Study of public seating facilities with behavior and activity approaches on pedestrian street Ir. H. Djuanda Bandung

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Abstract. This research is motivated by the large number of public furniture, especially the means of seating on the pedestrian that is not functional, out of place and even unused. The expected result is finding criteria for suitable seating facilities design tendencies so that it can meet the needs of pedestrian users. The area which is the case study is the pedestrian of Ir. H. Djuanda street which is one of the icons of Bandung City. Three theories about human behavior according to Elizabeth D. Hutchison, Christopher Alexander and Edward T. Hall are used as an approximation method to observe users activities in pedestrian Ir. H. Djuanda street. In this study, the pedestrian Ir. H. Djuanda street with the boundaries of the area used as a car free day areas (from Simpang Dago to Layang Pasupati Underpass).

Keywords: Design criteria, Seating facilities, Pedestrian, Ir. H. Djuanda street

1. Introduction
According to the Big Indonesian Dictionary, the meaning of society is a number of humans in the broadest sense and are bound by a culture that they consider the same. Meanwhile, according to TejoyuwonoNotohadiprawiro [1], society is a group of people who are bound by, or who bind themselves to, a certain principle of life. Pedestrian is the main part of an urban community. In fact, sometimes, it can give its own characteristics to the city environment. Pedestrian facilities should develop according to the human needs of its users. Therefore, to accommodate these activities, pedestrian public facilities (public facilities) are needed. Public facilities are usually located in public spaces, namely spaces that can accommodate the interests in the public or the general public, for example communicating with colleagues, informal gatherings of certain communities, playing, sightseeing, looking at parks and greenery, just seeing people passing by or paying attention activities of people around the space [2]. Whether we realize it or not, the image and identity of an area in a small or larger scope plays an important role in urban life. Apart from being a means of identifying an area, image and identity will also have an influence on user behavior patterns, especially regarding the environment in which they are located [3]. This paper departs from problems of the psychological and physical interaction of users with the design of pedestrian public facilities and their environment which will then be directed to good design criteria to be applied.
2. Methodology

Three theories about human behavior according to Elizabeth D. Hutchison, Christopher Alexander and Edward T. Hall are used as an approximation method to observe users activities in pedestrian Ir. H. Djuanda street.

The science of human behavior includes three main objects, namely humans, environment and time. Human psychological condition has a reciprocal relationship to human behavior. Elizabeth D. Hutchison describes aspects of human behavior among American social workers in her book entitled Aspects of Human behavior, Personal, Environment and Time [4].

In the personal dimension, human behavior is an interaction between biological, psychological and social systems. The personal, environmental and time dimensions move dynamically and simultaneously. The three aspects: Personal, environment and time are discussed one by one in Elizabeth D. Hutchison's book, however, each aspect cannot stand alone without the other. Elizabeth D. Hutchison argued that the study of human behavior is a multidimensional science, which develops through various sources of effect. However, he also argues that research on each dimension can produce statements by changes in attitudes and functions as the personal towards the environment [4].

Christopher Alexander is an architect and researcher. Currently he is a lecturer at the Institute for Environmental Structure at the University of California since 1963. His latest book, Nature of Order, is the culmination of his research on humans and their relationship to nature. It is clear about the title of the book, that the content of the discussion of the book goes far beyond architecture itself. In essence, he discussed the unity of how humans and their surroundings form life. Nature of Order contains the concept of his research on the importance of the interaction (relationship) between functional elements and aspects of human behavior so that natural and non-natural factors can interact in a balanced manner and flow well. Christopher Alexander explains the importance of the role of a designer to see the original culture of a place before he designs the environment. Because initially, the environment has been designed by indigenous people unselfconsciously. If the environment is designed by someone from outside the environment (self-conscious) and without seeing the characteristics of the humans who live in it, there will be no balance between the objects of the environment and the humans in it [5].

Research on how people use space was also carried out by Hall [6] with the title The Hidden Dimension and The Silent Language. He made a very sensitive observation, namely how distance affects the communication received by each person. The observation is a measure of the distance between humans and other humans so that it can interpret social relationships that maintaining distance are "coldness", whereas the closer the distance means "friendliness". Furthermore, the observations made lead him to the conclusion that culture also influences the definition of a distance between individuals.

