

EMBRACING THE CHAOTIC STREET VENDORS THROUGH ADAPTABLE AND PERMEABLE MODULE CONFIGURATIONS

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ABSTRACT: The fact that the formal sectors had not been able to accommodate workers implied the importance of informal sectors, one of which was street vendors. Embracing irregular occupancy in public spaces—usually within large numbers, street vendors were a phenomenon of informality that most of the time treated as damage to the city's image. Their chaotic expressions were currently resolved by relocating into specific areas, sometimes to no avail, and creating permanent spaces that tended to be monotonous, such as a kiosk. This study aimed to create an order by configuring street vendors into modules based on their characteristics and temporary activities while preserving their informal identity within their context. The concept of permeability and adaptability provided a qualitative approach to support pedestrian flows needed by the street vendors. Observations exposed the ever-changing street vendors' habits; at the same time, visual questionnaires revealed that the distinction of the street vendor was related to consumers' visibility and perception of their prominent informal identity. Explorations of module configurations utilize Rhinoceros and Grasshopper to get design strategies. The results are high visibility, a high level of physical accessibility, good access points, a grouping system, and spatial relationships within the context they occupy. These results were supported by analyzing visibility and connectivity using depthmapX. In order to create a practical configuration, the study was held in a chosen site of a commercial area in West Jakarta, in which street vendors occupied the area permanently and had regular pedestrian flow. The result would create a new layer in the street vendor center, which was inclusively accessible within its context while framing each of the vendors' informal identities. The implementation of this study would be an alternative solution in public spaces where cities coexisted with informality.

KEYWORDS: street vendor, adaptability, permeability, module, configuration

RESUMEN: El hecho de que los sectores formales no hayan podido acomodar a los trabajadores implica la importancia de los sectores informales, uno de los cuales es el de los vendedores ambulantes. Aceptando la ocupación irregular de los espacios públicos, por lo general en grandes cantidades, los vendedores ambulantes fueron un fenómeno de informalidad que la mayoría de las veces se trató como un daño a la imagen de la ciudad. Sus expresiones caóticas se resolvieron actualmente reubicándose en áreas específicas, a veces sin éxito, y creando espacios permanentes que tendían a ser monótonos, como un quiosco. Este estudio tuvo como objetivo crear un orden mediante la configuración de los vendedores ambulantes en módulos en función de sus características y actividades temporales, preservando su identidad informal dentro de su contexto. El concepto de permeabilidad y adaptabilidad proporcionó un enfoque cualitativo para apoyar los flujos de peatones que necesitan los vendedores ambulantes. Las observaciones expusieron los hábitos en constante cambio de los vendedores ambulantes; al mismo tiempo, los cuestionarios visuales revelaron que la distinción del vendedor ambulante estaba relacionada con la visibilidad y la percepción de los consumidores de su identidad informal prominente. Las exploraciones de las configuraciones de los módulos utilizan Rhinoceros y Grasshopper para obtener estrategias de diseño. Los resultados son una alta visibilidad, un alto nivel de accesibilidad física, buenos puntos de acceso, un sistema de agrupación y relaciones espaciales dentro del contexto que ocupan. Estos resultados fueron respaldados al analizar la visibilidad y la conectividad usando depthmapX. Con el fin de crear una configuración práctica, el estudio se llevó a cabo en un sitio elegido de un área comercial en el oeste de Yakarta, en el que los vendedores ambulantes ocuparon el área de forma permanente y tenían un flujo peatonal regular. El resultado crearía una nueva capa en el centro de vendedores ambulantes, que era inclusivamente accesible dentro de su contexto mientras enmarcaba la identidad informal de cada uno de los vendedores. La implementación de este estudio sería una alternativa de solución en espacios públicos donde las ciudades conviven con la informalidad.

PALABRAS CLAVES: vendedor ambulante, adaptabilidad, permeabilidad, módulo, configuración.

