

Urban Street-Side Usage Model and Conflict Determinant in Indonesia

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ABSTRACT

Street-side Space Usage Management has not been well implemented and replicated in Indonesia. It is necessary to study the conceptual model of usage conflict. This research was inspired by the conflict tendency in The Shared use Street of Karndacharuck's concept. A qualitative rationalistic paradigm and expert opinion interview was implemented as the research methods. The study objects were some road segments that have generating activities with various levels of street-side conflicts on the cities in Surabaya, Jakarta, Surakarta and Bandung. A model of street-side usage was constructed to simulate generating activities, supporting activities, motorized and non-motorized traffic, motorized and non-motorized access. Street-side usage models that focus on comfort disturbances, safety risk and traffic congestion as the dimension of conflicts, produced four conflict determinant variables. Firstly the Size and space for approach and use (sufficient space to approach and use the place); secondly, the uncontrolled development of activities center; thirdly, Inadequate or lack of facilities and infrastructure for supporting activities; fourth, the inconsistency of public commitment to the use of street.

Keywords: Indicator, Shared Use Street-side, Conflict, Model, Measurement, Shared responsibility

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I. INTRODUCTION

1.1 Background

Street-side space is an element of the street, consisting of pedestrian path, bicycle lane, and supporting space [1]. Loukaitou-Sideris & Ehrenfeucht [2], argued that pedestrian paths are a part of urban forms in public lands have got less attention. In Indonesia, some urban streets are not equipped with street-side elements. If any, they do not function properly as pedestrian lanes. In general, urban streets have excessively utilized by various activities without considering the original uses and rules, such as street vendors, illegal building & parking, business activities, excavation for fiber optic cable, drinking water pipes, and urban gas pipeline so that pedestrians are obliged to walk on the edge of the street, shared with vehicles. Thus, the uncontrolled activities often cause hazard and traffic congestion [3, 4].

The situation were aggravated by the exorbitant land-use change. When a new urban activity was created, it always attracts possible users or visitors. More visitors attracted, the more street-vendors invade the area. They create simple stall selling merchandise in the strategic location, visible by the visitors. There is transaction and if they succeed in trading, there is tendency to expand and further settle in the vicinity.

1.2 Statement of the Problem

The street-side space originally was designed as the part of the road, for the pedestrians and bicycle riding usage. The design is completed in general ways (normative, universal, massive), regardless of the dynamics of informal sector activities in the context. The uncontrolled activities often reduce the road design capacity and create conflict.

Many international regulations, and guidelines, always portray the ideal street-side condition. On the other hand, they are difficult to implement in the developing countries context [5]. Further, Kusbiantoro [6] also argues that pedestrian facilities on urban road systems are very urgent, while Hidayat [7] emphasises street vendors to be accommodated because their important role in the urban economy.

1.3 Purpose and Significance

This study aims to examine the conflict phenomenon that occurs between static activities and motor vehicles in the shared street-side. It explores and analyses the conflict mapping and conflict indicators supporting the consensus model of street-side usage model (based on the conflict settlement). The study was conducted extensively in Surabaya, Jakarta, Surakarta and Bandung. The research's location criteria selection are the location with variety of activities obstructing of street-side uses.

The significance of the study is to establish indicators to measure and prevent conflict in the Shared Used Street. The results of study are to contribute of a model and set of indicators for conflict measurement and prevention in the street-side use.

II. LITERATURE REVIEW

2.1 Shared use Street

Many studies on Shared-Use-Street discussed on the ideal condition, factors and design indicator of the shared-use street-corridor. This research was focused on the social conflict and/ or transportation conflict caused by interaction among the street-side activities. The theory is built based on the theory of Shared Use Street from Karndacharuk, et al. [8].

Shared Space is a design approach and utilization concept of public spaces. Its purpose is to contribute the socio-human activities within the public domain, with reducing the vehicular traffic [9]. Shared Space is a common space used by humans in urban environments to enjoy the safe and accessible daily life. The space are used for social interaction, while restricting car traffic and reducing the speed. The regulation must be followed by behavior changes of all road users, the design as well as appropriate public spaces design [10].

The Karndacharuk concept of Shared Use Street theory explains the spatial interactions with the Venn diagram. The diagram explains the space usage between commercial activities relationship to the existing transportation system, and using Place, Mobility and Access parameters in Shared Use Street. The prevailing Shared Use Street theory in the developed countries was not applicable for developing countries because of social and transportation conflicts related to the informal sectors.

2.2 Conflict

According to Hoban [11], the notion of conflict is a natural disagreement caused by different individuals or groups in needs, perceptions, feelings, emotions, attitudes, values, beliefs, or strengths. Meanwhile, Mantha [12] states that conflict is an expression of disagreement between individuals or groups of different attitudes, beliefs, values or needs, in which the parties involved perceive a threat to their needs, interests or problems.

Street usage conflict was categorized into social conflict and transportation conflict. Social Conflict is a disruption of the use of street-side space on social activities, by means of comfort disorder [13]. Meanwhile, the definition of traffic conflict by Amundsen and Hyden in Ambros [14], is an event involving the interaction between two and several road users who become closer between each other within the similar space and time. The conflict eventually will create accidents if their movements directed away (with braking or turning away). Both conflict parameters were observed as the conflict indicators.