Those theories are used in observation step according to environmental dimensions, time dimensions and personal dimensions, and the results are 15 design principles references about seating facilities from human behavior aspects and produce the tendency of seating facilities design.

3. Theoretical Review

Amenity Comfort – In research on behavior, there are several aspects that can be found in behavior when the researcher has finished making observations. These aspects can be found from various data that have been collected by many researchers. One aspect that was found was the existence of behavior arising from various stimulants in the environment. If an area is found to have less or maybe more stimulation, it will cause abnormal behavior, caused by abnormal stimulation [7]. Lack or excess of stimulants can be caused by the improper design
or arrangement of the site. When the place lacks light, there is no fresh airflow, people will tend to feel bored faster or even fall asleep. However, if on the other hand, the place is too bright or the noise level is very high, it will cause distraction and stress levels to the user.

The variables that determine convenience itself are

- There are facilities that support the activities of public space users.
- Tailored user groups that make the most of public spaces.
- Supports psychological comfort to the environment, especially when it is used both against sunlight, wind and so on.
- A balanced design between expressions of visual art and functionally as a place for social interaction.
- Supporting physiological comfort is seen from the suitability of the integration of scales and shapes that is closely related to the human scale.

**Variation (Contrast)** – The aspect of variation (contrast) is one of the general criteria for public facilities according to the Urban Design Plan San Francisco 1970 [8]. The principle of variation or contrast is directed at the arrangement and shape of the model which is the center of attention to an area (point of interest). The elements of variation (contrast) differ from each region. Objects of the form of sculptures, attractive seating designs, are also elements of variation (contrast) that can attract the user's attention.

**Spatial Role** – Non-verbal communication can be found in a person's sitting position or posture and describes the "role" of the relationship (spatial) between individuals. Various kinds of spatial roles that can be found are confronting roles, consorting roles, conversational roles and co-existing roles. Confronting roles is an attitude to two or more people sitting opposite each other and having two different opinions (arguments). Usually the two of them see things from different points of view. In those situations, people usually want to sit across from each other, so they can see each other's faces and try to dominate the conversation. This situation is also found when two people play chess (game), they automatically sit facing each other and it is impossible for them to sit side by side. In contrast to confronting roles, consorting roles is attitudes to two or more people who organize themselves in order to see an object from the "perspective" or the same opinion. Usually, this kind of spatial role will form a sitting pattern side by side. If the available seats are seats facing each other, they will look for the seats that are closest to each other. Another pattern that is not so different from consorting roles is conversational roles. In this pattern, people want to communicate by talking and seeing each other's faces. Conversational roles describe two people that are sitting opposite each other but are not in contention, but receive each other's input. A co-existing role is a sitting pattern that is usually formed by people that don't know each other in a room. For example, on a train that are not fully occupied by passengers per line. Most people will seek a separate sitting position where eye contact is avoided as much as possible.

**Area Flow (Cross) Road and Non Flow** – Based on observations, it was found that the characteristics of users prefer to sit in a shady area such as under a tree even though it is not hot and rainy. Consideration of the cross-road area for people is very important to make and place a seat. In the case of sitting on the pedestrian of Ir. H Djuanda is basically in the cross-person area.

**Self conscious and Un-Selfconscious Design** – Some form into human behavior sometimes appear purposeful, have specific intentions that are clearly fixed on one object. Other behaviors appear to have no specific intentions or goals and are difficult to describe. A room can hold one of the two types. This can be observed from daily activities at home, such as cooking and resting. Cooking has a process and a goal to be produced, namely food. Therefore, this activity requires good light, a clean area, cupboards, and easy access to storage of cooking ingredients. In contrast to resting activities, everyone has their own criteria for the environment so that they can rest in a relaxed manner. This can also be seen in
the real case of pedestrian seating on Ir. H. Djuanda street. Some sitting facilities designed for a specific purpose but not used for their intended purpose have been neglected. However, there are also areas that are not designed as “comfortable” seating but are used.

**Sociofugal and Sociopetal Sitting Pattern** – Usually the sitting facilities made around the tree tend to form a sociopetal sitting position (facing each other) to casually discuss or tell stories while the sociofugal sitting pattern is the opposite sitting patterns. Sociofugal and sociopetal factors are one of the important factors because they can affect the use or disuse of these sitting facilities if they do not match the sitting attitude in that place.

