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# A Study of Space Syntax in WuliEpoch Culture Center and Capslo Homeless Shelter

Tang Siwen<sup>1</sup>, Yasser Arab<sup>2</sup>\*, Piyaporn Thurakitchamnong<sup>3</sup>\*, Ahmad Sanusi Hassan<sup>1</sup>, Nimit Tounnawarat<sup>4</sup>, and Bhattraradej Witchayangkoon<sup>5,6</sup>

<sup>1</sup>School of Housing, Building & Planning, Universities Sains Malaysia, MALAYSIA.

<sup>2</sup>Department of Architectural Engineering, Dhofar University, Salalah, SULTANATE of OMAN.

<sup>3</sup>Department of Architecture and Urban Planning, Faculty of Architecture, Rajamangala University of Technology Srivijaya, Songkhla, THAILAND.

<sup>4</sup>Department of Civil Engineering, Faculty of Engineering, Rajamangala University of Technology Krungthep, Bangkok, THAILAND.

<sup>5</sup>Department of Civil Engineering, Thammasat School of Engineering, Thammasat University, Rangsit, THAILAND.

<sup>6</sup>Thammasat University Research Unit in Climate Change and Sustainability, Department of Civil Engineering, Thammasat School of Engineering, Thammasat University, THAILAND.

\*Corresponding Author (Emails: yarab @du.edu.om, piyaporn.t @rmutsv.ac.th).

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#### Abstract

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#### **Keywords:**

Space syntax analysis; Access analysis; Segregation of circulation; Wayfinding; Spatial configuration; Users' circulation; Depth of space; Building corridor; Spaces design; Level of permeability.

The study intends to understand and review the spatial organizations of a selected WuliEpoch Culture Center and homeless shelter as representations of their respective typologies. The roles of these typologies, which heavily focus on providing support to the people, are discussed at length. The study is carried out by analyzing the space syntax of the case studies using measurable scale graphs. Through referencing source material and logical reasoning, the functions of the spaces are identified and mapped. The WuliEpoch Culture Center illustrates high circulation between different types of users. There is also significant prioritization to create efficient flow throughout the building. The homeless shelter organizes its spaces using a central spine located on each floor. The use of corridors and sub-corridors throughout the building helps define the different levels of access and privacy. This study shows the unique spatial structures of WuliEpoch Culture Center and homeless shelters, revealing the nature of spaces designed to convenience the people.

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# **1** Introduction

This paper focuses on the analysis and identifies the space syntax in the WuliEpoch Culture Center and Capslo Homeless Shelter. To start with, a smooth indoor tour flow and high-level security protection must integrate an excellent spatial design. A building achieves its function not through its built form but mainly within its house layout spaces (Hassan, 2001). Also, Space syntax is a theory of space and a set of analytical, quantitative, and descriptive tools for analyzing the layout of space in buildings and cities (Hillier & Hanson, 1984; Hillier & Tzortzi, 2006). The diverse nature of these spaces leads to unique spatial structures when several spaces are put together to create a functioning complex for any given purpose (Namazian 2013). WuliEpoch Culture Center attempts to create a triptych of architecture, landscape, and interior design in the project. While the project is encompassed by the splendor of Western Hills, the architecture and interior design put up an immersive show within the landscape. A continuous path wrapped around from exterior to interior. The first nature of the landscape and the second nature of the interior space join seamlessly through the path. The ambiance along the path is circumferential and religious to some extent, as a way to worship nature. As the site is triangulated, the project responds to the site, by stacking layers of curve walls, in a crisscrossing fashion to create layers of courtyards. Seeking a dialogue with the courtyard house in Beijing, as well as the Great Wall scenery nearby, the material used for the project is carefully proportioned masonry wall, and it is used throughout landscape, architecture, and interior design. A uniform tone brings historic gravitas to the project.

#### 2 Literature Review

The term space syntax encompasses a set of theories and techniques for the analysis of spatial configurations (Nes, 2014). It was to develop insights into the mutually constructive relationship between society and space. As space syntax has evolved, certain measures have been found to correlate with human spatial behavior, and space syntax has thus come to be used to forecast the likely effects of architectural and urban space on users. Space syntax is ultimately concerned with the relationship between human beings and the spaces they inhabit. It includes identifying how spaces are designed and used by people in a way that conveys social or cultural significance (Dursun 2007; Architects & Urbanists Workshop 2018; Bazerghi et al. 2016). In other words, a related theme in space syntax research is to understand configured space itself, particularly its formative process and its social meaning (Bafna, 2003). On the other hand, Spatial organizing of functional layouts of houses plays a significant role in achieving the spatial-functional efficiency degree, which varies over time. (Mustafa & Hassan 2010; Palaiologou & Griffiths 2019).

