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SPACE SYNTAX ANALYSIS ON INDOOR ARENA'S LAYOUT PLAN OF SPICE ARENA, PENANG

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ABSTRACT

Space syntax is a human-focused approach tool that supports humans to identify the relationship between human activities and the spaces within a habited area. This paper mainly focusses on the space syntax that defined from the existing case study Spice Arena, Penang. Method of utilising information found from the resources like the internet and interview the respective parties involved in the building renovation. Likert scale method is used to present the finalist of the research which justifies the wayfinding and permeability of Spice Arena. The finding of this paper showing the wayfinding in the Spice Arena is instead a dilemma. Based on the outcome, the round spatial arrangement of Spice Arena is somewhat supportive for the visitors to seek for wayfinding. However, some areas are narrow and dense which are not suitable to cater to the large volume of visitors. Hence, the finding of this paper hopes to aid the designer in their future arena design.

Disciplinary: Architectural Sciences.

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1. INTRODUCTION

The objective of this research paper is to provide a proper practice toward the space syntax by analysing and providing an in-depth study based on the design intentions learned from the selected case study arena. The process of this research can give a better understanding of wayfinding and pick up the arena design weaknesses and strengths. Peculiarities of the arena design often different compare to other arena designs around the globe. Such a unique design feature of spatial arrangement often come in two types of perceptions. The perception of inexperienced visitors often the most important in this study due to them are the primary use for the arena to be served.

The understanding of inexperienced wayfinding will show the different navigation strategies compare to the user with prior experience with the building (Hölscher et al., 2006). Hence,

different methods of direction will be obtained in this method. Space syntax the other name as an individual study about accessibility within graphs (Penn, 2003). It is an accessibility study within the aiding of graphical presentation way to present the finding. The graphical presentation mainly will be utilising the aid of software to produce. The result for this paper believes mostly in identifying the possibilities of the accessibility based on the inexperienced visitors toward the selected arena layout as well as the space syntax.

2. LITERATURE REVIEW

Space syntax is a tool for identifying the relationships between human activities and the spaces within habited space (Bafna, 2003). Investigation for the spatial transition of human movement from one area to another is the primary purpose of space syntax. Transition spaces and connectivity often come across during the analysing process, space syntax analysis often representing by the level of permeability which lies within building design. However, the building design is based on the purpose and functions that the designer intended to portrait. Space syntax can be considered as a study of accessibility within graphs for deriving the results of wayfinding (Yusoff, 2019). Kevin A. Lynch (1960) used the term for his book “The Image of the City”, where he defined wayfinding as “consistent use of organisation of definite sensory cues from the external environment”. In another word, space syntax allows people to investigate the relationship between human activities and spaces from the structure of the inhabited area in all different forms (Penn, 2003). The habituated societies often use space as the keyword and necessary information to organise themselves.

The arena is a space that designed intentionally to occupy many functional spaces within and allow to hold huge capacities of spectators in a time per event. It is being labelled as “Place of Assembly” in Fifth Schedule of Uniform Building By-Laws where people with the same motive are using a public or private for social, education, recreation, business, and other activities (UBBL, 2013). The internal planning, wayfinding and level of permeability must be able to cater to the high volume of human movement to avoid unnecessary trouble in all aspects. Other words, the control of securities and the ingress-egress often are the most significant challenge when designing arena. This research is being carried out with the intention of analysing the positive and negative aspect of selected case study and providing information from the finding to enhance future arena design.

Architecturally, the arena always designed to contribute and revitalisation of neighbourhoods. In other words, it is a space that design for events is gathering. However due to the security issues, information regarding the plans of the arena hardly able to be released to the public from the respective parties who were in charged (Ahlfeldt & Maennig, 2009). Furthermore, architecturally designed to occupy more than 10,000 people always being categorised for high complexity. Given a limited timeframe to carry out the analysis for such typology is challenging to complete in time.

The nature of space syntax in this paper is centric toward wayfinding and identification of the level of permeability from the selected case study (Hillier, 1999). Building floor plans are the primary information to be obtained before the research being carried out. Floor plans of the case study chosen able to give us a clear view of the information that we required. Indications are to be labelled and organized correctly on the floor plans which later lead to the second stage where the data is translated into graphs or diagrams. Likert scale method comes in when the findings need to be rated formally.

2.1 SPICE ARENA

The Spice Arena (Figures 1-3) is known as the new pulse of Penang where the arena capable of hosting for many significant events. Events such as concerts, exhibitions, indoor sports competitions and Trade Centre often being held here. The newly renovated Spice Arena from original Pisa Arena which is located at the central heart of Bayan Lepas Southern Province of Penang Island Malaysia. It is designed with the capacities of a minimum of 10,000 terrace seats, and flexibilities of internal space layout often become the main attraction from many events.



Figure 1: the Spice Arena from opposite shop-lots view.



Figure 2: the side entrance of the Spice Arena



Figure 3: the main sheltered entrance of Spice Arena from the Spice Convention Hall

Spice Arena was selected due to the availability of information and multiple awards winning projects such as No. 1 The Edge Malaysia Awards, FLABCI World Prix d' Excellence Awards, FLABCI Malaysia Property Awards (Setia Spice, 2018). Its location near to Universiti Sains Malaysia, this provides an easy to understand the spaces and circulation (Figures 4-9) in the arena.