2.3 Development of systemic model and filling the theory gap

To develop the systemic model, the research used Vensim software tools. Vensim is suitable because able to map out the large system, with many complicated interactions. Vensim was used to perform system analysis considering into account the interdependency between their factors (Ford & Lerner, 1992 in Thelen & Smith [15]).

In the process, the absent of information in the theory was responded with information gathering as well as assimilating related theories. The interrelationship was later aggregated into the sub-dimensions, variables and / or theoretical indicators of research to answer the gap [16]. Lastly, the Vensim software ability in performing dynamic system analysis was not used in this study.

III. METHODS

3.1 Research Approach and Category

Deductive - Inductive approach was selected in the research design. The case study strategy, mono method and qualitative rationalistic is applied in the research (Saunders, et.al, 2011, in Saunders and Tosey [17]). Research steps of the study are described in the following sequence. The study began with collecting field problems based on the existing phenomena. Later the study tried formulating the problem based on the conflict theory and stakeholder's expectation.

Research parameters were determined based on conflict analysis. The subset of parameters was extracted from theory and observation. The causal relationships were redrawn using the Vensim software. The new sub-parameter (which were not stated in the theory), were later assimilated in the causal model. This step was

conducted with the coding process (open coding and axial coding) to identify the linkages, similarities, and differences [18]. Vensim software was selected because of its capacity to create systemic thinking and describing interdependent interactions.

3.2 Validation of Model and Conflict Determinant Factors

Qualitative data (from interviews and object observations) were analyzed and interpreted based on qualitative approaches [19, 20, 21]. Transcripts of interviews and field notes were coded with keywords to identify supporting parameters identified from theories [18].

The analysis was focused on how the initial point of conflict and the organization. Later the relationships and interactions among key stakeholders were also mapped. Qualitative analysis was performed to analyze the symptom of the discoursed situation with a logical testing.

IV. MODEL DEVELOPMENT

The research framework follows Fig. 1 and described in the following sub-sections, started from Literature and desk study as the input, to get the conceptual model. Continue with data collection from the field observation and expert opinion, data analysis and evaluation, finally to get the output.

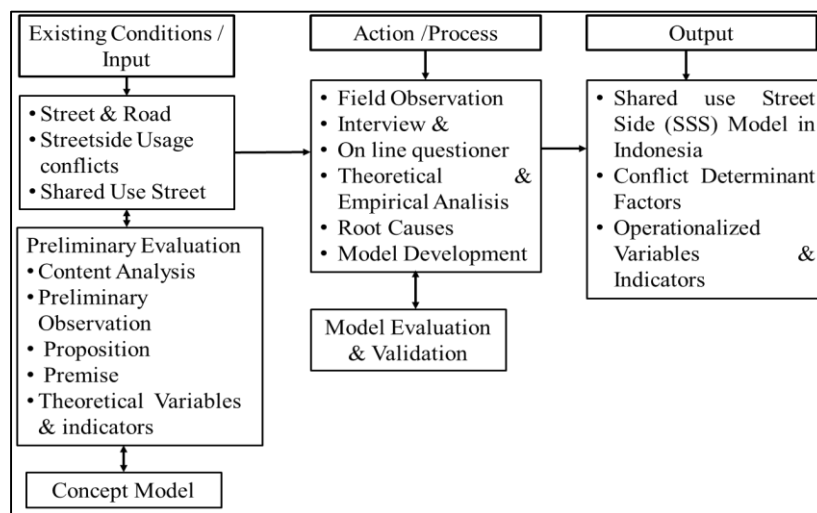


Figure 1. Theoretical Framework

4.1 Premise of urban street-side space usage conflict.

The underlying premise of the model is "the concept of shared use street can not be applied in the context of limited space, too many activities and lack of time management, because of the possible conflict", so the separation of uncontrolled activities has to be done to create sharing in the street-side space.

Firstly, if the spatial arrangement for by traffic movement (Mobility) is utilised for static activities (street vendors) (Place), the risk of safety is going to be increased. Secondly, if a space for vehicular traffic access (Access) is occupied static activities (street vendors) (Place), the disturbance of comfort is going to be felt. Thirdly, if the space for traffic movement used entering the center of activities, a traffic jam is going to happen (See Fig.2)

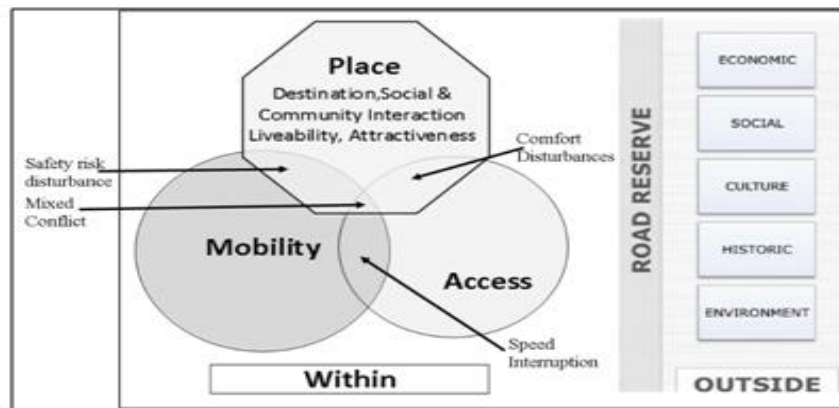


Figure 2 Social and Transportation Conflict in Concept Model of Shared Use Street (After Karndacharuk [8])

4.2 Venn and Box Diagram and Space Model

Utilizing street-side space and reducing the vehicle traffic are the key concept to create shared-use space in adjacent of the urban center of activities. Both of the mitigation will reduce the possible conflict and create economic activities in the places.