Burt (2006) characterised transitional housing for homeless families. Butterworth (2009) reviewed the relationship between the built environment and wellbeing.

# **3 Case Study: WuliEpoch Culture Center**

WuliEpoch Culture Center located in Shijing Mountain around Beijing, is close to the magnificent Xishan, it is a sales experience area at the foot of Xishan that also functions as a cultural center. This project draws on the heritage and inspiration of Xishan and proposes a new definition for the experience place of the contemporary Chinese metropolis. The two basic elements of Vitruvian's original home, the original home, are the fire source and the shelter. Walking around the fire source under the shelter is a daily ritual in life. The same rituals also exist in religious buildings, forming a pilgrimage path around the center of religious buildings. Faith and rituals are essential to a family. For the expression of home, the project combines the architectural atmosphere in religion with the concept of the surrounding path of development, so that tourists can travel the Western Hills in a new way and make the landscape constantly change around the architecture.



Figure 1: An Exterior Perspective of The WuliEpoch Culture Center

To welcome the 2022 Beijing Winter Olympics, the project includes a 1,500-square-meter surrounding experience center and a 400-square-meter community ice rink. The experience center also includes a planning display area, a cultural tea bar, a bar, a VIP room, and a children' s playroom.



Figure 2: Key Plan and Location Plan of The WuliEpoch Culture Center in Shijingshan, China. (Geolocation 39.959148, 116.130313; Courtesy of Google Maps).

# 4 Case Study: Capslo Homeless Shelter

The new Center will include a multitude of spaces that range from community rooms, dayuse services areas, kitchen and community enterprise spaces, offices, medical and mental health areas, and dormitories (Winstanley, 2011; Shier 2007). The overall design is structured around a central spine that guides the organization of the programming and distribution of services according to the cardinal directions. Security of the spaces increases from the public areas located on the West to the much more intimate and private areas on the East side of the building. A similar language is employed as the spaces become much more informal as one travels from North to South within the building. The Southern portion of the building is characterized by a porous public atmosphere with multiple exterior connections, while the Northern becomes inward-focused and compartmentalized in response to its private-focused functions.



Figure 3: An Exterior Perspective of The Capslo Homeless Shelter, California, USA.

# 5 Method

This study is an analytical study using quantitative analysis via graphs to identify the quality of spatial networking in terms of their permeability and level of wayfinding. A literature review on the academic discourse of spatial syntax and building typology is first carried out to provide a basis from which a proper investigation of the case studies can take place.

To examine the spatial networking, an effective analysis method must be developed. This study uses a level-of-movement graph to indicate both the level of permeability and wayfinding of the spaces present within each case study (Table 1).

Table 1: Likert Chart of Space Syntax Analysis							
Likert Scale Numbering	Level of Permeability	Level of Wayfinding					
0-2	Public	Very Easy					
3-5	Semi-Public	Easy					
6-8	Private	Difficult					
9-12	Extremely Private	Very Difficult					

To analyze the model, in the beginning, there needs a completed floor plan traced by AutoCad to show clearly the layout of the building. And find each space's wayfinding and

permeability depth in the plan. After filling in the level of movement chart which will show the categories of public, semi-public, private, and extremely private levels of permeability; as well as the difficulties in wayfinding. In the end, a comparison between each floor's level of permeability will show the positive or negative results of spatial configuration. The analysis will improve the further floor plan design intention in the same typology building.

The vertical scale represents the level of permeability starting from Entry Level up to Most Private. Each number in the circle corresponds to a space labelled with the same number on the floor plans of the building. The various lines connecting the circles indicate that there exists a relationship between the related spaces.

The scales on the graphs give the different depths of access between the entry to the site and the entry to the building. Generally, the higher the number, the lower the permeability and the greater the depth of the space.

The building's spatial structure is analyzed by user category. Two primary user categories have been identified for the Culture Center (visitors, staff) and three primary user categories for the homeless shelter (residents, administrative staff and consultants, and kitchen staff). Each user category will have a graph representing their respective flows throughout the building. Where possible, the spaces of the case studies have been labelled according to reference material made available by the architects or building owners. After analyzing each user's level of permeability individually, a comparison will be made between these categories to understand the depth of each group's access to the building.

