the direction, use and design circulation. The direction were analyzed based on the horizontal and vertical circulation by study on the pathway of the building as well as the vertical transportation system such as elevators and escalators that been introduce in Stesen Sentral. By analyzing the direction of the pathway in the building, author are able to understand the use of the spaces where to determine the common and private space in Stesen Sentral. Study on the floor layout that obtained from the internet and its official website allows authors to indicated and categorized the spaces into its usage. Google street view is also used to get the clearer picture and understanding of the internal spaces of Stesen Sentral. By accessing into the internal building where using the Google street view software, author are able to visualized the internal spaces and the circulation elements in Stensen Sentral. locate The spaces have been located and determined while referring back to the literature review that have mentioned on two rules of thumb for design circulation which the circulation pathways should be clear and unobstructed and the spaces are within the shortest distance between each other.

## 3.2 WALKING DISTANCE

Walking distances in Stesen Sentral were determined based on the study of the surrounding area by analyzing the site using Google map as well as Google street view. The distance from one

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building to another as well as the internal spaces are measured by using the Google ruler on the Google Earth, the estimated distance were recorded. The information regarding to the public transportation routes and stations (bus stop) can be downloaded from KL Rapid website and Stesen Sentral website, making it possible to determine the public transportation around the case study site and the distances. The pedestrian linkage and car parking spaces can be seen by using the Google satellite map as well as the site layout plan obtained from the website. Temperature and weather of the case study site can be retrieved from the internet as well as perception and observation through the site visit.

### 3.2.1 INFLUENCES ON WALKING DISTANCE

The influences on walking distance of the Stesen Sentral were determined by study on its characteristic of the building internal and surrounding elements as well as built environments. The footpaths and lighting for the building internal and external will be analyzed by Google street view and floor layout plans. The public transportation as well as the motorcycle and bicycle pathways was analyzed based on the observation and info from the internet sources. The completeness and efficiency of the designated path are determined based on its current conditions and maintenance as well as the linkage system to the case study site.

## 4. ANALYSIS

KL Sentral (Figure 3) is being developed by consortium which includes Malaysia Resources Corporation Berhad (MRCB), Keretapi Tanah Melayu Berhad (KTMB) and Pembinaan Redzai Sdn Bhd. Kl Sentral is spread over 72 acres of land bordered by Jalan Travers, Jalan Damansara and Jalan Tun Sambanthan.

**Figure 3**: Site layout of Kuala Lumpur Sentral.

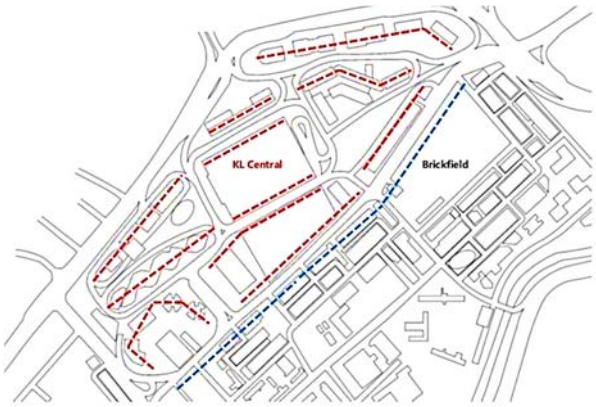


**Figure 4**: Red doodle line shown the horizontal façade of KL Sentral, Blue doodle line shown the horizontal façade of Brickfiled (adjacent building).

### 4.1 BUILDING FORM

Figure 1 shown that the overall development of KL Sentral is organized into individual small parcels where link together by using the paths. Linear arrangement of buildings in parcels have given a visual consistency and the distance from one building to another allows the walkable spaces within the human walking distance. In order to maximize the surveillance and improve the safety of

Stensen Sentral, the horizontal façade of the building are facing to the adjacent buildings. Figure 4 indicated the horizontal façade of KL Sentral.

