TERRITORY OF RESEARCH ON SETTLEMENTS AND ENVIRONMENT

INTERNATIONAL JOURNAL OF URBAN PLANNING

23

TEMA

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UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II
CENTRO INTERDIPARTIMENTALE L.U.P.T.

Federico II University Press

fedOA Press

Vol. 12 n. 2 (DECEMBER 2019)
e-ISSN 2281-4574

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TERRITORIO DELLA RICERCA SU INSEDIAMENTI E AMBIENTE
INTERNATIONAL JOURNAL OF URBAN PLANNING

Federico II University Press
fedOA Press

TRIA 23 (2/2019) 51-74/ e-ISSN 2281-4574
DOI 10.6092/2281-4574/6633
www.tria.unina.it - Web of Science (WoS) indexed journal

abstract

Urban System Analysis Through Behavioural Perception: Case of A City in Global South

Mainak Ghosh, Sayantani Saha

Abstract

Cybernetics helps us understanding the nature of urban spaces with environmental and behavioural perception as the fundamental tools. Nowadays, unorganized encroachments of street vendors/ hawkers, slums etc. in urban areas are a growing problem in the developing countries of Global South, leading to conflicts and unplanned characteristics. This paper focuses on organizing the activities related to encroachments of street vendors/ hawkers occupying the sides of busy urban streets, by organizing the behaviour of the end users. An urban place can be analysed along with its users. Users behaviour during different activities gives different possibilities, proximal cues of an area, which can be formulated as self-sustaining and rotating 'System' and 'Sub-sys-

tems'. Street vending/ hawking on a busy urban street is related with many other sub-activities like buying of those goods and travelling simultaneously. These activities create a conflict and a situation of congestion and pandemonium. This paper will emphasise how environmental and behavioural perception can upgrade the 'System and Sub-systems' framed out of these hawking, buying and travelling activities, into an effective and flexible one with reduced nuisances by behavioural change. There is a question, "how people will react if their regular behaviour practice changes, will it be good to them or not?" Sometimes change in behaviour makes their activities easier, it is just the arrangement of what they want, what are the positive cues within their behaviour while doing the systematic activities or what they actually tend to.

Keywords:
Cybernetics & System, Environmental Perception, Behaviour, Hawkers/ Street Vendors, Urban Place.

Analisi del sistema urbano attraverso la percezione comportamentale: caso di una città nel sud globale

La cibernetica ci aiuta a comprendere la natura degli spazi urbani con la percezione ambientale e comportamentale utilizzati come strumenti fondamentali. Oggi, le invasioni non organizzate di venditori ambulanti, gli slums, ecc. nelle aree urbane sono un problema crescente nei paesi in via di sviluppo del Sud del mondo, portando a conflitti e situazioni non pianificate. Questo articolo si concentra sull'organizzazione delle attività relative alle invasioni di venditori ambulanti che occupano i lati delle strade urbane trafficate, influenzando il comportamento degli utenti finali. Un luogo urbano può essere analizzato insieme ai suoi utenti. Il comportamento degli utenti nelle diverse attività offre diverse possibilità, segnali prossimali di un'area, che possono essere formulati come "Sistema" e "Sottosistemi" autosufficienti. Lo street vending / hawking in una strada urbana trafficata è collegato a molte altre attività secondarie come l'acquisto di beni e mobilità. Queste attività creano un conflitto e una situazione di congestione. Questo articolo metterà in risalto il modo in cui la percezione ambientale e il comportamentale può migliorare il "Sistema e sottosistemi" definito da queste attività di vendita ambulante, acquisti e mobilità, in una più efficace e flessibile ottenendo una riduzione dei fastidi grazie al cambiamento comportamentale. C'è una domanda: "come reagiranno le persone se la loro pratica comportamentale regolare cambia, sarà buona per loro o no?" A volte il cambiamento nel comportamento rende le loro attività più facili, esso rappresenta solo la migliore organizzazione di ciò che desiderano fare, dei positivi aspetti all'interno del loro comportamento mentre svolgono le proprie attività sistematiche o ciò che realmente tendono a fare.

Parole Chiave:
Cibernetica & Sistemi, Percezione ambientale, Comportamento, Venditori ambulanti, Luoghi urbani

Urban System Analysis Through Behavioural Perception: Case of A City in Global South

Mainak Ghosh, Sayantani Saha

Introduction

An urban place can be described in various ways, as we relate urban design with behavioural science, the pattern of human psychology directs human behaviour, which in turn creates the sense of place or the sense of belonging. Behavioural urbanism and its related area of study, behavioural architecture, is an interdisciplinary field focused on the interaction between humans and the built environment, studying the effects of social, cognitive, and emotional factors in understanding the spatial behaviour of individuals (Heimsath 1977). Thus, the appropriation of any urban place can be achieved by formulating the environmental perceptions into a systematic manner which can regulate the character of the urban place. However, the whole methodogy is related to 'Cybernetics'.