The road is defined as the infrastructure of land transport covering all parts of the road, including complementary buildings and equipment intended for traffic [22]. The traffic is later defined as the movement of vehicles and people in space Road traffic [23]. The aim of the study is to construct a model to regulate the vehicles and people movement, (or motorized traffic movement and non-motorized traffic movement).

To further dissect the conflicts of street-side usage, the concept of shared-use street model is redesigned as with certain sub-parameters. The Place concept is classified into spatial of the Urban Center of Activities (P1) and space for the supporting functions [such as street vendors] (P2). Secondly, the space for mobility (Mobility) was categorised into space for motorized traffic (M1: motorized movement) and Space for non-motorized traffic [or pedestrian] (M2: non-motorized movement). Thirdly, space for the building access was categorised into motorized vehicle access space (A1: motorized access) and non-motorized access space [or pedestrian access] (A2: non-motorized access). Lastly, Conflict (C) was defined as the potential contention between the six sub-parameters. These sub-parameters were derived from the observations and interviews.

The Box and Venn Diagram Models, in Fig. 3 as well as the Street-side spatial model in Fig. 4 reveal the above phenomena explaining the meaning and position of sub-systems as follows: The proposed concept is "The similar spatial is not be able to be used for different activities at the same time". There are several conflict between static and movement activities, and between motorized and non-motorized traffic in the street spaces of major cities in Indonesia. The conflicts occur because of too many uncontrolled activities exist in the limited space with different nature (speeds and intentions).

The inter-relation of human activities framework in the Place-Mobility-Access dimension, (described in Fig. 5) was constructed with the redefinition of sub-parameters:

- Based on its speed, human activities are categorized into two, ie Non Movement and Movement Activity
- Based on the type of activity, the Place are categorized into two, as the main activity or generating activity (P1) and supporting activities (P2)
- Based on the type of mobility mode dimension, The Mobility aspect are categorized into two, as motorized movement (M1) and non-motorized movement (M2),
- Based on unity of movement, Access aspect are also categorised into two, access of motorized traffic from M1 to P1 is called A1, while non-motorized traffic access from M2 to P2 is called A2