The hierarchy of KL Sentral shown that the focus point is located on the Stesen Sentral due to its height is the lowest among the surrounding buildings. Hence, the buildings are sheltered from the direct sun light that the surrounding high-rise building have blocked it. Figures 5 and 6 shows the hierarchy of KL Sentral and the contrast in height with surrounding buildings in sketches.

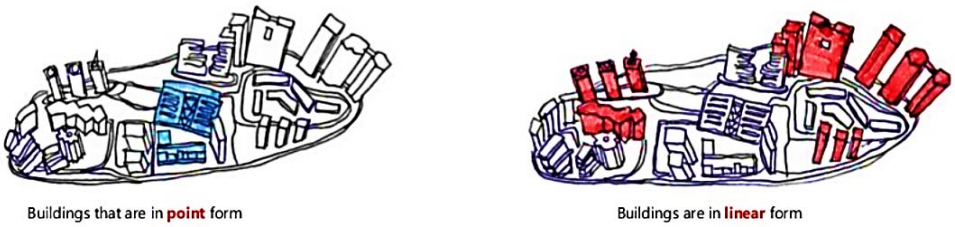


**Figure 5**: Study on the form pattern of KL Sentral

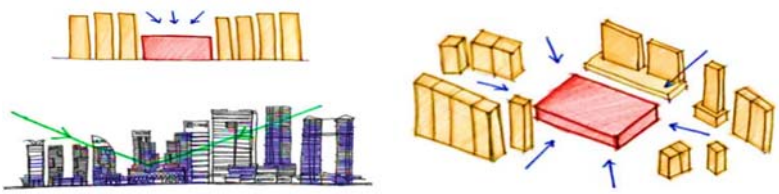

**Figure 6**: The elevation shows the hierarchy and focus point of KL Sentral

## 4.2 MOVEMENT AND CIRCULATION

The movement and circulation of the KL Sentral is based on the architects design philosophy which is the "Coral" that illustrate the city where life flows efficiently without limitation. KL Sentral can be access easily where it connected with the major roads and highways. The vehicles enter from Jalan Tun Sambanthan, Jalan Damansara, Jalan Bangsar and Jalan Travers to the KL Sentral causing the traffic into the most congested period during the peak hours, hence the loop system (road design) worsen the traffic situation.

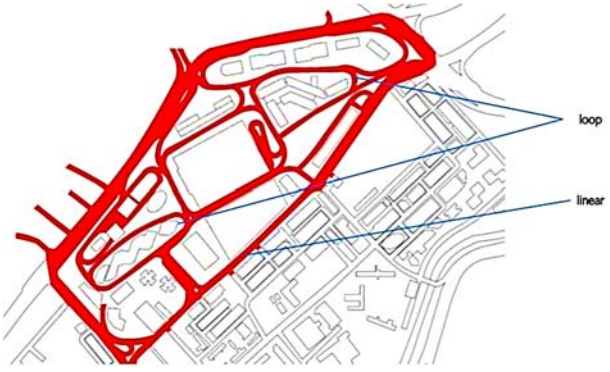


**Figure 7**: Road system surrounding KL Sentral.

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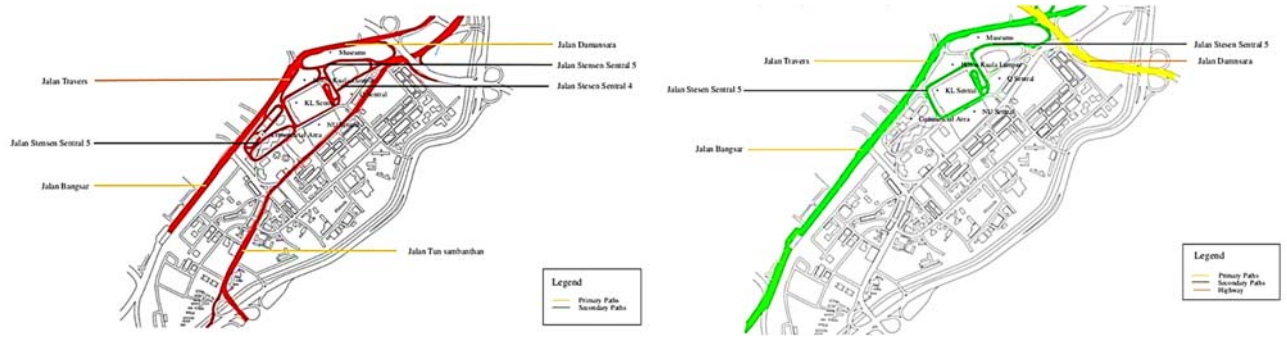