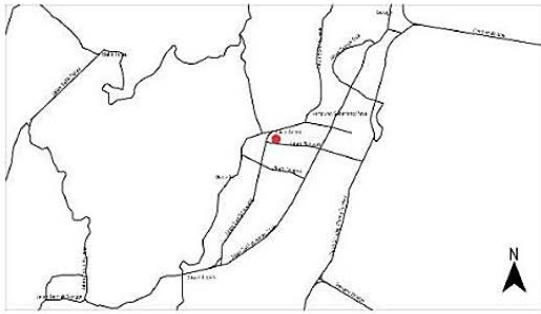


Figure 4: Key Plan of Spice Arena

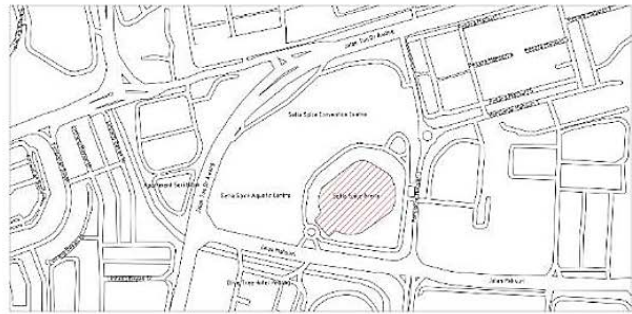


Figure 5: Location Plan of Spice Arena.

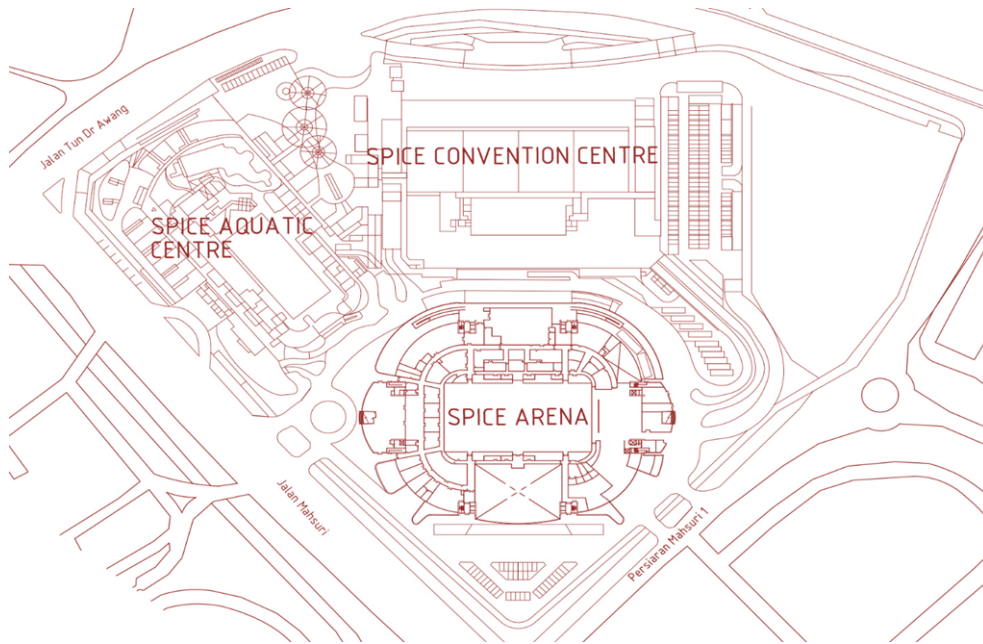


Figure 6: the Site Plan of Spice Arena

3. METHODOLOGY

The selection of a proper case study for space syntax is the crucial part to start for this research to begin. The case study selection must have close typology with the design thesis topic. In this case, Spice Arena had been selected to be the case studies due to the location and information availability and nearer to be visited for a site visit. Despite the selection of a case study to begin, proper information should be collected along the way. Such information like drawing will need to retrace to produce our version. As proceeding toward the analysis progress, labelling system required to be appropriately defined to avoid confusion happen on further stages. For example, Spice Arena having three storeys in total which the number or symbol system will require to indicate according to level to avoid the repetition to other level spaces.

As the research proceeds further in detail, different kinds of presentation graph methods will need to be introduced. This is due to the circulation design of the Spice Arena are in the form of a loop. All the spaces within able to be connected through a continuous walking corridor. Besides that, multiple entrances are situated around the arena which allows the ingress and egress to be happening all around. Conventional vertical and horizontal space syntax graphs are difficult to present the flow of connectivity and the level of permeability. Ended up might cause a misinterpretation of the design. However, the circular space syntax graph is being introduced in this case due to the circular space syntax graph able to fulfill the placement and circulation of the Spice

Arena designs. The circular space syntax graph having the level of permeability will be differentiated by the colour zone growing from the outermost line toward the centre point. Meantime, building levelling will be indicated base on the position of the mainline. Spaces relationship able to be presented in the more natural form in this case due to all the labelling and symbols able to place accordingly.

4. ANALYSIS

This analysis will start from the basement plan (Figure 7-12). As the analysis moves up, the floor number increases along as well. The process of analysis will be presented as a view of a visitor who visits the Spice Arena for the event.