Cybernetics

Cybernetics is a transdisciplinary approach for exploring regulatory systems—their structures, constraints, and possibilities. Norbert Wiener defined cybernetics in 1948 as "the scientific study of control and communication in the animal and the machine." In other words, it is the scientific study of how humans, animals and machines control and communicate with each other (Norbert 1948).

Cybernetics is applicable when a system being analysed incorporates a closed signalling loop—originally referred to as a "circular causal" relationship—that is, where action by the system generates some change in its environment and that change is reflected in the system in some manner (feedback) that triggers a system change (Norbert 1948).

The essential goal of the broad field of cybernetics is to understand and define the functions and processes of systems that have goals and that participate in circular, causal chains that move from action to sensing to comparison with desired goal, and again to action. Its focus is how anything (digital, mechanical or biological) processes information, reacts to information, and changes or can be changed to better accomplish the first two tasks (Kevin 1994).

Cybernetics basically establishes the connections between the parts of Behavioral Urbanism like environment perception and behaviour, visually processed information, mental maps, proximal cues given by the environment, and the action taken by the users.

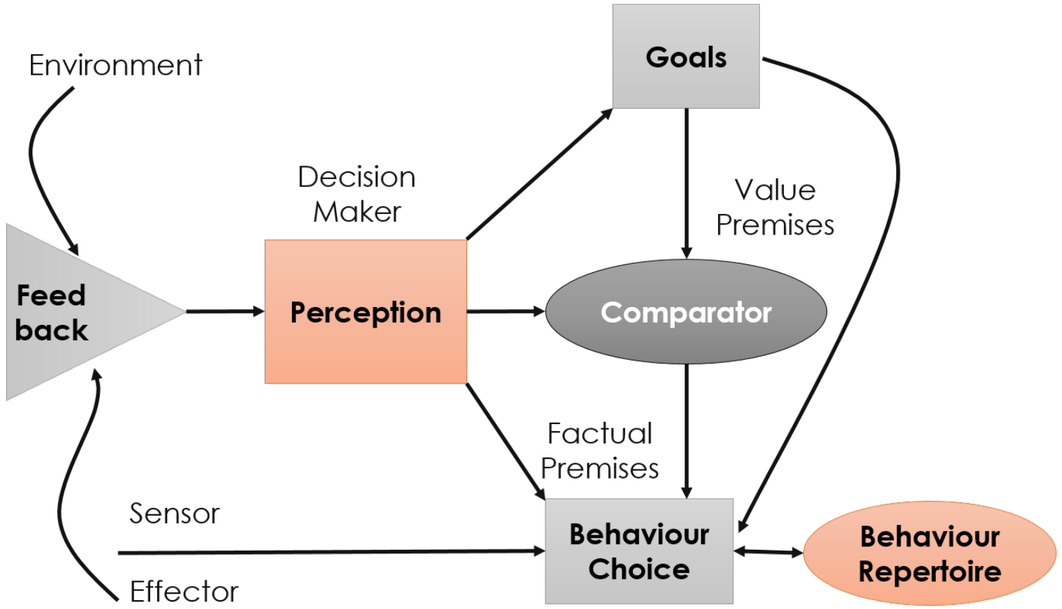

Fig. 1 - Cybernetics and the relationship between its components (Source: Griesinger 1979)

Perception

Perception (from the Latin perceptio) is the organization, identification, and interpretation of sensory information in order to represent and understand the presented information, or the environment (Daniel 2011). Perception depends on complex functions of the nervous system, but subjectively seems mostly effortless because this processing happens outside conscious awareness (Goldstein 2009). Perception is not only the passive receipt of these signals, but it's also shaped by the recipient's learning, memory, expectation, and attention (Richard 1987).

Perception is simply what an individual think of an object/place/state, what information the individual process on the first glance of the same. This sense is unstable, dependent on human behaviour and their mood. Time/State/Location/Person can influence in changing one's perception on something.

Environmental Perception and Behaviour

The subjective detailing of physical and social environments refer to environmental perception, in which the objective world is replaced by a simpler, precise environment. The filtering and collection of the entire necessary sensory data is impossible for the human brain, since it is difficult to assimilate total acreage. In practical terms it pro-

vides for the orientation, comfort and movement of man within his environment (Pocock 1971). Thus, it can be stated that Environmental perception can be used as the tool to estimate spatial behaviour on the basis of 'Mental Maps', which may contribute to plan effective future environments.