**Harmony Compatibility** – The element of harmony / suitability is also one of the general criteria for public facilities in the San Francisco Urban Design Plan 1970 [8]. The principle of harmony / compatibility emphasizes the harmony of the design of public facilities with topography, be it a matter of scale or suitability of mass.

**Fixed Featured Space and Semi-Fixed Featured Space** – Edward Hall identifies three basic types of spatial patterns as follows [6]: Fixed-feature space, that is, a room with a fixed boundary that is relatively fixed and not easily moved, such as massive walls, windows, doors or floors. Semi-fixed feature space is a space where the divider can move. An informal space is a space that is formed only for a short period of time, such as a space formed when two or more people gather. Thus, it needs to be realized that in behavior setting design it is not always necessary to establish fixed spaces, either with fixed or semi-permanent boundaries. A lot of space is actually formed when it is needed for a particular activity.

**Personal Distance** – Edward Hall [6] argues that personal space is a communication distance, where the distance between individuals is also the distance to communicate. In controlling existing disturbances, humans regulate their personal distance from other parties. Hall divides the distance between four types, namely:

- **Intimate distance**: close phases and distant phase (15.24-71.12 cm) Distance to embrace each other, a friend or family member, etc.
- **Personal distance**: close phases (45.72-76.2 cm) and far phase (76.2 cm- 1.2 m) Distance between conversations with two friends or between people who are already close to each other.
- **Social distance**: close phase (1.2-2.13 m) and far phase (2.13- 3.65 m). This is the normal limit of individuals with similar activities or the same social groups.
- **Public distance**: close phases (3.65 - 7.62 m) and far phase (more than 7.62 m) For more formal relationships such as lecturers in front of class or actors with their audience.

**Territory** – Territory is a condition that is built either directly or indirectly by someone. This situation is related to privacy from the activities that are being carried out. The territory itself can be built by both children and parents. Children, for example, indirectly build their territory at home. Television is usually a favorite of children when they relax at home. In the public sphere, humans also need privacy and territory.

**Public Spaces and Privacy Spaces** – Privacy is the desire or tendency towards someone not to be disturbed by their loneliness. To be able to find privacy, one must be skilled at balancing one's desires for the desires for others and the physical environment around them. Amos [9] argues that privacy is the ability of a person or group of people to control their interactions with others visually, caudally, and olfactory to get what they want. Westin [10] says that sometimes we also want to be in solitude with someone or several people we choose.

**Monochronic Behavior and Polychronic Behavior** – In his book entitled The Silent Language, Edward Hall formulates two different ways of using time, namely monochronic and polychronic. Monochronic is a characteristic of the behavior of people that do one thing only at a time and cannot be disturbed by other activities. Meanwhile, polychronic behavior is
behavior that involves a lot of communication with other people, so that they can do various things at one time. By using time of polychronic, various activities can be interspersed with other activities so that they are not boring.

**Formal Space and Informal Space** – As previously discussed in the discussion of fixed feature space and semi-fixed feature space, informal space is a space that is formed only into a short time, and occurs outside of awareness. Called an informal space not because this space is not important. However, in fact, a lot of space is created immediately for certain activities. Informal space can give the main character of a culture. Usually, informal spaces are formed when a community has a fixed gathering place.

**Ease of Access** – This element is an important element, because the easier the location is accessed by many people, the higher the level of benefit of public facilities in it. Public spaces should be easily accessible both physically and visually by potential users.

**Use of Environmental Affordances** – Gibson [11] said, humans learn to detect the value or meaning of something, perceive different objects, categorize, then note their differences and similarities and even learn them for themselves regardless of what they are studied for. People will be interested in the use of environmental affordances according to their values and motivations, depending on previous experiences and also on the advantages they see when they carry out these activities. The overall results of the observations are summarized in the final table by selecting what aspects need to be considered for designing a public furniture in each area, based on a study of environmental dimensions, time dimensions and aspects of human behavior.

Pedestrian Ir. H. Djuanda street will function as a public facility for the community requiring some public furniture in it. In this study, the pedestrian street Ir. H. Djuanda with the boundaries of the area used as a car free day areas (from Simpang Dago to Layang Pasupati Underpass in Figure 1).