#### 6 Result

#### 6.1 Result of Analysis: Capslo Homeless Shelter

For the space syntax analysis of the CAPSLO homeless shelter, three user categories can be identified, namely residents, administrative staff and health consultants, and kitchen staff. Their circulation throughout the space will be translated into a graph format from which the depth permeability may be understood.



Figure 4: Site plan and ground floor plan of homeless shelter



Figure 5: First-floor plan of homeless shelter

The Community Action Partnership of San Luis Obispo County (CAPSLO) aims to address issues of poverty and low-income groups. Designed by Gwynne Pugh Urban Design Studio, in partnership with Garcia Architecture + Design, the spaces are organized along a central spine from which users can be channelled into the many spaces (Winstanley, 2011). This site plan was designed by the researcher based on the assumption to provide material for analysis in this research. Figures 5 and 6, the homeless shelter is made up of two floors with the top floor being dedicated to dormitory space. The lower floor is more community-oriented with offices, a library, recreational zones, and medical and mental health consultancy spaces.

No.	Space	No.	Space	No.	Space
<b>G1</b>	Public entrance to the site	19	Lockers	43	Reading nook
<b>G2</b>	Back entrance to the site	20	Lockers	44	Sun deck
<b>P1</b>	Visitor parking	21	Office	45	Security counter
<b>P2</b>	Staff Parking	22	Waiting area	46	office
L	Loading area	23	Restroom	47	Family lounge
R	Recreational area	24	Medical exam room	<b>48</b>	Family dorm
1.	Main Entrance	25	Medical exam room	<b>49</b>	Shared kitchen
2	Reception	26	Mental health room	50	Private dormitory
3.	Dining Hall	27	Mental health room	51	Shared washroom
4.	Community room	<b>28</b>	Washroom	52	Female dorm lounge
5	Lobby	<b>29</b>	washroom	53	Female Dormitory
6	kitchen	30	Donation room	54	Women's washroom
7	Community enterprise	31	Mechanical room	55	Janitor's room
8	Front Office	32	Medical consultant office	56	Office
9	Office	33	Medical consultant office	57	Private dormitory
10	Preparation area	34	Children's classroom	<b>58</b>	Private dormitory
11	Loading-bay	35	Staff break room	59	Children's playroom
12	Refuse chamber	36	Main office	60	Play deck
13	Men's locker	37	Phone area	61	Shared washroom
14	women's locker	38	Mail/day storage	62	Shared washroom
15	women's washroom	39	Library	63	Storage
16	men's washroom	<b>40</b>	Computer area	<b>S1-3</b>	Staircase
17	laundry	41	Male dormitory	<b>C1-7</b>	Corridors
<b>18</b>	Janitor's room	42	Male dorm washroom		

 Table 2: List of spaces for the homeless shelter.

Table 2 gives the list of spaces for the homeless shelter with numbers corresponding to labels in Figures 4 and 5.

The residents have the most elaborate spatial networking, partly because their user category has been generalized to include all genders and resident types. The residents are divided by gender, with the inclusion of family units and dorms. Furthermore, there are also different spaces for sleeping, depending on the duration of the stay. Except for the spaces that are not for sleeping, the toilets attached to these spaces, and the gender-specific washrooms, the circulation for all types of residents is generally the same.



Figure 6: Space syntax graph showing residents' circulation through the CAPSLO homeless shelter

The graph Figure 6 reveals that C1 and C4 are the primary conduits from which a majority of the spaces are accessed. Despite the dorm rooms and sleeping areas being on a separate floor, the permeability lies at the same level as many spaces on the ground floor. This is because staircase S1 is at a low depth and S2 is at the same depth as C1. From a logical standpoint, it seems that the upstairs spaces have been made easily accessible to the residents, allowing them to go in and out without passing through too many spaces. This is an indication of good spatial organization that is optimized.

It is generally understood that the staff have free access to all spaces within a building. However, this graph is more representative of the kind of spaces that would typically be accessed by the staff in their day-to-day activity.





Figure 7, the dotted lines represent spaces that the staff are suggested to be able to enter freely but may not be directly related to their typical work routine. First of all, it is good to note that the staff have two parking areas and two suggested entrances into the building. It indicates greater control and access over the facility as compared to the residents. The staff can quickly access the back office from the parking (P2) via C3, then C2. C3 also allows them quick access to the above floor from the office (36) and P2. Quick access is also given to mental health consultants, whose offices (26 & 27) are directly accessible from the parking space, P1.