**Figure 8**: Access and Exit to Primary path and Secondary Path at KL Sentral.

Figures 7 and 8 shows the access to the KL Sentral and exit from the KL Sentral from the major roads and highway. The vehicles are come from the primary paths and connect to the secondary paths which is Jalan Stensen Sentral from different directions. The secondary paths that surrounded with the building allows the vehicle to drop off the passenger to the dedicated points and also connecting to the car-parking facilities. Figure 8 shows the exit route (green line) from Jalan Stesen Sentral 5 to the Jalan Travers which might not be sufficient to cater for the large amount of vehicles coming in and out from the KL Sentral. Besides that, surrounded of KL Sentral have provided the public transport services accessing to the Stensen Sentral like bus, monorail and pedestrian walkway. The Transit Oriented Development (TOD) in KL Sentral is Bus – Taxi – Train that link among each other.

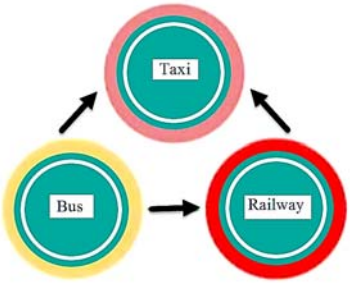


**Figure 9**: The relationship of Transit Oriented Development (TOD) in KL Sentral

Bus stations are located around the KL Sentral which encourage the passenger and commuter to use the public transport access to the Stesen Sentral in order to reduce the traffic congestion. Figure 10 have shown the dedicated bus station across the KL Sentral. The concept of the public transport system is from the "Leaf" that the building cities whose individual parts constantly support each other, resulting in systems that are productive.

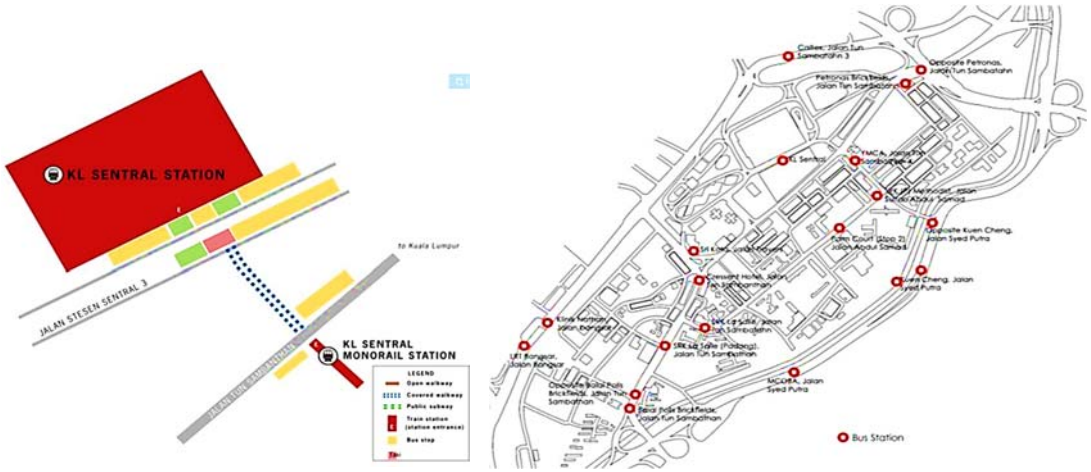


**Figure 10**: KL Sentral Monorail Station and the Bus Station across the KL Sentral.

As the KL Sentral is a mixed-development consisting commercial, hotels, offices and residential apartments, the traffic control in KL Sentral is thus essential. The towers surrounded to the Stesen Sentral consist of an appropriate drop off area without contributing congestion to other building areas. Traffic control security are always standby to ensure no parking are allow for vehicles along the road curb that might cause the traffic congestion to the KL Sentral. However, it is still not able to solve the overall traffic congestion outside the central business district (CBD) on the primary roads during the peak hours which is the before and after the office hours. Figure 11 shows the circulation pattern surrounded the KL Sentral.