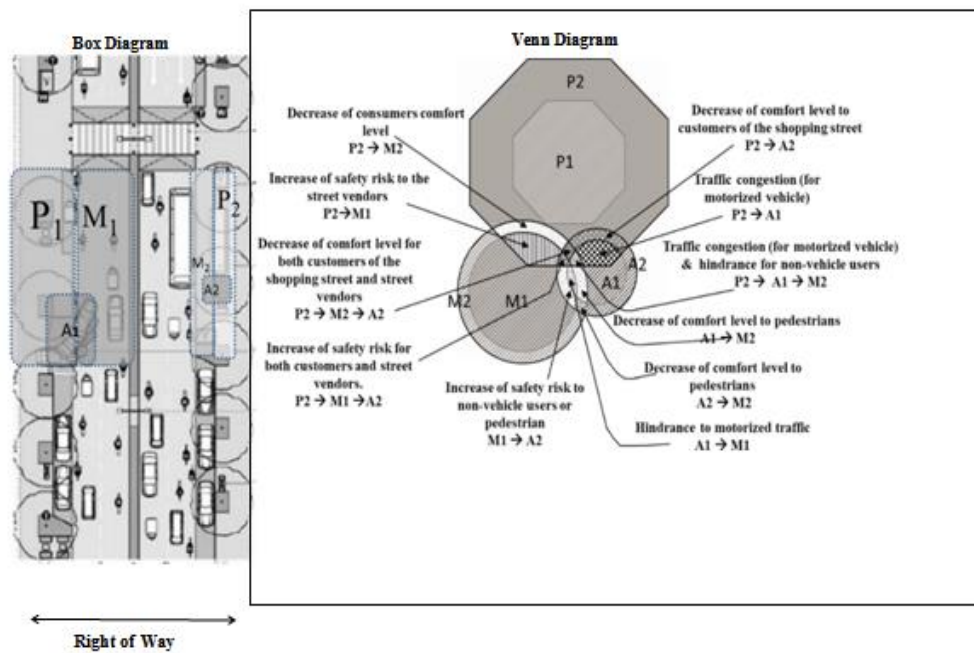


Figure 3 Box Diagram and Venn Diagram of Street-side Usage Models

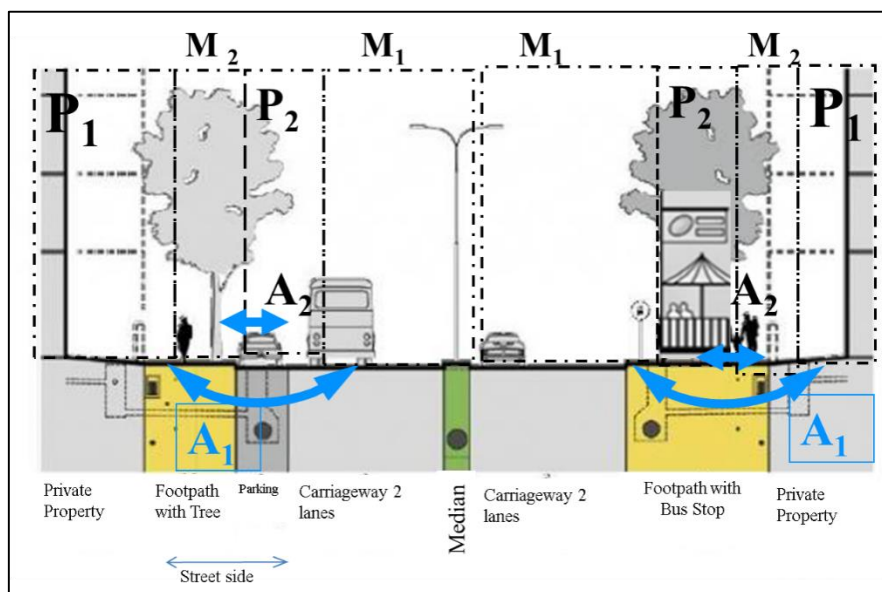


Figure 4 Street-side Space Model (After Rehan [6])

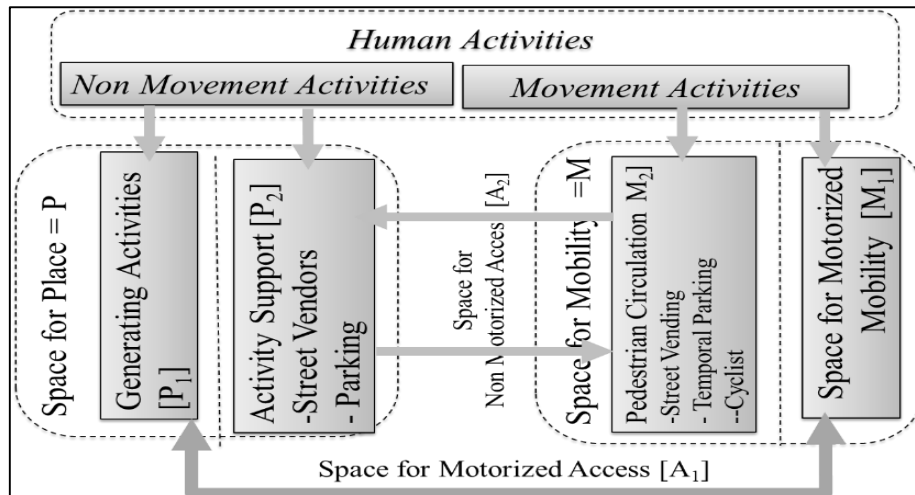


Figure 5 Theoretical Framework of relationship structure between human activities on the Place, Access and Mobility Variable. (Source: After Dobbin [25])

4.3 Theoretical Variables and Indicators of shared use street conflict

Based on the literature review, thirteen indicators are found related to conflict incident. The 13 sub-variables were able to be used for identification of conflict. From these thirteen sub-parameters, seven indicators actually represent public place-making variables, three indicators represent mobility variables, and three indicators represent access (Fig. 6.)

The categorization of parameters from Shared-use Street theory in Fig.6, is constructed based on the understanding of the three dimensions of research, namely Place, Mobility and Accessibility as follows: Place is a link between people or individuals and certain places [3], in which both of them interact marked by behaviour and actions.

The place attachment also shows the functional relationship between community dependence and place [26]. The concept of place attachment can define as the bonding between the person and place because of the experience of physical context. This place attachment affects the perception of people, so the Place-making variables represents the Place dimension.

Mobility refers to the movement of people or goods in integration in transportation system, which relate to the speed. The mobility concept focuses on uninterrupted flows of road users to a location, provision of road access and good delivery service.

Access is a physical means / connection that allows traffic or passing which can generate economic and social activities [27]. Access concept focuses on ease of access, for motor-vehicle and pedestrians. In addition, it refers to the people walking without of any disturbance. To ensure the local-scale accessibility of the streets, they should have sufficient width, flat footways, transition zone, entrance and exit gate, as well as path way.

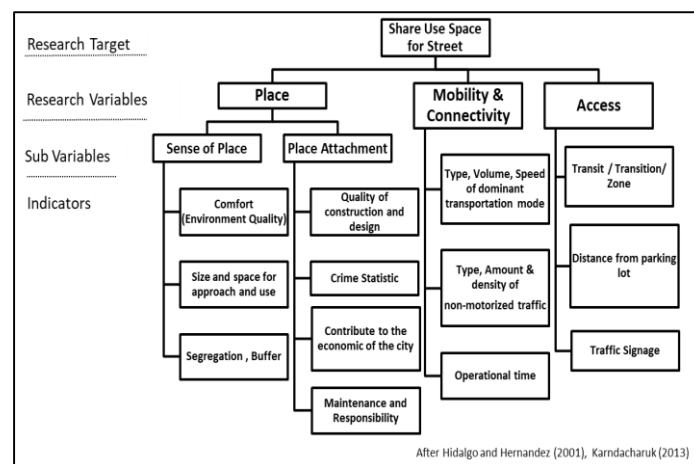


Figure 6 Structure of Theoretical Variables of Shared Use Street

V. RESULTS AND DISCUSSIONS

5.1 Conflict Analysis

From observing various streets in major cities (Surabaya, Jakarta, Bandung and Surakarta) it can be concluded as follows:

- More than 50 % of informant agree that a street-side usage conflict happens in uncomfortable and unsafe users feeling and traffic congestion. There fore the three variables are key variables.
- The street-side usage in Indonesia is uncontrolled. It grows naturally because of economic demand of middle to lower income society. Lack of commitment & consensus on Shared-use Street are found causing this.
- Several types of buildings causing to the conflicts are: Activity Centers (P1) for commercial or residential and limited space of Supporting Activities, especially street vendors(P2).
- The determinants of the conflict of Street-side Use are the width of Right of Way (ROW), informal economic activities, the proximity to the Activities Center, the continuity of commitment in managing public space.
- Social sub-factors of conflict determinants that need attention: Representing Aspects of Consensus and Community Participation: Commitment & Consensus for cooperation, Readiness to participate and share responsibility, as well as expectation related to user needs and behavior

5.2 Street-side Usage Model in Indonesia

Using photography recording, secondary data similar cases in developing countries, and direct observation of street-side usage in 4 major cities in Indonesia, the street-side usage conflicts are strongly found happening within locations with limited street-width dimension (see Table 1 below for the facts).

In Developed Countries	In major cities in Indonesia
The Street-side Spaces have adequate space (more than 30 meters of street space width), so the conflict can be minimized by maneuvering	Most of the streets geometric are non-standard. (Right of Way dimension is between 4-14 meters), so the conflict occurs between street-side users because of the limited shared-use space in the same time.
The Street-side spaces have been designed considering on proximity /safety distance between users and mass and speed differences to be used for maneuver and transition area / buffer.	In the design, Street-side Spaces had no considering on proximity and buffer.
Level of public awareness is high, and law enforcement works well	The level of public awareness is low, Law enforcement does not work appropriately

Table 1. Problem Analysis of Street-side Usage

The interpretation results of the above triangulation data analysis, schematic models shown in Table 2 are the conceptual model for urban street-side usage in developed countries (a), in major cities in Indonesia today (b) and the proposed shared use street usage model (c).

(a) Schematic Model and Description of street-side usage in Developed Countries	
	<ul style="list-style-type: none"> - Occupancy of non-movement activity (Place) is consistent to standard size, - Space for mobility and Access function of motorized and non-motorized traffic are sufficient. - The availability of the overall space is much greater than the needs, so proximity between users reduces the potential for conflict. - Movement intersection between supporting activity (P2), non-motorized traffic and non-motorized access (A2), they doesn't result in significant conflicts, as they have relatively similar speed and there are alternative path.

(b) Schematic Model and Description of street-side usage in Indonesia	
	<ul style="list-style-type: none"> - Non movement Activity (Place) occupied street-side public spaces for private interests. - Space for mobility and access function of motorized and non-motorized traffic are not eligible. - Conflicts arise due to the multi-usage of street-side with limited dimensions, thus conflicting with the main function of the road - The points of conflict are: decrease of comfort level for both customers of the shopping street and street vendors, increase of safety risk for both customers and street vendors, increase of safety risk to non-vehicle users or pedestrian, traffic congestion (for motorized vehicle) & hindrance for non-vehicle users
(c) The Ideal Schematic Model and Description of street-side usage	
	<ul style="list-style-type: none"> - Non-movement activities have to be accommodated in the nearest yard (place), so that they do not occupy the street-side public space for private interest - Optimal space reorganizing for mobility and access function of motorized and non-motorized traffic. - Street-side conflicts can be minimized by setting the cooperative commitment among stakeholders

Legend:

- M1: Space Usage for Mobility Function of Motorized Traffic
- M2: Space Usage for Mobility Function of Non-Motorized Traffic
- A1: Space Usage for Access Function of Motorized Traffic
- A2: Space Usage for Access Function of Non-Motorized Traffic
- P1: Space Usage for Generating Human Activities
- P2: Space Usage for Supporting Activities

Table 2 Comparison of Urban Street-side Usage Model Concept

Based on the all the methods above, the resulted Street-side Spaces usage model is usable to assess the conflict occurred in the street-side space, including: P1 (Place of generating activities), P2 (Place of Supporting Activities), M1(Space for Motorized Traffic Mobility), M2 (Space for non-motorized traffic mobility), A1(Space for motorized traffic access), and A2 (Space for non-motorized traffic access). The size and the position of each sub-variable play a dominant role in determining the occurrence level of conflicts.

5.3 Conflict Determinant and Filling the Gap

Activities occurred in Street-side Spaces represent the contention between public and private activities within the public spaces. Based on the interview related to the success and failure of Shared-use Street in many cases, it was found that continuity of commitment is not portrayed in the previous theory of Shared-Use Street.