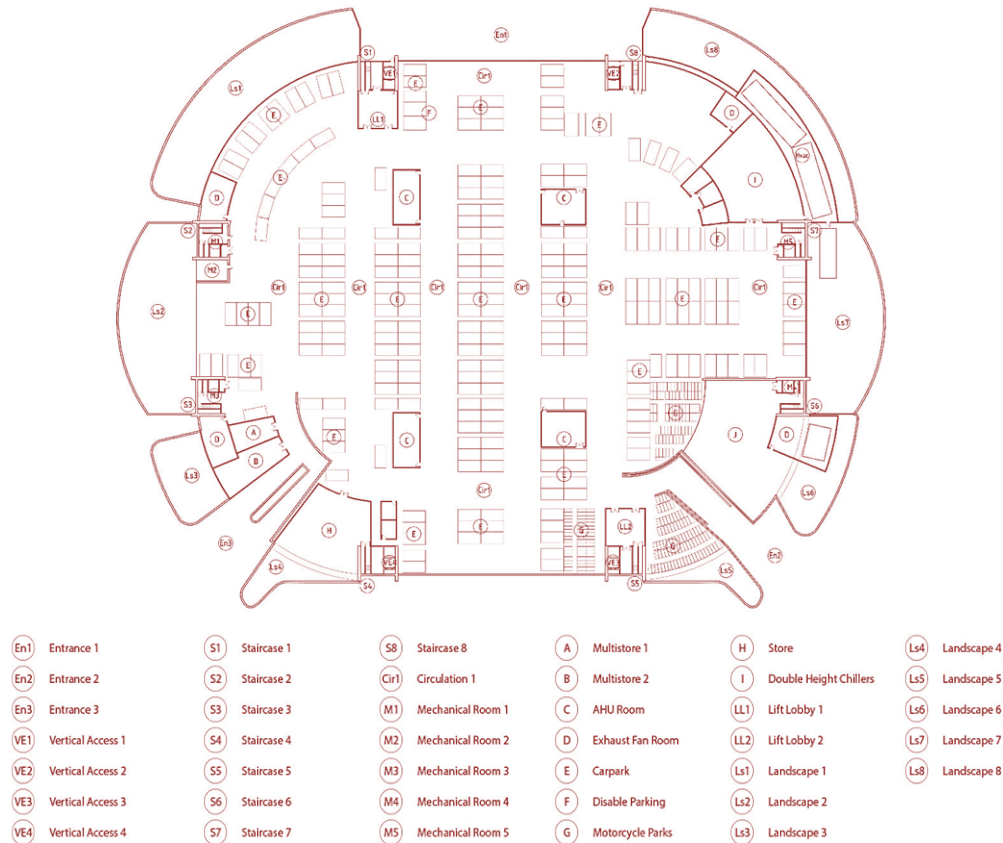


Figure 7: Basement Plan indication.

There are two main entrances (blue colour indication) in the basement that mainly serve the vehicular ingress and egress. The current basement plan contains two main lift lobbies (brown colour indication), and multiple lift cores come with fire staircases (green colour indication). The vertical access is situated around the building. When visitors enter the basement carpark, they can park all the parking whichever available. The whole basement circulation is connected. Visitors can walk from one end to another. Besides the carpark and motor parking, there are a few spaces and services contained in the basement such as multiple mechanical rooms, fire tanks, pump rooms, air-conditional compressor units, loading bay, and so on. Most visitors will approach directed toward the lift lobbies after they parked. Even though they address the approach to lift lobby, most of them will prefer to park their vehicle near to both lift lobbies. The way of movement for the car will be filled starting from both the lift lobbies then slowly until the middle of the basement carpark.