1. INTRODUCTION

The informal sector is defined as an economic activity that is not officially registered to the government nor does not pay taxes [1]. This sector is a workplace for people who could not find work within formal sectors, usually with lower education [2]. Street vendors are one inseparable phenomenon from the informal sector. Street vendors are traders who, in their business, occupy locations that do not belong to them nor are designated as places of business, such as roads or sidewalks [3]. They usually use instruments that are easy to move and dismantle [4]. Due to their practice of occupying public spaces, the government provides a solution by relocation. However, this solution faces challenges that have not achieved its full potential as the street vendors keep returning to their original locations.

The decreasing interest of street vendors to move and their decision to settle in the original locations are mainly caused by the dropping income in the relocation area. The area chosen often does not pay attention to the potential context, accessibility, and pedestrian traffic. The lack of attention to context may lead to another phenomenon, for example, renting a formal kiosk as a warehouse [5]. On the other hand, formalizing street vendors in relocation areas as a kiosk also causes the loss of their informal identity. The formalizing acts tend to create uniformity among the street vendors, although each has its own identity and characteristics in carrying out trading activities. These characteristics are categorized based on their behavior, such as distribution patterns, service patterns, trading facilities, commodities, time, location, and users [6]. However, the existence of street vendors is generally assumed damage to the harmony of space; thus, they need to eliminate.

The described issues are closely related to the irregular occupancy of street vendors, causing the impression of slums that degrade the image of the occupied area. This issue is explained by the tendency of street vendors that are chaotic, disturbing orderliness, taking up road space, and reducing the comfort of other users [7]. The diverse yet unorganized characteristics of street vendors become a factor that emphasizes its presence as an 'out-of-place' element in urban areas [8]. Nevertheless, the existence of street vendors in urban areas is unavoidable as there is always demand from the public, prompting their appearance to follow core activities with many potential consumers. Therefore, the solution to eliminate street vendors to achieve orderliness and harmony is not always the best option.

The irregular pattern within the informal characteristics of the street vendors will be translated into a parameter embodied in design through a spatial module strategy approach. This 'order in chaos' will be achieved using the concept of adaptability and permeability in architecture. This concept is considered suitable for the temporary habit of street vendors that requires

a space that could adapt and the need for pedestrian traffic that brings consumers. Thus, research questions are raised as follows:

1. What are the parameters in street vendor modules based on the characteristics of trades?
2. How to generate design strategies for street vendor modules using the concept of permeability and adaptability?

This study aims to produce a design strategy for street vendor centers based on the configuration of modules using the integrated concept of permeability and adaptability. Arranging street vendors' modules in their space would maintain orderliness and informality characteristics. The resulting module design strategies could be an alternative approach to problem-solving.

2. ADAPTABILITY AND PERMEABILITY FOR STREET VENDORS

Conflicts and changes in space function due to the appearance of street vendors are causing them to be seen as disturbing elements that are not 'in-place' [8]. The term 'out-of-place' is explained as an object that can not meet the criteria so that it becomes imperfect and risks damaging the environment it occupies [9]. However, the 'out-of-place' theory asserts that street vendors are likely to become 'in-place' elements depending on the surrounding context. It is essential to consider the space occupied by street vendors to create order while preserving informality that integrates with the surrounding context. Therefore, relevant studies are conducted on the research, consisting of the characteristics of street vendors, the concept of adaptability, and permeability.

2.1 Street vendor's characteristics

Street vendors spread in two main patterns: focus agglomeration (clustering) and street concentration (linear) [6]. The pattern of street vendors' service is divided into three main groups: mobile, semi-permanent, and permanent [6]. The trading facilities used by street vendors vary widely and depend on the activities and commodities being sold. In addition, they are categorized into five types, namely pikulan, gelaran, gerobak, semi-permanent warung, and kiosk [10]. Street vendors provide services to all economic classes so that consumers' perception determines how street vendors exist. Thus, the variables that influence consumers' perceptions include the level of comfort, strategic location, accessibility, and trading commodities [11].