**Figure 11**: The vehicle circulation surrounding KL Sentral

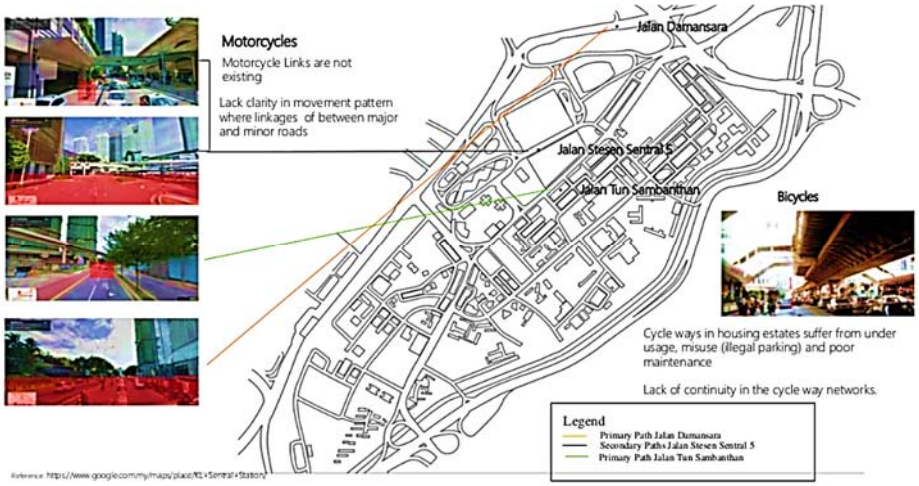


**Figure 12**: Pictures show the insufficient motorcycles link way and bicycle path

Furthermore, based on the analysis on KL Sentral, the motorcycles and bicycles pathway are

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not appropriate designed and planned. The motorcycle links is not clear in it movement pattern and the linkages of between the major and minor roads. Although there is the existing bicycle pathway near to the housing areas, while it is suffer from under usage and poor maintenance as well as misuse for the car owner which they simply park on the bicycle pathway. The continuity in the bicycle path design is incomplete which they link to nowhere or stopped on halfway.

In the planning of KL Sentral, the furthest buildings between each other are not exceed 400m which provided the walkable distance from the station which corresponds to the distance that the human can walk in 5 minutes at 4.8km/h. The walkway are advisable to be covered or shelter to protect from the rain, providing zebra crossing, pedestrian traffic light, 24 hours securities in order to encourage more people to walk. Besides that, it also creating a common space to the different levels of workers in that areas that able to shared. Figure 13 have shown the movement and circulation pattern of pedestrian.

**Figure 13**: The red line shows the pedestrian walkable distance from one building to another while the blue line shows the overall pedestrian movement and circulation within KL Sentral.