**Figure 1. Research Limits Simpang Dago to Layang Pasupati Underpass**

4. Discussion

4.1. *Ir. H. Djuanda Street (area car free day) during the Covid-19 Pandemic*

The car free day areas was chosen because of the use of seating facilities on the pedestrian Ir. H. Djuanda has a high intensity of use for the car free day. During the Covid-19 car free day pandemic H. Djuanda or commonly known as CFD Dago had to be temporarily stopped to prevent the spread of the corona virus. Usually, Dago's CFD activities are always crowded around Bandung residents and used for relaxing and exercising. This activity takes place from
06.00 to 10.00 WIB on Sundays. Although the Dago CFD was eliminated, currently there are many sports activities carried out by residents throughout the area. Cycling activities is currently becoming a new trend during the Covid-19 pandemic, so the Dago CFD area has experienced an increase in cycling activities that occur in it as shown in figure 2. This research tries to connect the design of the existing seating facilities on the pedestrian of Ir. H. Djuandastreet with the behavior and activities that occurred during the Covid-19 pandemic.

![Figure 2. Cycling activities at Ir. H. Djuanda Street](image)

4.2. Seating Facilities Ir. H. Djuanda Street Bandung (car free day area from Simpang Dago to Pasupati Underpass)

Based on the survey results, there are several types of seating facilities found along Pedestrian Ir. H. Djuanda Bandung. The west side of the pedestrian is dominated by iron frame picnic chairs with wooden chairs and tables (table 1, no.3). The East side of the pedestrian is dominated by four chairs and a table made of iron (table 1, no.2). Apart from the two dominating types, there are other types such as garden chairs (tables 1, no.4 and 5) and concrete cubes (table 1, no.1). After knowing the types of seating facilities available, then an analysis of each type was carried out based on 15 aspects (table 2).

| No. | Types of Seats                                      | Picture |
|-----|----------------------------------------------------|---------|
| 1   | Concrete cubes / blocks                           | ![Concrete cubes](image) |
| 2   | 4 chairs and a round table iron frame             | ![4 chairs](image) |
| 3   | Iron frame picnic chair                           | ![Iron frame picnic chair](image) |
| 4   | Iron frame garden chairs, wooden plinth and backrest | ![Iron frame garden chairs](image) |
| 5   | Iron frame chair                                  | ![Iron frame chair](image) |
Table 2. Aspects were analyzed on the seating facilities based on their type

| aspect | comfortable | sturdy / strong durable material | sturdy / strong durable material | sturdy / strong durable material | material is not durable |
|--------|-------------|----------------------------------|----------------------------------|----------------------------------|-------------------------|
| 1      |             |                                  |                                  |                                  |                         |
| 2      |             |                                   |                                  |                                  |                         |
| 3      |             |                                   |                                  |                                  |                         |
| 4      |             |                                   |                                  |                                  |                         |
| 5      |             |                                   |                                  |                                  |                         |
| 6      |             |                                   |                                  |                                  |                         |
| 7      |             |                                   |                                  |                                  |                         |
| 8      |             |                                   |                                  |                                  |                         |
| 9      |             |                                   |                                  |                                  |                         |
| 10     |             |                                   |                                  |                                  |                         |
| 11     |             |                                   |                                  |                                  |                         |
| 12     |             |                                   |                                  |                                  |                         |

1. comfortable: material is not durable
2. have variety / contrast: √
3. no variation / contrast: √
4. have variety / contrast: √
5. no variation / contrast: √
6. have variety / contrast: √
7. no variation / contrast: √
8. have variety / contrast: √
9. no variation / contrast: √
10. have variety / contrast: √
11. no variation / contrast: √
12. have variety / contrast: √