Street vendors tend to operate by adjusting to the rhythm of daily activities, following the community's character in the locations they occupy [6]. The impact is a difference in operational time between street vendors and their occupants. How-

ever, some street vendors rely heavily on the relationship between shops and markets around their trading location, causing their service time to vary based on the behavior of formal sectors [12].

2.2 Adaptability concept in street vendor’s modular system

Adaptability is the ability to respond to various users, functions, and space requirements without making significant changes to the activities and space occupied [13]. The concept of adaptability can be achieved by an independent design layer system in which each part operates as a separate component. The layer system allows the addition, replacement, and subtraction of one component without affecting the entire system [14]. Another term is modular construction, a way of building with components usually produced off-site and assembled on-site according to the arrangement or placement [15]. Based on the study above, the adaptability and the street vendor modular system are described through six layers: structure, skin, service, space plan, and stuff [16]. This study will cover and emphasize structure, skin, and space plans. Each component could be approached through a modular system according to the characteristics and space requirements of the street vendors. It could then be constructed and installed to form adaptive street vendor modules.

2.3 Permeability concept within street vendors

As the street vendors serve all classes and types of people, ensuring the space they occupy is inclusive. Inclusive spaces accommodate various community groups—socially, physically, and perceptively—regardless of age, gender, cultural background, economy, ethnicity, and belief [17] [18]. This quality of space could be achieved through permeability. Permeability is a measure of movement that allows one to choose access by the connectivity of the system route [19] [20]. Perceptually and functionally, the space should be easy to understand, safe, comfortable, diverse, attractive, and easy to reach in terms of accessibility [21]. Aspects that affect the quality of permeability can be seen in table 1.

Table 1. Permeability parameter, adapted from [19]

Quality	Description	Parameter
Permeability	Refers to accessibility that allows a person to choose his or her access to a place.	Visible
		Physically accessible
		Hierarchical layout
		Segregated pedestrian and vehicle
		Many access points
		Link to surroundings

A strategic location can be achieved through a complementary approach with the formal shops in the area. The existence of the formal sector will attract street vendors and pedestrians.

At the same time, the existence of street vendors will attract other street vendors. Likewise, the existence of pedestrians attracts others. Street vendors need consumers from formal sectors such as shops (‘large magnets’) and vice versa [19] (see figure 1 - left).

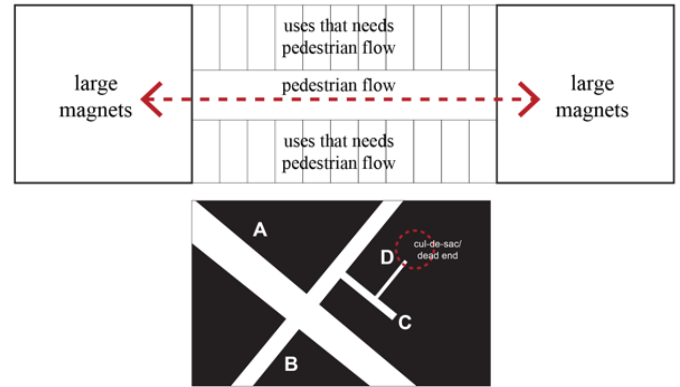


Figure 1. (Left) Concentrated pedestrian flow; (Right) Hierarchical layout, adapted from [19]

Street vendors in groups also tend to attract greater attention, thus, increasing visibility and consumers. Diverse groups allow a more inclusive, attractive, and visible space [22]. On the other hand, the space should not form any dead ends as a hierarchical layout. The cul-de-sac form will reduce permeability due to the formed dead-ends [19] (see figure 1 - right).