The mental map portrays only a portion of real world, since it is impossible for man to have first-hand or even second-hand knowledge of all parts (Pocock 1971). Mental map acts as individual pieces for any spatial information like from part to whole. It works with the 'immediate action space' or 'immediate movement field' and the person involved in it, which dictates daily and weekly pattern of living in a summative manner. Evidence suggests that travel patterns tend to be very stable over time and that the urban information field is small and skewed (Simmons 1968).

Mental maps/images are the core parts that influence human spatial behaviour. it emphasises the relativity of mental images in all stages of the planning process and that it links planning decision-making to a more realistic paradigm of man-environment relationships (Patricios 2008).

Urban Space

The urban spaces are those outdoor spaces that are among the buildings and allow communication, transit and social interaction of the inhabitants within the city. These may be public, semi-public and private, being delimited by the "facing" of buildings and/or natural physical barriers that the clash (sea, rivers, reliefs topographic, etc.). It is in the urban spaces, where the inhabitants are important activities of their daily lives, shedding of public way past events, present and future which mark the history of the city (Franco).

"In the city the first thing are the streets and squares, collective spaces, then come the buildings and tracks. The public space defines the quality of the city, because it indicates the quality of life of the people and the quality of the citizenship of its inhabitants"- Jordi Borja.

This is the cumulative term that means the space of repose/ the spaces where there are no built forms. It means the grounds which we use for roads, parks, plazas, gardens, pools, lakes etc. Urban Place is the space where people breathes or can see the sky. These spaces may be crowded or may be lonely. They just give the cues which in turn creates some kind of mental images on a person's brain and he/she behaves according to that. Space attributes determines human behaviour to an extent.

System, Activities and its relation to Urban Space

Uncertainty of human model that was the basis for most of architectural theories, leads to a misunderstanding of human

environment Nature most of design theories are based on easy going model of deter-

mination –Response of environment and human behaviour relationship in this model, natural are built environment is the motivation and behavior of human is the response for (Watner 1979).

Thus, there is a casual relationship between human behaviour and spatial environments. As per the present or given spatial attributes human behaves based on the mental maps/images processed in their brains. Now, these behaviour effects the spatial environments and again in turn the attributes effects behaviour. So, this is a continuous process related to any kind of human activity within which a 'System' can be formed with subsidiary 'Subsystems'.

Present Scenario of Hawking/Street Vending in Kolkata/India

In the retailing sector of India as well as Kolkata, there are two types, one is 'Organized Retailing' and the other one is 'Unorganized Retailing'. Organized Retailing means trading activities undertaken by licensed retailers (private limited or limited organizations), that is, those who are registered for sales tax, income tax, etc. These include the publicly traded supermarkets, corporate-backed hypermarkets and retail chains, and also the privately-owned large retail businesses (ICRIER 2007).

Fig. 2 - Hogg Market, Supermarket, Kolkata, India

Fig. 3 - Diamond Plaza mall, Hypermarket, Kolkata, India

Unorganized Retailing means traditional formats of low-cost retailing, for example, the local corner shops, owner manned general stores, hawkers, convenience stores, hand cart and pavement vendors, etc. (ICRIER 2007).

A hawker is a vendor of merchandise that can be easily transported; the term is roughly synonymous with costermonger or peddler. In most places where the term is used, a hawker sells inexpensive items, handicrafts, or food items. Whether stationary or mobile, hawkers often advertise by loud street cries or chants, and conduct banter with customers, to attract attention and enhance sales (ICRIER 2007).

There are two patterns of Street Vending/ Hawking in India, one is 'Individual' and the rest one is 'Group'. In 'Individual' hawking hawkers can sell different items individually as per required purpose of surroundings like perishable and non-perishable items for daily needs, food, books, cosmetics, etc. In 'Group' hawking hawkers can sell similar items in bunches or in linear pattern as per required purpose of surroundings/context/ ethnicity like perishable and non-perishable items for daily needs, food, books, cosmetics, etc.