Revised of sub-variable and indicators of in Fig. 7, was derived from validation of the linkage diagram between of inter-relationship of variables and conflict determinant of Street-side Usage model. These root causes of conflict were described as follow:

- Size and space for approach and use (sufficient space to approach and use the place) are the root causes of conflict. Such as: dimension of Rights of Way (RoW), function of the road, the number of lines and lanes, consistency of the number of lanes, limited space for supporting activities in the activity centers, and the absence of a real-time or virtual (proximity) separation between street users, design quality, user needs and behaviors.
- Development of uncontrolled important urban economy-generating activities attracts supporting activities in the corridors. Therefore, the high level of uncontrolled supporting activities exceeding the spatial capacity of the place disturb the comfort and speed traffic.
- The distance to transit or generating center of activities.
The area nearby to the urban activity center or transit zone has a higher risk for conflict because of economic potential. Therefore, this area can selected for solving conflicts with social consensus.
- Inadequate facilities and infrastructures for serving the supporting activities, nearby the activity center reduces the sustainability of the supporting activities. The facilities needed are public transport facilities, collective parking facilities, the number and capacity of the access-and-exit gate.
- Traffic congestions happened because of motorized and non-motorized traffic maneuvers. The activities often happened in the loading and unloading zones for goods or passengers. They were also found happened in the parcel entrance. The congestions later also cause traffic flow diversion and slower speed (M1). Besides that, the limited dimensions parcel entrance gate of non-motorized traffic often creates hindrance to the motorized traffic.
- The sense of community is the key to success in managing these public spaces. The sub-parameters are the willingness to participate; the policy factors were represented by individual factor, political factors

and social factors. Firstly, the individual factor was found related to the willingness-to-pay and user-need-and-behavior. Secondly, the political factors also found related to the variables of commitment and consensus. Lastly, the social factors were related to the shared responsibility and the use of public space. The Sense of Community plays great role in the implementation of Shared-use Street concept in Indonesia. This is in line with the prescription of Sense of Community, Cilliers & Timmermans [28] that highlight importance of community planning with deep understanding of the social dynamics of place and people.

- Therefore, the determination of the priority user needs has to be connected to the activities and rising opportunities, and government development plan. The participatory process plays greatly in successful the implementation of the concept.

Fig. 8 is the result of tracing determinant of Street-side usage conflict, analyzed from interrelationship diagram in Fig.7, while Fig. 9 is the structure of Variables and Sub-Variables of Street-side Usage Control Models.

Street-side Usage Control Model (Table 1, Fig.7, Fig. 8, and Fig. 9) below are the result of validation with triangulation technique, in the hope that it can be implemented to build Shared use Street-side Model in Indonesia.

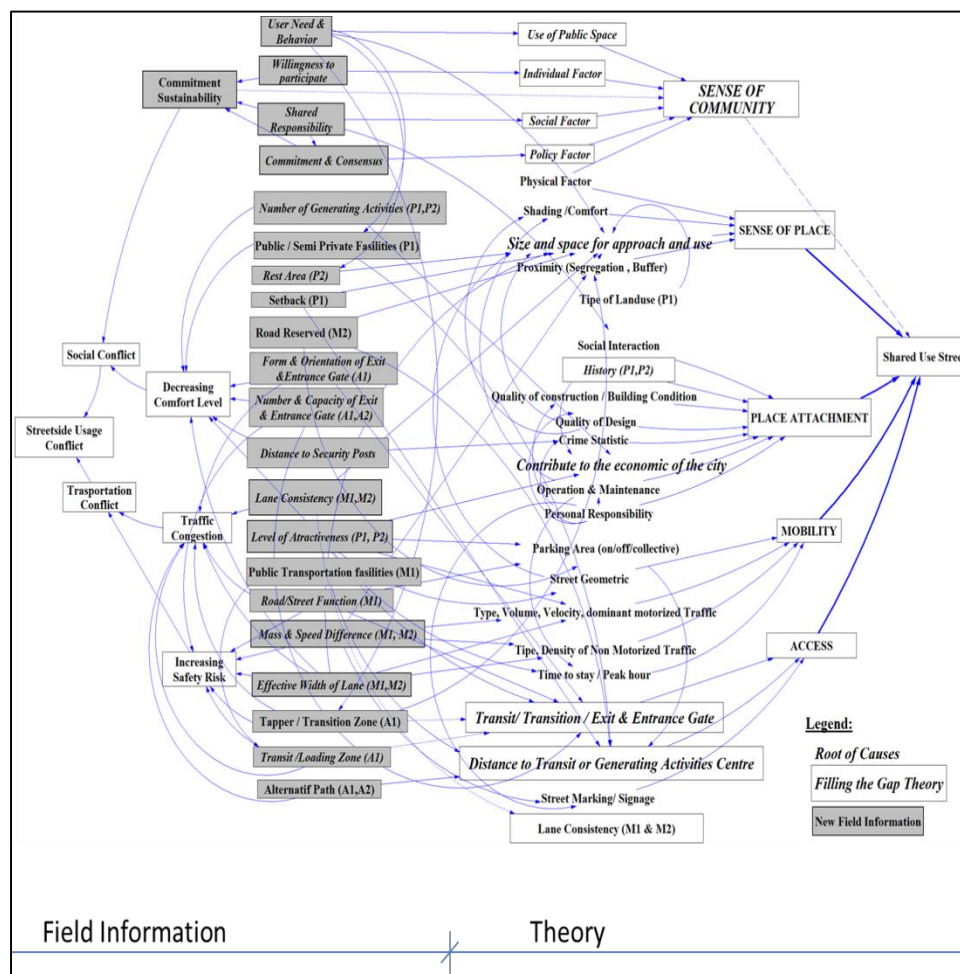


Figure 7. Interrelationship Diagram of Shared Use Street indicators related to the Conflict Variables and Filling The Theory Gap