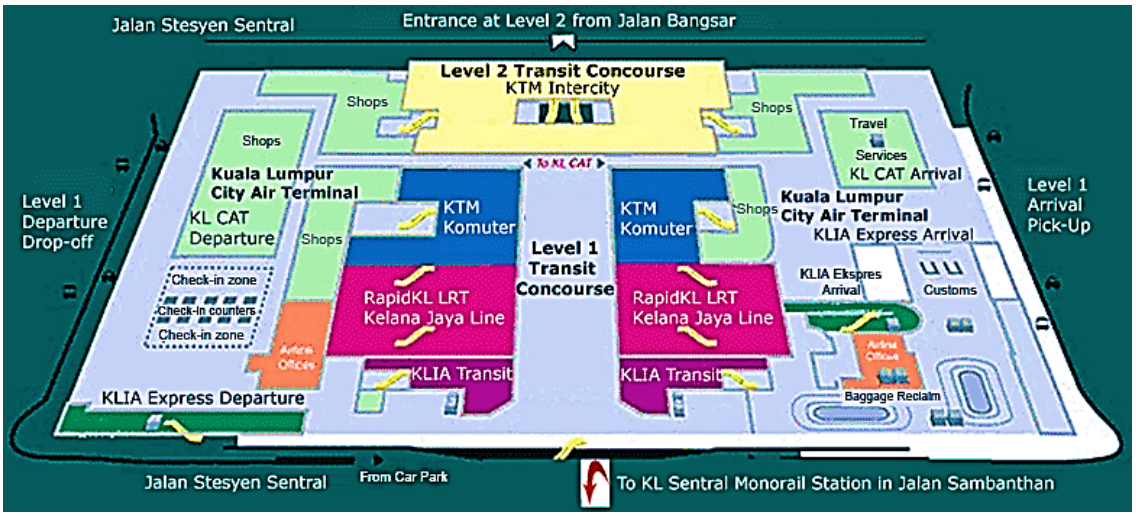


**Figure 14**: Internal layout of Stesen Sentral KL

The internal building of Stesen Sentral has a large concourse area which efficiently cater for large amount of passengers or commuters. The rail lines are located on both side along the concourse giving a commuter a clear direction and the big signboard on the top of each train entrance helps the commuter to differentiate the train lines before enter into the train platform by

passing the electronic ticketing machine. Other than the rail lines along the concourse area, some small retails and stalls also open their business between the train lines as well as the centre of concourse area, photos are shown in Figure 15. Figure 14 can see the arrival and departure entrance are clearly separate where the departure drop-off and the hall are located on the left of the building while the arrival and pick-up point are located on the right side of the building. By separated the departure and arrival helps to ease the traffic congestion during the peak season in terms of passenger flows as well as vehicles.

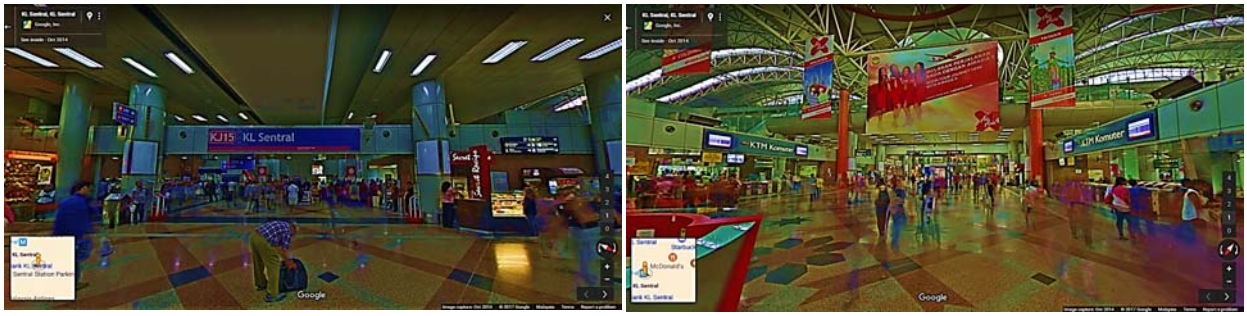


**Figure 15**: Large Signboard for respective trail lines and retail shops inside the Stesen Sentral KL (Courtesy of Google street view)

The Stesen Sentral is inter-connected with the NU Sentral shopping complex by four pairs of escalators in both directions with a wide staircase at the center between the escalators located at Level 1. Each floors of Stesen Sentral provided the escalators and staircases for the commuter to access from this floor to another. The paths inside the Stesen Sentral can be categorized into primary, secondary and tertiary walkways, the primary path is the concourse area as well as common areas that is most widely and easily accessible. The secondary path will be the walkway that connecting with the concourse area to the designated area for example LRT station platform or KTM station platform, while the tertiary path would be the walkway inside the designated area itself that connecting the services area as well as consider a private spaces. Figure 16 shows the vertical transportation system in Stesen Sentral.