Fig. 4 - Vendors with Permanent Structure, Kolkata, India

Fig. 5 - Hand Cart, Kolkata, India

Fig. 6 - Street Vendors/ Hawkers, New Market, Kolkata, India

Fig. 7 - Street Vendors/ Hawkers, New Market, Kolkata, India

Fig. 8 - Phuchka/ Paanipuri/ Golgappa, Individual, Burrabazar, Kolkata, India

Fig. 9 - Book Sellers, Group, College Street, Kolkata, India

Facts and Figures regarding Street Vending/ Hawking in India

- According to the Ministry of Housing and Urban Poverty Alleviation, there are 10 million street vendors in India, with Mumbai accounting for 250,000, Delhi has 450,000, Kolkata, more than 150,000, and Ahmedabad, 100,000.
- Most of them are immigrants or laid-off workers, work for an average 10–12 hours a day, and remain impoverished (ICP, SIOR 2008-14).
- In India, street vending makes up 14% of total (non-agricultural) urban informal employment (ICP, SIOR 2008-14).
- Organised retailing was absent in most rural and small towns of India in 2010. Supermarkets and similar organised retail accounted for just 4% of the market (The Economist 2008).

Development Trend in Retail Sector in Kolkata/ India

Modern development trends are based on the globalisation effects, based on the upgradation of the modern system, but this upgradation does not include the present structures of the system, it talks about an orientation or a transformation towards a totally new system. The change from unorganized to organized one, duly neglecting the stakeholders' opinion about the unorganized retailing which occupies the most of the volume of retailing in India. Following are some facts about the present development trend;

- India has highest number of outlets per person (7 per thousand) Indian retail space per capita at 2 sq. ft. (0.19 m^2)/ person is lowest in the world Indian retail density of 6 percent is highest in the world (Indian Retail Sector Report 2014).
- The organised retail market has a share of 8% as per 2012 (Indian Retail Sector Report 2014).
- Over 90% of trade is conducted through independent local stores (Traditional Retail Trade in India 2009).
- A number of merger and acquisitions have begun in Indian retail market. PWC estimates the multi-brand retail market to grow to $220 billion by 2020 (PWC 2012).

Failure in the Modern Development Trade

Failure is on the approaches- "The Top-down Approaches" which are taken up by the Indian Govt. for managing this street vending/hawking on urban streets do not include the participation of the street vendors/hawkers and the users (street shoppers, people)- the major two stakeholders. Some top-down considerations are as follows as per Street Vendors Act, 2014, Govt. of India:

1. All street vendors will be accommodated in a designated vending zone.
2. In case of declaration of a specified area as a no-vending zone, the vendors will be relocated to another area.
3. The local authority may physically remove the vendor and make seizure of goods of such vendors who have not relocated to the vending zones.

A specified vending zones do not allow interaction of people or street shoppers with the buyers and sometimes it erases the traditionality of the unorganised retailing in some cases of old cities in India. Thus, it is the main failure in the Government formulations. Following are some of the examples of the same.

Book Market, College Street, Kolkata, India

College Street is a 1.5 km (approx.) long street in central Kolkata in the Indian state of West Bengal. It stretches (approximately) from Ganesh Chandra Avenue Crossing in Bow Bazar area to Mahatma Gandhi Road crossing (Boi Para Archived 2013). It is the Cultural Book Community of Kolkata or known as 'Boi Para'. It is a street where smell of old and new books mesmerizes while walking through it. College street consists two type of shops; one is the age-old traditional permanent book shops and others are these street shops.

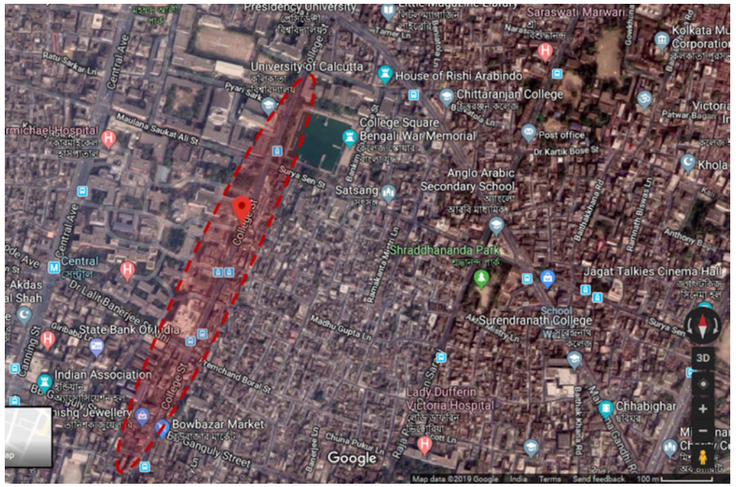

Fig. 10 - Map of Kolkata Showing location of College Street (Map Source: Google Maps, Graphics Source: Author)

Fig. 11 - The Street view of College Street, Kolkata, India (Source: Author)

Figure 12: Street Shops of College Street nent (Source: Author)

Figure 13: Traditional Perma- Book Shops of College Street (Source: Author)