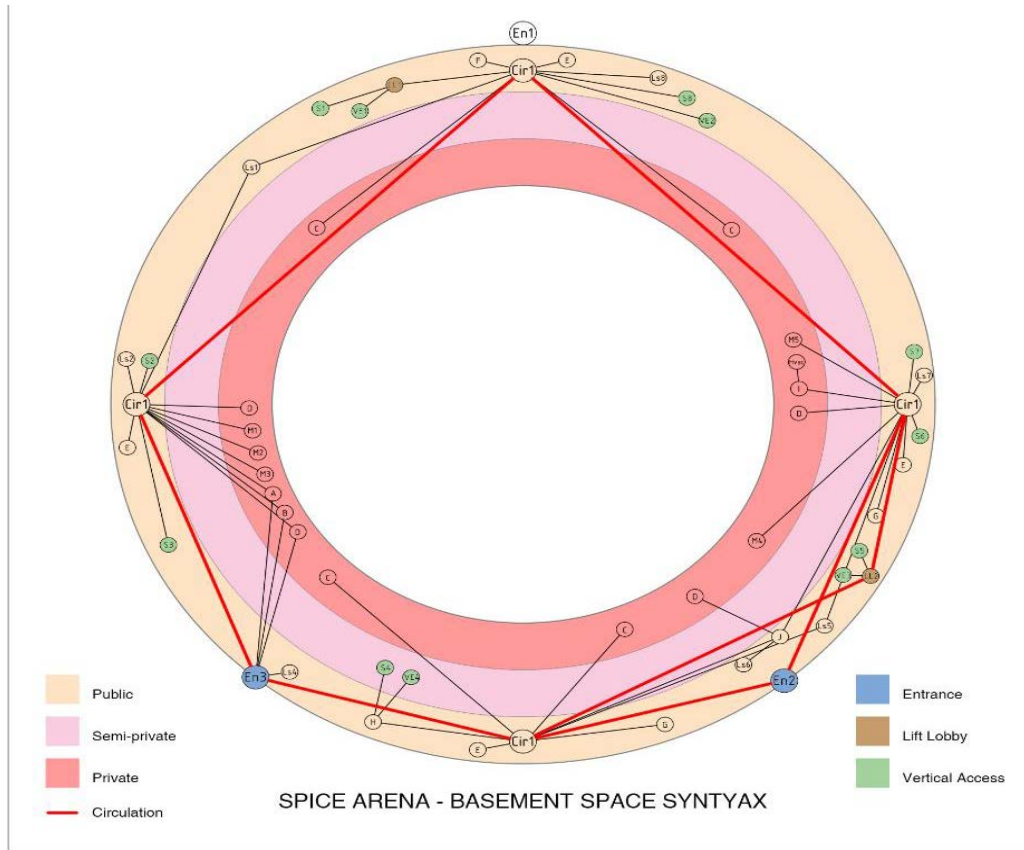


Figure 8: the Basement Plan Space Syntax Diagram

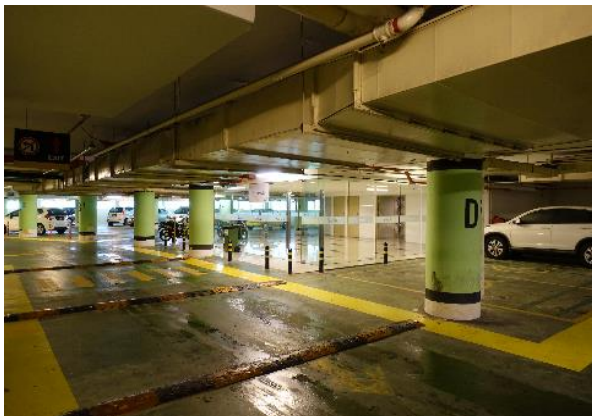


Figure 9: Basement Lobbies

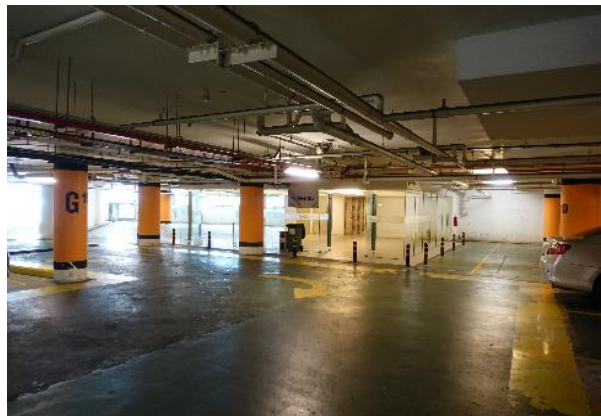


Figure 10: the Basement Lobbies

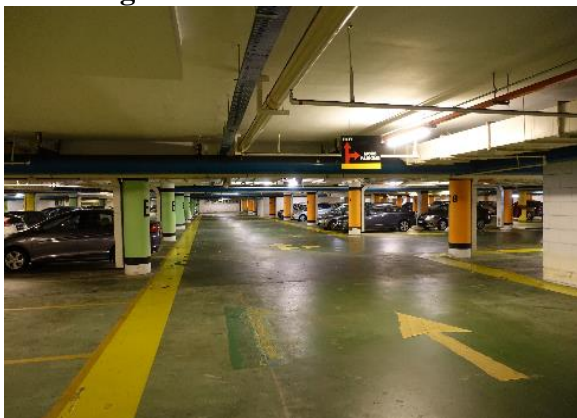


Figure 11: Basement open carparks

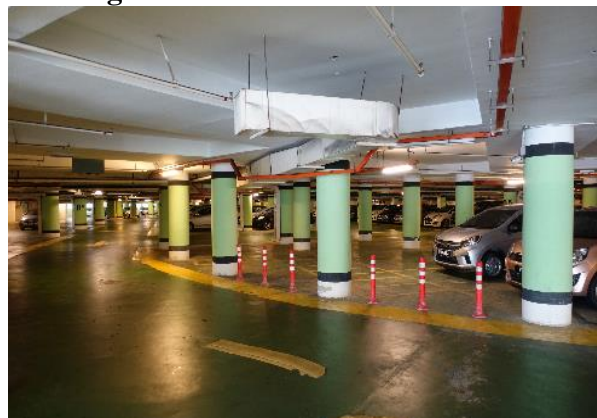
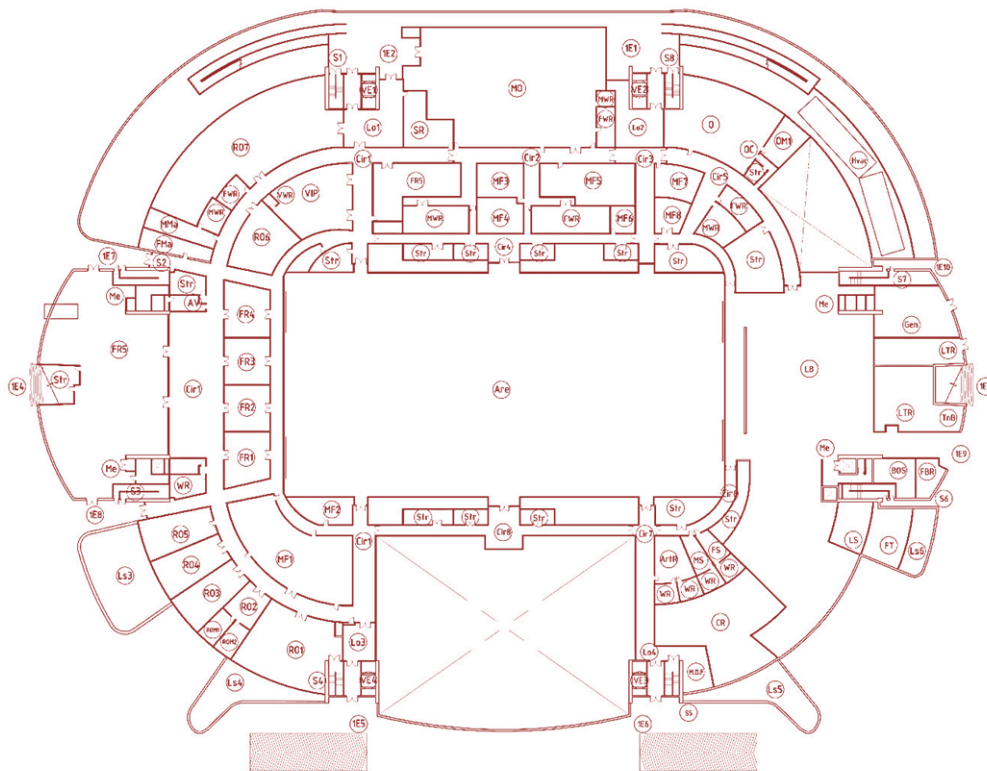