In the context of street vendors, dead space is crucial as vendors could not find consumers with no pedestrian flow. Dead space is created if the circulation is too wide or too narrow. If the circulation space is too wide, consumers tend to gather only on one side. On the other hand, circulation that is too narrow creates a crowd. The ideal circulation size should be 1.5 – 2 m wide to avoid dead spots with the line of traders 18 – 25 m long [23] (see figure 2). Thus, the hierarchical layout that creates dead space needs to be avoided from the presence of street vendors.

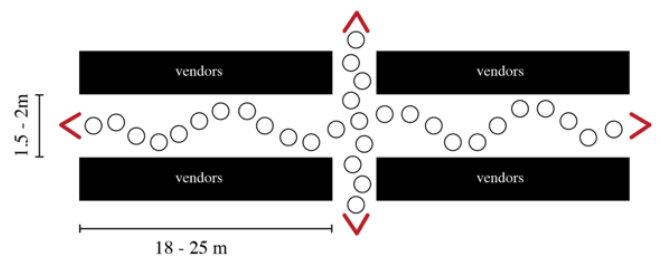


Figure 2. Ideal street vendor’s space dimension, adapted from [23]

Access points and links to the surroundings emphasize the number of access to the space occupied by street vendors, thus enabling vendors to be reached within a shorter distance. The

number of access points that connect between places allows the space to adapt easily to surrounding functions [19]. This ability is essential to the street vendors because of their dynamic activity, such as occupying one specific space that changes at different times by different vendor types. It is then concluded that the concept of permeability is vital to accommodate street vendors' activities.

3. METHODOLOGY

Research methods were done by observations, visual questionnaires, and explorations. Analysis was done on the collected data, resulting in criteria as a base to explore street vendor modules. The explorations will be affected by qualitative parameters studied in the previous point. It consists of visibility, accessibility, hierarchy, access points, and visual perception of the street vendor characteristics and activities.

3.1 Data collecting method

The study was first done through observation. This phase includes observing street vendors' activities throughout the day and spatial elements based on the trading type of equipment. The research was conducted in Jakarta, precisely in Glodok Chinatown and Pasar Pagi Asemka. These locations are chosen due to the variety of diverse street vendors in activities, trading instruments, commodities, service patterns, and spatial relations between vendors. The observation is carried out by observing the pattern of street vendor trading activity, starting from preparation, activities during trading, perception of the consumer, and spatial elements occupied during the trade. The resulting analysis will determine space criteria for the street vendor module explorations.

The second method was a visual questionnaire containing visualization choices and open-ended questions. Visual questionnaires were distributed to 65 respondents who had at least a few times. Consumer perception is an essential aspect in this study to understand the qualitative impact of the informal street vendors—including characteristics, ways of trading, and equipment—concerning the permeability and adaptability concept. These two methods are complemented by in-depth interviews with several subjects with the aim of a more profound and vivid answer related to the research or if any anomalies are found.

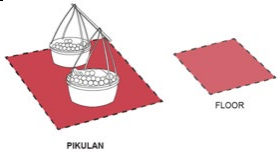
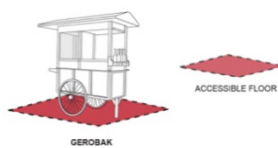
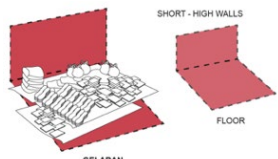
The third method is exploration. Utilizing Rhinoceros, Grasshopper, and DepthmapX, exploration is done on a 5x5 grid of 2.5x2.5 m, which is later divided into circulation and vendor modules. The grid is chosen to limit the number of the vendor in one module. Exploration is carried out in three stages. First, based on visibility and access points criteria, obstacles are placed on the grid in the form of 'walls'. This 'wall' is assumed to be a manifestation of the trading instruments that should not block one another in terms of visibility. Second, the exploration is done on the curated results from the first stage