West Bengal State Govt. tried to shift the whole traditional shopping activities of College Street into the newly designed hypermarket/ mall named 'Barnaparichay', Kolkata, India, just at the end of the shopping street. The mall is named after the famous character

Fig. 12 - Street Shops of College Street

Fig. 13 - Traditional Permanent Book Shops of College Street

identification book of Bengali literature written by great philosopher, writer, educator Ishwar Chandra Vidyasagar. This building was meant to be the first book mall of India by Kolkata Municipal Corporation and Bengal Shelter Housing Development (Bengal Shelter). But the fate of this structure became tragedy as this single building is not a sympathetic solution to the environment essence and behaviour of the users and book sellers of College Street. Construction started in 2007, till now, only part one completed, Maximum tailoring and clothing shops are relocated, very few book sellers are relocated.

If the Failure is not the Top-down approaches, then it is only "ill-management" from the stakeholder's side. Lack of necessary infrastructure, facilities, space creates a pandemonium on the footpaths and main streets where the street vending activities happen, leading to severe accidents.

Fig. 14 - Barnaparichay Mall, College Street, Kolkata, India (Source: Author)

Gariahat Market, Kolkata, India

This is one of the famous street markets of Kolkata, can be stated as shopaholic's dream for junk jewellery, clothes and accessories, home making items, utensils of different materials etc. This Market also serve people from the footpath of both sides of the main road. It is situated within a circular precinct of Gariahat Crossing at one end of Rash Bihari Avenue, Kolkata, India. That area has a mixed land usage; ground floors

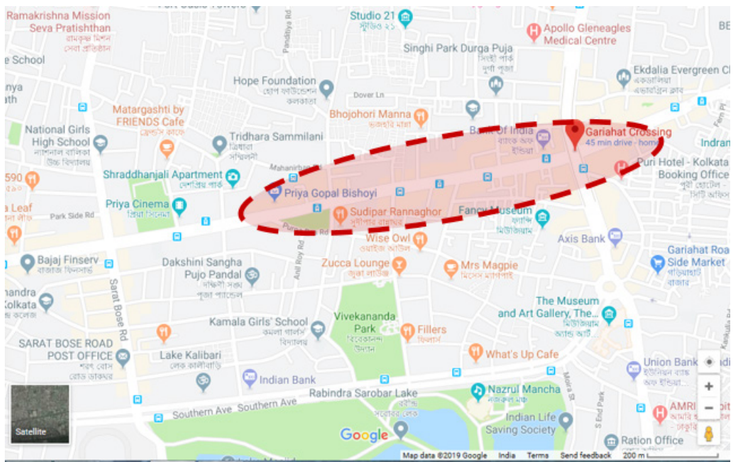

Fig. 15 - Map of Kolkata Showing location of Gariahat Crossing (Map Source: Google Maps, Graphics Source: Author)

Fig. 16 - Street Shops of Gariahat market (Source: Author)

of buildings have permanent shops and on the opposite are the street hawkers. This scenario is same for the both sides of the main road.

The large volume of hawkers and buyers causes ill-management of space usage. Vendors occupy the maximum width of the street, congestion is created on both sides of a main vehicular road, footpaths and pavements become totally covered with temporary shades of these vendors/hawkers, lamp-posts, electric wires, pipe lines, telephone lines become add-ons to the congestion and result to accidents. As a result Gariahat Market caught huge fire breakout on 20th January, 2019. As per The Telegraph India, 22nd January, 2019, "A failure of the principles of urban living after every fire, the government makes pious resolutions and conducts fire safety inspections and then nothing moves." The system of urban living is not only related with the organized part of activities, but also the unorganized part has to be incorporated.

Aim & Objectives

The aim of this paper is Understanding an urban street including hawking, buying, traveling, through Behavioral perception, framing them in system and sub-systems and arranging their parts/cues to make it an adjustable and suitable one as a part of it. Following are the objectives;

- To select a similar place where street shopping and hawking is a pre-dominant factor might be in a small scale.
- To frame a system of activities in the case example area and the sub-systems and the relation between them.
- To find out the detailed factors of behavioural perception of the area.
- To establish the desirable and non-desirable factors within the system and the sub-systems.
- To find out how a holistic and sustainable approach can be established against

the problem by arranging and relocating the desirable factors and eliminating the non-desirable ones.

- To incorporate the unorganized commercial activities i.e. hawking and buying as a part of the organized system.