Figure 12: Basement open carparks



1E1	Level 1 Entrance 1	1E8	Level 1 Entrance 8	Cir1	Circulation 1	Cir8	Circulation 8	S6	Staircase 6	MF4	Multi Function 4	FWR	Female Washroom	RO7	Rental Office 7	VES	Vertical Access 5	VWR	VIP Washroom	MS	Male Star Room
1E2	Level 1 Entrance 2	1E9	Level 1 Entrance 9	Cir2	Circulation 2	LB	Loading Bay	S7	Staircase 7	MF5	Multi Function 5	RO1	Rental Office 1	FR1	Function Room 1	O	Office	FS	Female Star Room		
1E3	Level 1 Entrance 3	1E10	Level 1 Entrance 10	Cir3	Circulation 3	S1	Staircase 1	MO	Management Office	MF6	Multi Function 6	RO2	Rental Office 2	ROA2	Rental Office Meeting 2	FR2	Function Room 2	OM1	Office Meeting Room 1	Are	Arena
1E4	Level 1 Entrance 4	Lo1	Lobby 1	Cir4	Circulation 4	S2	Staircase 2	SR	Security Room	MF7	Multi Function 7	RO3	Rental Office 3	VE1	Vertical Access 1	FR3	Function Room 3	OC	Office Corridor	Me	Mechanical Room
1E5	Level 1 Entrance 5	Lo2	Lobby 2	Cir5	Circulation 5	S3	Staircase 3	MF1	Multi Function 1	MF8	Multi Function 8	RO4	Rental Office 4	VE2	Vertical Access 2	FR4	Function Room 4	HVAC	HVAC Room	MDF	MDF Room
1E6	Level 1 Entrance 6	Lo3	Lobby 3	Cir6	Circulation 6	S4	Staircase 4	MF2	Multi Function 2	Str	Store Room	RO5	Rental Office 5	VE3	Vertical Access 3	FR5	Function Room 5	Gen	Generator Room	LS	Landscape
1E7	Level 1 Entrance 7	Lo4	Lobby 4	Cir7	Circulation 7	S5	Staircase 5	MF3	Multi Function 3	MWR	Male Washroom	RO6	Rental Office 6	VE4	Vertical Access 4	VIP	VIP Room	LTR	LT Room	AV	AV Room
								HTR	HT Room	TnB	TnB Room	FT	Fire Tank	BOS	Back of House	FRP	Fire Pump Room	CR	Crew Room	ArtR	Artist Room

Figure 13: Ground Floor Plan indication

There are several entrances on the ground floor (Figures 13-20). Such entries are being situated at all rounds of the building. All the entries come along with the fire staircases beside entries with label 1E1, 1E2, 1E5 and 1E6 are come with lift core attached. Generally, the ground of Spice Arena is design with equipped main function rooms, rental offices, management office, back of the house, VIP room, artist rooms, function rooms, temporary police station and so on. The overall ceiling height of the spaces is about 2.4m which causing the ground floor to feel like a very narrow space although the 3m width of the corridor is being introduced here. It is good that all passages are connected in a loop yet segmented by the fire rated door according to zoning. However, without proper indication in all the spaces at the corridor can be very confusing in the wayfinding experience. Furthermore, linking all passages in a loop will lead the visitor toward the back of the house quickly. Usually, the back of the house is where the most hidden part that people wanted to hide it away for security and safety purposes. In this case, might not be a good practice that leads the visitor toward it.