For residents, C1 acts as the primary corridor into many of the spaces. The private dorm rooms (50, 56, 57, and 58) have been excluded from this graph, assuming from the researchers' perspective that the spaces are private and only accessible by the residents of the room, except with consent. Given the temporary nature of the residents' stay, however, they will be able to access these spaces when the rooms are vacant. However, that is not the norm and therefore, has been excluded from the graph..

Figure 8, the kitchen staff has the simplest spatial structure of the three. However, they do have access to spaces exclusive to their roles in the building, save the administrative staff should there be an inspection or any other need for it. What sets the kitchen staff's spatial network apart is the access to the loading area 'L' and consequently the loading bay, 11 and the refuse chamber, 12.



Figure 8: Space syntax graph showing Kitchen Staff circulation through the CAPSLO homeless shelter

Given their role in the building program, the level of permeability goes only up to five on the scale of depth, as opposed to eight for administrative staff and consultants. Their work mostly takes place in the kitchen (6), the preparation area (10), and the dining/multipurpose hall (3). They are given access to the lockers, washrooms, and changing lockers along C1 labeled 19, 13, 16, 15, & 14.

Just like the administrative staff, they have two ways of entry into the building. The first is via the main entrance (1), and the second is through the loading bay (11).

# 6.2 Result Of Analysis: Wuliepoch Culture Center

In the long and narrow section, we have drawn up two axes, one pointing to Badachu and the other pointing to Xiangshan. These two axes are close to each other, unfolding the architectural landscape and the treatment of the elevation along the street. Shijingshan urban area in Beijing is located on the other side of the road.



Figure 9: First Floor Plan of Wuliepoch Culture Center



Figure 10: Second Floor Plan of Wuliepoch Culture Center

Along the axis of the bar, the bar, the bar, and the bar are arranged in turn. Among them, the cultural tea bar area is a ramp around the bar, crossing the children's room and the front desk leading to the skating rink, spiraling up to the VIP room on the second floor and the experience room of the motel room. Here, the streamline is turned to be 90 degrees vertical to the main axis of the building. On the ramp and during the access to the VIP room, the ice rink can be seen, and the space forms an interconnected whole.

After arriving at the VIP room on the second floor, the indoor corridor on the side once again leads the streamline to the outside. Visitors can continue to spiral up to the roof terrace on the top floor through the continuous roof ramp to enjoy the spectacular scenery of Beijing West Mountain.

#### 7 Discussion

**Capslo Homeless Shelter**: The most prominent finding from this case study is the use of a central spine to organize access into the many spaces of the building. C1 and C4 are the central corridors that funnel users into many spaces, as illustrated in the graphs. The graphs also reveal that the residents and staff have an almost identical level of complexity in their spatial organization, with each having access to different spaces on either floor. While circulation for the residents is more dominant on the upper floor, the staff have balanced access between both floors.

The homeless shelter also makes use of multiple entrances to define different paths for each user. The staff have been given a private corridor (C2) from which they may access their office

space. They are provided with a dedicated entrance and staircase (S3) for quick access to the building and upper floor. The first level gives clear emphasis on safety and security, with many control measures to maintain those aspects of the circulation. The central spine on the upper floor (C4) utilizes several subcorridors or transition spaces before channeling the user into the private dormitory spaces. This is perhaps to increase the level of privacy in those spaces, putting them an extra level higher on the scale of depth. The male and female dormitories and placed on either end of the building, ensuring no trespassing occurs in either space. A security counter is placed opposite S2 and in between the two gender-specific dorms, further reinforcing control and security. Table 3 presents a justified chart illustrating the levels of permeability, wayfinding, and hierarchical order.

Table 5. Justified Chart of Level of Fermeability and wayinding and Herarchy Older							
Level of Permeability	of Permeability Floor Level NO. of Spaces		Number	Percentage			
and Wayfinding	and Wayfinding			(%)			
Dublio/Vory Foou	Basement	Basement E1, E2, E3, E4, Bm, MEa, 3, 7, Sb4, Sb3, S0a, Sb2		18.2			
r ublic/ very Easy	Ground Floor	E5, Mb1, C1, C2, L1b, S4a, S2a	7	15.3			
			19	14.1			
	Basement M1, M2, M5, M6, M7, 4, 5, 6, 8, 9, 10, 11, T1, L1a		15	21.1			
Semi-Public/Easy	Ground Floor LB1, LB2, LB3, MEb, 12, 14, 15, 20, 21, 23, 24,		24	24			
		34, 37, 38, 39, T3, T4, S0b, S3a, S6a, S1a, S5a					
			56	53			
Semi-Private/	Semi-Private/Basement1, 2, Sb1DifficultGround FloorLB4, LB5, 18, 26, 27, 29, 30, 31, S6a		3	5			
Difficult			9	17			
			45	37			
Private/ Very	Ground Floor	25	1	1.6			
Difficult			1				
			15	21.1			
		Total	96	100			