Case Example

Detail of the area

Case example area is a stretch of Dum Dum Road, Kolkata i.e. from Nagerbazar More to Dum Dum Station Underpass. As the part of one of the oldest outgrowths of Kolkata i.e. South Dum Dum, the neighbourhood is not so called planned and designed. The selected stretch passes just through the neighbourhoods as there are no buffer zones in between a main road and the neighbourhoods, but this is an important node which connects Jessore Road to B.T. Road. Figure 19 demonstrates the selected stretch along with few of its important elements to show the business of the stretch. Here, the red dots just show the most important landmarks i.e. South Dum Dum Municipality, schools, shopping malls, bus-stands, colleges on the surface of the road and the yellow line shows the access to the huge Nagerbazar Market, though there are numerous landmarks on this stretch. This stretch actually gives access to the feeding zones for the feeders in the neighbourhood i.e. to the main traffic terminals (Dum Dum Station, Nagerbazar More), different schools and colleges, markets of perishable and non-perishable goods. Activities related to these events creates different systems. Now, some of these systems are stable configurations and some are unstable.

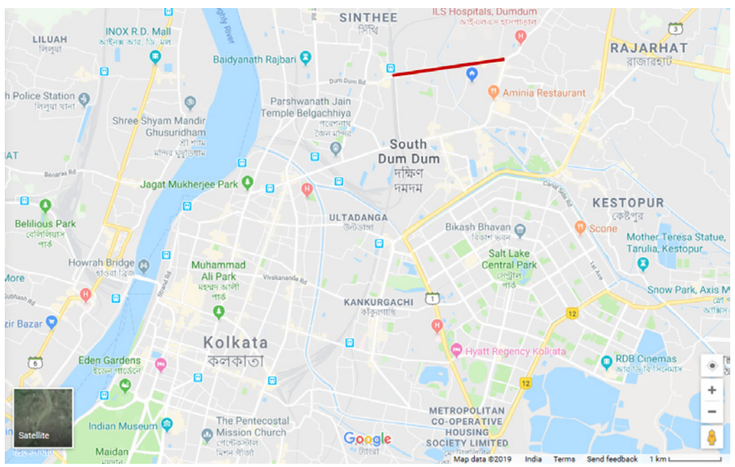

Fig. 17 - Map of Kolkata Showing Case Example Area

Fig. 18 - Details of the Case Example Area

Fig. 19 - Daily Needs and Goods Both Perishable and Non-perishable

Fig. 20 - Flower, Newspaper, other

Fig. 21 - Food Joints at the Junction Of Neighbourhood Street And Main Road

Fig. 22 - Food joints for Breakfast, Lunch, Evening Snacks and Dinner

System and Activities

Following are the System and Sub-systems framed out from the activities of the case example area;

- **Main System -** The whole stretch consists of hawkers on both sides of 15m wide Dumdum road. The position of these hawkers does not change but the purpose of these hawkers' changes. In the morning, hawkers with perishable goods come into act to cater the people from surrounding neighbourhoods. Some of these people are directly coming from the neighbourhood and some are returning with their children from schools. On the next stage, another group of hawkers start serving prepared foods to the people going to their workplaces, schools, colleges and children/guardians returning from different places. From the evening, another group of hawkers start selling fancy elements and foods to feed the homecoming people and students. The activity of hawkers is a Stable System which configures differently for different people for different times of the day.
- **Sub-system 1 -** These junctions, where the neighbourhood streets meet the main road act as differently abled activity zones. In the morning, these zones cater school or college going students/guardians along with their fooding, chatting, etc. At one time in late morning, these zones become meeting points of elderly people to proceed for their marketing, chatting, walking, etc. During the whole day, these zones address the group of workers to avail correct vehicles to reach to their workplaces/returning from the workplaces. These zones remain same, create a Stable Configuration, but the end

users and their activities change.

- **Sub-system 2 -** The fringe areas beside the footpaths between the above stated activity zones act as parking/stands for different end users with different activities. From the late night and up to early morning, extra buses from Nagerbazar bus stand and trucks which serve the perishable market are parked here. From the late morning and up to end of the evening, short distance cars like pull cars for school children, auto/rickshaw/taxi/Toto for workers, local people meant out for marketing and other activities. These parking zones are Stable but the type of vehicles changes as per the purpose of the end users.