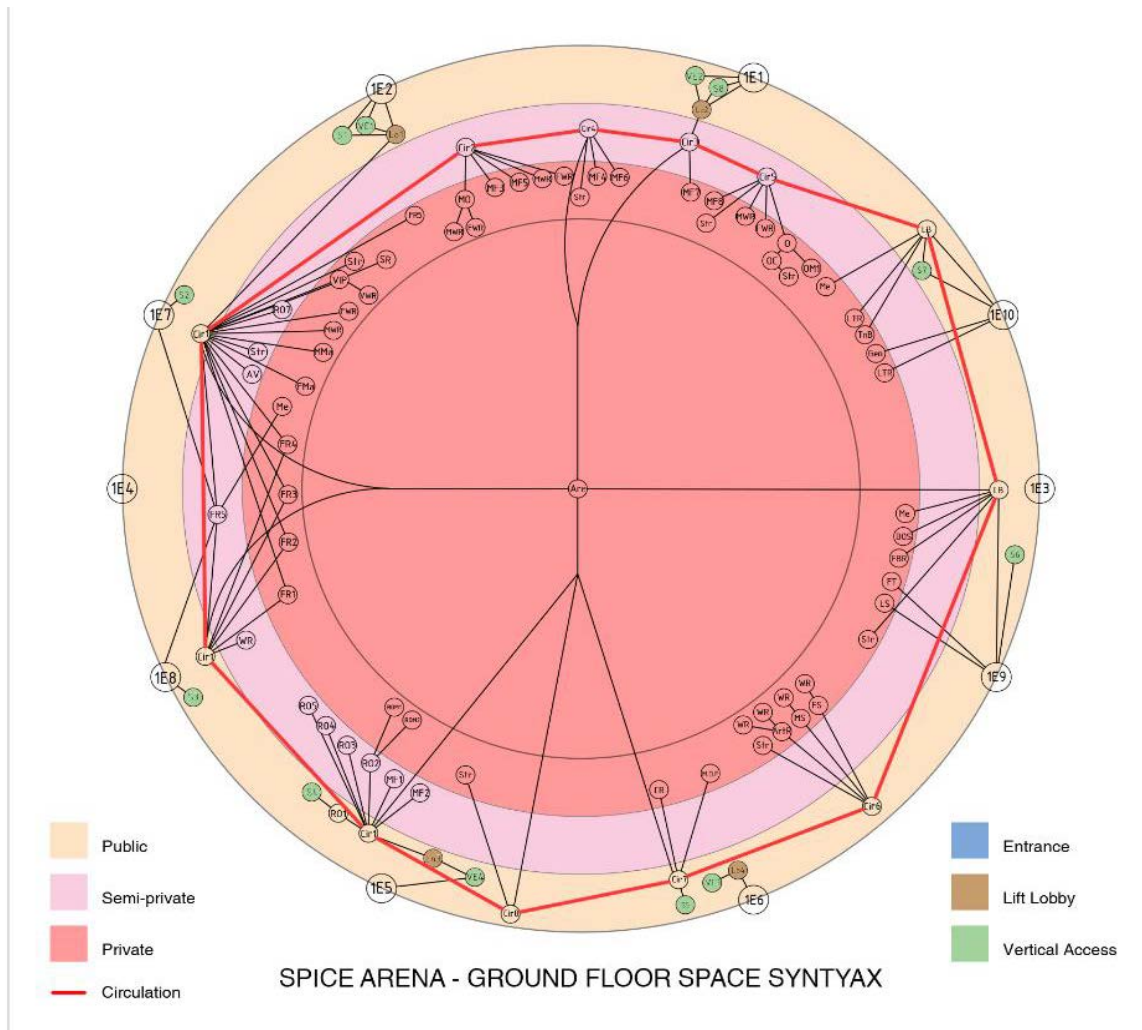


Figure 14: Shown the Ground Floor Plan Space Syntax Diagram.