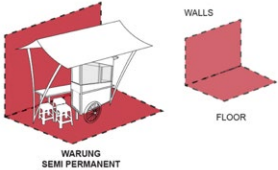
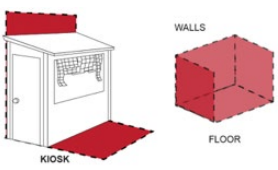
with visibility, accessibility, and hierarchy. The location of an obstacle is a controlled variable at this stage. However, height is the independent variable that is changed to create varying results. The last stage is inserting the possibility of street vendors that'll occupy the space depending on spatial elements applied to the module. These three stages will be analyzed and selected based on theoretical studies, observations, and questionnaires that have been carried out.

3.2 Data analysis method

Through the observations, it is found that every street vendor requires a high level of visibility to attract consumers. Street vendors must be visible to consumers; thus, they can identify them in their informal form. These five criteria will be the basis for exploring the modules. The results of the observations are concluded through table 2.

Table 2. Observation conclusion of street vendor characteristics.

Instruments	Spatial elements	Description
<i>Pikulan</i>		<ul style="list-style-type: none"> - No special instruments are required - Mobile to semi-static type - Waiting or approaching consumers - Non-permanent - Space requirement: 1 - 2 m²
<i>Cart (Gerobak)</i>		<ul style="list-style-type: none"> - Instrument: cart - Dominantly mobile type - Waiting or approaching consumers - Wheel access is essential - Space requirement: 2 - 4 m²
<i>Gelaran</i>		<ul style="list-style-type: none"> - Instruments: mat, wood plank, box, hanger, shelf, chair, etc. - Semi-static type - Dependant on pedestrian flow - Non-permanent instruments - Wall elements are essential - Space requirement: 2 - 8 m²

Instruments	Spatial elements	Description
Semi-permanent <i>warung</i>		<ul style="list-style-type: none"> - Instruments: cart, mat roof - Semi-permanent to permanent type - Dependant on pedestrian flow - Wall and roof elements are essential - Space requirement: 5 - 8 m²
Kiosk		<ul style="list-style-type: none"> - Instrument: kiosk - Permanent type - Dependant on pedestrian flow - Wall and roof elements are essential - Space requirement: 2 - 4 m²

On the other hand, the visual questionnaire result concludes that most respondents chose the visualization of street vendors as an easier to perceive an image. The main reason is the familiarity and habit of seeing street vendors in the informal form with their trading instruments. Tenants within food courts are considered less effective by the respondents than seeing street vendors by their distinctive identity. Based on the answers, the three main elements that influence the identity of street vendors are text, trading instruments, and commodities. In conclusion, the questionnaire shows that informal characteristics of street vendors are crucial in invisibility to consumers as it is easier to find, see, and distinguish one vendor from another.

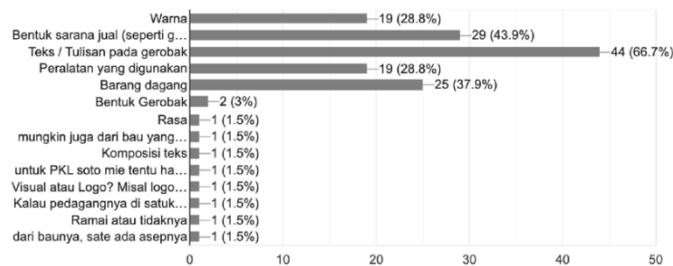


Figure 3. Percentage of respondents in distinguishing street vendors, based on the respondent using Google Form.

The exploration begins by simulating relationships between trading instruments based on spatial elements and physical accessibility. This exploration will form the possibility of various vendors occupying the same space at different times. The main result divides the module space into three possibility zone: mobile, static and temporary; static and permanent. The use of low walls can help security factor for gelaran type. Walls and roofs are needed for semi-permanent stalls and kiosks. An accessible flat floor element is the primary criteria for street vendors with carts, while elevated floorings are used by pikulan and gelaran

types. Thus, the relationship between street vendors is important for module configurations. Three configurations were selected and considered the most suitable for street vendors to occupy. The explorations are then supported by isovist analysis, accessibility, access points, and the possibility of types of street vendors that can occupy each module (see figure 4).