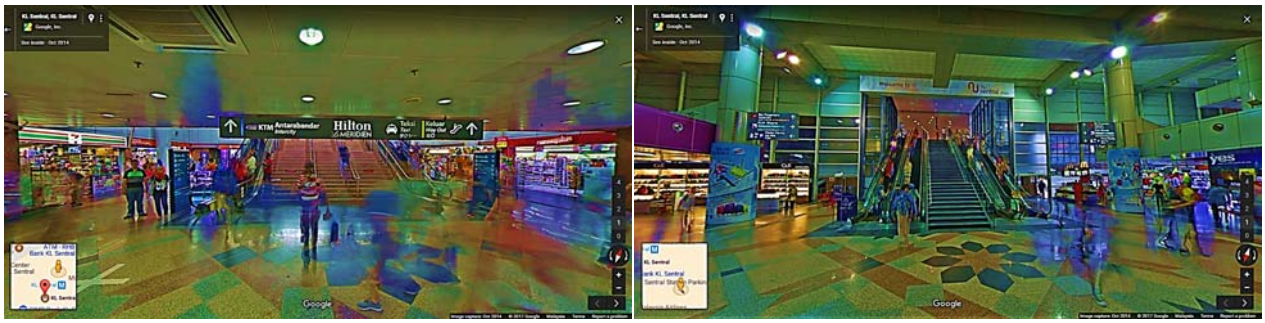


**Figure 16**: Escalators and staircases can be easily seen in the Stesen Sentral that connected different level of floors. (Courtesy of Google street view)

## 5. DISCUSSION

The result findings present the overall circulations and space planning in Stesen Sentral as well

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as the research conclusion to be discourse accordingly in this discussion. Subsequently, the analysis part is based on the online case studies from different journals and researches that have analyzed on the building as well as the author's personal perception and determinants attributes on the experience when visit to case study site.

## 5.1 VEHICLE CIRCULATION

Based on the analysis, the vehicle movement within the KL Sentral is insufficient. The congestion during the peak hours on the major roads is crowded. This is because KL Sentral are located on the Central Business District (CBD) where it is the most congested area in KL City. The separation of departure and arrival halls in two different direction help to ease the traffic congestion within KL Sentral and each of the buildings have its own dedicated drop off points and the vehicle are not allow to park on the road side in order to smoothen the internal circulation surrounding KL Sentral. Passenger and commuter are advice to use the public transportation system to reach Kl Sentral by bus, or public train services. The bus stations surrounded the KL Sentral offer to public the cheapest and sustainable way to reach the building. The walkable distance between the buildings in KL Sentral allow the building employers or building users to walk to their destination.

However, the pedestrian walkway and cycling path surrounded KL Sentral is not completed and well design. Some of the pedestrian walkway are too narrow that increase the risk of pedestrians safety and the incomplete shelter on the pedestrian walkway which discourage the public to consider to use the pedestrian walk. Malaysia is a hot and humid country where the rain can come anytime in just a short period of raining sign, pedestrian walk without the shelter or roof in Malaysia is not viable. Most of the Malaysian are prefer to walk under a shelter place instead of open place like western country. It can be seen in KL Sentral when during the hot climate in high temperature weather, only the western tourists are able to walk under the hot sun without any shelter or umbrella while fewer number of Malaysian can do it in same way. In author's experience and perception during the visit to KL Sentral, most of the commuter are not willing to walk under the open spaces without any shelters or tools to block the direct sunlight. With the emerged and conveniency of Uber and Grab Car services through the mobile apps, most of the commuters would rather to use Uber or Grab Car services instead of walking. The cheap fare enable the commuter to share among their friends and even cheaper than using the public bus services, and the latter need to spend more time to wait for the next buses.