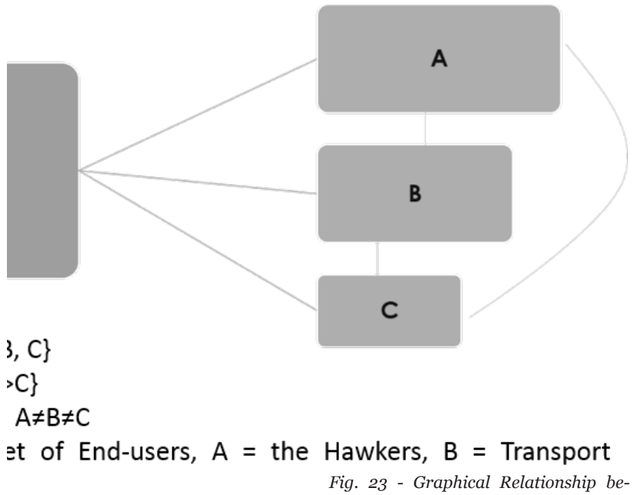

Fig. 23 - Graphical Relationship between the System and Sub-systems

Methodology of Analysing the Systems – The methodology of demonstrating the system and the sub-systems is as follows;

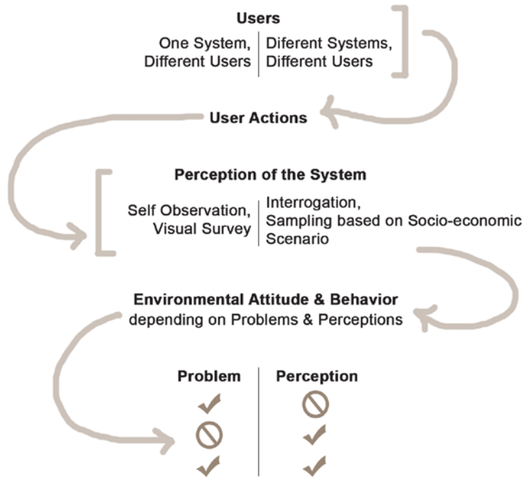

Fig. 24 - Methodology of Analysing System and Sub-systems

Fig. 25 - Demonstration of Main System

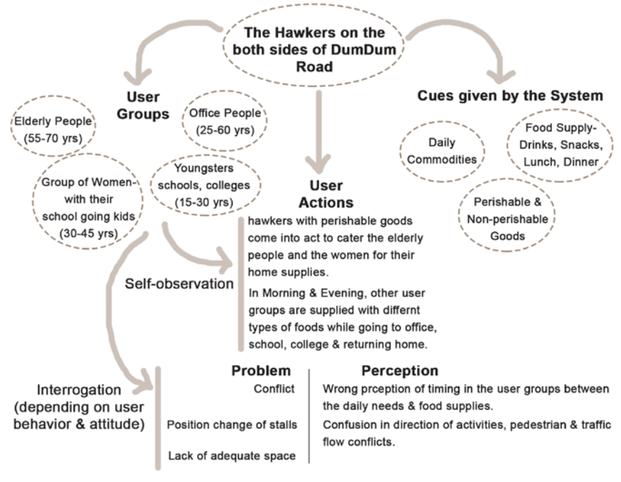

Fig. 26 - Demonstration of Sub-system 1

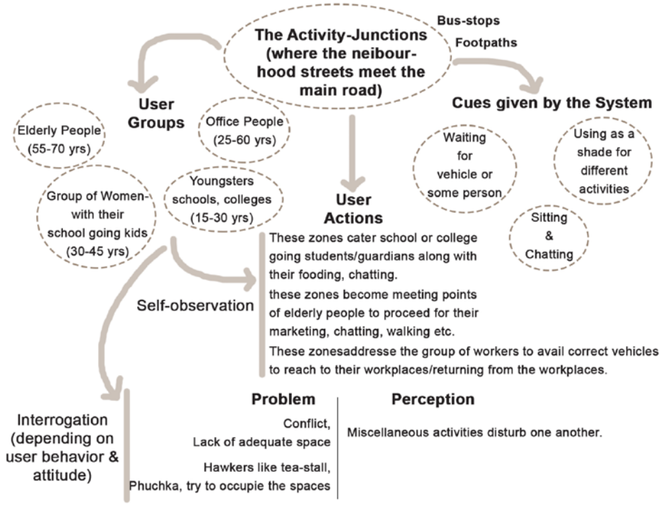

Fig. 27 - Demonstration of Sub-system 2

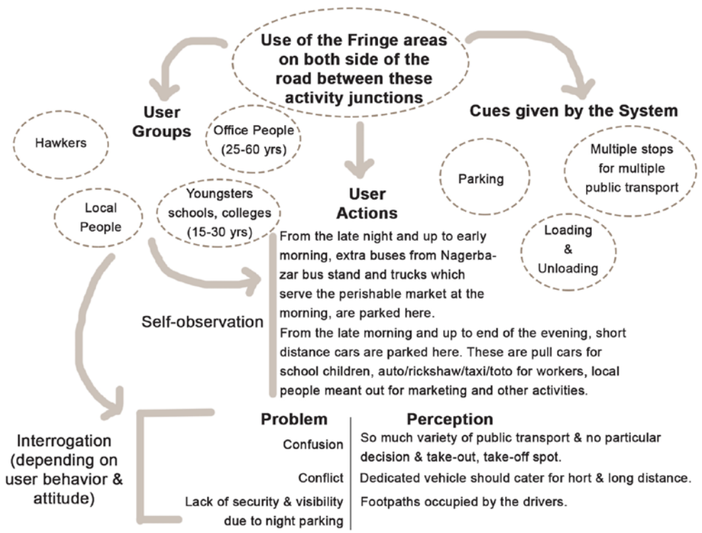

Fig. 28 - Conflict of Street Activities

Fig. 29 - Possible Approach to Solution

Demonstration of the Main System

Environmental Perception and Behavioural qualities

Table 1 - Measurement of Behavioural Perception
(Source: Author)

Sl. No.	Type of User	Grading (desirable/ undesirable)
1.	Elderly people roaming for marketing	Desirable
2.	Elderly people jogging in a group	Undesirable
3.	Students intending to directly catch any travel mode	Undesirable
4.	Students intending to have food	Desirable
5.	Group of women with their children	Desirable
6.	People intending to directly catch any travel mode	Undesirable
7.	People intending to have food/intension for marketing	Desirable
8.	Hawkers with different type of item at different time (e.g. fancy item sellers at morning, breakfast sellers at evening)	Undesirable

Measurement of behaviour focusing the main system by selecting different types of users in the selected area and grading them in two categories: desirable/undesirable;

Analysis of the selected area on the basis of factors influencing the behaviour of the

users. This analysis is done on the basis of factors like Hedonic, Gain, and Normative and Habits.

Hedonic Factors

I. Beneception and Nociception factors-

- The correct need of items at correct times reduces the walking distance of people from their neighbourhoods.
- People could collect/have all the essentials at their way to home or work.
- People could compare different options as this gives them pleasure.
- Increases social interactions.
- Too much of same variety creates chaos.
- These hawkers' activities create obstructions for traveling activities at peak times.
- Sometime people have to cross nodes due to clustering of same activities at one place – create chaos.

II. Appetitive and Aversive factors-

- Need of different types of food at different timing of the day cherishes people.
- Need of different types of perishable/non-perishable items at definite times of the day cherishes people.
- Footpaths sometime dirty and narrow, people have to walk the along the carriageway – creates disturbance.

III. Affect rich- Affect poor-