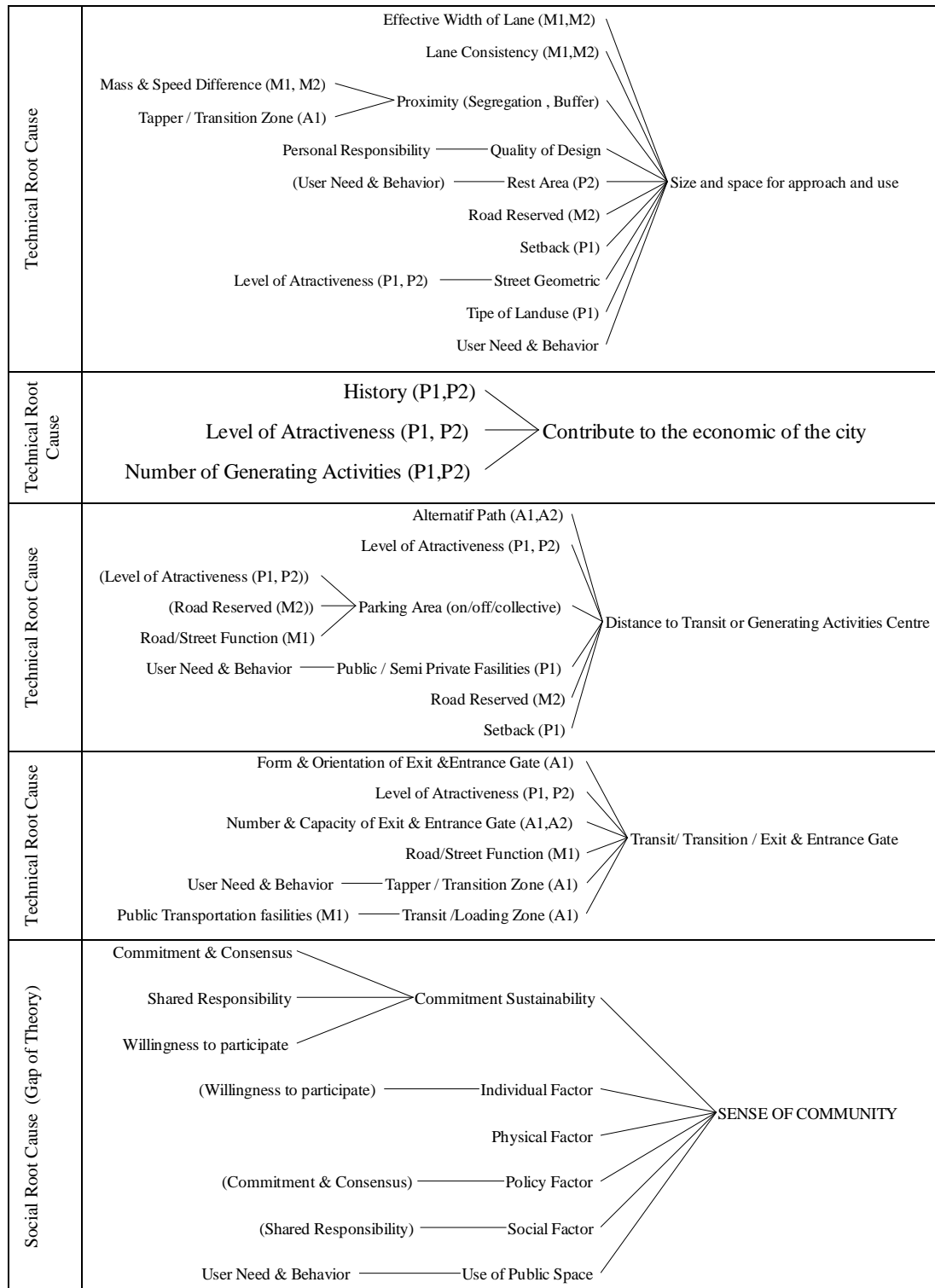


Figure 8 Determinants of Street-side Usage Conflict

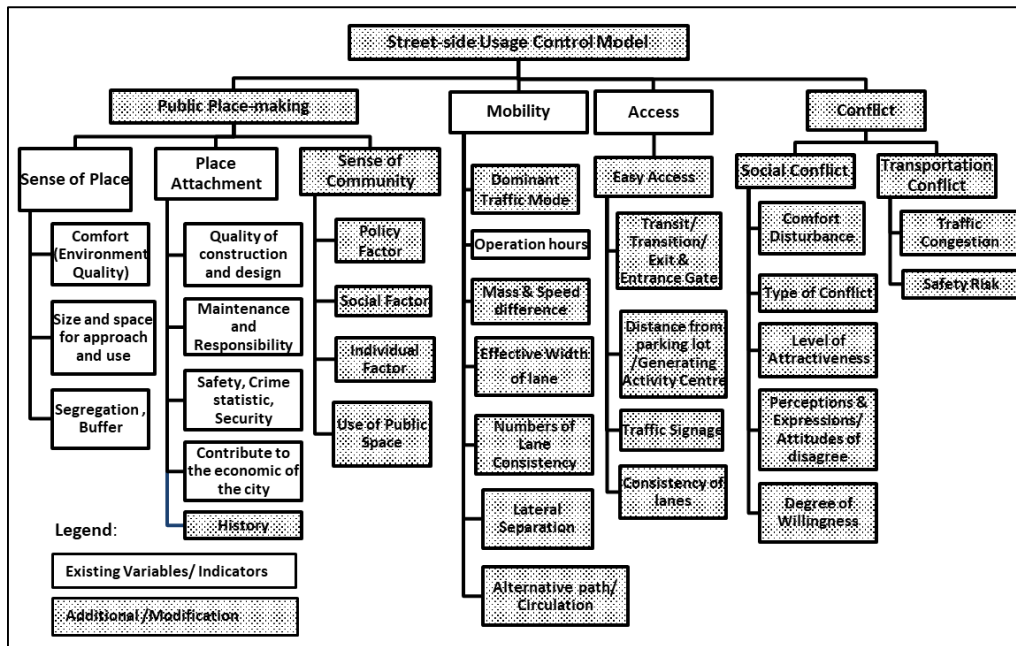


Figure 9 Structure of Variables and Sub-Variables of Street-side Usage Control Model

5.4. Operation of Variables and Indicators.

Operationalization of the variables and sub-variables were derived from Vensim analysis. Table 3 and Table 4 represent the Operationalization of Non-Physical and Physical Variables and Indicators, used as a conflict measurement tool of the Street-side Usage Conflict Model.

Conflict Indicators			
Measurement Validity	Measurement Validity	Measurement Validity	Measurement Validity
Frequency of use	Frequency of use	Frequency of use	Frequency of use
Occupation Duration	Occupation Duration	Occupation Duration	Occupation Duration
Consensus Indicators			
Commitment & Consensus for Cooperation	Commitment & Consensus for Cooperation		Commitment & Consensus for Cooperation
Existing Cooperation Activity	Existing Cooperation Activity		Existing Cooperation Activity
Local Resources	Local Resources		Local Resources

Table 3 Operationalization of Non-Physical Variables and Indicators of Street-side Usage Conflict Model

Motorized Traffic Mobility (M1)	Non-Motorized Mobility (M2)	Motorized Access (A1)	Non-Motorized Access (A2)	Generating Activity (P1)	Supporting Activity (P2)
Road/ Street Function		Orientation, location & Capacity Exit / Entrance Gate		Land Use Types	Occupancy and dynamics of supporting / non-formal activities
				Number of Important Activity Centers	Fence border line
Geometric of landscape		Transit/ Transition/ Loading Zone.	Street-side curb shape	Building Orientation & Condition	Street-side shade level
Speed & Mass Difference			Vertical Segregation & signage separation or road markings		Presence of parking place (on-street, off Street or collective)
Consistency of lanes	Consistency of lanes			Building Setback	Rest Area
Alternative Path	Alternative Path		Distance from parking lot / Activity Center	Economic Attractiveness	Crime/ Security Guard

Table 4 Operationalization of Physical Variables Indicators of Street-side Usage Conflict Model

VI. CONCLUSION AND SUGGESTIONS

6.1 Conclusion

Through a qualitative approach, the research strongly argue that conflicts over the use of street-side in Indonesia can be mitigated with a model of street-side usage developed by this research. The results are related