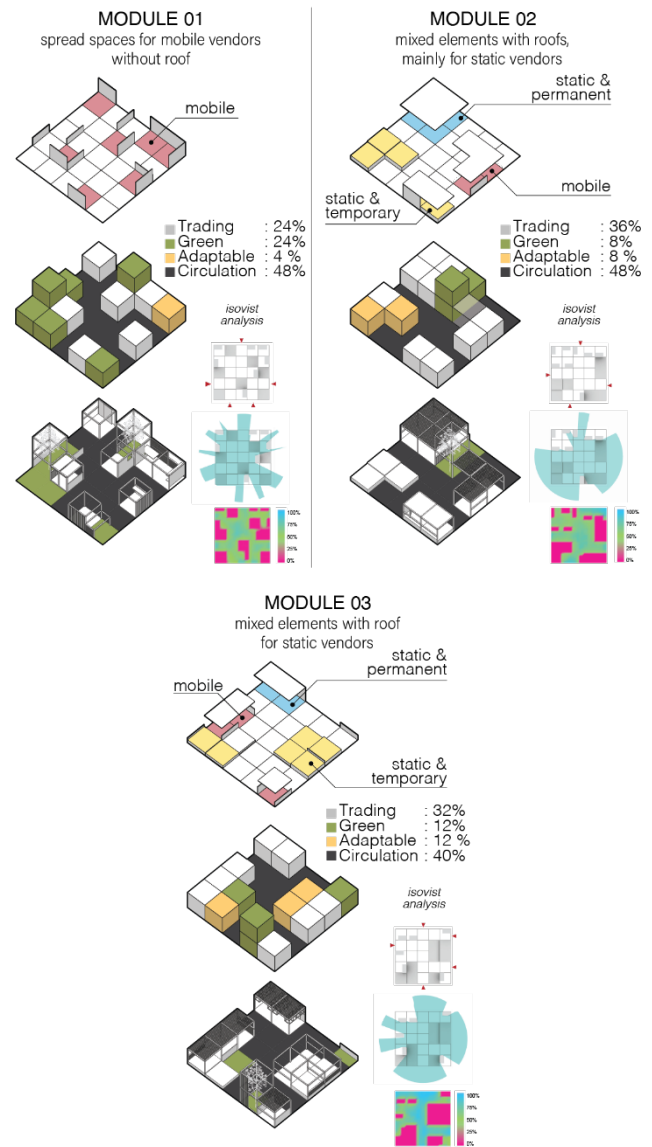


Figure 4. Street vendors' module configuration explorations

In conclusion, the conducted methods support the theory of permeability and quality of space through visibility, accessibility, hierarchical arrangement, and access points. It is also important to notice the informality of street vendors that stands as a unique character from the consumer's perspective. The identity of street vendors is formed by their informal characteristics

related to consumers' perception and visibility. These qualitative criteria will affect how street vendors should remain visible to their consumers. Therefore, module configurations have the main objective of establishing order while highlighting the informality of street vendors.

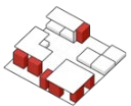
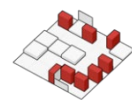
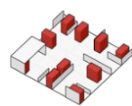
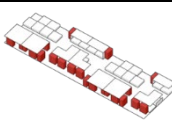
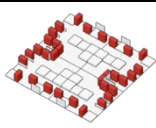
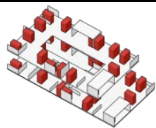
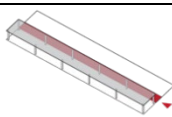
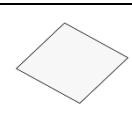
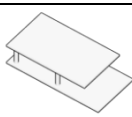
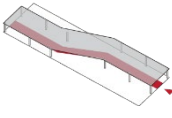
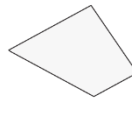
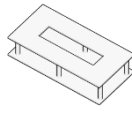
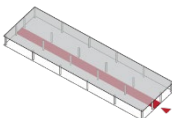
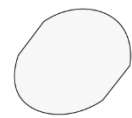
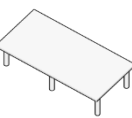
4. RESULT AND DISCUSSION