Figure 15: VIP Lounge at Ground Floor area



Figure 16: Circulation A at Ground floor area



Figure 17: Rental office corridor

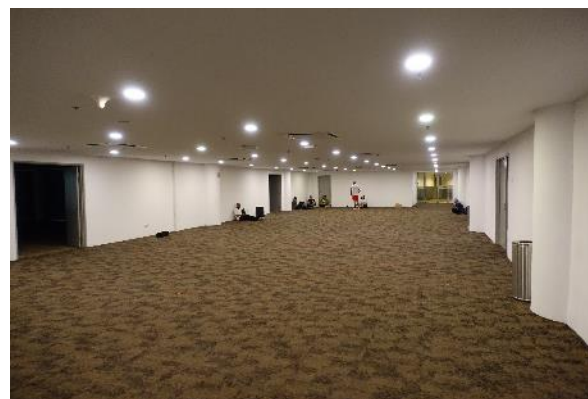


Figure 18: Pre-function area of multipurpose Hall

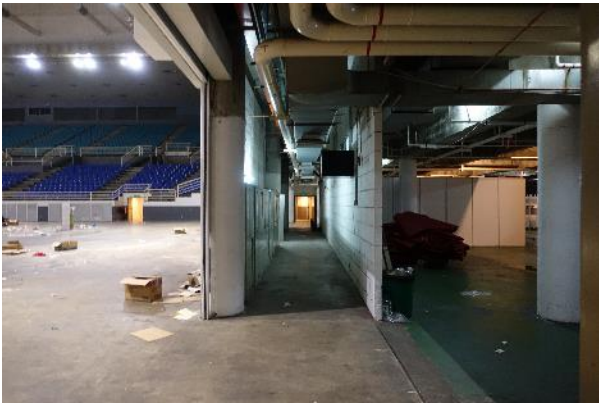


Figure 19: Transition area between the arena and back of house

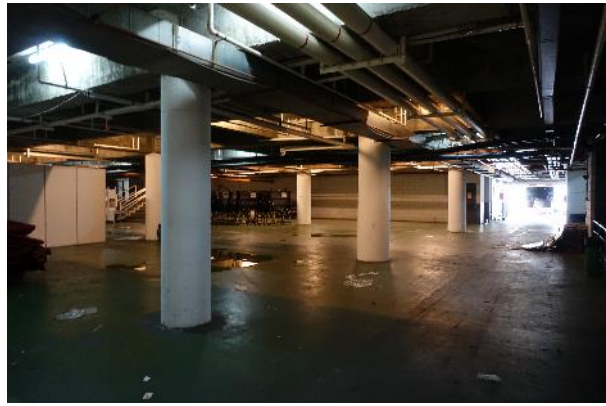


Figure 20: Loading bay at back of house

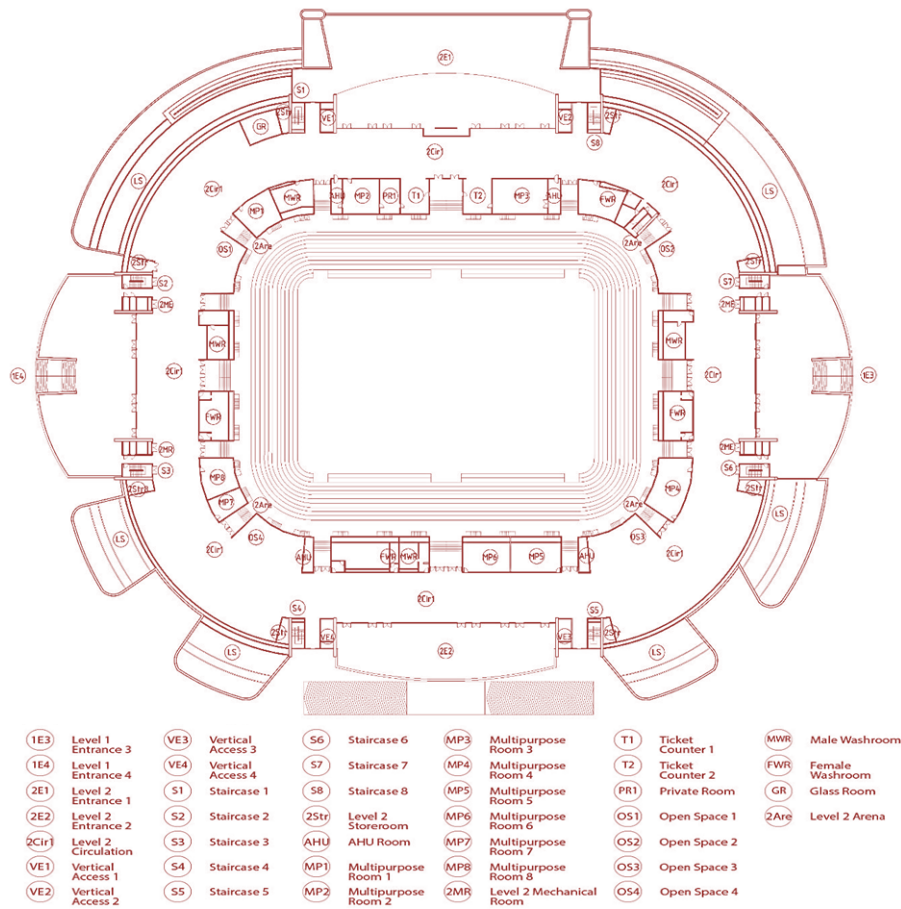


Figure 21: the First Floor Plan Space Syntax Diagram.