to philosophical framework of the street-side usage and potential conflict that probably happened. Street-side usage conflict can be assessed and managed by observing five aspects, such as public place-making, mobility, access, social conflicts, and transportation conflicts.

The contribution of the exploratory research is a clear and equitable model of Street-side usage model for conflict prevention. It is supported by conflict indicators, conflict determinant and interrelated factors, which can be used as policy for future Shared-use Street design and management.

6.2 Recommendation

The application of roads and streets concept in Indonesia are still ambiguous. This was detected by observing the same geometric shapes of roads and streets, differing only in size, although the application of functions is almost the same.

Non-standard streets, less than 11 meters of two lanes are indication of the conflict trigger. Narrow streets with collector function and local street status was found in many big cities in Indonesia. Although they do not carry heavy loads from continuous traffic, they provide access to adjacent property and often become an integral part of non-motorized road networks. The improvement of non-standard streets can be done by making it one path only, or decreasing the function of the road and transferring the mobility volume to alternative path according to consensus priority.

Tightening and supervision of building and business permit requirements for business and services have to be equipped with supporting activity facilities according to the type and amount of the needs in their lots or in expanded adjacent unused land. Cul-de-sac system is recommended to anticipate the street-side usage conflict.

The newly built activity center and transit area are absolutely equipped with building setbacks, road reserved, taper, y shape entrance-exit gate, semi-private facilities such as collective parking and alternative pedestrian paths. A private area accessed by the public is proposed as an alternative place to overcome conflict correspond to the prior consensus in the adjacent to the center of activity or transit area, for example using it as a collective parking area or a place for relocating the informal activities.

It is required an engineering as well as social arrangement of street-side usage related to the needs and behavior according to type of land use and network functions as consensus.

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