Table 3: Justified Chart of Level of Permeability and Wayfinding and Hierarchy Order

**Wuliepoch Culture Center**: In the centralized building volume, the building roof ramp introduces a large amount of skylight into the interior, reducing the energy consumption of artificial lighting in the daytime. These spiral ramps have a profound impact on the indoor space and light changes, and the large number of spaces interspersed from these floor changes to achieve. The change of the swinging floor is finally expressed in the form of an "inverted West Mountain". The mottled warm color wooden ceiling pendants indicate the red leaf scene of the West Mountain in autumn. From the entrance to the ice rink, the color changes from warm color to white, this meets the needs of the real ice ground and the control of reverberation.

The indoor floor and wall materials are consistent with the outdoor materials, which are all made of concrete, and the indoor ramp also extends to the outdoors. In this way, the experience in this building is a large-scale flowing place without distinguishing space. The free streamline swings up and down, and you can see a panoramic view of Xishan Mountain from the interior.

# 8 Conclusion

Both case studies seem to embody a certain degree of segregation and focus in the spatial organization of each user group and their limitations of access are clearly defined. This is particularly helpful in buildings that are very community-oriented such as the ones in the case study. The case studies have a very different spatial organization with the shelter opting for corridors, whereas the WuliEpoch Culture Center uses the primary public area as the center of the space. Therefore, after the analysis of the layout of the WuliEpoch Culture Center of Science, the result shows that the overall building has been designed with proper consideration of the spatial arrangement. However, some of the spaces that should be considered as the public level are interspersed in some private spaces. Thence in overall, the space syntax of the whole building is quite good.

### 9 Availability of Data and Material

All information is included in this article.

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**Tang Siwen** is a Student of Master of Architecture in Housing, Building and Planning, Universiti Sains Malaysia (USM), Penang, Malaysia. She obtained her degree in Bachelor of Science in Architecture from the Infrastructure University Kuala Lumpur. Her research is about the Space Syntax Analysis of WuliEpoch Culture Center and Capslo Homeless Shelter.



**Dr. Yasser Arab** is an Assistant Professor at the Department of Architectural Engineering, College of Engineering, Dhofar University, Oman. He obtained his Bachelor of Architecture from Ittihad Private University, Aleppo, Syria. He obtained his Master's and PhD in Sustainable Architecture from Universiti Sains Malaysia (USM), Penang, Malaysia. His research focused on the Environment Performance of Residential High-Rise Buildings' Façade in Malaysia. He teaches Studio for first-year students and is involved in supervising students of Master of Architecture and Urban Design. He is a Registered Architect in the Syrian Engineers Union.



**Piyaporn Thurakitchamnong** is a Lecturer at the Department of Architecture and Urban Planning, Faculty of Architecture, Rajamangala University of Technology Srivijayaand, Thailand. She got a Bachelor of Science degree in Technical Education (majoring in Architecture and Design Education) and a Master of Science in Technical Education (majoring in Architecture Education) both from the School of Industrial Education and Technology, King Mongkut's Institute of Technology Ladkrabang, Thailand. Her works encompass Architectural Design and Architectural Conservation, focusing on Buildings and Historic Towns, as well as Product Design & Graphics.



**Professor Dr Ahmad Sanusi Hassan** is a Professor in the Architecture Programme at the School of Housing, Building and Planning, Universiti Sains Malaysia (USM), Penang, Malaysia. He obtained his Doctor of Philosophy (PhD) degree from the University of Nottingham, United Kingdom. His research focuses on Sustainable Architecture and Urban Design Development for Southeast Asia, History and Theory of Architecture, Daylighting and Thermal Comfort.



**Nimit Tounnawarat** is an Assistant Professor in the Department of Civil Engineering, Faculty of Engineering, Rajamangala University of Technology Krungthep, Thailand. He got his Master's degree in Civil Engineering from Thammasat University. His research is integrated within the fields of Civil Engineering and Technology.



**Dr.Bhattraradej Boonsap Witchayangkoon** is an Associate Professor in the Department of Civil Engineering, Thammasat School of Engineering, Thammasat University. He received his B.Eng. from King Mongkut's University of Technology Thonburi with Honors. He continued his PhD study at the University of Maine, USA, where he obtained his PhD in Spatial Information Science & Engineering. His interests involve Applications of Emerging Technologies to Engineering.