- Proximity of this road to the Dum Dum station allow sub-urban sellers to gain profit.
- The main markets of Dum Dum road are also open markets and the price distribution of the products is not high among the hawkers and the bounded markets.

Gain factors:

- The hawkers' structures are very cheap sometimes. Municipality had taken some initiatives to give them sustainable, low-cost structures made with recycled items and the use common dustbins to allow low cost behaviour.
- Their own dustbins act as the serving dustbins in the long stretch of Dum Dum road.

Normative factors:

- The place is not designed for hawkers but the walkable stretch between nodes allow walking, chatting, grouping of people which in turn encourages he systematic change in the activities of the hawkers fulfilling the needs of the neighbourhood.

Habits:

- People intend to group/chat over marketing/taking food.

- People intend to have things/food just before/after using the traveling mode to office/school and the neighbourhoods.
- Almost equally distributed neighbourhoods allow people to walk along the street and explore things.

Conclusion

All the parts of the system and the sub-systems are known through this methodology of Cybernetics. Arranging, subtracting or adding parts within the system and the sub-systems can lead to comfortable and stakeholder-friendly solutions. In this paper, Methodology of identifying and analysing an urban problem have been emphasised. There may one or more solutions to this problem of an Indian urban street regarding Hawking, Buying and Traveling, but the ideal system should possess:

- Systematic behaviour can be modified just through arranging the places of the hawkers as per the needs and also preventing the obstruction from the transport activities
- The small food items must be just beside the bus stops at the nodes, then the fancy items/perishable items. After that in the middle of these from both sides, the items which are necessary for all times of the day must be sold.
- Water supply and waste bins should be provided in the middle stretch for the common use of heavy, messy and perishable item sellers, and also in turn do not disturb the nodal activities.
- To change the Behavioral attitude, use of shrubs where the sitting/hawkers is not allowed, permanent spaces for specific type of hawkers and sitting arrangements at specific zones.

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Images Source

Fig. 1 Griesinger 1979;
Figg.2-3-4-5-6-7-8-9-11-12-13-14-16-19-20-21-22-23-24-25-26-27-28-29 authors; Figg. 10-15-17-18 Map Source: Google Maps, Graphics Source: author;
Table 1: authors.

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