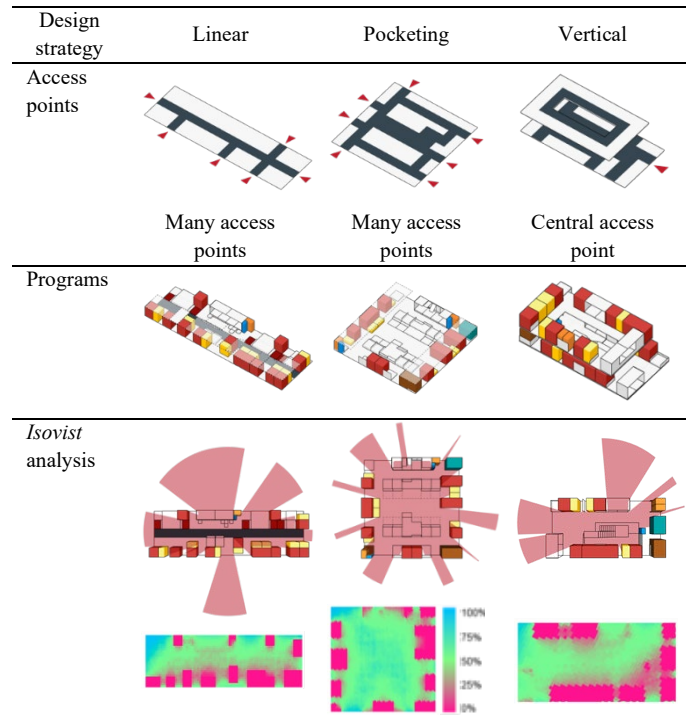
The design strategy will give an alternative approach to the chaotic characteristics of street vendors through the permeability and adaptability concept. The concept of permeability emphasizes the integration between street vendors and pedestrians. At the same time, the concept of adaptability emphasizes the spatial function of the street vendors' modules. Therefore, the following design strategy for street vendors will hold the ability to be implemented depending on the context.

4.1 Spatial planning strategy with permeability concept

This design strategy will answer the issue of the spatial configuration of street vendors. These strategies could be implemented when faced with a different context. The resulting strategies are divided into three types: linear, pocketing, and vertical (see table 3).

Table 3. Street vendor spatial strategy.




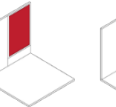



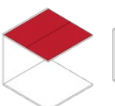



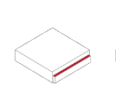
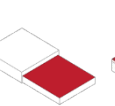
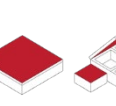
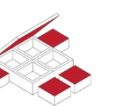
Design strategy	Linear	Pocketing	Vertical
Module type	 Module type 03	 Module type 01	 Module type 04
Module configuration	 Linear configuration	 Grouping configuration	 Vertical configuration
Implementation strategy	 Mostly open	 Rectangular site	 Mezzanine type
	 Half-open	 Asymmetry site	 Through type
	 Covered	 Round site	 Elevated type



4.2 Spatial elements strategy with adaptability concept

The spatial element strategy covers on a micro-scale, the smaller modules that street vendors occupy. This strategy also answers the issue of space function that different street vendors occupy throughout the day with the concept of adaptability. Each spatial element will be described through strategy recommendations in creating a space that is able to accommodate the temporary activities of street vendors (see table 4). This strategy recommendation can be implemented depending on space requirements. For example, the same space is occupied by various street vendors from time to time. Therefore, the explorations showed possibilities of adaptable spatial elements function, such as a foldable wall, extendable floors, and foldable shelf.