On the other hand, motorcycle and bicycle path is not effective in KL Sentral. The direction of motorcycle path is unclear and confusing. While the bicycle path is not complete as well as occupied by the irresponsible car driver who park their car on the bicycle path. Bicycle can become a sustainable vehicle which reduce the traffic congestion and reduce the carbon footprint. The local government or the management of KL Sentral should encourage the commuter to use bicycle as one of the commute system, and improve the bicycle facilities around the KL Sentral as well as Stesen

Sentral. For example, the trains company shall reserve a bicycle dedicated space in the train for bicycle user as well as providing the bicycle carpark in Stesen Sentral. By doing this, to encourage more KL citizens to use bicycle as their daily commute system can benefit in many aspects. Nonetheless, the government are not look it seriously although they verbally promoting the cycling activities is good and sustainable. The bicycle infrastructure is the most important and initial phase to be prepared in order to promote the bicycle culture in that area. Without sufficient infrastructures and bicycle facilities, only the verbally promoting is not enough.

## 5.2 SPACES PLANNING & COMMUTER FLOWS

Spaces in Stesen Sentral are clear and straight forward. The departure hall located at the north of the building while the arrival hall located at the south of the building, in between is the train lines that lead to it respective waiting platform as well as the retails and stalls. The separation of the departure and arrival hall help to ease the traffic congestion in terms of vehicle or commuter flows in Stesen Sentral KL. These two halls are connected with the central transit concourse in the middle by a small pathway with the retail shops on both side of the corridor. This helps to eliminate the lonely feel when the commuter access from the halls to the concourse as well as provides a feeling that the distance is shorter when there is the retail shops or stalls along the corridor. On the both end of Stesen Sentral on level 1 is the escalators and staircases that connected to level 2 and NU Sentral shopping complex. The separation of the access help to diverse the commuter flows focus on one area that cause the congestion.

The transit concourse at level 1 in Stesen Sentral considered as the horizontal public circulation where the commuters access through it to enter the respective train lines platform. The concourse is designed in straight and direct circulation pattern that allow the commuter to easily find their way and to ease the traffic congestion during peak hours because the curvier and bending circulation would increase the crowded and congested situation. The concourse serve as a public circulation is often the main pathway that connect the spaces, for instance in Stesen Sentral, the concourse are connected with all the train lines, KTM, LRT, KLIA Transit as well as the departure and arrival hall. The different train lines are separated at both side of transit concourse as well as level 2 to distribute the commuter flows.

Furthermore, vertical circulation become one of the major elements in Stesen Sentral as the commuters travel from floor to another. Sufficient numbers of provided escalators and elevators solve the congestion problem inside the Stesen Sentral. The staircases help reassuring the crowded situation during peak session when most of the commuter are using escalators or elevators access from floor to floor. The big signboard on top of each train station bring the conveniences towards the commuter to look for their way and avoid walk into wrong direction.

Based on the literature reviews, the spaces and circulation planning in Stesen Sentral can be considered as efficient because the horizontal and vertical movement are well design which the

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circulation is direct & straight forward, hence it shaped the overall Stesen Sentral building form as a rectangular shape of building.

## 6. CONCLUSION

Based on the research conducted, it can be assumed that the circulation planning is essential in a building. Without the proper planning for the circulation and spaces inside the building would cause the traffic congestion and crowded human flows during peak hours. It is important that the accessibility in either new or renovated buildings are true usability. The design and planning of entrances and internal circulation routes have a major impact on the buildings user. The Architect or designer as well as the building planner must look into the issue seriously, while sometimes the codes of requirements are not sufficient because it might be inadequate or too general and simple in certain areas. Architects and designer need more information to help them in the design of building circulation while most of the planners or developers are not really look into the important of circulation in a building rather than their profit. However, the architects and building designers must always remind themselves that making the circulation accessible is a basic requirement in building design. Effective circulation design can improve the safety, satisfaction and productivity for the user. Other than that, to make the circulation effective, we must always take care of the special user such as people with disabilities and inconvenience, we must not ignore them to make the most convenient form of circulation harder to use. The true universal design is to make the accessible circulation the basic system for everyone uses, becoming a successful building.

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