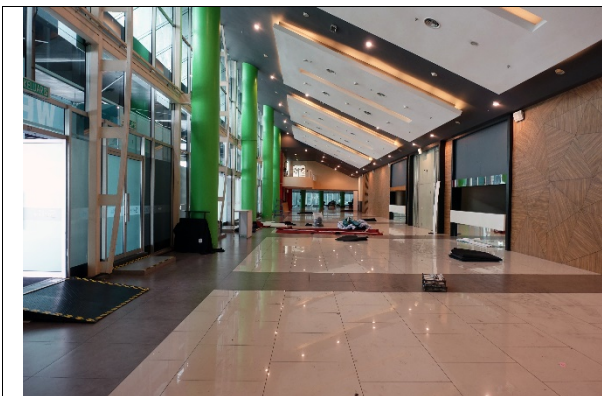


Figure 22: Pre-function area of first floor



Figure 23: Circulation space at the first floor

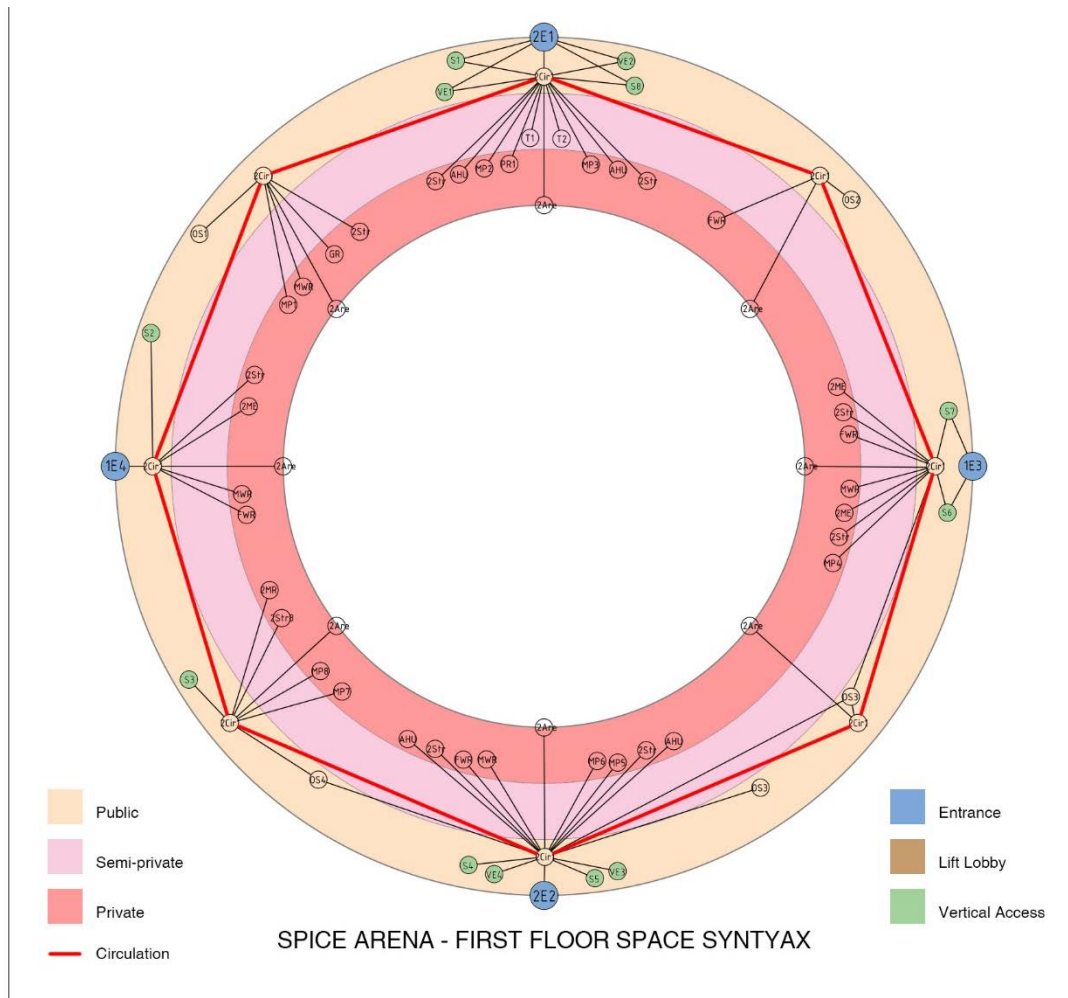


Figure 24: The First Floor Plan indicating the Space Syntax Diagram.

The First-floor plan layout (Figures 21-24) has wider and looser space planning. The common area circulation still designed to be connected as a loop but with the benefit of more comprehensive and relaxing space, it has become suitable to be the proper exhibition area or pre-function area for the event. A visitor that comes from the Spice Convention Centre, will have to walk through the main entrance (2E2) which shown in Figure 22. The interior design in this area is somehow different compared to other circulation around due to this is the primary ingress and egress sheltered connection from Spice Convention Centre. However, the wayfinding on this floor are more transparent, and easier compared to the ground floor.

5. DISCUSSION

There are categories of visitors and users (Purpose of Visit) who visiting Spice Arena. Method for categorising them will able to relate to the function of Spice Arena itself closely. First, Spice Arena is mainly designed to cater to the "Performance". Performance can be closely linked to such events like concerts, public talks, competitions which involve entrance fees. Visitors who come for such an event often have a specific direction while walking in the arena. They will direct themselves toward the concourse area based on the entrance indication after they park their vehicle. However, the level of wayfinding is found to be very different for the event such as organising an exhibition for a particular event. Such exhibition often encourages the visitor to move around the internal layout of the arena. The level of permeability is often hardly able to apply in this case due

to different motives having. Commonly exhibition will maximise the functional spaces as much as possible. It is tough to control the visitor movement while there are multiple entrances around the arena. High visitor volume usually will affect human change also. Most visitors often like to find the shortest travel distance to travels within the building. However, the third phenomenon often happens to the visitor who travels to Spice Arena to visit the offices or the office workers. We can find multiple organisation offices within Spice Arena such as Branch of Penang Municipal Council, SP Setia Management, SP Setia Voluntary Police Station, Media Studio and so on. Such offices are located around the ground floor. The visitor often moves from one end to another due to the compartmentalising of all circulation in the ground floor. Compartmentalised ground floor plan circulation often makes the visitors confuse for the direction.

5.1 WAYFINDING IN THE BASEMENT

Basement design rather simple. They have an open plan layout which most of the visitor are free to park at the parking lot freely. Wayfinding in the basement shown rather direct in the way that visitors can approach the lifts directly after they parked. However, to determine their course of travel for the first time will be difficult. This is due to all the lifts at the basement that will lead them to a different part of the arena.

5.2 WAYFINDING IN THE GROUND FLOOR

Ground floor layout presented in a low ceiling and narrow space designs. The visitor must go through many tiers of the compartment to reach their destination. Due to the location is situated below the first-floor arena grandstand thus the ceiling height is minimal by the floor height. The overall experience of the ground floor given for the visitor is not very appropriate due to the reasons mentioned, and the circulation will lead to the back of the house quickly.

5.3 WAYFINDING IN THE FIRST FLOOR

The visitor who not park their car at the arena basement most of them will walk through the 2E2 entrance. This is due to there are alternative parking located at Spice Convention Centre. The first floor has rather direct and straightforward of wayfinding for exhibition and arena performance. However, a visitor who came for the office and admin work has nothing to do to the first floor. The overall user experience for the first floor is slightly better than the first floor due to having more extensive pre-function space and design with a higher ceiling. It has felt welcoming in the way of the design approach.

Having the study of space syntax analysis on the indoor arena of the Spice Arena, Penang, the summarized result is given in Table 1.

Table 1: Summarized permeability result of Spice Arena, Penang.

Element	Very easy	Easy	Neutral	Hard	Very hard
Basement		✓			
Ground floor				✓	
First floor	✓				

6. CONCLUSION

Spice Arena was renovated from the previous arena name Pisa which design by oversea architect 30 years ago. Most of the layout design might not be suitable based on the current urban

context. This paper has shown the limitations and the advantages of Spice Arena which can adopt as a reference to future arena design. Overall wayfinding in Spice Arena can be considered acceptable base on the current renovated building design and building layout of 30 years ago. The only part that shown the unsatisfied wayfinding is the ground floor layout. This is mainly due to the ceiling height constraints from the grandstand in arena and compartmentalisation of the entire corridor by the facilities in it. Visitors might easily lose their direction in there. However, to overcome such situation, proper signages are required. Furthermore, low ceiling and compact spaces causing the unpleasant air quality at ground floor which will bring the unfortunate experience to the visitors. The common area in the arena should be designed as large as possible to cater to the large volume of crowds.

7. ACKNOWLEDGEMENTS

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8. DATA AND MATERIAL AVAILABILITY

This study data can be provided upon contacting the corresponding author.

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