7. area flow (cross) the path of people: √
8. area non flow: √
9. self conscious design: √
10. un-self conscious design: √
11. socioligual sitting pattern (opposite): √
12. sociopetal sitting pattern (opposite): √
13. according to the topography: √
14. not match the topography: √
15. fixed-featured space: √
16. semi fixed-featured space: √
17. close-up: √
18. intimate-long distance (15.3-71.12 cm): √
19. personal close-up distance (45.72-76.2 cm): √
20. personal long distance (76.2-121.92 cm): √
21. close-social distance (1.21-2.13 m): √
22. social-long distance (2.13-3.65 m): √
23. public-close distance (3.65-7.62 m): √
24. public-long distance (>7.62 m): √
25. high level territory: √
26. low-level territory: √
27. public sphere: √
28. private sphere: √
29. monochronic behavior: √
30. polychronic behavior: √
5. Result
The results of understanding the character of each available seating facility (table 2) are used as a reference for compiling a design that is in accordance with the activities and conditions during the Covid-19 pandemic. The design change was carried out with a focus on adding a bicycle parking function which is also a barrier media that helps users maintain distance (Table 3).

| aspect | behavior | | | | | |
|---------|----------|---|---|---|---|---|
| 13      | formal space | √ | √ | √ | √ | √ |
|         | informal space | √ | √ | √ | √ | √ |
| 14      | easily accessible | √ | √ | √ | √ | √ |
|         | not easily accessible | √ | √ | √ | √ | √ |
| 15      | use of environmental affordances | √ | √ | √ |

**Table 3. Design Development**

| iron frame chair | development variation 1 | development variation 2 |
|------------------|--------------------------|--------------------------|
| ![Iron Frame Chair](image) | ![Development Variation 1](image) | ![Development Variation 2](image) |

| present condition | design development | |
|-------------------|--------------------| |
| iron material / iron structure, seat and wooden backrest | concrete material | |
| can be used by 2 people who do not know each other | spacing | |
| can be used by 2-3 people who know each other | maintained | |
| user facing the same direction | |

- maintains the use of the line element repetitions seen in the current state
- Used for 2 people and 2 bicycles parked in the middle of the user, intended to replace the barrier between 2 users
- can be used by 2 people who know each other or not
- in a position where there is no bicycle parked in the middle, it can be used by 3 people who know each other.
| iron frame picnic chair | design development |
|-------------------------|---------------------|
| iron frame material with a seat and table made of wood | dominant concrete material, the chair uses iron as a supporting structure |
| can be used 2-4 people who know each other | 2-4 people can use them who know each other or not |
| users can sit side by side | additional bicycle parking as a restriction and seat area changed to not allow side-by-side seating |
| user characters can sit opposite | maintained |
| have a table | have a table |
| can be used for 4 people | used for 4 people and 4 bicycles parked in vertical and horizontal lines, as a separator between users in position where there are no bikes parked, each user is still separated from the unit seat design |

| single concrete cubes | design development |
|-----------------------|---------------------|
| concrete material | concrete material, the chair uses iron as a support |
| can be used by 1 person | can be used by 1 person with an additional 1 bicycle park that can be used as a backrest |

| side by side single concrete cubes | design development |
|-----------------------------------|---------------------|
| concrete material | concrete material |
| can be used by 2 people | can be used by 2 people with an additional 2 parking bikes which can be used as a backrest as well as a limitation so that there is no confronting role |
6. Conclusions
Based on the results of observations on the pedestrian of Ir. H. Djuanda street Bandung, especially in the Dago car free day area, found that each activity pattern and different behavior was found based on the available seating forms. The results of these observations are adjusted to current conditions during the Covid-19 pandemic, where design development focuses more on adjusting the distance between users so that there is no physical contact. Basically, the facing direction pattern that occurs to the existing case is maintained. This distance arrangement is regulated by combining the concept of an activity that is currently popular with the Covid-19 pandemic, namely cycling. Bicycle parking is an element that is deliberately presented in every design development, intended as a barrier that functions optimally when users park their bikes in the provided area. If no bicycles are parked, the concrete and iron supporting elements become an indirect barrier or separation between the users of the seating facilities. Changes have also occurred due to several considerations that the current materials used for several seating designs are not suitable for Bandung's climate of high rainfall. The use of wood in some seating facilities needs to be replaced with materials that are more supportive of its outdoor presence. Therefore, the main material is chosen for concrete, this material has the advantage of an easy processing process and an economical price. This material also has the most optimal characteristics for open spaces. Physical characteristics of concrete materials are weather proof, easy to form and strong (concrete is reinforced by an iron frame and wire).

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