Table 4. Street vendor spatial elements strategy.

Spatial elements	Strategy implementations				
Wall					
Roof					
Floor					

This strategy plays a role in the micro context as an approach to various types of vendors with their needs. Each element can also then be collaborated to create unique modules based on the needs of the street vendors within the context.

4.3 Street vendor module scenario

The recommended design strategy is to 'scatter' street vendor modules into several locations, on a smaller scale, within one sequence. Instead of configuring many modules to gather traders at once, the strategy implies dividing the modules into smaller sizes and turning the context into a sequence of pedestrian flow. By guiding the pedestrian from one point to another, this design approach with permeability concept will create an order in vendors, within the context they existed, yet without losing their informality. Figure 5 describes an example of a layout that has been analyzed using Space Syntax.

density, street vendors modules can be placed to encourage pedestrians from busy roads to less crowded streets. This strategy will encourage an increase in the flow of consumers to these street vendors' locations (see table 5).



Figure 5. Scattered street vendor design modules.

Table 5. The design strategy of street vendor pockets.

Configuration strategy	Isovist analysis	Integrated program & sequence strategy
<p>5 focus agglomeration</p>		
<p>4 focus agglomeration</p>		
<p>3 linear</p>		
<p>2 focus agglomeration</p>		
<p>1 linear</p>		

5. CONCLUSION

Street vendors are generally seen as out-of-place elements caused by their chaotic and irregular nature of occupying space. On the other hand, the street vendors cannot be separated from informal trading activities, specific to their distribution patterns, service patterns, instruments, time, location, and commodities. This is one reason why street vendors lose their identity when being formalized. The identity of the street vendor is crucial to be preserved in the resulting design strategy. Therefore, the strategy should find patterns in the irregularity of the street vendors and arrange them in the form of modules. The modules arranged through adaptability and permeability could maintain some qualities. The qualities include order, pedestrian flow, consumers, limiting vendors number, and creating a sustained informality in the urban area without evicting them.

The research begins by examining the characteristics of street vendors. Then the study covers theories regarding out-of-place elements, the concept of adaptability, and permeability. Through this study, it is concluded that several criteria support the exploration method and design strategy. These criteria answer the first issue, where the street vendors module will be created based on trading instruments, integrated with permeable and adaptable quality. The observation and questionnaires then support the theoretical study by producing criteria such as space programs, spatial elements, and activities. The method is followed by exploration using Rhinoceros and Grasshopper to produce modules. A design strategy is produced, consisting of spatial planning, spatial elements, and a spatial module strategy scenario integrated with the concepts of adaptability and permeability. The design strategy is divided into several aspects and can be implemented separately depending on space and context requirements.

The resulting design strategy is a guideline for the alternative approach for the street vendor who lost their identity during transformation or relocation. This strategy will answer the third issue, in which module configurations will create order in the chaotic nature of street vendors without eliminating their informality. The resulting configuration strategies are of three types: linear, pocketing, and vertical. This design strategy is expected to be an alternative solution without the need to eliminate street vendors, transform vendors, and relocate them. On the other hand, this design strategy seeks order in street vendors without losing their way of doing as street vendors. Therefore, this design strategy must be integrated adequately to accommodate the activities of the PKL.

The design strategy is generated through criteria that are analyzed using isovist to show that the module configurations do not block each other from the consumer's point of view and physical reach. With this concept, it is expected that each ven-

dor has the same possibility to be viewed by their potential consumers. This concept creates a new layer in the later designed street vendor centers, where consumers can reach all street vendors at ease and visible with all the familiarity of instruments and activities. Finally, this design strategy has its strength in street vendors arrangement without losing its identity as an informal sector.

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